Solicitation for:
Main St. Municipal Parking Lot Project
IFB 18-02
City of Woburn, Massachusetts

Posted: August 16, 2017
Due: August 31, 2017 @ 11:00 AM
Questions by: August 22, 2017 @ 12:00 NOON
To: odeluca@cityofwoburn.com

Deliver to:
City of Woburn
Purchasing Department
ATTN: Orazio DeLuca, MCPPO
Chief Procurement Officer
10 Common Street
Woburn, MA 01801

Parking Lot Improvements

Main Street Parking Lot Construction

CITY OF WOBURN

PROJECT MANUAL
for
BIDDERS

Prepared by
The City of Woburn Engineering Department
July 2017

Section 00010
WOBURN, MASSACHUSETTS
"Main St. Municipal Parking Lot Project"
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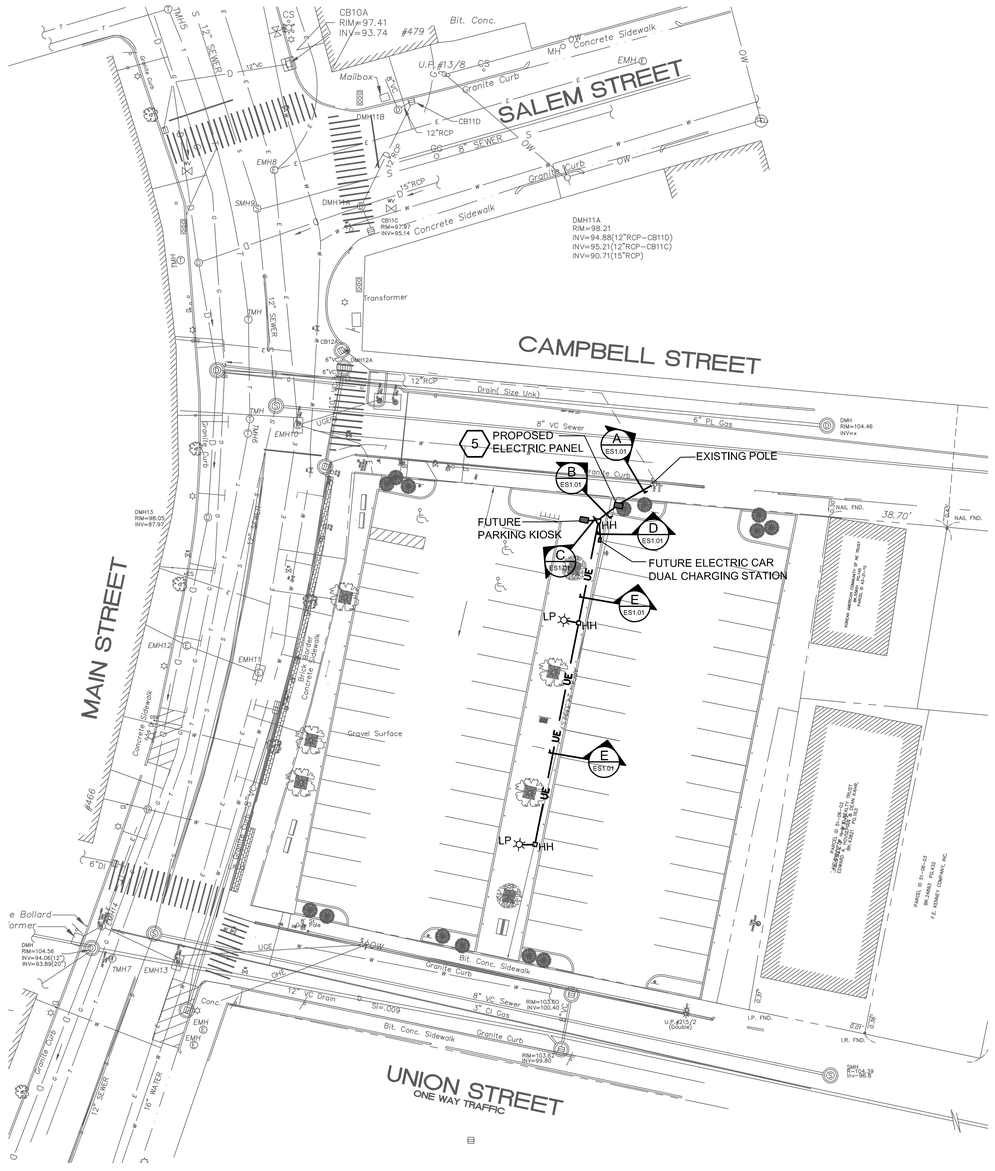
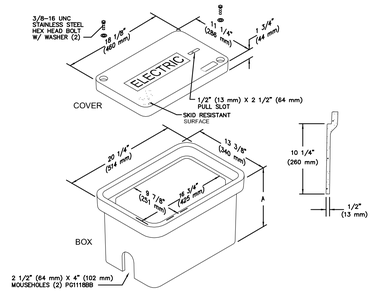
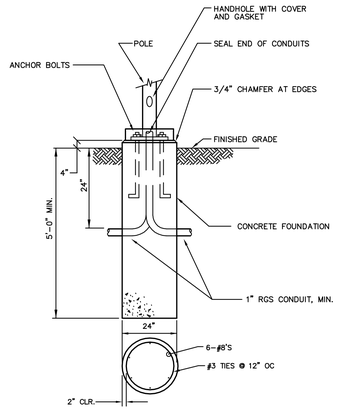


1 ELECTRICAL SITE PLAN
1"=20'-0"



STRONGWELL #PG1118BA12, OR EQUIV.
(#PC1118WA00 COVER)

2 TYPICAL SITE LIGHTING PULL BOX
NOT TO SCALE

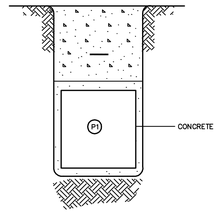


COORDINATE EXACT SIZE AND CONFIGURATION WITH LIGHTING FIXTURE MANUFACTURER.

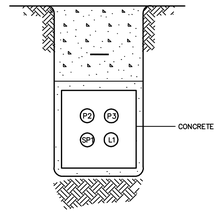
3 SITE LIGHTING POLE BASE DETAIL
NOT TO SCALE

DRAWING NOTES

1. THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.
2. ALL ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WILL ALL APPLICABLE NATIONAL, STATE AND LOCAL CODES AND CURRENT NATIONAL ELECTRICAL CODE (NEC) BY ELECTRICIANS LICENSED IN MASSACHUSETTS.
3. THE ELECTRICAL CONTRACTOR SHALL VERIFY WITH THE OWNER AND UTILITY COMPANY (EVERSOURCE) THE LOCATION AND ELECTRICAL REQUIREMENTS OF ALL EQUIPMENT PRIOR TO INSTALLING ANY CONDUIT AND/OR CABLE.
4. THE ELECTRICAL CONTRACTOR SHALL FOLLOW ALL REQUIREMENTS BY UTILITY COMPANY (EVERSOURCE) FOR OBTAINING ELECTRICAL SERVICE AND APPLY FOR THE SERVICE REQUEST. THE CITY OF WOBURN WILL PAY ALL THE UTILITY CHARGES.
5. THE ELECTRICAL CONTRACTOR SHALL PROVIDE A PAD MOUNTED COMBINATION UTILITY METER, MAIN DISCONNECT AND DISTRIBUTION PANEL FROM B-LINE COMMERCIAL METER PEDESTAL BY EATON MODEL #CMP4121MC-1 (200 AMPS, 1 PHASE, 3 WIRE WITH MOUNTING PAD MODEL #MB1515) OR APPROVED EQUAL.



TRENCH DETAIL A
NOT TO SCALE ES1.01



TRENCH DETAIL B
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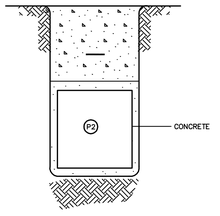

TRENCH DETAIL C
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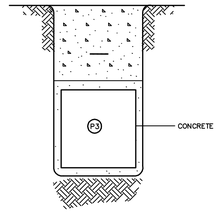
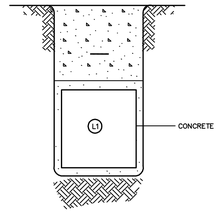


TRENCH DETAIL D
NOT TO SCALE ES1.01



TRENCH DETAIL E
NOT TO SCALE ES1.01

SITE LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER	LAMPS QTY.	LAMPS TYPE	VOLT.	WATTS/ FIXT.	REMARKS	EQUIVALENT BY
LP	SITE POLE FIXTURE	HOLOPHANE WSE2-P30-40K-AS-BK-5-BK-6-HI-PCLL-F POLE - HL-A-14-FTJ-16-PO7-AGB-BK	-	LED 6748 LUMENS 4000K	120V	60W	PROVIDE PHOTOCELL FIXTURE SHALL MATCH WOBURN CITY STANDARD FIXTURES. AUTO SENSING VOLTAGE	TOWN STANDARD

NOTES:
1. ALL 0-10VOLT LED DIMMING DRIVERS SHALL MEET THE REQUIREMENTS OF IEC 60929 AND SHALL HAVE AN ISOLATED 0-10VDC CONTROL CIRCUIT

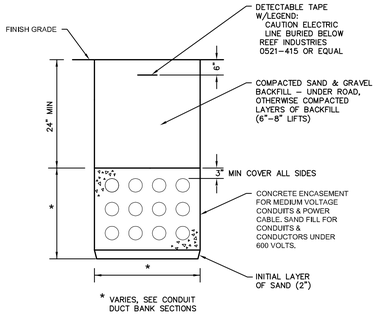
CONDUIT & CONDUCTOR SCHEDULE

CONDUIT	SIZE	PVC	CABLE SIZE	CONDUIT USE DESCRIPTION
P1	3"	PVC	BY UTILITY	MAIN SERVICE FROM POLE
P2	2"	PVC	PULL ROPE	FUTURE PARKING KIOSK
P3	2"	PVC	PULL ROPE	FUTURE ELECTRIC CAR DUAL CHARGING STATION
SP1	2"	PVC	PULL ROPE	SPARE CONDUIT
L1	1"	PVC	2#8,#10G	LIGHTING

PANELBOARD SCHEDULE

BUS SIZE: 200 AMPS
VOLTAGE: 240 V, 1 PH, 3W
SERVICE RATED: YES
SHORT CIR. CURRENT RATING: 65000 AMPS
ENCLOSURE: NEMA 3R
MOUNTING: PAD MOUNT
MAIN: MCB
MOUNTING PAD: MB1515

DIRECTORY	WATTS OF LOAD L1	WATTS OF LOAD L2	CKT BKR AMPS	POLES		CKT BKR AMPS	WATTS OF LOAD L1	WATTS OF LOAD L2	DIRECTORY
LIGHTING	120	-	20	1	2	-	-	-	SPACE
SPACE	-	-	-	3	4	-	-	-	SPACE
SPACE	-	-	-	5	6	-	-	-	SPACE
SPACE	-	-	-	7	8	-	-	-	SPACE
SPACE	-	-	-	9	10	-	-	-	SPACE
SPACE	-	-	-	11	12	-	-	-	SPACE



* VARIES, SEE CONDUIT DUCT BANK SECTIONS

4 TYPICAL TRENCH SECTION
NOT TO SCALE

RFS engineering
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MA: 50 Milk St, 16th Floor | Boston, MA 02109
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Main Street Parking Lot

City of Woburn

Revisions		
Rev.	Issued	Date

Title

ELECTRICAL SITE PLAN

Project No.	8400.001
Drawn By	AA
Checked By	PJC
Project Mgr.	SBN
File Name	8400 ES1.01.dwg
Date	08/14/2017
Scale	1" = 20'

DRAWING NO.

ES1.01

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Section 00020
Invitation to Bid
City of Woburn, Massachusetts
Main St. Municipal Parking Lot Project
18-IFB-002

Sealed bids for "City of Woburn Massachusetts, *"***Main St. Municipal Parking Lot Project***"* will be accepted by the **Engineering Department** acting through the **Purchasing Agent. Sealed bids** will be accepted at the Office of the Purchasing Agent, City Hall, 10 Common Street, Woburn, Massachusetts 01801, until **11:00 AM on August 31, 2017** and at that time the bids shall be publicly opened and read aloud.

The proposed work includes **the construction of a municipal parking lot with a work area of approximately 25,000 SF, including installation of drainage system, site lighting, backfill and compaction, fine grading and paving, landscaping, and appurtenant work.**

The Contract Documents, including Specifications and Drawings, may be examined at the Purchasing Department, City Hall, 10 Common Street, Woburn, Massachusetts 01801, on and after **August 16, 2017** between the hours of 9:00 A.M. and 4:30 P.M., Monday through Wednesday, 9:00 A.M. and 7:00 P.M on Thursday and 9:00 A.M. and 1:00 P.M on Friday. Copies of the Contract Documents may be obtained at the Office of the Purchasing Agent upon payment of **$50.00** (checks only) for each set obtained, for which a refund will be made if returned to the Purchasing Agent in good condition within two weeks after the opening of bids. No refund will be made for documents received after this period. If a bidder requests drawings and specifications to be mailed out to him or her, an additional check in the amount of **$25.00** made out to "City of Woburn" shall be required prior to mailing. This charge is to cover the cost of mailing and handling and will not be refunded.

Each bid must be accompanied by bid security in the form of certified check, cashier's check; treasurer's check or bid bond in an amount not less than 5 percent of the value of the bid. Bidders may not withdraw their bids for a period of 30 calendar days after the bid opening.

Attention of bidders is called particularly to the requirements as to conditions of employment to be observed and minimum rates to be paid under the contract as determined by the Department of Labor and Industries under the provisions of the Massachusetts General Laws, Chapter 149, Section 26-27D inclusive.

Bids must be submitted in triplicate, in a sealed envelope, clearly labeled "Main St. Municipal Parking Lot Project 18-IFB-002", or they may be rejected.

Participation Goals, effective as of July 1, 2011: Pursuant to MGL. Chapter 7, § 40N, the goals for MBE and WBE participation established for this municipal contract, are as follows:

MBE/WBE: Combined Goal of 10.4% of the Contract Price.

In accordance with G.L. c. 23A, § 44 and G.L. c. 7, § 40N, the Contractor shall comply with all applicable requirements for the Work promulgated by the Massachusetts State Office of Minority and Women Business Assistance (SOMWBA). Refer to for further Information: www.somwba.state.ma.us

The successful bidder will be required to furnish a Performance Bond in an amount equal to 100 percent of the contract price and a Labor and Material Payment Bond, in an amount equal to 50 percent of the contract price, for the faithful performance of the Contract. The right is reserved to waive any informalities in or to reject any or all bids received, and to award the contract to any of the Contractors bidding on the work if, in the City's' opinion, the best interests of the City thereby will be promoted.

Complete instructions for the filing of bids are included in Section 00100 of the Contract Documents, Instructions to Bidders.

CITY OF WOBURN, MASSACHUSETTS

Orazio Deluca
Purchasing Agent

Section 00100

INFORMATION FOR BIDDERS

"Main St. Municipal Parking Lot Project"
18-IFB-002

1. RECEIPT AND OPENING OF BIDS

The City of Woburn, Massachusetts, herein called the Awarding Authority, will receive sealed Bids for Construction of the work to be done under this Contract, including the following, all as indicated on the Contract Drawings and specified herein:

A. Furnish all labor, materials, tools and equipment for the project as specified on the attached drawings and specifications.

B. The construction of all incidentals to complete work as described above.

Such bids, addressed to the City of Woburn, and clearly marked " "**Main St. Municipal Parking Lot Project**, **18-IFB-002**" will be received at the Office of the Woburn Purchasing Agent, City Hall, 10 Common St., Woburn, Massachusetts 01801, until the date and time stated in the Invitation to Bid,

2. BID FORM

A. Each Bid shall be submitted on the required Forms for General Bids. These forms shall be removed and submitted separately. All blank spaces for bid prices must be filled in with the lump sum and unit prices for which the Bid is being submitted. **Three copies of the bid forms must be submitted.**

B. Bid forms must be completed in ink or by typewriter. Where so indicated, amounts shall be stated in words and figures. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

C. A Bid which includes for any item a Bid Price that is abnormally low or high may be rejected as unbalanced.

D. A bid security in the amount of 5% of the bid shall accompany each bid. The bid security may be in the form of certified check, cashier's check; treasurer's check or bid bond.

3. AVAILABILITY OF DOCUMENTS

A. Bid Forms and Contract Documents will be available for pick up at the Office of the Woburn Purchasing Agent. Contractors will be limited to one set of bid documents. Additional sets may be purchased for $50.00 per set. Interested parties are recommended to call the office **(781-897-5950)** in advance of pick-up of documents.

4. ALTERNATES

Where Alternates exist in the bid, each Bidder shall acknowledge Alternates on the Form for General Bid by entering the dollar amount of addition or subtraction necessitated by the Alternate. In the event an Alternate does not involve a change in the amount of the base bid, the Bidder shall so indicate by writing "No Change', or "N.C." or "0" in space provided that Alternate.

5. COMPARISON OF BIDS

A. Bids will be compared on the basis of the extended prices (unit price times the quantity) stated in the Bid.

B. In the event of a discrepancy between written and numerical figures in extended prices, the written figures shall govern.

6. WITHDRAWAL OF BIDS

A. Any bid may be withdrawn prior to the time designated for receipt of bids upon written request. Withdrawal of bids must be received over the Bidder's signature prior to the date and time set for receipt of bids.

B. Bidders may not withdraw or modify their bids for a period of 30 days, Saturday, Sunday and legal holidays excluded, following the opening of the bids.

7. ADDENDA AND INTERPRETATIONS

All questions by prospective bidders as to the interpretations of the Information for Bidders, bid forms, form of contract, general and supplementary conditions, drawings, specifications or bonds, must be submitted in writing to Orazio DeLuca, MCPPO (odeluca@cityofwoburn.com) Chief Procurement Officer-Purchasing Department, City Hall, 10 Common St, Woburn, Massachusetts 01810, by **August 22, 2017 at 12:00 Noon**. An interpretation of all questions so raised which, in the Engineer's opinion requires interpretation, will be made public via addendum issued by the Purchasing Department. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under this bid as submitted. All addenda so issued shall be covered in the Bid and shall become part of the Contract Documents.

8. DELETIONS FROM CONTRACT

The Awarding Authority reserves the right, prior to award of the Contract, to delete any portion of the contractor's work as its interests may appear, and to adjust the quantities of work at any time.

9. EXAMINATION

By submitting a bid, the bidder warrants that it has examined the site of the work, the specifications and drawings and is fully acquainted with all conditions and restrictions pertaining to the work and the execution thereof. No claim for any extra work or extension of time will be allowed for failure to observe this requirement. Conditional bids will not be accepted.

10. CONTRACT TIME

All work of the Contract, excluding final payment only, shall be completed by **June 30, 2018**. The Owner wishes to proceed with this project as soon as practical.

11. ABILITY AND EXPERIENCE

A. The Owner will not award a contract to any bidder who cannot furnish satisfactory evidence of their ability and experience in this type of work and that they have sufficient plant and capital to enable them to prosecute and complete the work within the given time period.

B. The Owner may make such investigations as it deems necessary to determine the above and a bidder shall furnish any information requested in this regard and shall furnish same under oath if required.

12. INSURANCE CERTIFICATES

The Contractor will not be permitted to start any construction work until they have submitted certificates of insurance acceptable to the Awarding Authority and Owner. Certificates shall be submitted at the time of execution of the contract. Refer to Special Supplementary Conditions for details regarding the insurance requirements under this contract.

13. RIGHTS OF THE OWNER

A. The Owner may reject, as informal, bids that are incomplete, conditional, or obscure, or that contain additions or erasures that are not initialed or other irregularities.

B. The Owner reserves the right to reject any or all bids or to accept any bid as their interests may appear.

C. The Owner anticipates awarding a contract for this project within ten (10) days of the date of bid opening; however, this date is subject to change. Bidders shall be prepared to submit within five (5) working days all documents and information required for full execution of the Contract Agreement. If the Contractor fails to do so, the Owner reserves the right to rescind the Contract Award.

14. EXECUTION OF THE AGREEMENT

A. Within ten (10) days of the receipt of the Agreement signed by the successful bidder, the Owner shall sign the Agreement and return a duplicate of the executed Agreement.

B. The Notice to Proceed shall be issued within ten (10) days of the execution of the Agreement. This time period may be extended by mutual agreement between the Owner Authority and the Contractor.

15. MINIMUM WAGE RATES

Construction associated with this contract is governed by the Massachusetts Prevailing Wage law.

16. SAFETY AND HEALTH REGULATIONS

A. The successful bidder shall comply with the Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 (PC-91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL-91-54).

B. The successful bidder shall have a competent person or persons, as required under Occupational Safety and Health Act, on the Site to inspect the work and to supervise the conformance of the work with the regulations of the Act.

C. This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926. Contractors shall be familiar with the requirements of these regulations. Contractors must provide copies of OSHA certification cards for all employees to be utilized for this project.

17. NON-DISCRIMINATION IN EMPLOYMENT

A. Contracts for work under this proposal shall obligate the Contractor and any Subcontractors not to discriminate in employment practices.

B. Bidders for the General Contract must submit with their initial bid a signed statement as to whether they have previously performed work subject to the President's Executive Order No. 11246, or any preceding similar Executive Order.

C. Bidders must, if requested, submit a compliance report concerning their employment practices and policies in order to maintain their eligibility to receive the award of the contract.

D. Bidders must, if requested, submit a list of all subcontractors who will perform work on the project and submit written signed statements from authorized agents of the labor pools with which they will or may deal for employees on the work, together with supporting information to the effect that said labor pools' practices and policies are in conformity with Executive Order 11246, and that said labor pools will affirmatively cooperate in or offer no hindrance to the recruitment, employment, and equal treatment of employees seeking employment and performing work under the Contract, or certification as to what efforts have been made to secure such statement when such agents or labor pools have failed to furnish same prior to the Award of the Contract.

18. ACCESS TO THE SITE

Representatives of the City of Woburn, the Grant Awarding Agency and of the Commonwealth of Massachusetts shall have access to the work wherever it is in preparation or progress and the successful Bidder shall provide proper facilities for such access and inspection.

19. "OR EQUAL" CLAUSE

A. Whenever the specifications define the material or article required by using the name of the proprietary product or of a manufacturer or vendor rather than by using descriptive detail of substance and function, the words "or equal" are to be understood to follow immediately the name of the maker, vendor, or proprietary product. The words, "or equal" shall be interpreted as including any material or article which, in the opinion of the Project Engineer, is equal in quality, durability, appearance, strength and design to the article named and which will perform adequately the functions imposed by the general design.

B. Whenever in the specifications the names of manufacturers are mentioned as indicating that their products will comply with a particular specification, or when specific trade names or plate numbers or letters are mentioned, it is not intended to exclude products of other manufacturers whose names, trade names or symbols have not been mentioned, provided however, that such products otherwise comply, in

the opinion of the Project Engineer, with the specification. The Project Engineer's opinion in all cases mentioned in this section shall be final.

20. PROJECT GUARANTEE

A. The Contractor guarantees that the work and services to be performed under the Contract and all work, material, and equipment performed, furnished, used or installed in the construction of the same, shall be free from defects and flaws and shall be performed and furnished in strict accordance with the Drawings, Specifications, and other Contract Documents; that the strength of all parts of all manufactured equipment shall be adequate and as specified and that the performance test requirements of the Contract shall be fulfilled. This guarantee shall be for a period of one (1) year from and after the date of completion and acceptance of the work as stated in the final estimate. If part of the work is accepted by the Owner, the guarantee for that part of the work shall be for a period of one (1) year from the date fixed for such acceptance.

B. If at any time within said period of guarantee any part of the work requires repairing, correction or replacement, the Owner may notify the Contractor in writing to make the required repairs, correction or replacements. If the Contractor neglects to commence making such repairs, corrections or replacements to the satisfaction of the Owner within three (3) days from the date of receipt of such notice, or having commenced fails to prosecute such work with diligence, the Owner may employ other persons to make the same, and all direct and indirect costs of making said repairs, corrections or replacements, including compensation for additional professional services, shall be paid by the Contractor.

C. It is hereby, however, agreed and understood that this guarantee shall not include any repairs or replacements made necessary by any cause or causes other than improper, inadequate, or defective work, quality of the work, materials or design by the Contractor or those employed directly or indirectly by the Contractor.

21. INFORMATION NOT GUARANTEED

A. All information given on the Drawings or in the other Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources available to the Owner. All such information is furnished only for the information and convenience of bidders and is not guaranteed.

B. It is agreed and understood that the Owner does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes, or other structures encountered during construction will be the same as those indicated on the Drawings or in the other Contract Documents.

C. It is agreed further and understood that no bidder or contractor shall use or be entitled to use any of the information made available to them or obtained in any examination made by them in any manner as a basis of or ground for any claim or demand against the Owner or the Project Engineer, arising from or by reason of any variance which may exist between the information made available and the actual subsurface or other conditions, natural phenomena, existing pipes or other structures actually encountered during the construction work, except as may be otherwise expressly provided for in the Contract Documents.

22. LAWS AND REGULATIONS

The Bidder's attention is directed to the fact that all applicable Federal Laws, State Laws and municipal ordinances related to the construction of the project shall apply to the contract throughout, as though herein written out in full.

23. METHOD OF AWARD - LOWEST RESPONSIBLE AND ELIGIBLE BIDDER

A. The Contract will be awarded on the basis of the lowest bid of the Base Bid submitted by a responsible and eligible bidder if such bid does not exceed the amount of funds available to finance the Contract.

B. If the amount of available funds exceeds the lowest bid of the Base Bid, the Contract will be awarded on the basis of the total bid for the Base Bid plus Alternates, to the extent that there are available funds. The Owner may select no or all Alternates, or any combination of Alternates in descending numerical order, to the extent that there are available funds. The Contract will be awarded on this basis to the lowest Qualified Bidder of the Base Bid and Alternates selected (if any).

C. During the period of the Contract, the Owner shall have the right to add Alternate items through a Change Order at the Bid Price shown on the Form for General Bid.

24. SEVERABILITY

If any provisions of this Agreement or portion of such provision of the application thereof to any persons, entity, or circumstances is held invalid, the remainder of the Agreement (or remainder of such provision) and the application of such to other persons, entities, or circumstances shall not be affected thereby so long as such remaining or modified provisions reflect the intent of the parties.

25. POWER OF ATTORNEY

Attorneys-in-fact who sign contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

30. NOTICE OF REQUIREMENTS RELATING TO SUBCONTRACTOR

Bidders are specifically advised that the following conditions apply to any person for, or other party to whom it is proposed to award a subcontract under this contract:

A. The Subcontractor must be acceptable to the Owner and is subject to verification by the Owner of its eligibility to perform work under this contract.

Section 00300
STATEMENT OF BIDDER'S QUALIFICATIONS
And Bid Forms

1.01 BIDDERS AFFIDAVIT

All questions must be answered, and the data given must be clear and comprehensive. This statement must be notarized. If necessary, Questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires.

1. Name of Bidder.

2. Permanent main office address

3. When organized?

4. If a corporation, where incorporated?

5. How many years have you been engaged in the contracting business under your present firm or trade name?

6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion.)

7. General character of work performed by your company.

8. Have you ever failed to complete any work awarded to you? If so, where and why?

9. List the more important projects recently completed by your company, stating the approximate cost for each and the month and year completed.

10. Experience in construction work similar in importance to this project.

11. List your major equipment <u>available for this contract.</u>

12. Background and experience of the principal members of your organization, including the officers

13. Credit available: $_____.

14. Give bank references: _____.

15. List all MassDOT pre-qualifications held: _____

16. The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Owner or the Engineer in verification or recitals comprising this Statement of Bidder's Qualifications.

Dated at _____this_____ day of

_____, 20_____.

_____

By: _____

Title: _____

State of _____)

) ss

County of _____)

_____ being duly sworn, deposes

and say that he is _____of_____

_____ and that the answers to the foregoing questions and all statements

therein contained are true and correct.

Subscribe and sworn to me before this _____ day of _____, 20_____.

_____

Notary Public

My commission expires _____, 20____.

1.02 BID BOND

PROJECT: "**Main St. Municipal Parking Lot Project**"
18-IFB-002

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned

_____

as PRINCIPAL, AND _____

and SURETY, are held and firmly bound unto the _____

called the OWNER in the penal sum of _____ ($_____), lawful money of the United State, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the accompanying bid, dated _____, 20___, for _____.

NOW THEREFORE, if Principal shall not withdraw said bids within the period specified therein after the opening of the same, or, if not period be specified, within sixty (60) days after the said opening, and shall within the period specified therefore, or if not period specified, within ten (10) days after the prescribed forms are presented to him for signature, enter into a written Contract with the OWNER in accordance with the Bid as accepted and give bond with good and sufficient surety or sureties, as may be required for the faithful performance and proper fulfillment of such Contract; or in the event of the withdrawal of said Bid within the period specified, or the failure to enter into such Contract and give such bond within the time specified, if the Principal shall pay the OWNER the difference between the amount specified in said Bid and the amount of with the OWNER may procure the required work or supplies for both, in the latter be in excess of the former, then the above obligation shall be voice and of no effect, otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bonded parities have executed this instrument under there several seals this _____day of _____, 20___, the name and corporate seal of each corporate party being thereto affixed and presented duly signed by this undersigned representative, pursuant to authority of its governing body.

In presence of:

_____ (SEAL)
(Individual Principal)

Business Address _____

Partnership _____ (SEAL)

Business Address _____

Attest: By _____(Corp. Principal)

Business Address _____

By _____

Attest: By _____ (Affix Corp. Seal)

Attest: By _____ (Corp. Surety)

_____

By _____

Countersigned
By

_____
Attorney-in-Fact,
State of _____

1.03 CERTIFICATE AS TO CORPARATE PRINCIPAL

I, _____, certify that I am the _____

_____

Secretary of the Corporation names as Principal in the within bond; that _____, who signed and said bond on behalf of the Principal was then _____ of said corporation; and that I know his signature, and his signature thereto is genuine; and that said bond was duly signed, sealed, and attested to for and in behalf of said corporation by authority of this governing body.

_____ (Corporate Seal)

Title

_____PROJECT

IDENTIFICATION: "**Main St. Municipal Parking Lot Project**"
18-IFB-002

THIS BID IS SUBMITTED TO: **Orazio DeLuca, MCPPO, Purchasing Agent**
Woburn City Hall
10 Common Street
Woburn, MA 01801
(781) 897-5950

1. The undersigned BIDDER proposes and agrees, if the BID is accepted, to enter into an Agreement with OWNER to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract time indicated in this Bid and in accordance with the Contract Documents.

2. BIDDER accepts all of the terms and conditions of the Instructions to Bidders. This Bid will remain open for sixty days after the day of Bid opening. BIDDER will sign the Agreement and submit the Contract Surety and other documents required by the Contract Documents within fifteen days after the date of the OWNER'S Notice of Award.

3. In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:

   3.1 BIDDER has examined copies of all the Contract Documents and of the following addenda:

   Date Number

   (receipt of all of which is hereby acknowledged) and also copies of the Notice to Bidders and the Instructions to Bidders.

   3.2 BIDDER has examined the site and locality where the Work is to be performed, the legal requirements (federal, state and local laws, ordinances, rules and regulations)

and the conditions affecting cost, progress of performance of the Work and has made such independent investigations as BIDDER deems necessary.

3.3 This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation, and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for himself any advantage over any other Bidder or over OWNER.

4. BIDDER will complete the Work for the prices shown in the attached Bid Forms.

5. BIDDER agrees that the work will be completed on or before **June 30, 2018**.

6. The following documents are attached to and made a condition of the Bid:

6.1 A tabulation of Subcontractors and other persons or organizations required to be identified in this Bid.

6.2 Required Bidders Qualification Statement with supporting data (if requested by the Owner or the Engineer.

7. Communication concerning this Bid shall be addressed to:

Orazio DeLuca, MCPPO, Purchasing Agent
Woburn City Hall
10 Common Street
Woburn, MA 01801
(781) 897-5950
odeluca@cityofwoburn.com

8. The terms used in this Bid which are defined in the General Conditions of the Construction. Contract, included as part of the Contract Documents, have the meanings assigned to them in the General Conditions.

SUBMITTED on _____, 20____

The BIDDER is:
An Individual

By _____ (SEAL)
(Individual's Name)

Doing business as _____

Business address: _____

_____

_____

Telephone No.: _____

A Corporation

By _____
(Corporation Name)

_____
(State of Incorporation)

By _____
(Name of person authorized to sign)

(Corporation Seal) _____

Attest

_____
(Secretary)

Business Address: _____

_____

_____

Telephone No.: _____

A Joint Venture

By _____
(Name)

_____
(Address)

By _____
(Name)

_____
(Address)

By _____
(Name)

_____
(Address)

(Each joint venture must sign. The manner of signing for each individual, partnership, and corporation that id party to the joint venture should be in the manner indicated above.)

"Main St. Municipal Parking Lot Project"
18-IFB-002

CHECKLIST OF ITEMS TO BE SUBMITTED WITH BID

- ☐ Form for General Bid
- ☐ Certification as to Corporate Vote
- ☐ Non-Collusion Affidavit
- ☐ Certification of Payment of State Taxes

FORM FOR GENERAL BID
"**Main St. Municipal Parking Lot Project**"**, 18-IFB-002**

BID FORM

Bid of _____(herein after called the "Bidder), a _____corporation /a partnership /an individual (strike out inapplicable terms) doing business as
_____.
To City of Woburn (hereinafter called the "City"):

The undersigned hereby declares to have carefully examined the Contract Invitation to Bid, Information for Bidders, form of Contract and General, Supplementary, and Special Conditions, Specifications and Contract Drawings referred to and also the site upon which the proposed work is to be performed.

A. The undersigned also hereby declares that the winning Bidder is the only person interested in the bid: that it is made without any connection with any person making any bid for the same work; that no person acting for, or employed by the City of Woburn is directly or indirectly interested in this Bid, or in any contract which may be made under it, or in expected profits to arise there from: that it is bona fide and made without directly or indirectly influencing or attempting to influence any other person or corporation to bid or to refrain from bidding or to influence the amount of the bid of any other person or corporation, and without collusion or fraud with any other person or connection with any other person bidding for the same work; and that this Bid is made with distinct reference and relation to the plans and specifications prepared for this contract and herein mentioned. The undersigned declares that in regard to the conditions affecting the work to be done and the labor and materials needed, this Bid is based solely on its own investigation and research and not in the reliance upon any representations of any employee, officer or agent of the City. As used herein, the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal identity.

B. No oral, written or telegraphic amendments to this Bid will be accepted. A bidder wishing to amend this Bid after transmittal to the City may do so only by amending this Bid itself prior to the time for opening the bids.
Drainage Structure

C. The undersigned propose to furnish all labor, equipment and material required for the "**Main St. Municipal Parking Lot Project**"**, 18-IFB-002,** located in Woburn, Massachusetts, in accordance with the accompanying Contract Documents, Plans and Specifications prepared by the Woburn Engineering Department, within the time set forth herein for the Contract Prices specified below, subject to additions and deductions according to the terms of the Contract Documents. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this Bid is a part.

This Bid includes the Addenda numbered _____.

The undersigned proposes to perform the Work, furnish all materials, and complete the Work in its entirety in the manner and under the conditions required at the prices listed as follows:

Item #	Quantity	Written Description Bid Price (in words)	Total Cost (in figures)
1	1	Lump sum for furnishing all labor, tools, equipment, materials and incidentals required to construct the Municipal Parking Lot its entirety as shown on the contract drawings and as specified herein: at_____Dollar Lump Sum	$_____ Lump Sum

D. In submitting this Bid, the Bidder understands that the City reserves the right to reject any or all of the bids, and to waive any informalities in the bidding. The City further reserves the right to award the base bid contract and any or all of the alternates indicated above.

E. The Bidder agrees that this Bid shall be good and may not be withdrawn for a period of Sixty (60) calendar days after scheduled closing time for receiving bids.

F. Upon receipt of written notice of the acceptance of this bid, Bidder will execute a contract within 10 days.

G. The undersigned further certifies under the penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under provisions of §29F of MGL c.29 or any other applicable debarment provisions of any chapter of federal or Massachusetts General Laws or any rule or regulation promulgated thereunder.

H. The undersigned further certifies that they are able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work and that they will comply fully with all laws and regulations applicable to awards made subject to Davis-Bacon regulations.

I. The undersigned agrees that all sub-contractors that perform work on this project will do so under a written agreement with the Contractor.

Respectfully submitted:

(Seal – if bid is by a corporation)

_____
(Name of General Bidder

By_____
(Name of Person Signing Bid and Title)

_____
(Business Address

Federal ID# _____

_____
(Municipality and State)

CERTIFICATION AS TO CORPORATE VOTE

If a corporation, complete below or attach to each signed copy of the Contract a notarized copy of vote of corporation authorizing the signatory to sign this Contract.

At a duly authorized meeting of the Board of Directors of the

_____ held on _____
(Name of Corporation) (Date)

at which all the Directors were present or waived notice, it was VOTED, that,

_____ held on _____
(Name) (Officer)

of this company be and hereby is authorized to execute contract and bonds in the name and behalf of said company, and affix its corporate seal thereto; and such execution of any contract or obligation in this company's name on its behalf by such

_____ of the company, shall be valid
(Officer)

and binding upon this company.

A true copy,

ATTEST: _____
(Clerk)
Place of Business: _____

_____

I hereby certify that I am the Clerk of _____, that
(Name of Corporation)
_____ is the duly elected _____ of
(Name) (Officer)
said company, and that the above vote has not been amended or rescinded and remains in full force and effect as the date of this Contract.

(Corporate Seal)

NON-COLLUSION AFFIDAVIT

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

_____

Signature and Title

_____

Company Name

_____

Date

CERTIFICATION OF PAYMENT OF STATE TAXES

Pursuant to M.G.L. Chapter 62C, Sec. 49A, I certify under the penalties of perjury that I, to the best of my knowledge and belief, have filed all state tax returns and paid all state taxes required under law.

_____
Name of Company

_____
Social Security Number or
Federal Identification Number

_____
Signature and Title

_____
Date

INSURANCE SPECIFICATIONS
INSURANCE REQUIREMENTS FOR AWARDED VENDOR ONLY:

Prior to commencing performance of any work or supplying materials or equipment covered by these specifications, the contractor shall furnish to the Office of the Purchasing Director a Certificate of Insurance evidencing the following:

A. GENERAL LIABILITY - Comprehensive Form

Bodily Injury Liability.....….....$ One Million
Property Damage Liability.....$ One Million

B. COVERAGE FOR PAYMENT OF WORKER'S COMPENSATION BENEFIT PURSUANT TO CHAPTER 152 OF THE MASSACHUSETTS GENERAL LAWS IN THE AMOUNT AS LISTED BELOW:

WORKER'S COMPENSATION.….....$ Statutory
EMPLOYERS' LIABILITY..….....……$ Statutory

C. AUTOMOBILE LIABILITY INSURANCE AS LISTED BELOW:

BODILY INJURY LIABILITY.....$ Statutory

l. A contract will not be executed unless a certificate (s) of insurance evidencing above described coverage is attached.
2. Failure to have the above-described coverage in effect during the entire period of the contract shall be deemed to be a breach of the contract.
3. All applicable insurance policies shall read:
"CITY OF WOBURN" as a certificate holder and as an additional insured for general liability only along with a description of operation in the space provided on the certificate.

Certificate Should Be Made Out To:
City Of Woburn
Purchasing Department
10 Common St.
Woburn, MA 01801

Note: If your insurance expires during the life of this contract, you shall be responsible to submit a new certificate(s) covering the period of the contract. No payment will be made on a contract with an expired insurance certificate.

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A :	
INSURER B :	
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY							
	☐ COMMERCIAL GENERAL LIABILITY						EACH OCCURRENCE	$
	☐ CLAIMS-MADE ☐ OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$
							MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$
	☐ POLICY ☐ PRO-JECT ☐ LOC						PRODUCTS - COMP/OP AGG	$
								$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$
	☐ ANY AUTO						BODILY INJURY (Per person)	$
	☐ ALL OWNED AUTOS ☐ SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	☐ HIRED AUTOS ☐ NON-OWNED AUTOS						PROPERTY DAMAGE (Per accident)	$
								$
	☐ **UMBRELLA LIAB** ☐ OCCUR						EACH OCCURRENCE	$
	☐ **EXCESS LIAB** ☐ CLAIMS-MADE						AGGREGATE	$
	☐ DED ☐ RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						☐ WC STATU-TORY LIMITS ☐ OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? ☐ **(Mandatory in NH)**	N / A					E.L. EACH ACCIDENT	$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$

ADD "X" HERETO CERTIFY THAT THE CITY OF WOBURN IS AN ADDITIONAL INSURED

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

DESCRIPTION OF PROJECT, SOLICITATION NUMBER AND THAT THE CITY OF WOBURN IS A CERTIFICATE HOLDER AND ADDITIONAL INSURED

CERTIFICATE HOLDER

CERTIFICATES SHOULD BE MADE OUT TO:

CITY OF WOBURN
PURCHASING DEPARTMENT
10 COMMON ST
WOBURN, MA 01801

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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ACORD (...) **logo are registered marks of ACORD**

Form:___ CITY OF WOBURN
Contract Number:_____

OSHA GENERAL CONTRACTOR CERTIFICATION FORM

Pursuant to Chapter 306 of the Acts of 2004
An Act Relative to the Health and Safety on Construction Projects

GENERAL CONTRACTOR'S CERTIFICATION – BID FORM

I, the undersigned, hereby certify under penalties of perjury that I, and all subcontractors who are not filed sub-bidders, shall:

(1) certify that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is a least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

Signature: _____
(Individual Submitting Bid)
Duly Authorized

Name of Business or Entity:_____

Date: _____

RETURN THIS FORM WITH YOUR BID

CERTIFICATE OF AUTHORITY

At a duly authorized meeting of the Board of Directors of _____
(Name of Corporation)

held on _____ it was VOTED that:
(Date)

_____ _____
(Name) (Officer)

of this corporation, be and he/she hereby is authorized to submit bids and proposals, execute contracts, deeds and bonds in the name and on behalf of said corporation, and affix its corporate seal hereto; and such execution of any contract, deed or obligation in this corporation's name on its behalf by such _____ under seal of the company, shall be valid
(Officer)
and binding upon this corporation.

A True Copy,

ATTEST: _____

TITLE: _____

PLACE OF BUSINESS: _____

_____

DATE OF THIS CERTIFICATE: _____

I hereby certify that I am the clerk of the _____
(Corporation)

that _____ is the duly elected _____ of
(Name) (Office)
said corporation, and that the above vote has not been amended or rescinded and remains in full force and effect as of the date of this contract.

_____
(Clerk)

CORPORATE SEAL:

CERTIFICATE OF GOOD STANDING

TO: Contractor

FROM: Purchasing Department

RE: CERTIFICATE OF GOOD STANDING

The Contractor must comply with our request for a CURRENT "Certificate of Good Standing".

If you require information on how to obtain the "Certificate of Good Standing" or Certificate of Registration (Foreign Corporations) from the Commonwealth of Massachusetts, please call the Secretary of State's Office at (617) 727-2850 (Press #1) located at One (1) Ashburton Place, 17th Floor, Boston, MA 02133 or you may access their web site at:

www.sec.state.ma.us/corp/certificates/certificate_request.asp

If your company is incorporated outside of Massachusetts and therefore is a "foreign corporation", but is registered to do business in Massachusetts, please comply with our request for the Certificate of Registration from the Commonwealth of Massachusetts. If your company is a foreign corporation, but is not registered to do business in Massachusetts, please provide the Certificate of Good Standing from your state of incorporation.

Please note that without the above certificate (s), the City of Woburn cannot execute your contract.

IMPORTANT NOTICE
Requests for Certificates of Good Standing by mail may take a substantial amount of time. A certificate may be obtained immediately in person at the Secretary's Office at the address above. Also, at this time, the Secretary of State's Office may not have your current annual report recorded. If this is the case, and you are therefore unable to obtain the Certificate of Good Standing, please forward a copy of your annual report filing fee check with your signed contracts. Please forward your original Certificate of Good Standing to the Purchasing Department upon receipt.

Thank You,

Purchasing Agent

Form **W-9**
(Rev. December 2011)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

Give Form to the requester. Do not send to the IRS.

Print or type
See Specific Instructions on page 2.

Name (as shown on your income tax return)

Business name/disregarded entity name, if different from above

Check appropriate box for federal tax classification:
☐ Individual/sole proprietor ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶

☐ Other (see instructions) ▶

☐ Exempt payee

Address (number, street, and apt. or suite no.)

Requester's name and address (optional)

City, state, and ZIP code

List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on the "Name" line to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number

			–			–				

Employer identification number

		–							

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 4.

Sign Here Signature of U.S. person ▶ Date ▶

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

Note. If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

WEEKLY PAYROLL RECORDS REPORT
& STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works project for which the enclosed rates have been provided. A Payroll Form is available from the Department of Labor Standards (DLS) at www.mass.gov/dols/pw and includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the contract.

On a weekly basis, every contractor and subcontractor is required to submit a certified copy of their weekly payroll records to the awarding authority; this includes the payroll forms and the Statement of Compliance form. The certified payroll records must be submitted either by regular mail or by e-mail to the awarding authority. Once collected, the awarding authority is required to preserve those records for three years from the date of completion of the project.

Each such contractor and subcontractor shall furnish weekly **and** within 15 days after completion of its portion of the work, to the awarding authority directly by first-class mail or e-mail, a statement, executed by the contractor, subcontractor or by any authorized officer thereof who supervised the payment of wages, this form, accompanied by their payroll:

STATEMENT OF COMPLIANCE

_____, 20_____

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

do hereby state:

That I pay or supervise the payment of the persons employed by _____ on the _____
(Contractor, subcontractor or public body) (Building or project)

and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty nine of the General Laws.

Signature _____

Title _____

CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

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

Prevailing Wage Rates

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

ROSALIN ACOSTA
Secretary

WILLIAM D MCKINNEY
Director

Awarding Authority: City of Woburn

Contract Number: **City/Town:** WOBURN

Description of Work: The construction of a municipal parking lot with a work area of approximately 25,000 SF, including installation of drainage system, site lighting, backfill and compaction, fine grading and paving, lan

Job Location: Main Street

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2016	$33.25	$10.91	$10.89	$0.00	$55.05
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2016	$33.32	$10.91	$10.89	$0.00	$55.12
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2016	$33.44	$10.91	$10.89	$0.00	$55.24
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$88.29	$9.80	$19.23	$0.00	$117.32
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 1*	06/01/2017	$37.60	$7.60	$14.65	$0.00	$59.85
	12/01/2017	$38.45	$7.60	$14.65	$0.00	$60.70
	06/01/2018	$39.40	$7.60	$14.65	$0.00	$61.65
	12/01/2018	$40.35	$7.60	$14.65	$0.00	$62.60
	06/01/2019	$41.35	$7.60	$14.65	$0.00	$63.60
	12/01/2019	$42.35	$7.60	$14.65	$0.00	$64.60
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	06/01/2017	$34.90	$11.50	$7.10	$0.00	$53.50
	12/01/2017	$35.90	$11.50	$7.10	$0.00	$54.50
	06/01/2018	$36.90	$11.50	$7.10	$0.00	$55.50
	12/01/2018	$37.90	$11.50	$7.10	$0.00	$56.50
	06/01/2019	$38.90	$11.50	$7.10	$0.00	$57.50
	12/01/2019	$39.90	$11.50	$7.10	$0.00	$58.50
	06/01/2020	$40.90	$11.50	$7.10	$0.00	$59.50
	12/01/2020	$41.90	$11.50	$7.10	$0.00	$60.50
ASPHALT RAKER *LABORERS - ZONE 1*	06/01/2017	$37.10	$7.60	$14.65	$0.00	$59.35
	12/01/2017	$37.95	$7.60	$14.65	$0.00	$60.20
	06/01/2018	$38.90	$7.60	$14.65	$0.00	$61.15
	12/01/2018	$39.85	$7.60	$14.65	$0.00	$62.10
	06/01/2019	$40.85	$7.60	$14.65	$0.00	$63.10
	12/01/2019	$41.85	$7.60	$14.65	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$46.38	$10.00	$15.25	$0.00	$71.63
	12/01/2017	$47.38	$10.00	$15.25	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$46.38	$10.00	$15.25	$0.00	$71.63
	12/01/2017	$47.38	$10.00	$15.25	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 1*	06/01/2017	$37.10	$7.60	$14.65	$0.00	$59.35
	12/01/2017	$37.95	$7.60	$14.65	$0.00	$60.20
	06/01/2018	$38.90	$7.60	$14.65	$0.00	$61.15
	12/01/2018	$39.85	$7.60	$14.65	$0.00	$62.10
	06/01/2019	$40.85	$7.60	$14.65	$0.00	$63.10
	12/01/2019	$41.85	$7.60	$14.65	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 1*	06/01/2017	$37.60	$7.60	$14.65	$0.00	$59.85
	12/01/2017	$38.45	$7.60	$14.65	$0.00	$60.70
	06/01/2018	$39.40	$7.60	$14.65	$0.00	$61.65
	12/01/2018	$40.35	$7.60	$14.65	$0.00	$62.60
	06/01/2019	$41.35	$7.60	$14.65	$0.00	$63.60
	12/01/2019	$42.35	$7.60	$14.65	$0.00	$64.60
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2017	$42.92	$6.97	$16.21	$0.00	$66.10

Apprentice - *BOILERMAKER - Local 29*
Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$27.90	$6.97	$10.54	$0.00	$45.41
2	65	$27.90	$6.97	$10.54	$0.00	$45.41
3	70	$30.04	$6.97	$11.35	$0.00	$48.36
4	75	$32.19	$6.97	$12.16	$0.00	$51.32
5	80	$34.34	$6.97	$12.97	$0.00	$54.28
6	85	$36.48	$6.97	$13.78	$0.00	$57.23
7	90	$38.63	$6.97	$14.59	$0.00	$60.19
8	95	$40.77	$6.97	$15.40	$0.00	$63.14

Notes:

Apprentice to Journeyworker Ratio:1:5

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (WALTHAM)*	03/01/2017	$50.76	$10.75	$19.22	$0.00	$80.73

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Waltham*
Effective Date - 03/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.38	$10.75	$19.22	$0.00	$55.35
2	60	$30.46	$10.75	$19.22	$0.00	$60.43
3	70	$35.53	$10.75	$19.22	$0.00	$65.50
4	80	$40.61	$10.75	$19.22	$0.00	$70.58
5	90	$45.68	$10.75	$19.22	$0.00	$75.65

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$45.93	$10.00	$15.25	$0.00	$71.18
	12/01/2017	$46.92	$10.00	$15.25	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2016	$37.45	$7.60	$14.35	$0.00	$59.40
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2016	$36.30	$7.60	$14.35	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2016	$36.30	$7.60	$14.35	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 1*	06/01/2017	$37.10	$7.60	$14.65	$0.00	$59.35
	12/01/2017	$37.95	$7.60	$14.65	$0.00	$60.20
	06/01/2018	$38.90	$7.60	$14.65	$0.00	$61.15
	12/01/2018	$39.85	$7.60	$14.65	$0.00	$62.10
	06/01/2019	$40.85	$7.60	$14.65	$0.00	$63.10
	12/01/2019	$41.85	$7.60	$14.65	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 2 (Eastern Massachusetts)*	03/01/2017	$38.77	$9.90	$17.00	$0.00	$65.67
	09/01/2017	$39.78	$9.90	$17.00	$0.00	$66.68
	03/01/2018	$40.78	$9.90	$17.00	$0.00	$67.68
	09/01/2018	$41.82	$9.90	$17.00	$0.00	$68.72
	03/01/2019	$42.85	$9.90	$17.00	$0.00	$69.75

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER - Zone 2 Eastern MA*

Effective Date - 03/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.39	$9.90	$1.63	$0.00	$30.92
2	60	$23.26	$9.90	$1.63	$0.00	$34.79
3	70	$27.14	$9.90	$12.11	$0.00	$49.15
4	75	$29.08	$9.90	$12.11	$0.00	$51.09
5	80	$31.02	$9.90	$13.74	$0.00	$54.66
6	80	$31.02	$9.90	$13.74	$0.00	$54.66
7	90	$34.89	$9.90	$15.37	$0.00	$60.16
8	90	$34.89	$9.90	$15.37	$0.00	$60.16

Effective Date - 09/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.89	$9.90	$1.63	$0.00	$31.42
2	60	$23.87	$9.90	$1.63	$0.00	$35.40
3	70	$27.85	$9.90	$12.11	$0.00	$49.86
4	75	$29.84	$9.90	$12.11	$0.00	$51.85
5	80	$31.82	$9.90	$13.74	$0.00	$55.46
6	80	$31.82	$9.90	$13.74	$0.00	$55.46
7	90	$35.80	$9.90	$15.37	$0.00	$61.07
8	90	$35.80	$9.90	$15.37	$0.00	$61.07

Notes:

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (WALTHAM)*	07/01/2017	$46.30	$12.20	$19.41	$1.30	$79.21
	01/01/2018	$46.54	$12.20	$19.41	$1.30	$79.45
	07/01/2018	$46.79	$12.20	$19.41	$1.30	$79.70
	01/01/2019	$47.03	$12.20	$19.41	$1.30	$79.94
	07/01/2019	$47.27	$12.20	$19.41	$1.30	$80.18
	01/01/2020	$47.52	$12.20	$19.41	$1.30	$80.43

Apprentice - *CEMENT MASONRY/PLASTERING - Eastern Mass (Waltham)*

Effective Date - 07/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.15	$12.20	$12.41	$0.00	$47.76
2	60	$27.78	$12.20	$14.41	$1.30	$55.69
3	65	$30.10	$12.20	$15.41	$1.30	$59.01
4	70	$32.41	$12.20	$16.41	$1.30	$62.32
5	75	$34.73	$12.20	$17.41	$1.30	$65.64
6	80	$37.04	$12.20	$18.41	$1.30	$68.95
7	90	$41.67	$12.20	$19.41	$1.30	$74.58

Effective Date - 01/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.27	$12.20	$12.41	$0.00	$47.88
2	60	$27.92	$12.20	$14.41	$1.30	$55.83
3	65	$30.25	$12.20	$15.41	$1.30	$59.16
4	70	$32.58	$12.20	$16.41	$1.30	$62.49
5	75	$34.91	$12.20	$17.41	$1.30	$65.82
6	80	$37.23	$12.20	$18.41	$1.30	$69.14
7	90	$41.89	$12.20	$19.41	$1.30	$74.80

Notes:

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

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR *LABORERS - ZONE 1*	06/01/2017	$37.10	$7.60	$14.65	$0.00	$59.35
	12/01/2017	$37.95	$7.60	$14.65	$0.00	$60.20
	06/01/2018	$38.90	$7.60	$14.65	$0.00	$61.15
	12/01/2018	$39.85	$7.60	$14.65	$0.00	$62.10
	06/01/2019	$40.85	$7.60	$14.65	$0.00	$63.10
	12/01/2019	$41.85	$7.60	$14.65	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$47.38	$10.00	$15.25	$0.00	$72.63
	12/01/2017	$48.38	$10.00	$15.25	$0.00	$73.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$31.86	$10.00	$15.25	$0.00	$57.11
	12/01/2017	$32.55	$10.00	$15.25	$0.00	$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.71	$7.85	$0.00	$0.00	$33.56
2	55	$28.28	$7.85	$3.66	$0.00	$39.79
3	60	$30.85	$7.85	$3.99	$0.00	$42.69
4	65	$33.42	$7.85	$4.32	$0.00	$45.59
5	70	$35.99	$7.85	$14.11	$0.00	$57.95
6	75	$38.56	$7.85	$14.44	$0.00	$60.85
7	80	$41.13	$7.85	$14.77	$0.00	$63.75
8	90	$46.27	$7.85	$15.44	$0.00	$69.56

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: ADZEMAN *LABORERS - ZONE 1*	06/01/2017	$37.00	$7.60	$14.65	$0.00	$59.25
	12/01/2017	$37.85	$7.60	$14.65	$0.00	$60.10
	06/01/2018	$38.80	$7.60	$14.65	$0.00	$61.05
	12/01/2018	$39.75	$7.60	$14.65	$0.00	$62.00
	06/01/2019	$40.75	$7.60	$14.65	$0.00	$63.00
	12/01/2019	$41.75	$7.60	$14.65	$0.00	$64.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 1*	06/01/2017	$38.00	$7.60	$14.65	$0.00	$60.25
	12/01/2017	$38.85	$7.60	$14.65	$0.00	$61.10
	06/01/2018	$39.80	$7.60	$14.65	$0.00	$62.05
	12/01/2018	$40.75	$7.60	$14.65	$0.00	$63.00
	06/01/2019	$41.75	$7.60	$14.65	$0.00	$64.00
	12/01/2019	$42.75	$7.60	$14.65	$0.00	$65.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 1*	06/01/2017	$37.75	$7.60	$14.65	$0.00	$60.00
	12/01/2017	$38.60	$7.60	$14.65	$0.00	$60.85
	06/01/2018	$39.55	$7.60	$14.65	$0.00	$61.80
	12/01/2018	$40.50	$7.60	$14.65	$0.00	$62.75
	06/01/2019	$41.50	$7.60	$14.65	$0.00	$63.75
	12/01/2019	$42.50	$7.60	$14.65	$0.00	$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 1*	06/01/2017	$38.00	$7.60	$14.65	$0.00	$60.25
	12/01/2017	$38.85	$7.60	$14.65	$0.00	$61.10
	06/01/2018	$39.80	$7.60	$14.65	$0.00	$62.05
	12/01/2018	$40.75	$7.60	$14.65	$0.00	$63.00
	06/01/2019	$41.75	$7.60	$14.65	$0.00	$64.00
	12/01/2019	$42.75	$7.60	$14.65	$0.00	$65.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 1*	06/01/2017	$37.75	$7.60	$14.65	$0.00	$60.00
	12/01/2017	$38.60	$7.60	$14.65	$0.00	$60.85
	06/01/2018	$39.55	$7.60	$14.65	$0.00	$61.80
	12/01/2018	$40.50	$7.60	$14.65	$0.00	$62.75
	06/01/2019	$41.50	$7.60	$14.65	$0.00	$63.75
	12/01/2019	$42.50	$7.60	$14.65	$0.00	$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 1*	06/01/2017	$37.00	$7.60	$14.65	$0.00	$59.25
	12/01/2017	$37.85	$7.60	$14.65	$0.00	$60.10
	06/01/2018	$38.80	$7.60	$14.65	$0.00	$61.05
	12/01/2018	$39.75	$7.60	$14.65	$0.00	$62.00
	06/01/2019	$40.75	$7.60	$14.65	$0.00	$63.00
	12/01/2019	$41.75	$7.60	$14.65	$0.00	$64.00
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$45.93	$10.00	$15.25	$0.00	$71.18
	12/01/2017	$46.92	$10.00	$15.25	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$58.86	$9.80	$19.23	$0.00	$87.89
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$42.04	$9.80	$19.23	$0.00	$71.07
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$63.06	$9.80	$19.23	$0.00	$92.09
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$88.23	$9.80	$19.23	$0.00	$117.26
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) *ELECTRICIANS LOCAL 103*	03/01/2017	$48.33	$13.00	$17.45	$0.00	$78.78
	09/01/2017	$49.28	$13.00	$17.48	$0.00	$79.76
	03/01/2018	$50.48	$13.00	$17.51	$0.00	$80.99
	09/01/2018	$51.67	$13.00	$17.55	$0.00	$82.22
	03/01/2019	$52.87	$13.00	$17.59	$0.00	$83.46
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN *ELECTRICIANS LOCAL 103*	03/01/2017	$48.33	$13.00	$17.45	$0.00	$78.78
	09/01/2017	$49.28	$13.00	$17.48	$0.00	$79.76
	03/01/2018	$50.48	$13.00	$17.51	$0.00	$80.99
	09/01/2018	$51.67	$13.00	$17.55	$0.00	$82.22
	03/01/2019	$52.87	$13.00	$17.59	$0.00	$83.46

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 03/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.33	$13.00	$0.58	$0.00	$32.91
2	40	$19.33	$13.00	$0.58	$0.00	$32.91
3	45	$21.75	$13.00	$13.37	$0.00	$48.12
4	45	$21.75	$13.00	$13.37	$0.00	$48.12
5	50	$24.17	$13.00	$13.75	$0.00	$50.92
6	55	$26.58	$13.00	$14.11	$0.00	$53.69
7	60	$29.00	$13.00	$14.48	$0.00	$56.48
8	65	$31.41	$13.00	$14.85	$0.00	$59.26
9	70	$33.83	$13.00	$15.22	$0.00	$62.05
10	75	$36.25	$13.00	$15.60	$0.00	$64.85

Effective Date - 09/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.71	$13.00	$0.59	$0.00	$33.30
2	40	$19.71	$13.00	$0.59	$0.00	$33.30
3	45	$22.18	$13.00	$13.39	$0.00	$48.57
4	45	$22.18	$13.00	$13.39	$0.00	$48.57
5	50	$24.64	$13.00	$13.76	$0.00	$51.40
6	55	$27.10	$13.00	$14.12	$0.00	$54.22
7	60	$29.57	$13.00	$14.50	$0.00	$57.07
8	65	$32.03	$13.00	$14.87	$0.00	$59.90
9	70	$34.50	$13.00	$15.25	$0.00	$62.75
10	75	$36.96	$13.00	$15.62	$0.00	$65.58

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

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2017	$55.86	$15.28	$15.71	$0.00	$86.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.93	$15.28	$0.00	$0.00	$43.21
2	55	$30.72	$15.28	$15.71	$0.00	$61.71
3	65	$36.31	$15.28	$15.71	$0.00	$67.30
4	70	$39.10	$15.28	$15.71	$0.00	$70.09
5	80	$44.69	$15.28	$15.71	$0.00	$75.68

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

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2017	$39.10	$15.28	$15.71	$0.00	$70.09
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR *LABORERS - ZONE 1*	06/01/2017	$37.10	$7.60	$14.65	$0.00	$59.35
	12/01/2017	$37.95	$7.60	$14.65	$0.00	$60.20
	06/01/2018	$38.90	$7.60	$14.65	$0.00	$61.15
	12/01/2018	$39.85	$7.60	$14.65	$0.00	$62.10
	06/01/2019	$40.85	$7.60	$14.65	$0.00	$63.10
	12/01/2019	$41.85	$7.60	$14.65	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2017	$42.15	$10.00	$15.25	$0.00	$67.40
	11/01/2017	$42.88	$10.00	$15.25	$0.00	$68.13
	05/01/2018	$43.59	$10.00	$15.25	$0.00	$68.84
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2017	$43.61	$10.00	$15.25	$0.00	$68.86
	11/01/2017	$44.34	$10.00	$15.25	$0.00	$69.59
	05/01/2018	$45.06	$10.00	$15.25	$0.00	$70.31
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2017	$22.41	$10.00	$15.25	$0.00	$47.66
	11/01/2017	$22.83	$10.00	$15.25	$0.00	$48.08
	05/01/2018	$23.26	$10.00	$15.25	$0.00	$48.51
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 103*	03/01/2017	$48.33	$13.00	$17.45	$0.00	$78.78
	09/01/2017	$49.28	$13.00	$17.48	$0.00	$79.76
	03/01/2018	$50.48	$13.00	$17.51	$0.00	$80.99
	09/01/2018	$51.67	$13.00	$17.55	$0.00	$82.22
	03/01/2019	$52.87	$13.00	$17.59	$0.00	$83.46
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING *ELECTRICIANS LOCAL 103*	03/01/2017	$36.25	$13.00	$15.60	$0.00	$64.85
	09/01/2017	$36.96	$13.00	$15.62	$0.00	$65.58
	03/01/2018	$37.86	$13.00	$15.65	$0.00	$66.51
	09/01/2018	$38.75	$13.00	$15.67	$0.00	$67.42
	03/01/2019	$39.65	$13.00	$15.70	$0.00	$68.35

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$38.49	$10.00	$15.25	$0.00	$63.74
	12/01/2017	$39.32	$10.00	$15.25	$0.00	$64.57
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER *LABORERS - ZONE 1*	06/01/2017	$20.50	$7.60	$14.65	$0.00	$42.75
	12/01/2017	$21.50	$7.60	$14.65	$0.00	$43.75
	06/01/2018	$21.50	$7.60	$14.65	$0.00	$43.75
	12/01/2018	$22.50	$7.60	$14.65	$0.00	$44.75
	06/01/2019	$22.50	$7.60	$14.65	$0.00	$44.75
	12/01/2019	$23.50	$7.60	$14.65	$0.00	$45.75
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE I*	03/01/2016	$42.13	$9.80	$17.62	$0.00	$69.55

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.07	$9.80	$1.79	$0.00	$32.66
2	55	$23.17	$9.80	$1.79	$0.00	$34.76
3	60	$25.28	$9.80	$12.25	$0.00	$47.33
4	65	$27.38	$9.80	$12.25	$0.00	$49.43
5	70	$29.49	$9.80	$14.04	$0.00	$53.33
6	75	$31.60	$9.80	$14.04	$0.00	$55.44
7	80	$33.70	$9.80	$15.83	$0.00	$59.33
8	85	$35.81	$9.80	$15.83	$0.00	$61.44

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$46.38	$10.00	$15.25	$0.00	$71.63
	12/01/2017	$47.38	$10.00	$15.25	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$31.86	$10.00	$15.25	$0.00	$57.11
	12/01/2017	$32.55	$10.00	$15.25	$0.00	$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 2)*	01/01/2017	$40.91	$7.85	$16.10	$0.00	$64.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *GLAZIER - Local 35 Zone 2*

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.46	$7.85	$0.00	$0.00	$28.31
2	55	$22.50	$7.85	$3.66	$0.00	$34.01
3	60	$24.55	$7.85	$3.99	$0.00	$36.39
4	65	$26.59	$7.85	$4.32	$0.00	$38.76
5	70	$28.64	$7.85	$14.11	$0.00	$50.60
6	75	$30.68	$7.85	$14.44	$0.00	$52.97
7	80	$32.73	$7.85	$14.77	$0.00	$55.35
8	90	$36.82	$7.85	$15.44	$0.00	$60.11

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$46.38	$10.00	$15.25	$0.00	$71.63
	12/01/2017	$47.38	$10.00	$15.25	$0.00	$72.63

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 06/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$25.51	$10.00	$0.00	$0.00	$35.51
2	60	$27.83	$10.00	$15.25	$0.00	$53.08
3	65	$30.15	$10.00	$15.25	$0.00	$55.40
4	70	$32.47	$10.00	$15.25	$0.00	$57.72
5	75	$34.79	$10.00	$15.25	$0.00	$60.04
6	80	$37.10	$10.00	$15.25	$0.00	$62.35
7	85	$39.42	$10.00	$15.25	$0.00	$64.67
8	90	$41.74	$10.00	$15.25	$0.00	$66.99

Effective Date - 12/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$26.06	$10.00	$0.00	$0.00	$36.06
2	60	$28.43	$10.00	$15.25	$0.00	$53.68
3	65	$30.80	$10.00	$15.25	$0.00	$56.05
4	70	$33.17	$10.00	$15.25	$0.00	$58.42
5	75	$35.54	$10.00	$15.25	$0.00	$60.79
6	80	$37.90	$10.00	$15.25	$0.00	$63.15
7	85	$40.27	$10.00	$15.25	$0.00	$65.52
8	90	$42.64	$10.00	$15.25	$0.00	$67.89

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2017	$43.83	$11.45	$24.03	$2.38	$81.69
	02/01/2018	$44.98	$11.45	$24.03	$2.38	$82.84
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 103*	03/01/2017	$48.33	$13.00	$17.45	$0.00	$78.78
	09/01/2017	$49.28	$13.00	$17.48	$0.00	$79.76
	03/01/2018	$50.48	$13.00	$17.51	$0.00	$80.99
	09/01/2018	$51.67	$13.00	$17.55	$0.00	$82.22
	03/01/2019	$52.87	$13.00	$17.59	$0.00	$83.46
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2017	$43.83	$11.45	$24.03	$2.38	$81.69
	02/01/2018	$44.98	$11.45	$24.03	$2.38	$82.84
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537*	03/01/2017	$51.19	$9.70	$18.14	$0.00	$79.03
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537*	03/01/2017	$51.19	$9.70	$18.14	$0.00	$79.03
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HYDRAULIC DRILLS *LABORERS - ZONE 1*	06/01/2017	$37.60	$7.60	$14.65	$0.00	$59.85
	12/01/2017	$38.45	$7.60	$14.65	$0.00	$60.70
	06/01/2018	$39.40	$7.60	$14.65	$0.00	$61.65
	12/01/2018	$40.35	$7.60	$14.65	$0.00	$62.60
	06/01/2019	$41.35	$7.60	$14.65	$0.00	$63.60
	12/01/2019	$42.35	$7.60	$14.65	$0.00	$64.60
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2016	$45.09	$11.75	$14.20	$0.00	$71.04
	09/01/2017	$47.09	$11.75	$14.20	$0.00	$73.04
	09/01/2018	$49.34	$11.75	$14.20	$0.00	$75.29
	09/01/2019	$51.84	$11.75	$14.20	$0.00	$77.79

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

Effective Date - 09/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.55	$11.75	$10.45	$0.00	$44.75
2	60	$27.05	$11.75	$11.20	$0.00	$50.00
3	70	$31.56	$11.75	$11.95	$0.00	$55.26
4	80	$36.07	$11.75	$12.70	$0.00	$60.52

Effective Date - 09/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.55	$11.75	$10.45	$0.00	$45.75
2	60	$28.25	$11.75	$11.20	$0.00	$51.20
3	70	$32.96	$11.75	$11.95	$0.00	$56.66
4	80	$37.67	$11.75	$12.70	$0.00	$62.12

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (BOSTON AREA)*	03/16/2017	$44.65	$7.80	$20.85	$0.00	$73.30

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *IRONWORKER - Local 7 Boston*

Effective Date - 03/16/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$26.79	$7.80	$20.85	$0.00	$55.44
2	70	$31.26	$7.80	$20.85	$0.00	$59.91
3	75	$33.49	$7.80	$20.85	$0.00	$62.14
4	80	$35.72	$7.80	$20.85	$0.00	$64.37
5	85	$37.95	$7.80	$20.85	$0.00	$66.60
6	90	$40.19	$7.80	$20.85	$0.00	$68.84

Notes:

** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 1*	06/01/2017	$37.10	$7.60	$14.65	$0.00	$59.35
	12/01/2017	$37.95	$7.60	$14.65	$0.00	$60.20
	06/01/2018	$38.90	$7.60	$14.65	$0.00	$61.15
	12/01/2018	$39.85	$7.60	$14.65	$0.00	$62.10
	06/01/2019	$40.85	$7.60	$14.65	$0.00	$63.10
	12/01/2019	$41.85	$7.60	$14.65	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 1*	06/01/2017	$36.85	$7.60	$14.65	$0.00	$59.10
	12/01/2017	$37.70	$7.60	$14.65	$0.00	$59.95
	06/01/2018	$38.65	$7.60	$14.65	$0.00	$60.90
	12/01/2018	$39.60	$7.60	$14.65	$0.00	$61.85
	06/01/2019	$40.60	$7.60	$14.65	$0.00	$62.85
	12/01/2019	$41.60	$7.60	$14.65	$0.00	$63.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER - Zone 1*

Effective Date - 06/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$22.11	$7.60	$14.65	$0.00	$44.36
2	70	$25.80	$7.60	$14.65	$0.00	$48.05
3	80	$29.48	$7.60	$14.65	$0.00	$51.73
4	90	$33.17	$7.60	$14.65	$0.00	$55.42

Effective Date - 12/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$22.62	$7.60	$14.65	$0.00	$44.87
2	70	$26.39	$7.60	$14.65	$0.00	$48.64
3	80	$30.16	$7.60	$14.65	$0.00	$52.41
4	90	$33.93	$7.60	$14.65	$0.00	$56.18

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 1*	06/01/2017	$36.85	$7.60	$14.65	$0.00	$59.10
	12/01/2017	$37.70	$7.60	$14.65	$0.00	$59.95
	06/01/2018	$38.65	$7.60	$14.65	$0.00	$60.90
	12/01/2018	$39.60	$7.60	$14.65	$0.00	$61.85
	06/01/2019	$40.60	$7.60	$14.65	$0.00	$62.85
	12/01/2019	$41.60	$7.60	$14.65	$0.00	$63.85
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 1*	06/01/2017	$36.85	$7.60	$14.65	$0.00	$59.10
	12/01/2017	$37.70	$7.60	$14.65	$0.00	$59.95
	06/01/2018	$38.65	$7.60	$14.65	$0.00	$60.90
	12/01/2018	$39.60	$7.60	$14.65	$0.00	$61.85
	06/01/2019	$40.60	$7.60	$14.65	$0.00	$62.85
	12/01/2019	$41.60	$7.60	$14.65	$0.00	$63.85
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 1*	06/01/2017	$37.00	$7.60	$14.65	$0.00	$59.25
	12/01/2017	$37.85	$7.60	$14.65	$0.00	$60.10
	06/01/2018	$38.80	$7.60	$14.65	$0.00	$61.05
	12/01/2018	$39.75	$7.60	$14.65	$0.00	$62.00
	06/01/2019	$40.75	$7.60	$14.65	$0.00	$63.00
	12/01/2019	$41.75	$7.60	$14.65	$0.00	$64.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MASON TENDER *LABORERS - ZONE 1*	06/01/2017	$37.10	$7.60	$14.65	$0.00	$59.35
	12/01/2017	$37.95	$7.60	$14.65	$0.00	$60.20
	06/01/2018	$38.90	$7.60	$14.65	$0.00	$61.15
	12/01/2018	$39.85	$7.60	$14.65	$0.00	$62.10
	06/01/2019	$40.85	$7.60	$14.65	$0.00	$63.10
	12/01/2019	$41.85	$7.60	$14.65	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 1*	06/01/2017	$36.85	$7.60	$14.65	$0.00	$59.10
	12/01/2017	$37.70	$7.60	$14.65	$0.00	$59.95
	06/01/2018	$38.65	$7.60	$14.65	$0.00	$60.90
	12/01/2018	$39.60	$7.60	$14.65	$0.00	$61.85
	06/01/2019	$40.60	$7.60	$14.65	$0.00	$62.85
	12/01/2019	$41.60	$7.60	$14.65	$0.00	$63.85
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 1*	06/01/2017	$36.85	$7.60	$14.65	$0.00	$59.10
	12/01/2017	$37.70	$7.60	$14.65	$0.00	$59.95
	06/01/2018	$38.65	$7.60	$14.65	$0.00	$60.90
	12/01/2018	$39.60	$7.60	$14.65	$0.00	$61.85
	06/01/2019	$40.60	$7.60	$14.65	$0.00	$62.85
	12/01/2019	$41.60	$7.60	$14.65	$0.00	$63.85
This classification applies to all tree work associated with the removal of standing trees, and trimming and removal of branches and limbs when the work is not done for a utility company for the purpose of operation, maintenance or repair of utility company equipment. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR *LABORERS - ZONE 1*	06/01/2017	$37.10	$7.60	$14.65	$0.00	$59.35
	12/01/2017	$37.95	$7.60	$14.65	$0.00	$60.20
	06/01/2018	$38.90	$7.60	$14.65	$0.00	$61.15
	12/01/2018	$39.85	$7.60	$14.65	$0.00	$62.10
	06/01/2019	$40.85	$7.60	$14.65	$0.00	$63.10
	12/01/2019	$41.85	$7.60	$14.65	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2017	$38.78	$10.75	$17.67	$0.00	$67.20

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

Effective Date - 02/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.39	$10.75	$17.67	$0.00	$47.81
2	60	$23.27	$10.75	$17.67	$0.00	$51.69
3	70	$27.15	$10.75	$17.67	$0.00	$55.57
4	80	$31.02	$10.75	$17.67	$0.00	$59.44
5	90	$34.90	$10.75	$17.67	$0.00	$63.32

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2017	$50.80	$10.75	$19.22	$0.00	$80.77

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 02/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.40	$10.75	$19.22	$0.00	$55.37
2	60	$30.48	$10.75	$19.22	$0.00	$60.45
3	70	$35.56	$10.75	$19.22	$0.00	$65.53
4	80	$40.64	$10.75	$19.22	$0.00	$70.61
5	90	$45.72	$10.75	$19.22	$0.00	$75.69

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$45.93	$10.00	$15.25	$0.00	$71.18
	12/01/2017	$46.92	$10.00	$15.25	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$45.93	$10.00	$15.25	$0.00	$71.18
	12/01/2017	$46.92	$10.00	$15.25	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 1) *MILLWRIGHTS LOCAL 1121 - Zone 1*	04/01/2017	$38.62	$9.90	$18.50	$0.00	$67.02
	10/01/2017	$39.52	$9.90	$18.50	$0.00	$67.92
	04/01/2018	$40.42	$9.90	$18.50	$0.00	$68.82
	10/01/2018	$41.32	$9.90	$18.50	$0.00	$69.72
	04/01/2019	$42.22	$9.90	$18.50	$0.00	$70.62

Apprentice - *MILLWRIGHT - Local 1121 Zone 1*

Effective Date - 04/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$21.24	$9.90	$5.31	$0.00	$36.45
2	65	$25.10	$9.90	$15.13	$0.00	$50.13
3	75	$28.97	$9.90	$16.10	$0.00	$54.97
4	85	$32.83	$9.90	$17.06	$0.00	$59.79

Effective Date - 10/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$21.74	$9.90	$5.31	$0.00	$36.95
2	65	$25.69	$9.90	$15.13	$0.00	$50.72
3	75	$29.64	$9.90	$16.10	$0.00	$55.64
4	85	$33.59	$9.90	$17.06	$0.00	$60.55

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MORTAR MIXER *LABORERS - ZONE 1*	06/01/2017	$37.10	$7.60	$14.65	$0.00	$59.35
	12/01/2017	$37.95	$7.60	$14.65	$0.00	$60.20
	06/01/2018	$38.90	$7.60	$14.65	$0.00	$61.15
	12/01/2018	$39.85	$7.60	$14.65	$0.00	$62.10
	06/01/2019	$40.85	$7.60	$14.65	$0.00	$63.10
	12/01/2019	$41.85	$7.60	$14.65	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$23.47	$10.00	$15.25	$0.00	$48.72
	12/01/2017	$23.99	$10.00	$15.25	$0.00	$49.24
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$27.54	$10.00	$15.25	$0.00	$52.79
	12/01/2017	$28.15	$10.00	$15.25	$0.00	$53.40
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$45.93	$10.00	$15.25	$0.00	$71.18
	12/01/2017	$46.92	$10.00	$15.25	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.71	$7.85	$0.00	$0.00	$33.56
2	55	$28.28	$7.85	$3.66	$0.00	$39.79
3	60	$30.85	$7.85	$3.99	$0.00	$42.69
4	65	$33.42	$7.85	$4.32	$0.00	$45.59
5	70	$35.99	$7.85	$14.11	$0.00	$57.95
6	75	$38.56	$7.85	$14.44	$0.00	$60.85
7	80	$41.13	$7.85	$14.77	$0.00	$63.75
8	90	$46.27	$7.85	$15.44	$0.00	$69.56

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	01/01/2017	$42.31	$7.85	$16.10	$0.00	$66.26

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - New*

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.16	$7.85	$0.00	$0.00	$29.01
2	55	$23.27	$7.85	$3.66	$0.00	$34.78
3	60	$25.39	$7.85	$3.99	$0.00	$37.23
4	65	$27.50	$7.85	$4.32	$0.00	$39.67
5	70	$29.62	$7.85	$14.11	$0.00	$51.58
6	75	$31.73	$7.85	$14.44	$0.00	$54.02
7	80	$33.85	$7.85	$14.77	$0.00	$56.47
8	90	$38.08	$7.85	$15.44	$0.00	$61.37

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2017	$40.37	$7.85	$16.10	$0.00	$64.32

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint*

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.19	$7.85	$0.00	$0.00	$28.04
2	55	$22.20	$7.85	$3.66	$0.00	$33.71
3	60	$24.22	$7.85	$3.99	$0.00	$36.06
4	65	$26.24	$7.85	$4.32	$0.00	$38.41
5	70	$28.26	$7.85	$14.11	$0.00	$50.22
6	75	$30.28	$7.85	$14.44	$0.00	$52.57
7	80	$32.30	$7.85	$14.77	$0.00	$54.92
8	90	$36.33	$7.85	$15.44	$0.00	$59.62

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) *LABORERS - ZONE 1*	06/01/2017	$36.85	$7.60	$14.65	$0.00	$59.10
	12/01/2017	$37.70	$7.60	$14.65	$0.00	$59.95
	06/01/2018	$38.65	$7.60	$14.65	$0.00	$60.90
	12/01/2018	$39.60	$7.60	$14.65	$0.00	$61.85
	06/01/2019	$40.60	$7.60	$14.65	$0.00	$62.85
	12/01/2019	$41.60	$7.60	$14.65	$0.00	$63.85
For Apprentice rates see "Apprentice- LABORER"						
PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	01/01/2017	$40.91	$7.85	$16.10	$0.00	$64.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*
Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.46	$7.85	$0.00	$0.00	$28.31
2	55	$22.50	$7.85	$3.66	$0.00	$34.01
3	60	$24.55	$7.85	$3.99	$0.00	$36.39
4	65	$26.59	$7.85	$4.32	$0.00	$38.76
5	70	$28.64	$7.85	$14.11	$0.00	$50.60
6	75	$30.68	$7.85	$14.44	$0.00	$52.97
7	80	$32.73	$7.85	$14.77	$0.00	$55.35
8	90	$36.82	$7.85	$15.44	$0.00	$60.11

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2017	$38.97	$7.85	$16.10	$0.00	$62.92

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*
Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.49	$7.85	$0.00	$0.00	$27.34
2	55	$21.43	$7.85	$3.66	$0.00	$32.94
3	60	$23.38	$7.85	$3.99	$0.00	$35.22
4	65	$25.33	$7.85	$4.32	$0.00	$37.50
5	70	$27.28	$7.85	$14.11	$0.00	$49.24
6	75	$29.23	$7.85	$14.44	$0.00	$51.52
7	80	$31.18	$7.85	$14.77	$0.00	$53.80
8	90	$35.07	$7.85	$15.44	$0.00	$58.36

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2016	$33.08	$10.91	$10.89	$0.00	$54.88
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2015	$42.04	$9.80	$19.23	$0.00	$71.07
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$42.04	$9.80	$19.23	$0.00	$71.07

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PILE DRIVER - Local 56 Zone 1*
Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.02	$9.80	$19.23	$0.00	$50.05
2	60	$25.22	$9.80	$19.23	$0.00	$54.25
3	70	$29.43	$9.80	$19.23	$0.00	$58.46
4	75	$31.53	$9.80	$19.23	$0.00	$60.56
5	80	$33.63	$9.80	$19.23	$0.00	$62.66
6	80	$33.63	$9.80	$19.23	$0.00	$62.66
7	90	$37.84	$9.80	$19.23	$0.00	$66.87
8	90	$37.84	$9.80	$19.23	$0.00	$66.87

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPEFITTER & STEAMFITTER *PIPEFITTERS LOCAL 537*	03/01/2017	$51.19	$9.70	$18.14	$0.00	$79.03

Apprentice - *PIPEFITTER - Local 537*
Effective Date - 03/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$20.48	$9.70	$7.50	$0.00	$37.68
2	45	$23.04	$9.70	$18.14	$0.00	$50.88
3	60	$30.71	$9.70	$18.14	$0.00	$58.55
4	70	$35.83	$9.70	$18.14	$0.00	$63.67
5	80	$40.95	$9.70	$18.14	$0.00	$68.79

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

Apprentice to Journeyworker Ratio:**

PIPELAYER *LABORERS - ZONE 1*	06/01/2017	$37.10	$7.60	$14.65	$0.00	$59.35
	12/01/2017	$37.95	$7.60	$14.65	$0.00	$60.20
	06/01/2018	$38.90	$7.60	$14.65	$0.00	$61.15
	12/01/2018	$39.85	$7.60	$14.65	$0.00	$62.10
	06/01/2019	$40.85	$7.60	$14.65	$0.00	$63.10
	12/01/2019	$41.85	$7.60	$14.65	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						
PLUMBERS & GASFITTERS *PLUMBERS & GASFITTERS LOCAL 12*	03/01/2017	$52.69	$11.32	$15.46	$0.00	$79.47

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PLUMBER/GASFITTER - Local 12*

Effective Date - 03/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$18.44	$11.32	$5.74	$0.00	$35.50
2	40	$21.08	$11.32	$6.49	$0.00	$38.89
3	55	$28.98	$11.32	$8.73	$0.00	$49.03
4	65	$34.25	$11.32	$10.23	$0.00	$55.80
5	75	$39.52	$11.32	$11.72	$0.00	$62.56

Notes:
** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic$58.50 Step5 with lic$65.36

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537*	03/01/2017	$51.19	$9.70	$18.14	$0.00	$79.03
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 1*	06/01/2017	$37.10	$7.60	$14.65	$0.00	$59.35
	12/01/2017	$37.95	$7.60	$14.65	$0.00	$60.20
	06/01/2018	$38.90	$7.60	$14.65	$0.00	$61.15
	12/01/2018	$39.85	$7.60	$14.65	$0.00	$62.10
	06/01/2019	$40.85	$7.60	$14.65	$0.00	$63.10
	12/01/2019	$41.85	$7.60	$14.65	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER *LABORERS - ZONE 1*	06/01/2017	$37.85	$7.60	$14.65	$0.00	$60.10
	12/01/2017	$38.70	$7.60	$14.65	$0.00	$60.95
	06/01/2018	$39.65	$7.60	$14.65	$0.00	$61.90
	12/01/2018	$40.60	$7.60	$14.65	$0.00	$62.85
	06/01/2019	$41.60	$7.60	$14.65	$0.00	$63.85
	12/01/2019	$42.60	$7.60	$14.65	$0.00	$64.85
For apprentice rates see "Apprentice- LABORER"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$46.38	$10.00	$15.25	$0.00	$71.63
	12/01/2017	$47.38	$10.00	$15.25	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$46.38	$10.00	$15.25	$0.00	$71.63
	12/01/2017	$47.38	$10.00	$15.25	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$31.86	$10.00	$15.25	$0.00	$57.11
	12/01/2017	$32.55	$10.00	$15.25	$0.00	$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY MIX CONCRETE DRIVERS after 4/30/10 (Drivers Hired After 4/30/2010)*TEAMSTERS LOCAL 25c*	07/01/2017	$28.18	$8.48	$9.72	$0.00	$46.38
READY-MIX CONCRETE DRIVER *TEAMSTERS LOCAL 25c*	07/01/2017	$29.48	$8.48	$9.72	$0.00	$47.68
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$45.93	$10.00	$15.25	$0.00	$71.18
	12/01/2017	$46.92	$10.00	$15.25	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
RESIDENTIAL WOOD FRAME (All Other Work) *CARPENTERS -ZONE 2 (Residential Wood)*	06/01/2016	$25.32	$9.80	$16.82	$0.00	$51.94
RESIDENTIAL WOOD FRAME CARPENTER ** ** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement.*CARPENTERS -ZONE 2 (Residential Wood)*	04/01/2017	$26.31	$7.07	$7.18	$0.00	$40.56
	10/01/2017	$26.93	$7.07	$7.18	$0.00	$41.18
	04/01/2018	$27.35	$7.07	$7.18	$0.00	$41.60
	10/01/2018	$27.77	$7.07	$7.18	$0.00	$42.02
	04/01/2019	$28.20	$7.07	$7.18	$0.00	$42.45
	10/01/2019	$28.63	$7.07	$7.18	$0.00	$42.88

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

Apprentice - *CARPENTER (Residential Wood Frame) - Zone 2*

Effective Date - 04/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$15.79	$7.07	$0.00	$0.00	$22.86
2	60	$15.79	$7.07	$0.00	$0.00	$22.86
3	65	$17.10	$7.07	$7.18	$0.00	$31.35
4	70	$18.42	$7.07	$7.18	$0.00	$32.67
5	75	$19.73	$7.07	$7.18	$0.00	$33.98
6	80	$21.05	$7.07	$7.18	$0.00	$35.30
7	85	$22.36	$7.07	$7.18	$0.00	$36.61
8	90	$23.68	$7.07	$7.18	$0.00	$37.93

Effective Date - 10/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$16.16	$7.07	$0.00	$0.00	$23.23
2	60	$16.16	$7.07	$0.00	$0.00	$23.23
3	65	$17.50	$7.07	$7.18	$0.00	$31.75
4	70	$18.85	$7.07	$7.18	$0.00	$33.10
5	75	$20.20	$7.07	$7.18	$0.00	$34.45
6	80	$21.54	$7.07	$7.18	$0.00	$35.79
7	85	$22.89	$7.07	$7.18	$0.00	$37.14
8	90	$24.24	$7.07	$7.18	$0.00	$38.49

Notes:

Apprentice to Journeyworker Ratio:1:5

RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 1*	06/01/2017	$37.10	$7.60	$14.65	$0.00	$59.35
	12/01/2017	$37.95	$7.60	$14.65	$0.00	$60.20
	06/01/2018	$38.90	$7.60	$14.65	$0.00	$61.15
	12/01/2018	$39.85	$7.60	$14.65	$0.00	$62.10
	06/01/2019	$40.85	$7.60	$14.65	$0.00	$63.10
	12/01/2019	$41.85	$7.60	$14.65	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$45.93	$10.00	$15.25	$0.00	$71.18
	12/01/2017	$46.92	$10.00	$15.25	$0.00	$72.17

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	08/01/2017	$41.36	$11.20	$14.80	$0.00	$67.36
	02/01/2018	$42.51	$11.20	$14.80	$0.00	$68.51
	08/01/2018	$43.61	$11.20	$14.80	$0.00	$69.61
	02/01/2019	$44.76	$11.20	$14.80	$0.00	$70.76

Apprentice - *ROOFER - Local 33*

Effective Date - 08/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.68	$11.20	$3.44	$0.00	$35.32
2	60	$24.82	$11.20	$14.80	$0.00	$50.82
3	65	$26.88	$11.20	$14.80	$0.00	$52.88
4	75	$31.02	$11.20	$14.80	$0.00	$57.02
5	85	$35.16	$11.20	$14.80	$0.00	$61.16

Effective Date - 02/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.26	$11.20	$3.44	$0.00	$35.90
2	60	$25.51	$11.20	$14.80	$0.00	$51.51
3	65	$27.63	$11.20	$14.80	$0.00	$53.63
4	75	$31.88	$11.20	$14.80	$0.00	$57.88
5	85	$36.13	$11.20	$14.80	$0.00	$62.13

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.
(Hot Pitch Mechanics' receive $1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	08/01/2017	$41.61	$11.20	$14.80	$0.00	$67.61
	02/01/2018	$42.76	$11.20	$14.80	$0.00	$68.76
	08/01/2018	$43.86	$11.20	$14.80	$0.00	$69.86
	02/01/2019	$45.01	$11.20	$14.80	$0.00	$71.01
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2017	$43.83	$11.45	$24.03	$2.38	$81.69
	02/01/2018	$44.98	$11.45	$24.03	$2.38	$82.84

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 17-A*

Effective Date - 08/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.53	$11.45	$5.61	$0.00	$34.59
2	40	$17.53	$11.45	$5.61	$0.00	$34.59
3	45	$19.72	$11.45	$10.76	$1.26	$43.19
4	45	$19.72	$11.45	$10.76	$1.26	$43.19
5	50	$21.92	$11.45	$11.71	$1.35	$46.43
6	50	$21.92	$11.45	$11.96	$1.36	$46.69
7	60	$26.30	$11.45	$13.61	$1.54	$52.90
8	65	$28.49	$11.45	$14.56	$1.64	$56.14
9	75	$32.87	$11.45	$16.47	$1.82	$62.61
10	85	$37.26	$11.45	$17.87	$2.00	$68.58

Effective Date - 02/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.99	$11.45	$5.24	$0.00	$34.68
2	40	$17.99	$11.45	$5.24	$0.00	$34.68
3	45	$20.24	$11.45	$10.31	$1.27	$43.27
4	45	$20.24	$11.45	$10.31	$1.27	$43.27
5	50	$22.49	$11.45	$11.21	$1.37	$46.52
6	50	$22.49	$11.45	$11.46	$1.38	$46.78
7	60	$26.99	$11.45	$13.02	$1.56	$53.02
8	65	$29.24	$11.45	$13.93	$1.67	$56.29
9	75	$33.74	$11.45	$15.74	$1.85	$62.78
10	85	$38.23	$11.45	$17.05	$2.03	$68.76

Notes:
Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SIGN ERECTOR *PAINTERS LOCAL 35 - ZONE 2*	06/01/2013	$25.81	$7.07	$7.05	$0.00	$39.93

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - *SIGN ERECTOR - Local 35 Zone 2*						
Effective Date - 06/01/2013						
Step percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1 50	$12.91	$7.07	$0.00	$0.00	$19.98	
2 55	$14.20	$7.07	$2.45	$0.00	$23.72	
3 60	$15.49	$7.07	$2.45	$0.00	$25.01	
4 65	$16.78	$7.07	$2.45	$0.00	$26.30	
5 70	$18.07	$7.07	$7.05	$0.00	$32.19	
6 75	$19.36	$7.07	$7.05	$0.00	$33.48	
7 80	$20.65	$7.07	$7.05	$0.00	$34.77	
8 85	$21.94	$7.07	$7.05	$0.00	$36.06	
9 90	$23.23	$7.07	$7.05	$0.00	$37.35	
Notes: Steps are 4 mos.						
Apprentice to Journeyworker Ratio:1:1						
SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2016	$33.54	$10.91	$10.89	$0.00	$55.34
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2016	$33.83	$10.91	$10.89	$0.00	$55.63
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1*	03/01/2017	$56.08	$8.77	$17.20	$0.00	$82.05
Apprentice - *SPRINKLER FITTER - Local 550 (Section A) Zone 1*						
Effective Date - 03/01/2017						
Step percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1 35	$19.63	$8.52	$8.70	$0.00	$36.85	
2 40	$22.43	$8.52	$8.70	$0.00	$39.65	
3 45	$25.24	$8.52	$8.70	$0.00	$42.46	
4 50	$28.04	$8.52	$8.70	$0.00	$45.26	
5 55	$30.84	$8.52	$8.70	$0.00	$48.06	
6 60	$33.65	$8.52	$10.20	$0.00	$52.37	
7 65	$36.45	$8.52	$10.20	$0.00	$55.17	
8 70	$39.26	$8.52	$10.20	$0.00	$57.98	
9 75	$42.06	$8.52	$10.20	$0.00	$60.78	
10 80	$44.86	$8.52	$10.20	$0.00	$63.58	
Notes: Apprentice entered prior 9/30/10: 40/45/50/55/60/65/70/75/80/85 Steps are 850 hours						
Apprentice to Journeyworker Ratio:1:3						
STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$45.93	$10.00	$15.25	$0.00	$71.18
	12/01/2017	$46.92	$10.00	$15.25	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$45.93	$10.00	$15.25	$0.00	$71.18
	12/01/2017	$46.92	$10.00	$15.25	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 103*	03/01/2017	$36.25	$13.00	$15.60	$0.00	$64.85
	09/01/2017	$36.96	$13.00	$15.62	$0.00	$65.58
	03/01/2018	$37.86	$13.00	$15.65	$0.00	$66.51
	09/01/2018	$38.75	$13.00	$15.67	$0.00	$67.42
	03/01/2019	$39.65	$13.00	$15.70	$0.00	$68.35
Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 103*						
Effective Date - 03/01/2017						
Step percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1 40	$14.50	$13.00	$0.44	$0.00	$27.94	
2 40	$14.50	$13.00	$0.44	$0.00	$27.94	
3 45	$16.31	$13.00	$12.54	$0.00	$41.85	
4 45	$16.31	$13.00	$12.54	$0.00	$41.85	
5 50	$18.13	$13.00	$12.81	$0.00	$43.94	
6 55	$19.94	$13.00	$13.09	$0.00	$46.03	
7 60	$21.75	$13.00	$13.37	$0.00	$48.12	
8 65	$23.56	$13.00	$13.65	$0.00	$50.21	
9 70	$25.38	$13.00	$13.93	$0.00	$52.31	
10 75	$27.19	$13.00	$14.21	$0.00	$54.40	
Effective Date - 09/01/2017						
Step percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1 40	$14.78	$13.00	$0.44	$0.00	$28.22	
2 40	$14.78	$13.00	$0.44	$0.00	$28.22	
3 45	$16.63	$13.00	$12.55	$0.00	$42.18	
4 45	$16.63	$13.00	$12.55	$0.00	$42.18	
5 50	$18.48	$13.00	$12.82	$0.00	$44.30	
6 55	$20.33	$13.00	$13.10	$0.00	$46.43	
7 60	$22.18	$13.00	$13.39	$0.00	$48.57	
8 65	$24.02	$13.00	$13.66	$0.00	$50.68	
9 70	$25.87	$13.00	$13.95	$0.00	$52.82	
10 75	$27.72	$13.00	$14.22	$0.00	$54.94	
Notes:						
Apprentice to Journeyworker Ratio:1:1						
TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2017	$49.70	$10.75	$19.22	$0.00	$79.67

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.85	$10.75	$19.22	$0.00	$54.82
2	60	$29.82	$10.75	$19.22	$0.00	$59.79
3	70	$34.79	$10.75	$19.22	$0.00	$64.76
4	80	$39.76	$10.75	$19.22	$0.00	$69.73
5	90	$44.73	$10.75	$19.22	$0.00	$74.70

Notes:

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	12/01/2016	$37.70	$7.60	$14.35	$0.00	$59.65
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	12/01/2016	$36.42	$7.60	$14.35	$0.00	$58.37
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2016	$36.30	$7.60	$14.35	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$45.93	$10.00	$15.25	$0.00	$71.18
	12/01/2017	$46.92	$10.00	$15.25	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2016	$34.12	$10.91	$10.89	$0.00	$55.92
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	12/01/2016	$48.58	$7.60	$14.75	$0.00	$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	12/01/2016	$50.58	$7.60	$14.75	$0.00	$72.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	12/01/2016	$40.65	$7.60	$14.75	$0.00	$63.00
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	12/01/2016	$42.65	$7.60	$14.75	$0.00	$65.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2016	$33.54	$10.91	$10.89	$0.00	$55.34
WAGON DRILL OPERATOR *LABORERS - ZONE 1*	06/01/2017	$37.60	$7.60	$14.15	$0.00	$59.35
	12/01/2017	$38.45	$7.60	$14.15	$0.00	$60.20
	06/01/2018	$39.40	$7.60	$14.15	$0.00	$61.15
	12/01/2018	$40.35	$7.60	$14.15	$0.00	$62.10
	06/01/2019	$41.35	$7.60	$14.15	$0.00	$63.10
	12/01/2019	$42.35	$7.60	$14.15	$0.00	$64.10
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2017	$46.38	$10.00	$15.25	$0.00	$71.63
	12/01/2017	$47.38	$10.00	$15.25	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12*	03/01/2017	$52.69	$11.32	$15.46	$0.00	$79.47
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/28/2016	$26.61	$7.50	$1.80	$0.00	$35.91
	09/03/2017	$27.14	$7.75	$1.81	$0.00	$36.70
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/28/2016	$37.70	$7.50	$8.87	$0.00	$54.07
	09/03/2017	$38.45	$7.75	$9.53	$0.00	$55.73
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/28/2016	$31.05	$7.50	$8.89	$0.00	$47.44
	09/03/2017	$31.66	$7.75	$9.44	$0.00	$48.85
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/28/2016	$24.39	$7.50	$1.73	$0.00	$33.62
	09/03/2017	$24.88	$7.75	$1.75	$0.00	$34.38
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/28/2016	$37.70	$7.50	$12.95	$0.00	$58.15
	09/03/2017	$38.45	$7.75	$13.61	$0.00	$59.81
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/28/2016	$33.26	$7.50	$9.63	$0.00	$50.39
	09/03/2017	$33.92	$7.75	$10.21	$0.00	$51.88
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/28/2016	$24.39	$7.50	$1.73	$0.00	$33.62
	09/03/2017	$24.88	$7.75	$1.75	$0.00	$34.38
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/28/2016	$19.96	$7.50	$1.60	$0.00	$29.06
	09/03/2017	$20.35	$7.75	$1.61	$0.00	$29.71
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/28/2016	$44.35	$7.50	$15.83	$0.00	$67.68
	09/03/2017	$45.23	$7.75	$16.61	$0.00	$69.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LINEMAN (Outside Electrical) - East Local 104*

Effective Date - 08/28/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$26.61	$7.50	$3.30	$0.00	$37.41
2	65	$28.83	$7.50	$3.36	$0.00	$39.69
3	70	$31.05	$7.50	$3.43	$0.00	$41.98
4	75	$33.26	$7.50	$5.00	$0.00	$45.76
5	80	$35.48	$7.50	$5.06	$0.00	$48.04
6	85	$37.70	$7.50	$5.13	$0.00	$50.33
7	90	$39.92	$7.50	$7.20	$0.00	$54.62

Effective Date - 09/03/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$27.14	$7.75	$3.31	$0.00	$38.20
2	65	$29.40	$7.75	$3.38	$0.00	$40.53
3	70	$31.66	$7.75	$3.45	$0.00	$42.86
4	75	$33.92	$7.75	$5.02	$0.00	$46.69
5	80	$36.18	$7.75	$5.09	$0.00	$49.02
6	85	$38.45	$7.75	$5.15	$0.00	$51.35
7	90	$40.71	$7.75	$7.22	$0.00	$55.68

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	01/01/2016	$28.98	$4.25	$3.12	$0.00	$36.35
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	01/01/2016	$27.31	$4.25	$3.07	$0.00	$34.63
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	01/01/2016	$27.31	$4.25	$3.07	$0.00	$34.63
TREE TRIMMER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	01/31/2016	$18.51	$3.55	$0.00	$0.00	$22.06

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is not on the ground. This classification does not apply to wholesale tree removal.

TREE TRIMMER GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	01/31/2016	$16.32	$3.55	$0.00	$0.00	$19.87

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is on the ground. This classification does not apply to wholesale tree removal.

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

Compliance Plan - Direct/indirect Participation of Subcontractors/Suppliers/Consultants

M/WBE firms may participate in the performance of this contract, either DIRECTLY or INDIRECTLY, as: Prime Bidders/Proposers; Joint Venture Partners; Subcontractors; and/or Suppliers. (if performing INDIRECTLY approval by CPS is required.)

Name of M/WBE Firm Race/Gender		
Address:		
City/State/Zip: Email:		
Telephone No. Fax CPS Vendor No.		
Contact Person		
Dollar Amt. $	%	Participation: Direct Y N Indirect Y N
Description of Commodity/Services:		

Name of M/WBE Firm Race/Gender		
Address		
City/State/Zip Email:		
Telephone No. Fax CPS Vendor No.		
Contact Person		
Dollar Amt. $	%	Participation Direct Y N Indirect Y N
Description of Commodity/Services		

Name of M/WBE Firm Race/Gender		
Address		
City/State/Zip Email:		
Telephone No. Fax CPS Vendor No.		
Contact Person		
Dollar Amt. $	%	Participation Direct Y N Indirect Y N
Description of Commodity/Services		

Total WBE Direct $_____ _____% Total

WBE Indirect $_____ _____%

Total MBE Direct $_____ _____%

Total MBE Indirect $_____ _____%

Section 00500
AGREEMENT
OWNER-CONTRACTOR AGREEMENT FOR PUBLIC WORKS CONSTRUCTION

THIS AGREEMENT made this _____ day of _____ in the year **2017**, between _____**;** with a usual place of business at _____ thereinafter called the CONTRACTOR, and the **City of Woburn**, acting by its Mayor, with a usual place of business at City Hall, 10 Common Street, Woburn, MA 01801-4139, hereinafter called the OWNER.

The CONTRACTOR and the OWNER, for the consideration hereinafter named, agree as follows:

1. Scope of Work

The Contractor shall furnish all labor, materials, equipment, and insurance to perform all work required for the project known as the **"Main St. Municipal Parking Lot", 18-IFB-002** Bid of **August 31, 2017** in strict accordance with the Contract Documents and all related Drawings and Specifications. The said Documents, Specifications, Drawings, and any GENERAL SUPPLEMENTARY CONDITIONS are incorporated herein by reference and are made a part of this Agreement.

2. Contract Price

The Owner shall pay the Contractor for the performance of this Agreement, subject to additions and deductions provided herein, in current funds, the sum of **$_____ based on the unit prices tendered with the bid.**

3. Commencement and Completion of Work

It is agreed that time is of the essence of this Agreement. The Contractor shall commence and prosecute the work under this Agreement upon execution hereof and shall complete the work on or before **June 30, 2018.**

A. Definition of Term. The Term "Substantial completion" shall mean the date certified by the Owner when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner may occupy the project, or designated portion(s) thereof, for the use for which it is intended.

B. Time as Essential Condition. It is understood and agreed that the commencement of and substantial completion of the work are essential conditions of this Agreement. It is further agreed that time is of the essence for each and every portion of the Contract Documents wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract Documents any additional time is allowed for the completion of any work, the new time fixed by such extension shall be of the essence of this Agreement. It is understood and agreed that the times for the completion of the work are reasonable, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

C. Progress and Completion. Contractor shall commence work promptly upon execution of this Agreement and shall prosecute and complete the work regularly, diligently and uninterruptedly at such a rate of progress as will insure Substantial Completion within the stipulated number of calendar days.

4. Performance of the Work

A. Direction of the Work. The Contractor shall supervise and direct the Work, using his best skills and attention which shall not be less than such state of skill and attention generally rendered by the contracting profession for projects similar to the Project in scope, difficulty and location. The Contractor shall maintain adequate supervisory personnel at the project site during the performance of the Work. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Agreement.

B. Responsibility for the Work

a. The Contractor shall be responsible to the Owner for the acts and omissions of his employees, Subcontractors and their agents and employees, and other persons performing any of the Work under a contract with the Contractor. This obligation shall also extend to the presence on the Site of suppliers of materials or equipment, their employees, contractors, and agents engaged in the work.

b. The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Owner in its administration of the Agreement, or by inspections, tests or approvals required or performed by persons other than the Contractor.

C. Permits and Fees. Unless otherwise expressly provided, the Contractor shall secure and pay for all permits and fees, licenses and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Agreement and which are legally required at the time the bids are received, and the same shall at all times be the property of the Owner and shall be delivered to the Owner upon completion of the Project.

D. Notices, Compliance With Laws

a. The Contractor shall give all notices and comply with all federal, state and local laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work. The Contractor shall provide the Owner with reproductions of all permits, licenses and receipts for any fees paid. The Owner represents that it has disclosed to the Contractor all orders and requirements known to the Owner of any public authority particular to this Agreement.

b. If the Contractor observes that any of the Contract Documents are at variance with applicable laws, statutes, codes and regulations in any respect, he shall promptly notify the Owner in writing, and any necessary changes shall be accomplished by appropriate modification.

c. If the Contractor performs any Work which he knows or should know is contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner, he shall assume full responsibility therefor and shall bear all costs attributable thereto.

d. In the performance of the Work, the Contractor shall comply with all applicable federal, state and local laws and regulations including those relating to workplace and employee safety. The Contractor shall notify the Owner immediately of any conditions at the place of

the work which violate said laws and regulations and shall take prompt action to correct and eliminate any such violations.

E. Project Superintendent. The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site at all times during the progress of the Work. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed on written request in each case.

F. Progress Schedule. The Contractor, immediately after being awarded the Contract, shall prepare and submit for the Owner's information an estimated progress schedule for the Work. The progress schedule shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

G. Drawings, Specifications, and Submittals

a. The Contractor shall maintain at the site for the Owner one record copy of all Drawings, Specifications, Addenda, Change Orders, and other Modifications, and "As-Built" Drawings and Specifications in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Product Data, and Samples. These shall be delivered to the Owner upon completion of the Work.

b. By approving and submitting Shop Drawings, Product Data, and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

c. The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Owner's approval of Shop Drawings, Product Data or Samples unless the Contractor has specifically informed the Owner in writing of such deviation at the time of submission and the Owner has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data, or Samples by the Owner's approval thereof.

d. The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Owner on previous submittals.

e. No portion of the Work requiring submission of a Shop Drawing, Product Data, or Sample shall be commenced until the submittal has been approved by the Owner. All such portions of the Work shall be in accordance with approved submittals.

H. Protection of the Work and Owner's Property. The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this Agreement. He shall at all times safely guard and protect his own work, and that of adjacent property from damage. The Contractor shall replace or make good any such damage, loss or injury. The Contractor shall clean the work area and restore it to its original condition upon completion of the work.

I. Quality of the Work. The Contractor shall perform the work in a good, workmanlike manner. The Contractor hereby guarantees that the entire work constructed by him under the Agreement will meet fully all requirements thereof as to quality of workmanship and materials. The Contractor hereby agrees to make at his own expense any repairs or replacements made necessary by defects in materials or workmanship supplied to him that become evident within one (1) year after the date of the final payment, and to restore to full compliance with the requirements set forth herein any part of the work constructed hereunder, which during said one (1) year period is found to be deficient with respect to any provisions of the Contract Documents. The Contractor also agrees to hold the Owner harmless from claims of any kind arising from damage due to said defects. The Contractor shall make all repairs and replacements promptly upon receipt of written orders for same from the Owner. If the Contractor fails to make the repairs and replacements promptly, the Owner may do the work and the Contractor shall be liable to the Owner for the cost thereof.

J. Warranty. The Contractor guarantees to Owner that all materials incorporated into the work will be new unless otherwise specified or agreed. Prior to final payment, the Contractor shall deliver to the Owner all manufacturers' warranties, together with such endorsements or assignments as are necessary to ensure to the Owner the full rights and benefits of such warranties.

5. Affirmative Action/Equal Employment Opportunity

The Contractor is directed to comply with all applicable State Laws, Ordinances, Bylaws, and rules and regulations regarding affirmative action/equal employment opportunity requirements. Failure of the Contractor to comply with any such law, rule or regulation shall constitute grounds for the Owner to terminate the Agreement.

6. Site Information Not Guaranteed; Contractor's Investigation

All information given in the Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources at present available to the Owner. All such information is furnished only for the information and convenience of the Contractor and is not guaranteed.

It is agreed and understood that the Owner does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes, or other structures encountered during construction will be the same as those indicated in the Contract Documents.

Contractor has familiarized himself with the nature and extent of the Contract Documents, work, locality, and with all local conditions and federal, state, and local laws, rules, ordinances, and regulations that in any manner may affect costs, progress, or performance of the work. Contractor has made, or has caused to be made, examinations, investigations, and tests and studies of such reports and related data in addition to those referred to in the paragraph above as he deems necessary for the performance of the work at the Contract Price, within the Contract Time, and in accordance with the other Terms and Conditions of the Contract Documents; and no additional examinations, tests, investigations, reports, and similar data are or will be required by the Contractor for such purposes.

Contractor has correlated the results of all such observations, examinations, investigations, tests, reports, and data with the Contract Documents. Contractor has given the Owner written notice of

all conflicts, errors, or discrepancies that he has discovered in the Contract Documents, and the resolution thereof by the Owner is acceptable to the Contractor.

It is further agreed and understood that the Contractor shall not use or be entitled to use any of the information made available to him or obtained in any examination made by him in any manner as a basis of or ground for any claim or demand against the Owner, arising from or by reason of any variance which may exist between the information made available and the actual subsurface conditions or other conditions or structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

7. Project Engineer

The City Engineering Department is the representative of the Owner (Public Works Superintendent) and the Contractor shall direct all communications, questions and comments on the work and the performance thereof to the City Enginner with copies to the DPW Superintendent. Except as otherwise provided, the City Engineer shall have all the authority of the Owner set forth in the Contract Documents. In general, the City Engineer shall have the authority to review the performance of the work, reject work which is defective or otherwise does not comply with the Contract Documents and to order the Contractor to remedy defective work and take such actions which are necessary to make the work conform to the Contract Documents.

8. Wage Rates

Prevailing Wage Rates as determined by the Commissioner of the Department of Labor and Workforce Development under the provisions of Massachusetts General Laws, Chapter 149, Section 26 to 27G, as amended, apply to this project. It is the responsibility of the Contractor to provide the City with certified payrolls and to comply with all requirements of the above-cited statutes.

The schedules of prevailing wage rates were included in the initial bid documentation.

9. Payments to the Contractor

A. The Owner shall make payment to the Contractor in accordance with the provisions of Sections 39F and 39G of Chapter 30 of the General Laws of the Commonwealth of Massachusetts. The Contractor shall submit requisitions for payment as required by said provisions and the directions of the Owner.

B. The Contractor's applications for payment shall be subject to approval by the Engineer.

C. Changes in the Work. No changes in the work covered by the approved Contract Documents shall be made without prior written approval of the Owner. Charges or credits for the work covered by the approved change shall be determined by one or more, or a combination of the following method:

   a. Unit bid prices previously approved

To the cost under (c) there shall be added a fixed fee to be agreed upon but not to exceed fifteen percent (15%) of the actual cost of work. The fee shall be compensation to cover the cost of supervision, overhead, bonds, profit and any other general expenses.

D. Claims for Additional Costs. If the Contractor wishes to make a claim for an increase in the Contract Sum, he shall give the Owner written notice thereof within twenty days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property. No such claim shall be valid unless so made. Any change in the Contract Sum resulting from such claim shall be authorized by Change Order.

10. Final Payment, Effect

The acceptance of final payment by the Contractor shall constitute a waiver of all claims by the Contractor arising under the Agreement.

11. Contract Documents

The Contract Documents consist of the following, together with this Agreement:

Invitation to Bid
Instructions to Bidders
This Contract Form
Bid Form
Performance Bond
Labor & Materials Payment Bond
Non-Collusion Certificate
Tax Compliance Certificate
Clerk's Certificate of Corporate Vote
Certificate of Insurance
General Conditions
Supplementary General Conditions
General Requirements
Specifications and Addenda
Contract Drawings
Schedule of Prevailing Wages

12. Terms Required By Law

This Agreement shall be considered to include all terms required to be included in it by the Massachusetts General Laws, and all other laws, applicable to the work required under this Agreement as though such terms were set forth in full herein.

13. Affirmative Marketing Program for State Assisted Projects

A. M.G.L., Chapter 193 of the Acts of 2004 established an Affirmative Marketing Program for municipal projects that are funded, in whole or in part, by state financial assistance in order to assure that Minority Business Enterprises (MBE) and Women Business Enterprises (WBE) certified by the State Office of Minority and Women Business Assistance (SOMWBA) have the opportunity to participate in state assisted building projects.

Effective July 1, 2011 the revised MBE/WBE Participation Goals for public agencies and municipalities with Affirmative Marketing Programs under G.L.c.7, § 40N, Executive Order or policy shall be combined goals as follows:

10.4% Combined MBE/WBE participation on Construction Projects

B. In accordance with M.G.L., Chapter 23A, Section 44 and chapter 7, Section 40N, the Contractor shall comply with all applicable requirements for the Work promulgated by the Massachusetts State Office of Minority and Women Business Assistance (SOMWBA).

14. Employee OSHA Safety Training

Pursuant to M.G.L., Chapter 30, Section 39S, the Contractor hereby certifies under the penalties of perjury as follows:

(1) that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;
(2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least ten (10) hours in duration at the time the employee begins work and that he shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and
(3) that all employees to be employed in the work subject to this contract have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least ten (10) hours in duration.

15. Indemnification

The Contractor shall indemnify and hold harmless the Owner from and against any and all claims, damages, losses, and expenses, including attorney's fees, arising out of the performance of this Agreement when such claims, damages, losses, and expenses are caused, in whole or in part, by the acts, errors, or omissions of the Contractor or his employees, agents, subcontractors or representatives.

16. Insurance

The Contractor shall purchase and maintain such insurance as will protect both the Owner and the Contractor from claims which may arise under the Agreement, including operations performed for the named insured by independent contractors and general inspection thereof by the named insured. In addition, the Contractor shall require its subcontractors to maintain such insurance. Coverage shall be provided for:

A. Claims under workers' or workmens' compensation, disability benefit and other applicable employee benefit acts;

B. Claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

C. Claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

D. Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person;

E. Claims for damages, including damages to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

F. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle; and

G. Claims involving contractual liability applicable to the Contractor's obligations under Article 13.

The limits of liability for coverage required under the preceding paragraph shall be as required by the Owner.

Except for Workmen's Compensation, all liability coverage shall name the City of Woburn as an additional insured and shall provide for 30 days prior written notice to the City of any modification or termination of coverage provided thereby. The Contractor shall provide the Owner with appropriate certificate(s) of insurance evidencing compliance with this provision prior to the commencement of any work under this Agreement.

17. Notice

All notices required to be given hereunder shall be in writing and delivered to, or mailed first class to, the parties' respective addresses stated above. In the event that immediate notice is required, it may be given by telephone or facsimile, but shall, to the extent possible, be followed by notice in writing in the manner set forth above.

18. Termination

A. Each party shall have the right to terminate this Agreement in the event of a failure of the other party to comply with the terms of the Agreement. Such termination shall be effective upon seven days' notice to the party in default and the failure within that time of said party to cure its default.

B. The Owner shall have the right to terminate the Agreement without cause, upon ten (10) days' written notice to the Contractor. In the event that the Agreement is terminated pursuant to this subparagraph, the Contractor shall be reimbursed in accordance with the Contract Documents for all Work performed up to the termination date, and for all materials or equipment not incorporated in the Work, but delivered and suitably stored at the site. Payment for material or equipment stored at the site shall be conditioned upon submission by the Contractor of bills of sale or such other evidence as is satisfactory to Owner to establish the Owner's title to such material or equipment or otherwise protect the Owner's interests.

19. Miscellaneous

A. Royalties and Patents. The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified; but if

the Contractor believes or has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner, and thereafter the Owner insists on the use of the design, process or products specified.

B. Assignment. The Contractor shall not assign or transfer any of its rights, duties or obligations under this Agreement without the written approval of the Owner.

C. Governing Law. This Agreement shall be governed by and construed in accordance with the law of the Commonwealth of Massachusetts.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals, the Owner by its authorized representatives who, however, incur no personal liability by reason of the execution hereof or of anything herein contained, as of the day and year first above written.

CITY OF WOBURN, MA

_____
Scott D. Galvin, Mayor

I certify that an appropriation is available
In the amount of this Contract:

_____
Charlie Doherty, City Auditor

_____
Account #

_____
Ellen Callahan Doucette, Esq., City Solicitor

_____
Orazio Deluca, Purchasing Director

_____
John E. Corey, PE, City Engineer

Contractor

By: _____

Name: _____

Title: _____

Section 00550
CHANGE ORDER FORM

Date: _____

Project: Main St. Municipal Parking Lot Project

Change Order No. **1**

Contract Amount (As Bid): _____

Contractor: _____

Amount of Previous Change Orders: **$0.00**

Net Change in Contract Price
(this Change Order): _____

Total Adjusted Contract Price
(including this Change Order): _____

Reason for Change in Contract:

The details of additional cost for this work have been enclosed.

Attachments: Itemized costs
Cost Summary Sheet

Date:

Project: Main St. Municipal Parking Lot Project
Change Order No.

The undersigned agree to the terms of the Change Order:

This Change Order is recommended by:

_____ _____
City Engineer Date

This Change Order is approved by:

_____ _____
Superintendent of Public Works Date

_____ _____
Contractor Date

_____ _____
Mayor Scott D. Galvin, City of Woburn Date

Certification of Appropriation under M.G.L. c.44, s.31C: An appropriation in an amount to cover the total costs of this change order was made:
By: _____ _____
City Auditor Date

Approved as to Legal Form
By: _____ _____
City Solicitor Date

Approved by Purchasing Department
By: _____ _____
City Purchasing Agent
Date

City of Woburn
Permit issued by D.P.W.
50 North Warren Street
Woburn, MA 01801
Phone (781) 897-5980
FAX (781) 897-5989

Permit Number _____

Date Issued _____

Expiration Date _____

TRENCH PERMIT

Pursuant to G.L. c. 82A §1 and 520 CMR 7.00 et seq.(as amended)

THIS PERMIT MUST BE FULLY COMPLETED PRIOR TO CONSIDERATION

Name of Applicant **Street Address**			**Phone** **Cell**
City/Town	**MA**	**ZIP**	
Name of Excavator (if different from applicant) **Street Address**			**Phone** **Cell**
City/Town	**MA**	**ZIP**	
Name of Owner(s) of Property **Street Address**			**Phone** **Cell**
City/Town	**MA**	**ZIP**	
Other Contact			**Permit Fee Received No ( ) Yes ( )**

Description, location and purpose of proposed trench:
Please describe the exact location of the proposed trench and its purpose (include a description of what is (or is intended) to be laid in proposed trench (eg; pipes/cable lines etc..) Please use reverse side if additional space is needed.

Insurance Certificate #:

Name and Contact Information of Insurer:

Policy Expiration Date:

Dig Safe #:

Name of Competent Person (as defined by 520 CMR 7.02):

Massachusetts Hoisting License # **License Grade:**	 **Expiration Date:**

BY SIGNING THIS FORM, THE APPLICANT, OWNER, AND EXCAVATOR ALL ACKNOWLEDGE AND CERTIFY THAT THEY ARE FAMILIAR WITH, OR, BEFORE COMMENCEMENT OF THE WORK, WILL BECOME FAMILIAR WITH, ALL LAWS AND REGULATIONS APPLICABLE TO WORK PROPOSED, INCLUDING OSHA REGULATIONS, G.L. c. 82A, 520 CMR 7.00 et seq., AND ANY APPLICABLE MUNICIPAL ORDINANCES, BY-LAWS AND REGULATIONS AND THEY COVENANT AND AGREE THAT ALL WORK DONE UNDER THE PERMIT ISSUED FOR SUCH WORK WILL COMPLY THEREWITH IN ALL RESPECTS AND WITH THE CONDITIONS SET FORTH BELOW.

THE UNDERSIGNED OWNER AUTHORIZES THE APPLICANT TO APPLY FOR THE PERMIT AND THE EXCAVATOR TO UNDERTAKE SUCH WORK ON THE PROPERTY OF THE OWNER, AND ALSO, FOR THE DURATION OF CONSTRUCTION, AUTHORIZES PERSONS DULY APPOINTED BY THE MUNICIPALITY TO ENTER UPON THE PROPERTY TO MONITOR AND INSPECT THE WORK FOR CONFORMITY WITH THE CONDITIONS ATTACHED HERETO AND THE LAWS AND REGULATIONS GOVERING SUCH WORK.

THE UNDERSIGNED APPLICANT, OWNER AND EXCAVATOR AGREE JOINTLY AND SEVERALLY TO REIMBURSE THE MUNICIPALITY FOR ANY AND ALL COSTS AND EXPENSES INCURRED BY THE MUNICIPALITY IN CONNECTION WITH THIS PERMIT AND THE WORK CONDUCTED THEREUNDER, INCLUDING BUT NOT LIMITED TO ENFORCING THE REQUIREMENTS OF STATE LAW AND CONDITIONS OF THIS PERMIT, INSPECTIONS MADE TO ASSURE COMPLIANCE THEREWITH, AND MEASURES TAKEN BY THE MUNICIPALITY TO PROTECT THE PUBLIC WHERE THE APPLICANT OWNER OR EXCAVATOR HAS FAILED TO COMPLY THEREWITH INCLUDING POLICE DETAILS AND OTHER REMEDIAL MEASURES DEEMED NECESSARY BY THE MUNICIPALITY.

THE UNDERSIGNED APPLICANT, OWNER AND EXCAVATOR AGREE JOINTLY AND SEVERALLY TO DEFEND, INDEMNIFY, AND HOLD HARMLESS THE MUNICIPALITY AND ALL OF ITS AGENTS AND EMPLOYEES FROM ANY AND ALL LIABILITY, CAUSES OR ACTION, COSTS, AND EXPENSES RESULTING FROM OR ARISING OUT OF ANY INJURY, DEATH, LOSS, OR DAMAGE TO ANY PERSON OR PROPERTY DURING THE WORK CONDUCTED UNDER THIS PERMIT.

APPLICANT SIGNATURE

_____ DATE _____

EXCAVATOR SIGNATURE (IF DIFFERENT)

_____ DATE _____

OWNER'S SIGNATURE (IF DIFFERENT)

_____ DATE:_____

For City/Town use -- Do not write in this section	
PERMIT APPROVED BY	**$_____ Application Fee**
PERMITTING AUTHORITY **Date**	
CONDITIONS OF APPROVAL	

CONDITIONS AND REQUIREMENTS PURSUANT TO G.L.C.82A AND 520 CMR 7.00 et seq. (as amended)

By signing the application, the applicant understands and agrees to comply with the following:

i. No trench may be excavated unless the requirements of sections 40 through 40D of chapter 82, and any accompanying regulations, have been met and this permit is invalid unless and until said requirements have been complied with by the excavator applying for the permit including, but not limited to, the establishment of a valid excavation number with the underground plant damage prevention system as said system is defined in section 76D of chapter 164 (DIG SAFE);

ii. Trenches may pose a significant health and safety hazard. Pursuant to Section 1 of Chapter 82 of the General Laws, an excavator shall not leave any open trench unattended without first making every reasonable effort to eliminate any recognized safety hazard that may exist as a result of leaving said open trench unattended. Excavators should consult regulations promulgated by the Department of Public Safety in order to familiarize themselves with the recognized safety hazards associated with excavations and open trenches and the procedures required or recommended by said department in order to make every reasonable effort to eliminate said safety hazards which may include covering, barricading or otherwise protecting open trenches from accidental entry.

iii. Persons engaging in any in any trenching operation shall familiarize themselves with the federal safety standards promulgated by the Occupational Safety and Health Administration on excavations: 29 CFR 1926.650 et.seq., entitled Subpart P "Excavations".

iv. Excavators engaging in any trenching operation who utilize hoisting or other mechanical equipment subject to chapter 146 shall only employ individuals licensed to operate said equipment by the Department of Public Safety pursuant to said chapter and this permit must be presented to said licensed operator before any excavation is commenced;

v. By applying for, accepting and signing this permit, the applicant hereby attests to the following: (1) that they have read and understands the regulations promulgated by the Department of Public Safety with regard to construction related excavations and trench safety; (2) that he has read and understands the federal safety standards promulgated by the Occupational Safety and Health Administration on excavations: 29 CMR 1926.650 et.seq., entitled Subpart P "Excavations" as well as any other excavation requirements established by this municipality; and (3) that he is aware of and has, with regard to the proposed trench excavation on private property or proposed excavation of a city or town public way that forms the basis of the permit application, complied with the requirements of sections 40-40D of chapter 82A.

vi. This permit shall be posted in plain view on the site of the trench.

For additional information please visit the Department of Public Safety's website at www.mass.gov/dps

Summary of Excavation and Trench Safety Regulation (520 CMR 14.00 et seq.)

This summary was prepared by the Massachusetts Department of Public Safety pursuant to G.L.c.82A and does not include all requirements of the 520 CMR 14.00. To view the full regulation and G.L.c.82A, go to www/mass.gov/dps
Pursuant to M.G.L. c. 82, § 1, the Department of Public Safety, jointly with the Division of Occupational Safety, drafted regulations relative to trench safety. The regulation is codified in section 14.00 of title 520 of the Code of Massachusetts Regulations. The regulation requires all excavators to obtain a permit prior to the excavation of a trench made for a construction-related purpose on public or private land or rights-of-way. All municipalities must establish a local permitting authority for the purpose of issuing permits for trenches within their municipality. Trenches on land owned or controlled by a public (state) agency requires a permit to be issued by that public agency unless otherwise designated.

In addition to the permitting requirements mandated by statute, the trench safety regulations require that all excavators, whether public or private, take specific precautions to protect the general public and prevent unauthorized access to unattended trenches. Accordingly, unattended trenches must be covered, barricaded or backfilled. Covers must be road plates at least ¾" thick or equivalent; barricades must be fences at least 6' high with no openings greater than 4" between vertical supports; backfilling must be sufficient to eliminate the trench. Alternatively, excavators may choose to attend trenches at all times, for instance by hiring a police detail, security guard or other attendant who will be present during times when the trench will be unattended by the excavator.

The regulations further provide that local permitting authorities, the Department of Public Safety, or the Division of Occupational Safety may order an immediate shutdown of a trench in the event of a death or serious injury; the failure to obtain a permit; or the failure to implement or effectively use adequate protections for the general public. The trench shall remain shutdown until re-inspected and authorized to re-open provided, however, that excavators shall have the right to appeal an immediate shutdown. Permitting authorities are further authorized to suspend or revoke a permit following a hearing. Excavators may also be subject to administrative fines issued by the Department of Public Safety for identified violations.

Summary of 1926 CFR Subpart P -OSHA Excavation Standard

This is a worker protection standard, and is designed to protect employees who are working inside a trench. This summary was prepared by the Massachusetts Division of Occupational Safety and not OSHA for informational purposes only and does not constitute an official interpretation by OSHA of their regulations, and may not include all aspects of the standard.
For further information or a full copy of the standard go to www.osha.gov.

- **Trench Definition per the OSHA standard:**
  - An excavation made below the surface of the ground, narrow in relation to its length.
  - In general, the depth is greater than the width, but the width of the trench is not greater than fifteen feet.
- **Protective Systems** to prevent soil wall collapse are always required in trenches deeper than 5', and are also required in trenches less than 5' deep when the competent person determines that a hazard exists. Protection options include:
  - Shoring. Shoring must be used in accordance with the OSHA Excavation standard appendices, the equipment manufacturer's tabulated data, or designed by a registered professional engineer.
  - Shielding (Trench Boxes). Trench boxes must be used in accordance with the equipment manufacturer's tabulated data, or a registered professional engineer.
  - Sloping or Benching. In Type C soils (what is most typically encountered) the excavation must extend horizontally 1 ½ feet for every foot of trench depth on both sides, 1 foot for Type B soils, and ¾ foot for Type A soils.
  - A registered professional engineer must design protective systems for all excavations greater than 20' in depth.
- **Ladders** must be used in trenches deeper than 4'.
  - Ladders must be inside the trench with workers at all times, and located within 25' of unobstructed lateral travel for every worker in the trench.
  - Ladders must extend 3' above the top of the trench so workers can safely get onto and off of the ladder.
- **Inspections** of every trench worksite are required:
  - Prior to the start of each shift, and again when there is a change in conditions such as a rainstorm.
  - Inspections must be conducted by the competent person (see below).
- **Competent Person(s) is:**
  - Capable (i.e., trained and knowledgeable) in identifying existing and predictable hazards in the trench, and other working conditions which may pose a hazard to workers, and
  - Authorized by management to take necessary corrective action to eliminate the hazards. Employees must be removed from hazardous areas until the hazard has been corrected.
- **Underground Utilities** must be:
  - Identified prior to opening the excavation (e.g., contact Digsafe).
  - Located by safe and acceptable means while excavating.
  - Protected, supported, or removed once exposed.
- **Spoils** must be kept back a minimum of 2' from the edge of the trench.
- **Surface Encumbrances** creating a hazard must be removed or supported to safeguard employees. Keep heavy equipment and heavy material as far back from the edge of the trench as possible.
- **Stability of Adjacent Structures:**
  - Where the stability of adjacent structures is endangered by creation of the trench, they must be underpinned, braced, or otherwise supported.
  - Sidewalks, pavements, etc. shall not be undermined unless a support system or other method of protection is provided.
- **Protection from water accumulation hazards:**
  - It is not allowable for employees to work in trenches with accumulated water. If water control such as pumping is used to prevent water accumulation, this must be monitored by the competent person.
  - If the trench interrupts natural drainage of surface water, ditches, dikes or other means must be used to prevent this water from entering the excavation.
- **Additional Requirements:**
  - For mobile equipment operated near the edge of the trench, a warning system such as barricades or stop logs must be used.
  - Employees are not permitted to work underneath loads. Operators may not remain in vehicles being loaded unless vehicles are equipped with adequate protection as per 1926.601(b)(6).
  - Employees must wear high-visibility clothing in traffic work zones.
  - Air monitoring must be conducted in trenches deeper than 4' if the potential for a hazardous atmosphere exists. If a hazardous atmosphere is found to exist (e.g., O_2 <19.5% or >23.5%, 20% LEL, specific chemical hazard), adequate protections shall be taken such as ventilation of the space.
  - Walkways are required where employees must cross over the trench. Walkways with guardrails must be provided for crossing over trenches > 6' deep.
  - Employees must be protected from loose rock or soil through protections such as scaling or protective barricades.

Section 00610
PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____
(Name of Contractor)

a _____ hereinafter called "Principal" and
(Corporation, Partnership, Joint Venture or Individual)

_____of _____, State of _____
(Surety) (City)

_____ hereinafter called the "Surety" and licensed by the State Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are held and firmly bound to the City of Woburn, Massachusetts, hereinafter called "Owner", in the penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas the Principal has entered into a certain contract with the Owner (the "Construction Contract"), dated the _____ day of _____, 20___, for the construction described as follows: _____.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of the Construction Contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under the Construction Contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise, this obligation shall remain in full force and effect.

PROVIDED, FURTHER, that the Surety's obligation under this Bond shall arise after (1) the Owner has declared the Principal in default of the Construction Contract or (2) has declared that the Principal has failed, or is otherwise unable or unwilling, to execute the work consistent with, and in conformance to, the Construction Contract (collectively referred to as a "Contractor Default"). The determination of a Contractor Default shall be made solely by the Owner.

When the Surety's obligation under this Bond arises, the Surety, at its sole expense and at the consent and election of the Owner, shall immediately take one of following steps: (1) arrange for the Principal to perform and complete the work of the Construction Contract; (2) arrange for a contractor other than the Principal to perform and complete the work of the Construction Contract; (3) reimburse the Owner, in a manner and at such time as the Owner shall decide, for all costs and expenses incurred by the Owner in performing and completing the work of the Construction Contract.

If the Surety does not proceed as provided in this Bond with due diligence and all deliberate speed, the Surety shall be deemed to be in default of this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner.

After the Surety's obligation under this Bond arises, the Surety is obligated, to the limit of the amounts of this Bond, for (1) the correction of defective work and completion of the Construction Contract; (2) additional design, professional services, and legal costs, including attorney's fees, resulting from the Contractor Default or from the default of the Surety under this Bond; (3) any additional work beyond the Construction Contract made necessary by the Contractor Default or default of the Surety under this Bond; and (4) liquidated damages as provided in the Construction Contract, or if none are so specified, actual and foreseeable consequential damages resulting from the Contractor Default or default of the Surety under this Bond.

Any proceeding, legal or equitable, under this Bond shall be instituted in any court of competent jurisdiction in the Commonwealth of Massachusetts.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Construction Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Construction Contract or to the work or to the specifications.

IN WITNESS WHEREOF, this instrument is executed in _____ ( ) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20___.

ATTEST:

_____
Principal

_____ By _____
(Principal Secretary)

_____

(SEAL) _____

_____
(Address-Zip Code)

_____
Witness as to Principal

_____

_____
(Address-Zip Code)

ATTEST:

_____
Surety

_____ By _____
(Attorney-in-Fact)

_____

(SEAL)

_____
(Address-Zip Code)

_____
Witness as to Surety

_____

_____
(Address-Zip Code)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

Section 00620
PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we

_____, a _____
(Name of Contractor) (Corporation, Partnership, Joint Venture or Individual)

hereinafter called "Principal" and _____
(Surety)

of _____, State of _____

hereinafter called the "Surety" and licensed by the State Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are held and firmly bound to the City of Woburn, Massachusetts, hereinafter called "Owner", in the penal sum of
_____ Dollars

($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20___, a copy of which is hereto attached and made a part hereof for the construction described as follows:

Main St. Municipal Parking Lot Project

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of this contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in six (6) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20_____.

ATTEST:

_____
Principal

By_____
(Principal Secretary)

_____

_____

_____
(Address-Zip Code)

_____
Witness as to Principal

_____ (SEAL)

_____
(Address-Zip Code)

ATTEST:

_____
Surety

By_____
(Attorney-in-Fact)

_____

_____
(Address-Zip Code)

(SEAL)

_____
Witness as to Surety

_____

_____
(Address-Zip Code)

NOTE: If Contractor is a Partnership, all partners should execute Bond.

Section 00700
GENERAL CONDITIONS

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Section 00700

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

ARTICLE 1

CONTRACT DOCUMENTS

1.1 DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Owner-Contractor Agreement, the Conditions of the Contract (General, Supplemental and other Conditions), the Drawings, the Specifications, all Addenda issued prior to and all Modifications issued after execution of the Contract, and all applicable laws, ordinances and regulations. A Modification is (1) a written amendment to the contract signed by both parties, (2) a Change Order, (3) a written interpretation issued by the Owner or (4) a written order for a minor change in the Work issued by the Owner pursuant to Paragraph 12.3. The Contract Documents include Bidding Documents such as the Advertisement or Invitation to Bid, the Instructions to Bidders, sample forms, the Contractor's Bid or portions of Addenda relating to any of these, or any other documents, specifically enumerated in the Owner-Contractor Agreement.

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. This Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined in Subparagraph 1.1.1.

1.1.3 THE WORK

The Work comprises the completed construction required by the Contract Documents and includes all labor necessary to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction.

1.1.4 THE PROJECT

The project is the total construction of which the Work performed under the Contract Documents may be the whole or a part.

1.1.5 "OR EQUAL"

The use of the words "Or Equal" following the name of any manufacturer, vendor or proprietary product shall be understood to mean that articles or materials may be substituted which, in the opinion of the Owner, are equal in quality, durability, appearance, strength, design and performance to the articles or materials named or described and will perform adequately in providing a first-class facility.

When submitting shop drawing information on articles or materials which are being proposed as substitutes for specified items, the Contractor shall clearly identify them as such. If the articles or materials are accepted as equal to those on which dimensions on the drawings are based, any dimensional variance from those shown and/or specified shall be shown on the shop drawings prepared by the Contractor, illustrating the manner in which conformity to dimensions and design is to be obtained. All such drawings shall be subject to the approval of the Owner and the installation of the article shall not proceed without first obtaining said approval.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 The Contract Documents shall be signed in not less than quadruplicate by the Owner and Contractor.

1.2.2 By executing the Contract, the Contractor represents that he has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents.

1.2.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonably

inferable therefrom as being necessary to produce the intended results. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

1.2.4 The organization of the Specifications into divisions, sections and articles, and the arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

1.3 OWNERSHIP AND USE OF DOCUMENTS

1.3.1 All Drawings, Specifications and copies thereof furnished by the Owner are and shall remain the Owner's property. They are to be used only with respect to this Project and are not to be used on any other project without the prior written consent of the Owner. With the exception of one contract set for each party to the Contract, such documents are to be returned or suitably accounted for to the Owner at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of any reserved rights.

ARTICLE 2

2.1 ADMINISTRATION OF THE CONTRACT

2.1.1 The designated representative of the Owner or its Engineer will visit the site at intervals appropriate to the stage of construction to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. However, the Owner's Representative or Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work.

2.1.2 The Owner shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so the Owner may perform its functions under the Contract Documents.

2.1.3 Based on the Owner's observations and an evaluation of the Contractor's Applications for Payment, the Owner will determine the amounts owing to the Contractor and will issue Certificates for Payment in such amounts, as provided in Paragraph 9.4.

2.1.4 The Owner will render information necessary for the proper execution or progress of the Work within twenty (20) days of any request by the contractor or in accordance with any time limit agreed upon.

2.1.5 The Owner will have authority to reject Work which does not conform to the Contract Documents. Whenever, in his opinion, he considers it necessary or advisable for the implementation of the intent of the Contract Documents, he will have authority to require special inspection or testing of the Work in accordance with Subparagraph 7.7.2 whether or not such Work be then fabricated, installed or completed. Any such rejection of work shall not relieve the Contractor of the responsibility for maintaining protection of the Work and the Owner's property.

2.1.6 The Owner or its Engineer will review and approve or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for conformance with the design concept of the Work and with the information given in the Contract Documents. Such action shall be taken with reasonable promptness so as to cause no delay. The Owner's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

2.1.7 The Owner will prepare Change Orders in accordance with Article 12, and will have authority to order minor changes in the Work as provided in Subparagraph 12.4.1.

2.1.8 The Owner will conduct inspections to determine the date of Substantial Completion and Final Completion, will review written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment upon compliance with the requirements of Paragraph 9.9.

ARTICLE 3

OWNER

3.1 DEFINITION

3.1.1 The Owner is the person or entity identified as such in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Owner means the Owner or his authorized representative, which for this Project shall be the City Engineer..

3.1.2 The Engineer for the Project is the City of Woburn Engineering Department

3.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

3.2.1 The Owner shall, at the time of execution of the Agreement and any subsequent Change Orders, certify for the Contractor that financial arrangements have been made to fulfill the Owner's obligations under the Contract.

3.2.2 The Owner shall furnish all surveys describing the physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.

3.2.3 Except as provided in Subparagraph 4.7.1. Owner shall secure and pay for necessary approvals, easements, assessments and charges required for the construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

3.2.4 Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the Work.

3.2.5 The Owner will furnish the Contractor with five copies of all Drawings and Specifications and revisions issued during the progress of the Work; all additional copies will be furnished upon request at the cost of reproduction.

3.2.6 The Owner, through its designated agent or Engineer, shall forward all instructions directly to the Contractor.

3.2.7 The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Work by Owner or by Separate Contractors, Payments and Completion, and Insurance in Articles 6, 9 and 11 respectively.

3.3 OWNER'S RIGHT TO STOP THE WORK

3.3.1 If the Contractor fails to correct defective Work as required by Paragraph 13.2 or fails to carry out the Work in accordance with the Contract Documents or if the Owner shall for any other reason so require, the Owner, by a written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated or until further written notice from the Owner; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Subparagraph 6.1.3. The Contractor shall resume the Work after such stoppage promptly upon written notice to do so from the Owner. If such stoppage is required through no fault of the Contractor, the Contract Time (and the dates for achieving Substantial Completion and Final Completion) shall be extended by a period equal to the period of the stoppage, and the Contractor shall be compensated for its reasonable and justifiable costs incurred as a result of such stoppage.

3.4 OWNER'S RIGHT TO CARRY OUT THE WORK

3.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within seven days after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to any other remedy he may have, perform such work or cause such work to be performed and/or make good such deficiencies. In such case an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for additional services made necessary by such default, neglect or failure. If the payments then or thereafter due the Contractor are not sufficient to cover the amount, the Contractor shall pay the difference to the Owner.

ARTICLE 4

CONTRACTOR

4.1 DEFINITION

4.1.1 The Contractor is the person or entity identified as such in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his authorized representative.

4.2 REVIEW OF CONTRACT DOCUMENTS

4.2.1 The Contractor shall carefully study and compare the Contract Documents and shall at once report to the Owner any error, inconsistency or omission he may discover. The Contractor shall not be liable to the Owner for any damage resulting from errors, inconsistencies or omissions in the Contract Documents which he discovers but shall be liable for damage to the extent he reasonably should have but failed to discover such errors, inconsistencies or omissions. The Contractor shall perform no portion of the Work at any time without Contract Documents or, where required, approved Shop Drawings, Product Data or Samples for such portion of the Work.

4.3 SUPERVISION AND CONSTRUCTION PROCEDURES

4.3.1 The Contractor shall supervise and direct the Work, using his best skill and attention which shall not be less than such state of skill and attention generally rendered by the contracting profession for projects similar to the Project in scope, difficulty and location. The Contractor shall maintain adequate supervisory personnel at the Premises during the performance of the Work. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract.

4.3.2 The Contractor shall be responsible to the Owner for the acts and omissions of his employees, Subcontractors and their agents and employees, and other persons performing any of the Work under a contract with the Contractor. This obligation shall also extend to the presence on the Site of suppliers of materials or equipment, their employees, contractors, and agents engaged in the work.

4.3.3 The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Owner in its administration of the Contract, or by inspection, tests or approvals required or performed under Paragraph 7.7 by persons other than the Contractor.

4.4 LABOR AND MATERIALS

4.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and service necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

4.4.2 The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him including all persons on the Site controlled directly or indirectly by the Contractor.

4.5 WARRANTY

4.5.1 The Contractor warrants to the Owner that all materials and equipment furnished under this Contract will be new and of recent manufacture unless otherwise permitted in writing by the Owner and that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective and, promptly after written notification of non-conformance, shall be repaired or replaced by the Contractor with Work conforming to such requirements. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions of Paragraph 13.2.

4.6 TAXES

4.6.1 The Contractor shall pay all applicable sales, consumer, use and other similar taxes for the Work or portion thereof provided by the Contractor which are legally enacted at the time bids are received, whether or not yet effective.

4.7 PERMITS, FEES AND NOTICES

4.7.1 Unless otherwise expressly provided in the Supplemental General Conditions, the Contractor shall secure and pay for all permits and fees, licenses and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required at the time the bids are received, and the same shall at all times be the property of the Owner and shall be delivered to the Owner upon completion of the Project.

4.7.2 The Contractor shall give all notices and comply with all federal, state and local laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work. The Contractor shall provide the Owner with reproductions of all permits, licenses and receipts for any fees paid. The Owner represents that it has disclosed to the Contractor all orders and requirements known to the Owner of any public authority particular to this Contract.

4.7.3 If the Contractor observes that any of the Contract Documents are at variance with applicable laws, statutes, codes and regulations in any respect, he shall promptly notify the Owner in writing, and any necessary changes shall be accomplished by appropriate Modification.

4.7.4 If the Contractor performs any Work which he knows or should know is contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner, he shall assume full responsibility therefor and shall bear all costs attributable thereto.

4.8 SUPERINTENDENT

4.8.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site at all times during the progress of the Work. The superintendent shall represent the Contractor and all communications given to the superintendent

shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed on written request in each case.

4.9 PROGRESS SCHEDULE

4.9.1 The Contractor, immediately after being awarded the Contract, shall prepare and submit for the Owner's information an estimated progress schedule for the Work. The progress schedule shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

4.10 DOCUMENTS AND SAMPLES AT THE SITE

4.10.1 The Contractor shall maintain at the site for the Owner one record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, and "As-Built" Drawings and Specifications in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Product Data and Samples. These shall be available to the Owner upon completion of the Work.

4.11 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

4.11.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

4.11.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.

4.11.3 Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

4.11.4 The Contractor shall review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of the Owner or any separate contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents.

4.11.5 By approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and

field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

4.11.6 The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Owner's approval of Shop Drawings, Product Data or Samples or the Engineer's approval of the same unless the Contractor has specifically informed the Owner or Engineer in writing of such deviation at the time of submission and the Owner or Engineer has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility from errors or omissions in the Shop Drawings, Product Data or Samples by the Owner's approval thereof.

4.11.7 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Owner or its Engineer on previous submittals.

4.11.8 No portion of the Work requiring submission of a Shop Drawing, Product Data or Sample shall be commenced until the submittal has been approved by the Owner or Engineer. All such portions of the Work shall be in accordance with approved submittals.

4.12 USE OF SITE

4.12.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with any materials or equipment.

4.13 CUTTING AND PATCHING OF WORK

4.13.1 The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work or to make its several parts fit together properly.

4.13.2 The Contractor shall not damage or endanger any portion of the Work or the work of the Owner or any separate contractors by cutting, patching or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the Owner or any separate contractor except with the written consent of the Owner and of such separate contractor.

The Contractor shall not unreasonably withhold from the Owner or any separate contractor his consent to cutting or otherwise altering the Work.

4.14 CLEANING UP

4.14.1 The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of the Work he shall remove all his waste materials and rubbish from and about the Project in full compliance with all applicable laws and regulations as well as all his tools, construction equipment, machinery and surplus materials and the Project shall be thoroughly cleaned and ready for immediate occupancy by the Owner.

4.14.2 If the Contractor fails to clean up at the completion of the Work, the Owner may do so as provided in Paragraph 3.4 and the cost thereof shall be charged to the Contractor.

4.15 COMMUNICATIONS

4.15.1 The Contractor shall forward all communications to the Owner through it's the City Engineer

4.16 ROYALTIES AND PATENTS

4.16.1 The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified, but if the Contractor believes or has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner, and thereafter the Owner insists on the use of the design, process or products specified.

4.17 INDEMNIFICATION

4.17.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, the Engineer and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or

resulting from the performance of the Work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom, and (2) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Paragraph 4.17.

4.17.2 In any and all claims against the Owner the Engineer or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Paragraph 4.17 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

4.17.3 The obligations of the Contractor under this paragraph 4.17 shall not extend to the liability of the Owner, the Engineer, their agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or (2) written directions or instructions given by the Owner, the Engineer, their agents or employees, provided they are the sole cause of the injury or damage.

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITION

5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the site. The term Subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a

Subcontractor or his authorized representatives. The term Subcontractor does not include any separate contractor or his subcontractors.

5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform any of the Work at the site. The term Sub-subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Sub-subcontractor or an authorized representative thereof.

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 Unless otherwise required by the Contract Documents or the Bidding Documents, the Contractor, as soon as practicable after the award of the Contract, shall furnish to the Owner in writing the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. The Owner will reply to the Contractor in writing within twenty (20) days stating whether or not the Owner, after due investigation, has reasonable objection to any such proposed person or entity.

5.2.2 The Contractor shall not contract with any such proposed person or entity to whom the Owner has made reasonable objection under the provisions of Subparagraph 5.2.1. The Contractor shall not be required to contract with anyone to whom he has a reasonable objection.

5.2.3 If the Owner has reasonable objection to any such proposed person or entity, the Contractor shall submit a substitute to whom the Owner has no reasonable objection.

5.2.4 The Contractor shall make no substitution for any Subcontractor, person or entity previously selected if the Owner makes reasonable objection to such substitution.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By an appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the

Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner. Said agreement shall preserve and protect the rights of the Owner under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with his Sub-subcontractors. The Contractor shall make availability to each proposed Subcontractor, prior to the execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Paragraph 5.3, and identify to the Subcontractor any terms and conditions of the proposed Subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of such Documents available to his Sub-subcontractors. The Contractor shall be fully responsible to the Owner for the acts and omissions of all Subcontractors and other entities or persons directly or indirectly employed by him to perform the Work. If requested by the Owner, the form and substance of any Subcontract with the Contractor shall be subject to the prior written consent of the Owner, which consent shall not be unreasonably withheld or delayed.

ARTICLE 6

WORK BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS

6.1.1 The Owner reserves the right to perform work related to the Project with his own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar Conditions of the Contract. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, he shall make such claim as provided elsewhere in the Contract Documents.

6.1.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term Contractor in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

6.1.3 The Owner will provide for the coordination of the work of his own forces and of each separate contractor with the Work of the Contractor, who shall cooperate therewith as provided in Paragraph 6.2.

6.2 MUTUAL RESPONSIBILITY

6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work, and shall connect and coordinate his Work with theirs as required by the Contract Documents.

6.2.2 If any part of the Contractor's Work depends for proper execution or results upon the work of the Owner or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Owner any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acceptance of the Owner's or separate contractors' work as fit and proper to receive his Work, except as to defects which may subsequently become apparent in such work by others.

6.2.3 Any costs caused by defective or ill-timed work shall be borne by the party responsible therefor.

6.2.4 Should the Contractor cause damage to the work or property of the Owner, or to other work on the site, the Contractor shall promptly remedy such damage as provided in Subparagraph 10.2.5.

6.2.5 Should the Contractor wrongfully cause damage to the work or property of any separate contractor, the Contractor shall upon due notice promptly attempt to settle with such other contractor by agreement, or otherwise to resolve the dispute. If such separate contractor sues or initiates an arbitration proceeding against the Owner on account of any damage alleged to

have been caused by the Contractor, the Owner shall notify the Contractor who shall defend such proceedings at the Contractor's expense, and if any judgment or award against the Owner arises therefrom the Contractor shall pay or satisfy it and shall reimburse the Owner for all attorneys' fees and court or arbitrations costs which the Owner has incurred.

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up as required by Paragraph 4.15, the Owner may clean up and charge the cost thereof to the contractors responsible therefor.

ARTICLE 7

MISCELLANEOUS PROVISIONS

7.1 GOVERNING LAW

7.1.1 The Contract shall be governed by the law of the Commonwealth of Massachusetts. All applicable provisions of Federal, state, or local laws, by-laws, rules, or regulations are incorporated into the Contract as if fully set forth herein, and shall prevail over any conflicting provisions of the General or Supplemental General Conditions.

7.2 SUCCESSORS AND ASSIGNS

7.2.1 The Owner and the Contractor each bind himself, his partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contractor shall not assign the Contract or sublet it as a whole without the written consent of the Owner, nor shall the Contractor assign any moneys due or to become due to him hereunder, without the previous written consent of the Owner.

7.3 WRITTEN NOTICE

7.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or member of the firm or entity or to an officer of the corporation for whom it was intended, or if delivered at or sent by registered or certified mail to the last business address

known to him who gives the notice. Written Notice to the Owner shall be delivered to the Superintendent of Public Works, DPW Barns, 50 North Warren Street, Woburn, MA 01801.

7.4 CLAIMS FOR DAMAGES

7.4.1 Should either party to the Contract suffer injury or damage to person or property because of any act or omission of the other party or of any of his employees, agents or others for whose acts he is legally liable, claim shall be made in writing to such other party within a reasonable time after the first observance of such injury or damage. The reasonable time shall not exceed fourteen days.

7.5 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

7.5.1 The Contractor shall furnish a Performance Bond in an amount at least equal to one hundred percent (100%) of the Contract price as security for the faithful performance of this Contract and also a Payment Bond in an amount not less than one hundred percent (100%) of the Contract price as security for the payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this Contract. The Performance Bond and the Payment Bond may be in one or in separate instruments in accordance with local law, and in a form acceptable to the Owner, and shall remain in effect through the one-year warranty period.

7.6 RIGHTS AND REMEDIES

7.6.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law, except as otherwise set forth therein.

7.6.2 No action or failure to act by the Owner, the Engineer or Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any

such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

7.7 TESTS

7.7.1 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested or approved, the Contractor shall give the Owner and Engineer timely notice of its readiness so the Owner and Engineer may observe such inspection, testing or approval. The Contractor shall bear all costs of such inspections, tests or approvals conducted by public authorities which are normal and customary for the type of work required by the Contract. Unless otherwise provided, the Owner shall bear all costs of other inspections, tests or approvals. All testing methods, organizations, and personnel shall be approved by the Owner or Engineer before the start of testing Work, without regard to what party will ultimately pay for such Work.

7.7.2 If the Owner or Engineer determines that any Work requires special inspection, testing, or approval which Subparagraph 7.7.1 does not include, it will instruct the Contractor to order such special inspection, testing or approval, and the Contractor shall give notice as provided in Subparagraph 7.7.1. If such special inspection or testing reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Owner's additional services made necessary by such failure; otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.

7.7.3 Required certificates of inspection, testing or approval shall be secured by the Contractor and promptly delivered by him to the Owner and Engineer.

7.7.4 If the Owner or Engineer is to observe the inspections, tests or approvals, he will do so promptly and, where practicable, at the source of supply.

ARTICLE 8

TIME

8.1 DEFINITIONS

8.1.1 Unless otherwise provided, the Contract Time is the period of time allotted in the Contract Documents for Substantial and Final Completion of the Work as defined in Subparagraph 8.1.3, including authorized adjustments thereto. Time is of the essence with regard to completion of the Work required by the Contract.

8.1.2 The date of commencement of the Work is the date established in a notice to proceed. If there is no notice to proceed, it shall be the date of the Owner-Contractor Agreement or such other date as may be established therein.

8.1.3 The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Owner when construction is substantially complete, in accordance with the Contract Documents, other than only custom punch list items, the lack of or completion of which will not interfere with the Owner's use, so the Owner can lawfully occupy and utilize the Work or designated portion thereof for the use for which it is intended. The Date of Final Completion of the Work is the date on which the Owner issues its final Certificate for Payment in accordance with Paragraph 9.9.1 hereof.

8.1.4 The term day as used in the Contract Documents shall mean calendar day unless otherwise specifically designated.

8.2 PROGRESS AND COMPLETION

8.2.1 All time limits stated in the Contract Documents are of the essence of the Contract.

8.2.2 The Contractor shall begin the Work on the date of commencement as defined in Subparagraph 8.1.2. He shall carry the Work forward expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time, and Final Completion thereafter in accordance with the provisions of the Contract Documents.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 If the Contractor is delayed at any time in the progress of the Work by any act or neglect of the Owner or Engineer or by any employee of the Owner or Engineer, or by any separate contractor employed by the Owner or Engineer, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in transportation, adverse weather conditions not reasonably anticipated, unavoidable casualties, or any causes beyond the Contractor's or its Subcontractor's control, or by delay authorized by the Owner, then, provided such delay in no way results from the act or neglect of the Contractor or any of its Subcontractors, the Contract Time shall be extended by Change Order for such reasonable time as the Owner may determine.

8.3.2 Any claim for extension of time shall be made in writing to the Owner not more than seven (7) days after the commencement of the delay; otherwise it shall be waived. In the case of a continuing delay only one claim is necessary. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the Work.

8.3.3 If no agreement is made stating the dates upon which interpretations shall be furnished, then no claim for delay shall be allowed on account of failure to furnish such interpretation until fifteen days after written request is made for them, and not then unless such claim is reasonable.

8.4 LIQUIDATED DAMAGES (No liquidated Damages Apply)

8.4.1 If the Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner the amount specified in the Contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contract shall be in default after the time stipulated in the Contract for completing the work.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of

damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

8.4.2 It is further agreed that time is of the essence of each and every portion of this Contract and of the specifications wherein as definite and certain length of times if fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this contract.

8.4.3 Provided, that the contractor shall not be charged with liquidated damages or any excess cost when the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; Provided, further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

1. To any preference, priority or allocation order duly issued by the Government;

2. To unforeseeable cause beyond the control and without the fault of negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and severe weather; and

3. To any delays of subcontractors or suppliers occasioned by any of the causes specified in subsection (1.) and (2.) of this article:

8.4.4 Provided, further, that the Contractor shall, within ten (10) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the Contract, notify the Owner, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter.

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Owner-Contractor Agreement and, including authorized adjustments thereto, is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Owner a schedule of values allocated to the various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Owner may require. This schedule, unless objected to by the Owner, shall be used only as a basis for the Contractor's Application for Payment.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 The Contractor shall submit to the Owner an itemized Application for Payment supported by such data substantiating the Contractor's right to payment as provided elsewhere in the Contract Documents for the period ending the 25th day of each month within the Contract period.

9.3.2 Unless otherwise provided in the Contract Documents, payments will be made on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site and, if approved in advance by the Owner, payments may similarly be made for materials or equipment suitably stored at some other location agreed upon in writing. Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance and transportation to the site for those materials and equipment stored off the site. The Contractor shall assume responsibility to protect all such materials from loss or

damage at no cost to the Owner, until they are finally incorporated into the Work, whether or not they have been paid for by the Owner.

9.3.3 The Contractor warrants that title to all Work, materials and equipment covered by an Application for Payment will pass to the Owner either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in this Article 9 as "liens"; and that no Work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor, or by any other person performing Work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

9.4 CERTIFICATES OF PAYMENT

9.4.1 The Owner will, within ten days after the receipt of the Contractor's Application for Payment, issue a Certificate for Payment to the Contractor for such amount as the Owner determines is properly due, or notify the Contractor in writing his reasons for withholding a Certificate as provided in Subparagraph 9.6.1.

9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Owner, based on its observations at the site as provided in Subparagraph 3.2.7 and the data comprising the application for Payment, that the Work has progressed to the point indicated; that, to the best of his knowledge, information and belief, the quality of Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Document upon Substantial Completion, to the results of any subsequent tests required by or performed under the Contract Documents correctable prior to completion, and to any specific qualifications stated in his Certificate); and that the Contractor is entitled to payment in the amount certified. However, by issuing a Certificate for Payment, the Owner shall not thereby be deemed to represent that he has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work or that he has reviewed the construction means, methods,

techniques, sequences or procedures, or that he has made any examination to ascertain how or for what purpose the Contractor has used the moneys previously paid on account of the Contract Sum.

9.5 PROGRESS PAYMENTS

9.5.1 After the Owner has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents. The Owner reserves the right to a 5% general retainage from each progress payment, which retainage shall be released to the Contractor upon substantial completion.

9.5.2 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's Work, the amount to which said Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contractor on account of such Subcontractor's Work. The Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payments to his Sub-subcontractors in similar manner.

9.5.3 The Owner may, on request and at his discretion, furnish to any Subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by the Contractor and the action taken thereon by the Owner on account of Work done by such Subcontractor.

9.5.4 The Owner shall not have any obligation to pay or to see to the payment of any moneys to any Subcontractor except as may otherwise be required by law.

9.5.5 No Certificate for a progress payment, nor any progress payment, nor any partial or entire use or occupancy of the Project by the Owner, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

9.6 PAYMENTS WITHHELD

9.6.1 The Owner shall decline to certify payment and withhold its Certificate in whole or in part, to the extent necessary reasonably to protect itself. If the Owner is unable to certify payment in the amount of the Application, he will notify the Contractor as provided in

Subparagraph 9.4.1. If the Contractor and the Owner cannot agree on a revised amount, the Owner will promptly issue a Certificate for Payment for the amount for which it determines is properly due. The Owner may also decline to certify payment or, because of subsequently discovered evidence or subsequent observations, it may nullify the whole or any part of any Certificate for Payment previously issued, to such extent as may be necessary in its opinion to protect itself from loss because of:

1. Defective work not remedied,

2. Third party claims filed or reasonable evidence indicating probable filing of such claims,

3. Failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment,

4. Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum,

5. Damage to the Owner or another Contractor,

6. Reasonable evidence that the Work will not be completed within the Contract Time, or material failure to carry out the Work in accordance with the Contract Documents.

9.6.2 When the above grounds in Subparagraph 9.6.1 are removed, payment shall be made for amounts withheld because of them.

9.7 FAILURE OF PAYMENT

9.7.1 If the Owner does not issue a Certificate for Payment, through no fault of the Contractor, within ten days after receipt of the Contractor's Application for Payment, then the Contractor may, upon ten additional days' written notice to the Owner, stop the Work until payment of the amount owing has been received. The Contract Sum shall be increased by the amount of the Contractor's reasonable and justifiable costs of shut-down, delay and start-up, which shall be effected by appropriate Change order in accordance with Paragraph 12.3.

9.8 SUBSTANTIAL COMPLETION

9.8.1 When the Contractor considers that the Work, or a designated portion thereof which is acceptable to the Owner, is substantially complete as defined in Subparagraph 8.1.3, the Contractor shall prepare for submission to the Owner a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all work in accordance with the Contract Documents. When the Owner on the basis of an inspection determines that the Work or designated portion thereof is substantially complete, he will then prepare for a Certificate of Substantial Completion which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the Date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion shall be submitted to the Owner and the Contractor for their written acceptance of the responsibility assigned to them in such Certificate.

9.8.2 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and Certification by the Owner, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof, as provided in the Contract Documents.

9.9 FINAL COMPLETION AND FINAL PAYMENT

9.9.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Owner will promptly make such inspection and, when it finds the Work acceptable under the Contract Documents and the Contract fully performed, it will promptly issue a final Certificate for Payment stating that to the best of its knowledge, information and belief, and on the basis of its observations and inspections, the Work has been completed in accordance with the terms and conditions of the

Contract Documents and that the entire balance found to be due the Contractor, and noted in said final Certificate, is due and payable. The Owner's final Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth in Subparagraph 9.9.2 have been fulfilled.

9.9.2 Neither the final payment nor the remaining retained percentage shall become due until the Contractor submits to the Owner (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or his property might in any way be responsible, have been fully paid or otherwise satisfied, (2) consent of surety, if any, to final payment and (3), if required by the Owner, other data establishing payment or satisfaction of all such obligations, such as the written document described in Paragraph 13.2.2, receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designated by the Owner. If any Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify him against any such lien. If any such lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

9.9.3 If, after Substantial Completion of the Work, final completion thereof is delayed for more than ninety (90) days through no fault of the Contractor or by the issuance of Change Orders affecting final completion, the Owner shall, upon application by the Contractor, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted, provided that the remaining balance for Work not fully completed or corrected shall not be less than the retainage stipulated in the Contract Documents, and if bonds have been furnished as provided in Paragraph 7.5, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Owner prior to certification of such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

9.9.4 The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:

1. Unsettled liens,

2. Faulty or defective Work appearing after Substantial Completion,

3. Failure of the Work to comply with the requirements of the Contract Documents, or

4. Terms of any special warranties required by the Contract Documents.

5. Obligations under the Performance and Payment Bonds.

9.9.5 The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled prior to the time of the final Application for Payment.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

1. All employees on the Work and all other persons who may be affected thereby;

2. All the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of his Subcontractors or Sub-subcontractors; and

3. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

10.2.2 The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations and orders of any public authority bearing on the safety of persons or property or their protection from damage, injury or loss.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

10.2.4 When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

10.2.5 The Contractor shall promptly remedy all damage or loss to any property referred to in Clauses 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, any Subcontractor, any Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable and for which the Contractor is responsible under Clauses 10.2.1.2 and 10.2.1.3, except damage or loss solely attributable to the acts or omissions of the Owner, the Engineer or anyone directly or indirectly employed by the Owner or Engineer, or by anyone for whose acts the Owner or Engineer may be liable, and not attributable to the acts or omissions of the Owner, the Engineer or anyone directly or indirectly employed by them, or by anyone for whose acts it may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to his obligation under Paragraph 4.13.

10.2.6 The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner.

10.2.7 The Contractor shall not load or permit any part of the Work to be loaded so as to endanger its safety.

10.3 EMERGENCIES

10.3.1 In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Article 12 for Changes in the Work.

ARTICLE 11

INSURANCE

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The Contractor shall purchase and maintain such insurance as will protect him and the Owner from claims set forth below which may arise out of or result from the Contractor's operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

1. Claims under workers' or workmen's compensation, disability benefit and other similar employees benefit acts;

2. Claims for damages because of bodily injury, occupational sickness or disease, or death of his employees;

3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;

4. Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person;

5. Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom; and

6. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than any limits of liability specified in the Contract Documents, or required by law, whichever is greater.

11.1.3 The insurance required by Subparagraph 11.1.1 shall include contractual liability insurance applicable to the Contractor's obligations under Paragraph 4.18.

11.1.4 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates shall contain a provision that coverages afforded under the policies will not be cancelled until at least thirty days prior written notice has been given to the Owner. Certificates of renewal shall be delivered to the Owner at least fifteen (15) days prior to the expiration date of any insurance policy. The Contractor shall not commence the Work until all insurance required hereunder shall have been obtained and approved by the Owner, and the Contractor shall not permit any Subcontractor or Sub-subcontractor to commence work until all insurance required of them shall have been similarly obtained and approved.

11.2 OWNER'S LIABILITY INSURANCE (NOT REQUIRED THIS CONTRACT)

11.2.1 The Owner, at its option, may purchase and maintain such insurance as will protect it against claims which may arise from operations under the Contract.

11.3 PROPERTY INSURANCE (NOT REQUIRED THIS CONTRACT)

11.3.1 The Owner may, at its option, purchase and/or maintain property insurance upon the entire Work at the site to the full insurable value thereof. This insurance shall include the interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work and shall insure against the perils of fire and extended coverage and shall include "all risk" insurance for physical loss or damage including, without duplication of coverage, theft, vandalism and malicious mischief. If the Owner does not intend to purchase or maintain such insurance for the full insurable value of the entire Work, he shall inform the Contractor in writing prior to commencement of the Work. The Contractor may then affect insurance which will protect the interests of himself, his Subcontractors and the Sub-subcontractors in the Work, and by

appropriate Change Order the cost thereof shall be charged to the Owner. If not covered under the all risk insurance or otherwise provided in the Contract Documents, the Contractor shall effect and maintain property insurance on portions of the Work stored off the site or in transit when such portions of the Work are to be included in an Application for Payment under Subparagraph 9.3.2. This insurance does not cover any tools owned by mechanics, any tools, equipment, scaffolding, staging towers, and other property owned or rented by the Contractor, the capital value of which is not included in the cost of the Work.

11.3.2 The Owner and Contractor waive all rights against (1) each other and the Subcontractors, Sub-subcontractors, agents and employees each of the other, and (2) separate contractors, if any, and their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by insurance obtained pursuant to this Paragraph 11.3 or any other property insurance held by the Owner as trustee. The Owner or the Contractor, as appropriate, shall require of separate contractors, Subcontractors and Sub-subcontractors by appropriate agreements, written where legally required for validity, similar waivers each in favor of all other parties enumerated in this Subparagraph 11.3.2.

11.3.3 The Owner as trustee shall have power to adjust and settle any loss with the insurers.

11.3.4 The construction site may be occupied by the Owner during the Work. Insurance shall not lapse or be cancelled on account of this occupancy. The insurance certificates required under this contract shall include this requirement.

11.4 LOSS OF USE INSURANCE (NOT REQUIRED THIS CONTRACT)

11.4.1 The Owner, at his option, may purchase and maintain such insurance as will insure him against loss of use of his property due to fire or other hazards, however caused.

ARTICLE 12

CHANGES IN THE WORK

12.1 CHANGE ORDER

12.1.1 A Change Order is a written order to the Contractor signed by the Owner, issued after execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order.

12.1.2 The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and the Contract Time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents.

12.1.3 The cost or credit to the Owner resulting from a change in the Work shall be determined in one or more of the following ways:

1. By mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

2. By unit prices stated in the Contract Documents or subsequently agreed upon;

3. By cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

4. By the method provided in Subparagraph 12.1.4.

12.1.4 If none of the methods set forth in Clauses 12.1.3.1, 12.1.3.2 or 12.1.3.3 is agreed upon, the Contractor, provided he receives a written order signed by the Owner, shall promptly proceed with the Work involved. The cost of such Work shall then be determined by the Owner on the basis of the reasonable expenditures and savings of those performing the Work attributable to the change, including, in the case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Clauses 12.1.3.3 and 12.1.3.4

above, the Contractor shall keep and present an itemized accounting together with appropriate supporting data for inclusion in a Change Order. Unless otherwise provided in the Contract Documents, cost shall be limited to the following: actual cost of materials, including sales tax and cost of delivery; labor, including social security, old age and unemployment insurance, and fringe benefits required by agreement or custom; workers' or workmen's compensation insurance; bond premiums, rental value of equipment and machinery; and the additional costs of supervision and field office personnel directly attributable to the change. Pending final determination of cost to the Owner, payments on account shall be made on the Owner's Certificate for Payment. The amount of credit to be allowed by the Contractor to the Owner for any deletion or change which results in a net decrease in the Contract Sum will be the amount of the actual net cost. When both additions and credits covering related Work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase, if any, with respect to that change.

12.1.5 Unit prices are stated in the Bid Form and the Contract shall include all costs of the Contractor to the Owner as listed in Paragraph 12.1.4. No additional charges shall be allowed for these items under any circumstances.

12.2 CONCEALED CONDITIONS

12.2.1 Should concealed conditions encountered in the performance of the Work below the surface of the ground or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the Contract Documents, or should unknown physical conditions below the surface of the ground or should concealed or unknown conditions in an existing structure of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in his Contract, be encountered, the Contract Sum shall be equitably adjusted by Change Order upon claim by either party made within twenty days after the first observance of the conditions.

12.3 CLAIMS FOR ADDITIONAL COST

12.3.1 If the Contractor wishes to make a claim for an increase in the Contract Sum, he shall give the Owner written notice thereof within twenty days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with Paragraph 10.3. No such claim shall be valid unless so made. Any change in the Contract Sum resulting from such claim shall be authorized by Change Order.

12.3.2 If the Contractor claims that additional cost is involved because of, but not limited to, (1) any written interpretation by the Owner or Engineer, (2) any order by the Owner to stop the Work pursuant to Paragraph 3.3 where the Contractor was not at fault, (3) any written order for a minor change in the Work issued pursuant to Paragraph 12.4, or (4) failure of payment by the Owner pursuant to Paragraph 9.7, the Contractor shall make such claim as provided in Subparagraph 12.3.1.

12.4 MINOR CHANGES IN THE WORK

12.4.1 The Owner and Engineer will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be affected by written order, and shall be binding on the Owner, Engineer and the Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 13

UNCOVERING AND CORRECTION OF WORK

13.1 UNCOVERING OF WORK

13.1.1 If any portion of the work should be covered contrary to the request of the Owner or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Owner, be uncovered for his observation and shall be replaced at the Contractor's expense.

13.1.2 If any other portion of the Work has been covered which the Owner has not specifically requested to observe prior to being covered, the Owner may request to see such Work and it shall be uncovered by the Contractor. If such Work be found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it be found that this condition was caused by the Owner or a separate contractor as provided in Article 6, in which event the Owner shall be responsible for the payment of such costs.

13.2 CORRECTION OF WORK

13.2.1 The Contractor shall promptly correct all Work rejected by the Owner or Engineer as defective or as failing to conform to the Contract Documents whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the Owner's additional services made necessary thereby.

13.2.2 The Contractor shall provide a document to the Owner certifying that if within one year after the Date of Substantial Completion of the Work or designated portion thereof or within one year after acceptance by the Owner of designated equipment or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective or requiring excessive service or maintenance or not in accordance with the Contract Documents, the Contractor shall correct it within seven (7) days after receipt of a written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such approval, which written acceptance shall specifically refer to such defect. This obligation shall survive termination of the Contract. The Owner shall give such notice promptly after discovery of the condition. The provisions of this paragraph are in addition to, and not in limitation of, the Owner's other rights and remedies hereunder and in law and equity.

13.2.3 The Contractor shall remove from the site all portions of the Work which are defective or non-conforming and which have not been corrected under Subparagraph 4.5.1, 13.2.1 and 13.2.2, unless removal is waived by the Owner in writing.

13.2.4 If the Contractor fails to correct defective or nonconforming Work as provided in Subparagraphs 4.3.1, 12.2.1 and 13.2.2. The Owner may correct it in accordance with Paragraph 3.4.

13.2.5 If the Contractor does not proceed with the correction of such defective or non-conforming Work within a reasonable time fixed by written notice from the Owner, the Owner may remove it and may store the materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten days thereafter, the Owner may upon ten additional days' written notice sell such Work at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the Owner's additional services made necessary thereby. If such proceeds of sale do not cover all costs which the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

13.2.6 The Contractor shall bear the cost of making good all work of the Owner or separate contractors destroyed or damaged by such correction or removal.

13.2.7 Nothing contained in this Paragraph 13.2 shall be construed to establish a period of limitation with respect to any other obligation which the Contractor might have under the Contract Documents, including Paragraph 4.5 hereof. The establishment of the time period of one year after the Date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which his obligation to comply with the Contract Documents may be sought to

be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to his obligation other than specifically to correct the Work.

13.3 ACCEPTANCE OF DEFECTIVE OR NON-CONFORMING WORK

13.3.1 If the Owner prefers to accept defective or nonconforming Work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Sum where appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 14

TERMINATION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 If the Work is stopped for a period of ninety (90) days under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a decision of a national emergency making materials unavailable, through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a contract with the Contractor, or if the Work should be stopped for a period of thirty days by the Contractor because the Owner has not issued a Certificate for Payment as provided in Paragraph 9.7 or because the Owner unjustifiably has not made payment thereon as provided in Paragraph 9.7, then the Contractor may, upon seven additional days written notice to the Owner, terminate the Contract and recover from the Owner payment for all Work executed and for any proven loss sustained upon any materials, equipment, tools, construction equipment and machinery, including reasonable profit and damages.

14.2 TERMINATION BY THE OWNER

14.2.1 To the extent permitted by law, if the Contractor is adjudged a bankrupt, or if he makes a general assignment for the benefit of his creditors, or if a receiver is appointed on account of his insolvency, or if he refuses or fails, repeatedly except in cases for which extension

of time is provided, to supply enough properly skilled workmen or proper materials, or if he fails to make prompt proper payment to Subcontractors for materials or labor, or disregards laws, ordinances, rules, regulations or order of any public authority having jurisdiction, or otherwise fails to comply with any provision of the Contract Documents, then the Owner may, without prejudice to any right or remedy and after giving the Contractor and his surety, if any, seven days' written notice, terminate the employment of the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever method he may deem expedient.

14.2.2 If the unpaid balance of the Contract Sum exceeds the costs of finishing the Work, including compensation for the Owner's additional services made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The obligation to pay said amount to the Contractor or to the Owner, as the case may be, shall survive the termination of the Contract.

Section 00750

TERMS and CONDITIONS

These TERMS and CONDITIONS shall apply to all Contracts with the City of Woburn.

1. BID OFFERS. The right is reserved to reject any and all bids or parts of bids and to make an award as may be determined to be in the best interests of the City of Woburn. Bids not submitted in triplicate will be rejected. Bids with erasures/alterations will be rejected.

2. PRICES quoted must be F.O.B. Delivered Destination-Woburn, MA. No charges will be allowed for packing, crating, freight, handling, or cartage unless specifically stated and included with bid.

3. AWARDS to a bidder may be cancelled if the bidder shall fail to prosecute the work with promptness and diligence.

4. PAYMENT. The City of Woburn shall make no payment for a supply or service rendered prior to execution of a written Contract. Bills for services, materials, or supplies furnished by bidders under Contract should be submitted before the first day of the in which payment is to be made to insure payment by twentieth day of that month, except where the allowance for a discount differs from the above. Contractor agrees to submit bills and delivery slips to the City Department in sufficient time for such discounts to be taken advantage of by the City and, in any event, shall not be less than ten (10) days from the submission to the Department of such bills and delivery slips. Time in connection with a discount offered will be computed from the date of delivery to the City, as specified on the order or from the date a correct invoice is received by the using agency of the City, if the latter date is later than the date of delivery.

5.GUARANTEES.The successful bidder shall repair, replace, or make good, without cost to the City, any defects or faults arising within one (1) year after the date of acceptance of articles furnished hereunder resulting from imperfect or defective work done or materials furnished by the Seller.

6. PATENTS. The Seller shall indemnify and save harmless the City and all persons acting for or on behalf of it from all suits and claims against them, or any of them, arising from or occasioned by the use of any material, equipment, or apparatus, or any part thereof, which infringes or is alleged to infringe on any patent rights. In case such material, equipment, or apparatus, or any part thereof, in any such suit is held to constitute an infringement, the Seller within a reasonable time, will, at its expense and as the City may elect, replace such material, equipment, or apparatus, or remove the material, equipment, or apparatus and refund the sums paid.

7. LEGALITY. The successful bidder shall comply with all applicable United States, Massachusetts, and/or City of Woburn codes, statutes, ordinances, rules, and regulations.

8. TAXES. Purchase**s** made by the City are exempt from Massachusetts Sales Tax and Federal Excise Taxes. Bid prices must exclude any such taxes. Exemption certificates will be furnished upon request.

9. BONDS. If this Invitation requires bid surety, the surety shall be in the form of bid bond of a MA Licensed Company, certified check, bank check, money order from a responsible bank, made payable to City of Woburn and must be filed with the original bid at the Office of the Purchasing Agent. Failure to submit surety will cause the bid to be rejected. The bid surety will be returned to the successful bidder within seven (7) days after the execution of the awarded contract and approval by the City of the performance bond. In the case of a default, the bid surety shall be forfeited to the City of Woburn. The successful bidder may be required to furnish a performance bond in an amount and with a MA licensed Surety satisfactory to the City. The Contractor will assume all costs for bonds.

10. ORDERS. Verbal Orders are not binding on the City of Woburn, and any delivery made or work performed without written order or written Contract are at the risk of the Seller or Contractor and may result in an unenforceable claim. The actual needs of City Departments shall govern the actual amount delivered under Contract to be drawn and entered into between the successful bidder and the City. Purchase Orders issued by the City to pay for goods or services shall be made part of Contract.

11. INDEMNITY. Contractor shall agree to Indemnify, Defend, and Hold the City Harmless from any and all claims arising out of the performance of this contract from the negligence, willful acts or omissions of the contractor, its employees, agents, or any sub-contractors.

12. EQUALITY. Where trade names or specific manufacturers are mentioned in the specifications, the City does not intend to limit competition, but merely to indicate the general type of commodity to be supplied. The City invites offers on comparable commodities to those named or described in the specification. Naming of any commercial name, trademark or other identifier shall not be construed to exclude any item or manufacturer not mentioned by name or as limiting competition, but shall establish a standard of equality only. An item shall be considered equal to the item so named or described if:(a)it is at least equal in quality, durability, appearance, strength, and design;(b)it will perform at least equally the function imposed by the general design for the purpose being contracted for or the material being purchased; and(c)it conforms in a substantial way, even with deviations, to the detailed requirements for the item in the specifications. The name and identification of all materials, other than the one named, shall be submitted to the City in writing for approval, prior to the purchase, use, or fabrication of such items. Subject to the provisions of M.G.L., Ch.30,s.39J, or other applicable statute, approval shall be at the sole discretion of the City, it shall be in writing to be effective, and the decision of the City shall be final. The City may require tests of all materials so submitted to establish quality standards at the vendor's expense. All directions, specifications, and advice by the manufacturer for the proper installation, handling, storage, adjustment, or operation of their equipment shall be complied with and the responsibility for the proper performance shall continue to rest with the vendor. Include a written brochure outlining all features of the product offered whenever possible.

13. MINORITY BUSINESS ENTERPRISE PLAN - Pursuant to M.G.L. c 7, §40N and M.G.L. c. 7, §61, the Supplier Diversity Office ("SDO") (formerly SOMWBA) and the Division of Capital Asset Management ("DCAM") have set revised participation goals for Minority Business Enterprise ("MBE") and Women Business Enterprise ("WBE") participation for affected state funded building projects and state assisted municipal building projects as defined in the above referenced laws and related Executive Orders, including Executive Orders 524 and 526.

Effective January 1, 2012, and until such time as the goals may be revised, the MBE and WBE participation goals for building construction and design awards and expenditures on new projects advertised on or after the effective date will be a combined MBE/WBE goal as follows:

10.4% combined MBE/WBE participation on construction contract awards; and,
17.9% combined MBE/WBE participation on design contract awards.

Overall annual designations by awarding authorities, as well as MBE/WBE participation on individual projects with a combined MBE/WBE participation goal, must include a reasonable representation of both MBE and WBE firms that meets or exceeds the combined goal. Proposed MBE/WBE participation plans that include solely MBE or solely WBE participation, or do not include a reasonable amount of participation by both MBE and WBE firms to meet the combined goal, will not be considered responsive. Where the prime contractor or designer is an SDO certified MBE or WBE, the prime must bring a reasonable amount of participation by a firm or firms that hold the certification which is not held by the prime contractor or designer on the project. Proposed participation on construction projects or design projects which consists solely of either an MBE or WBE representing 100% of the overall combined goal will not be considered reasonable participation.

The SDO and DCAM will determine whether there is reasonable participation by both MBE and WBE firms on individual projects under their respective oversight. Firms submitting MBE/WBE participation plans which do not provide reasonable participation by both MBE/WBE firms shall be provided an opportunity to revise and resubmit their plans within the time frame set by the awarding authority; however no price adjustments shall be permitted as a result of the revised plan. Firms failing to submit an MBE/WBE participation plan deemed reasonable and accepted by the awarding authority shall not be awarded the contract.

Participation by MBE and WBE firms must be documented, tracked and reported on separately as MBE participation and WBE participation by prime vendors, subcontractors and awarding authorities.

14. RIGHT TO KNOW LEGISLATION, M.G.L., Ch.111F and 454 CMR 21.06
All vendors furnishing substances or mixtures which may be classified as toxic or hazardous, pursuant to MGL,Ch.111F , are cautioned to obtain and read the Law and the Regulations referred to above. Copies may be obtained from the State House Bookstore, State House, Room 117, Boston, MA 02133 for a fee.

15. NON-COLLUSION AFFIDAVIT, M.G.L., Ch.30, s.39M and/or Ch.30B, s. 10
Any person submitting a bid or proposal for the procurement or disposal of supplies or services to any governmental body shall certify in writing on the bid or proposal, as follows: the undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club or other organization, entity, or group of individuals.

16. STATE TAXES PAID: Pursuant to M.G. L. Ch.62C, s.49A, the undersigned certifies that, to the best of their knowledge and belief, they have complied with all the laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting of child

support.

17. BID OFFERS will be reviewed and awards made as soon as is possible. Awards will be made within 30 business days from Bid Opening or will be rejected. Offers must be signed to be valid.

18. UNIT PRICE. The case of arithmetical error in any offer involving extension of prices quoted herein, the unit price will govern the final price of quantities offered.

19.INSURANCE.Contractor shall purchase and maintain coverage for Workers' Compensation, Comprehensive General Liability, including products, completed operations, and contractual liability; Automobile Liability to protect their employees and others from bodily injury and damages to property which may arise out of or result from the Contractor's operations under this agreement, whether such operations be the Contractor's, any subcontractor, or anyone directly or indirectly employed by any of them. This insurance shall be in limits specified by Law, or as specified in the specifications. **In no case shall the limits be less than $ 1,000,000 in Bodily Injury and in Property Damages**. A certificate of insurance naming the City of Woburn as Additional Named Insured shall be filed with the City prior to the commencement of any contract's operations. All policies and certificates shall contain an endorsement requiring at least thirty (30) days written notice, non-renewal or cancellation of coverage to City of Woburn. Compliance by the Contractor with the insurance requirements shall not relieve the Contractor from liability under the full indemnity provisions contained herein (see 11).

20. INDEPENDENT CONTRACTOR. The contractor is neither an agent nor an employee of the City of Woburn and is not authorized to act in behalf of the City of Woburn.

21. COMPLETE AGREEMENT. The written contract supersedes all prior agreements or understandings between the parties and shall not be changed unless mutually agreed by both parties in writing.

22. ASSIGNMENT / SUB-CONTRACTING. The Contractor shall not assign any interest in a contract nor engage any other entity, company, subcontractor or individual to perform any obligation to the City without prior written consent of the City of Woburn.

23. CONFLICT OF INTEREST. The bidder certifies that no official or employee of the City of Woburn has a financial interest in this offer or in the contract which the bidder offers to execute or in the expected profit to arise there from, unless there has been compliance with the provisions of M.G.L.,Ch.43, s.27 (Interest in Public Contracts by Public Employees) and of provisions of M.G.L.,Ch.268A,s.20 (Conflict of Interest Law) and that this offer is made in good faith without fraud or collusion or connection with any other person submitting an offer to the City of Woburn.

24. TERMINATION. The City of Woburn shall have the Right to terminate this Agreement, if:(A) the Contractor neglects or fails to perform or observe any of its obligations hereunder and cure is not affected by the Contractor within Fifteen (15) Days next following its receipt of a termination notice issued by the City of Woburn, or,(B)a judgment or decree is entered against the Contractor approving a petition for arrangement, liquidation, dissolution or similar relief relating to any bankruptcy or insolvency and such judgment or decree remains unvacated for Thirty (30) Days; or Immediately, if Contractor shall file a voluntary petition in bankruptcy or any petition or answer seeking any arrangement, liquidation or dissolution relating to bankruptcy, insolvency or

other relief of debtors, or shall seek or consent or acquiesce in appointment of any trustee, receiver or liquidation of Contractor's property; or (C) funds are not appropriated or otherwise made available to support continuation of performance in any Fiscal Year succeeding the first year of this Agreement. City of Woburn shall pay all reasonable and supportable costs incurred prior to termination which payment shall not exceed the value of any services provided. **NOTICE:** The City of Woburn may terminate this Contract or any Purchase Order issued hereunder **without cause** at anytime, effective upon the termination date stated in the notice of termination. The Contractor shall cease performance upon the stated termination date. If the Contract or any Purchase Order is terminated under this subsection, the Contractor shall be entitled to be paid for supplies and/or services delivered and accepted prior to the notice of termination. In no event shall the Contractor be entitled to be paid for any supplies or services delivered after the effective date of termination.

25. RETURN OF PROPERTY. Upon termination, the Contractor shall immediately return to the City of Woburn, without limitation, all documents ,plans, drawings, tools, equipment, and items of any nature whatsoever supplied to the Contractor by the City, or items developed by the Contractor in accordance with the terms of a Contract with the City of Woburn.

26. INTERPRETATION OF SPECIFICATIONS. Any prospective bidder that requests an interpretation of existing specifications' terms or conditions must do so within five (5) working days before the scheduled bid opening. All requests shall be in writing to the Purchasing Agent.

27. INFORMATION. The submission of a bid offer authorizes the City to contact any and all parties referenced by the bidder in regard to financial and operational information. The City shall have the right to request verification of any information or qualifications submitted as part of any offer to the City.

28. PRICE REDUCTION. It is understood and agreed that should any price reductions occur between the opening of the bid offers and the completion of the delivery of goods or services that the benefit of all such reductions will be extended to City.

29. GOVERNING LAW. The offer and any Contract which may ensue shall be governed by the Laws of the Commonwealth of Massachusetts.

30. ENFORCEABILITY. In the event that any provision of this offer or Contract is found to be legally unenforceable, such legal unenforceability shall not prevent enforcement of any other provisions of a Contract.

31. SAMPLES. Any qualified bidder may be required to submit samples of the goods offered at the request of the Purchasing Agent. Evaluation for acceptability will be a determining factor in the selection process.

32. DISCRIMINATION. It is understood and agreed that it shall be a material breach of Contract resulting from this bid offer for the Contractor to engage in any practice which shall violate any provision of M.G.L., Ch.151B, relative to discrimination in hiring, discharge, or, terms or conditions of employment.

CERTIFICATIONS

Statements below shall be submitted with each Bid or Proposal and shall be duly dated and signed with an **original signature** and all other information, or, the Bid or Proposal may be rejected.

In witness whereof, the undersigned certifies, under the pains and penalties of perjury that:

1. STATE TAXES PAID: Pursuant to M.G.L. Chapter 62C, s. 49A, the undersigned certifies that, to the best of my knowledge and belief, have complied with all the laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting of child support.

2. CERTIFICATE OF NON-COLLUSION: M.G.L. C. 30, s. 39M and/or C. 30B, s.10 : Any person submitting a bid or proposal for the procurement or disposal of supplies or services to any governmental body shall certify in writing, on the bid or proposal, as follows: The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club or other organization, entity, or group of individuals.

3. PUBLIC CONTRACTS - DEBARMENT: M.G.L. C. 550, Acts of 1991: The undersigned certifies that the said "person" is not presently debarred from doing public construction work in the Commonwealth of Massachusetts under the provisions of C. 29, s. 29F, or any other applicable debarment provision of any other Chapter of the General Laws, or any Rule or Regulation promulgated thereunder. Additionally, the undersigned is not presently debarred by any Agency of the Federal Government.

4.HEALTH & SAFETY ON PUBLIC CONSTRUCTION PROJECTS OVER $ 10000: Chapter 306 of the Acts of 2004: The undersigned certifies that the firm is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;(2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the U.S. OSHA that is at least 10 hours in duration at the time that the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and(3) that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the U.S. OSHA that is at least 10 hours in duration.

5. COMPLIANCE: The undersigned is in compliance with all of the provisions, and shall remain in full compliance with the provisions for the life of any Contract resulting from this solicitation. That the bidder is qualified to perform any such Contract and possesses, or shall obtain, all requisite licenses and/or permits to complete performance; shall maintain all unemployment, workers' compensation, professional and personal liability insurance policies sufficient to cover its performance under any such Contract; and shall comply with relevant prevailing wage rates and employment laws. To the best of its knowledge and belief has paid all local taxes, tax titles, utilities, motor vehicle excise taxes, and water and wastewater bills in MA as required by Law.

CERTIFICATION SIGNATURES

Print Company Name _____

Circle: Corporation Partnership Individual

Authorized Signature _____

Print Name _____

Title of Person Signing Bid or Proposal _____

Date _____

Company Federal ID # or Social Security # _____

State of Incorporation _____

Approval of a Contract, or other Agreement, will not be granted unless this form is signed and fully complete.

CERTIFICATE OF AUTHORITY

At a duly authorized meeting of the Board of Directors of _____
(Name of Corporation)

held on _____ it was VOTED that:
(Date)

_____ _____
(Name) (Officer)

of this corporation, be and he/she hereby is authorized to submit bids and proposals, execute contracts, deeds and bonds in the name and on behalf of said corporation, and affix its corporate seal hereto; and such execution of any contract, deed or obligation in this corporation's name on its behalf by such _____ under seal of the company, shall be valid
(Officer)
and binding upon this corporation.

A True Copy,

ATTEST: _____

TITLE: _____

PLACE OF BUSINESS: _____

_____

DATE OF THIS CERTIFICATE: _____

I hereby certify that I am the clerk of the _____
(Corporation)

that _____ is the duly elected _____ of
(Name) (Office)
said corporation, and that the above vote has not been amended or rescinded and remains in full force and effect as of the date of this contract.

_____
(Clerk)

CORPORATE SEAL:

CERTIFICATE OF CORPORATE VOTE

The undersigned certifies under penalty of perjury that this bid is in all respects bona fide, fair, and made without collusion or fraud with any other persons. "Person" shall mean any natural person, business partnership, corporation, union, committee, club, or organization, entity, or group of individuals.

_____
Signatures of Corporate or Company Officer

_____
Name of Firm

_____
Date

Pursuant to M.G.L. Ch. 62C, See 49A, I hereby certify, under pains and penalties of perjury, that _____ has complied with all laws of the Commonwealth of Massachusetts relating to taxes

_____
Social Security of Federal Identification Number

_____
Signatures of Individual or Corporate Name

By: _____
Corporate Officer
(If applicable)

As directed by the Department of Revenue, any person or corporation that fails to execute the attestation clause shall not be awarded the bid. (M.G.L., Ch. 62C, See 4A.) Submission of a Social Security of Federal Identification Number is purely voluntary.

SECTION 00800

SUPPLEMENTAL GENERAL CONDITIONS

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Attachment A - Wage Rates and Certificate of Compliance

Attachment B - (MBE/EEO/AA) Policies

1. Commonwealth of Massachusetts

1. INTRODUCTION

The following supplements modify, change, delete from or add to Section 00700 GENERAL CONDITIONS. Where any Subsection of the General Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these Supplemental General Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

2. In accordance with General Laws Chapter 149, Section 26 through 27D, the Contractor is obligated to comply with the prevailing wage rates established by the Commission of the Department of Labor and Industries for mechanics, apprentices, chauffeurs, teamsters and laborers employed on the Project. The schedule of applicable prevailing wage rates for the Project, together with a Certificate of Compliance therewith, are set forth in Attachment A herein.

3. The Insurance provisions of Article II of The General Conditions are amended by adding the following requirements:

The Contractor shall carry and continuously maintain until completion of the Contract, insurance as specified below and in such form as shall protect him performing work covered by this Contract, or the City of Woburn and its employees, agents and officials, from all claims and liability for damages for bodily injury, including accidental death, and for property damage, which may arise from operations under this Contract. The Contractor covenants and agrees to hold the City and its employees, agents and officials harmless from loss or damage due to claims for personal injury and/or property damage arising from, or in connection with operations under this Contract.

Except as otherwise stated, the amounts of such insurance shall be for each policy, not less than:

(A) For liability for bodily injury, including accidental death, $1,000,000 for any one person and $1,000,000 on account of one occurrence and $1,000,000 Aggregate Limit.

(B) For liability for property damage $1,000,000 on account of any one occurrence and $1,000,000 Aggregate Limit. Extra-territorial clause shall be included.

1.) Worker's Compensation insurance as required by the General Laws of the Commonwealth of Massachusetts.

2.) Bodily Injury Premise-Operations, Contractor's Protective and Completed Operations Public Liability Insurance in the amounts required in (A) above.

3.) Property Damage Premises-Operations, Contractor's Protective and Completed Operations Public Liability Insurance in the amounts required in (B) above.

4.) Bodily Injury Liability Insurance covering the operation of all motor vehicles owned by the Contractor and vehicles not owned by the Contractor, while such vehicles are being operated in connection with the prosecution of the work under this Contract, in the amounts required in (A) above.

5.) Property Damage Liability Insurance covering the operation of all motor vehicles owned by the Contractor and vehicles not owned by the Contractor while such vehicles are being operated in connection with prosecution of the work under this Contract, in the amounts required in (B) above.

6.) Contractual Liability Insurance covering the liability assumed by the Contractor in the amounts required under (A) and (B) above.

7.) Owner's Protective Insurance secured by the Contractor on behalf of the City of Woburn which will directly protect the City and/or its employees, agents and officers from liability for bodily injuries, including accident death, in the amounts required in (A) above, and for property damage in the amounts required in (B) above.

All policies shall be so written that the Owner will be notified of cancellation or restrictive amendment at least fifteen (15) days prior to the effective date of such cancellation or amendment. A certificate from the Contractor's Insurance Carrier showing at least the coverage and limits of liability specified above and expiration date shall be filed with the Owner before operations are begun.

Such certificates shall not merely name the types of policy provided, but shall specifically refer to this Contract and shall state that such insurance is required by this Contract. The Contractor shall make no claims against the City of Woburn or its officers for any injury to any of his officers or employees or for damage to his trucks or equipment arising out of work contemplated by this Contract.

4. Modified Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program and the Special Provisions for Participation by Minority and Women Business Enterprises.

The Contractor shall abide by the Commonwealth of Massachusetts' Modified Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program and the Special Provisions of Participation by Minority and Women Business Enterprises, (the Program is attached in its entirety as (Attachment B.1)), as well as with all other applicable Federal, State and Local equal employment opportunity, affirmative action, minority/women's business enterprise laws, rules, regulations and policies. (See Attachment B.2).

SECTION 00850

Excerpts from Chapter 30 of the Massachusetts General Laws

Certain excerpts from the Massachusetts General Laws are applicable to Construction contracts. Attention is directed to the following sections of Chapter 30 of the General Laws of Massachusetts as amended to date:

Section 39F. "(1) Every contract awarded pursuant to sections forty-four A to L inclusive, of chapter one hundred and forty-nine shall contain the following subparagraphs (a) through (i) and every contract awarded pursuant to section thirty-nine M of chapter thirty shall contain the following subparagraphs (a) through (h) and in each case those subparagraphs shall be binding between the general contractor and each subcontractor."

(a) Forthwith after the general contractor receives payment on account of a periodic estimate, the general contractor shall pay to each subcontractor the amount paid for the labor performed and the materials furnished by that subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(b) Not later than the sixty-fifth-day after each subcontractor substantially completes his work in accordance with the plans and specifications, the entire balance due under the subcontract less amounts retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the subcontractor; and the awarding authority shall pay that amount to the general contractor. The general contractor shall forthwith pay to the subcontractor the full amount received from the awarding authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(c) Each payment made by the awarding authority to the general contractor pursuant to subparagraphs (a) and (b) of this paragraph for the labor performed and the materials furnished by a subcontractor shall be made to the general contractor for the account of that subcontractor; and the awarding authority shall take reasonable steps to compel the general contractor to make each such payment to each such subcontractor. If the awarding authority has received a demand for direct payment from a subcontractor for any amount which has already been included in a payment to the general contractor or which is to be included in a payment to the general contractor for payment to the subcontractor as provided in subparagraphs (a) and (b), the awarding authority shall act upon the demand as provided in this section.

(d) If, within seventy-days after the subcontractor has substantially completed the subcontract work, the subcontractor has not received from the general contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, the subcontractor may demand direct payment of that balance from the awarding authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the awarding authority, and a copy shall be delivered or sent by certified mail to the general contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth-day after the subcontractor has substantially completed the subcontract work. Within ten-days after the subcontractor has delivered or so mailed the demand to the awarding authority and delivered or so mailed a copy to the general contractor, the general contractor may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the awarding authority and a copy shall be delivered to or sent by certified mail to the subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor and of the amount due for each claim made by the general contractor against the subcontractor.

(e) Within fifteen-days after receipt of the demand by the awarding authority, but in no event prior to the seventieth-day after substantial completion of the subcontract work, the awarding authority shall make direct payment to the subcontractor of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount (i) retained by the awarding authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the general contractor in the sworn reply; provided, that the awarding authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subparagraph (d). The awarding authority shall make further direct payments to the subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this subparagraph.

(f) The awarding authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (e) in an interest-bearing joint account in the names of the general contractor and the subcontractor in a bank in Massachusetts selected by the awarding authority or agreed upon by the general contractor and the subcontractor

and shall notify the general contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the general contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.

(g) All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to subparagraph (f) shall be made out of amounts payable to the general contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later become payable to the general contractor and in the order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the awarding authority to the general contractor to the extent of such payment.

(h) The awarding authority shall deduct from payments to a general contractor amounts which, together with the deposits in interest-bearing accounts pursuant to subparagraph (f), are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the general contractor.

(i) If the subcontractor does not receive payment as provided in subparagraph (a) or if the general contractor doe snot submit a periodic estimate for the value of the labor or materials performed or furnished by the subcontractor and the subcontractor does not receive payment for same when due less the deductions provided for in subparagraph (a), the subcontractor may demand direct payment by following the procedure in subparagraph (d) and the general contractor may file a sworn replay as provided in that same subparagraph. A demand made after the first-day of the month following that for which the subcontractor performed or furnished the labor and materials for which the subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the general contractor. Thereafter the awarding authority shall proceed as provided in subparagraph (e), (f), (g), and (h)."

Section 39G. "Upon substantial completion of the work required by a contract with the commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one-days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such list a notice

setting forth a reasonable time, which shall not in any even be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond by presentation of a written declaration or itemized list as aforesaid, to the contractor's certificate within the twenty-one-day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed."

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

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

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

"Within thirty-days after receipt by the awarding authority of a notice from the contractor stating that all of the work required by the contract has been completed, the awarding authority shall prepare and forthwith send to the contractor for acceptance a final estimate for the quantity and price of the work done and all retainage on that work less all payments made to date, unless the awarding authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation

required by the contract has not been completed. If the awarding authority fails to prepare and send to the contractor the final estimate within thirty-days after receipt of notice of completion, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth-day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date of payment therefor, whichever occurs first, provided that the awarding authority's inspection shows that not work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate."

"The awarding authority shall pay the amount due pursuant to any periodic, substantial completion or final estimate within thirty-five-days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth-day to the date of payment. In the case of periodic payment, the contracting authority may deduct from its payment a retention based on its estimate of the fair value of its claim against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five percent of the approved amount of any periodic payments, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided that a five percent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance."

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

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

Section 39K. "Every contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or public body, shall contain the following paragraph: Within fifteen-days (twenty-four-days in the case of the commonwealth) after receipt from the contractor, at the place designated by the awarding authority if such a place is so designated, of a periodic

estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, less (1) a retention based on its estimate of the fair value of its claims against the contractor and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five-days after (a) the contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the awarding authority, less than one percent of the original contract price, or (b) the contractor substantially completes the work and the awarding authority takes possession for occupancy, whichever occurs first, the awarding authority shall pay the contractor the entire balance due on the contract less, (1) a retention based on its estimate of the fair value of its claims against the contractor and of the cost of completing the incomplete and unsatisfactory items of work less (2) a retention for direct payments to subcontractors based on demand for same in accordance with the provisions of section thirty-nine F, or based on the record of payments by the contractor to the subcontractors under this contract if such record of payment indicates that the contractor has not paid subcontractors as provided in section thirty-nine F. If the awarding authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first-day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen-days (twenty-four-days in the case of the commonwealth) after receipt of such a periodic estimate from the contractor, at the place designated by the awarding authority if such a place is so designated. The contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor."

"The awarding authority may make changes in any periodic estimate submitted by the contractor and the payment due on said periodic estimate shall be computed in accordance with the changes so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the awarding authority may, within seven-days after receipt, return to the contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically corrected and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter. The provisions of section thirty-nine G shall not apply to any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building to which this section applies."

"All periodic estimates shall be submitted to the awarding authority, or to its designee as set forth in writing to the contractor, and the date of receipt by the awarding authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed subtrade and each subtrade listed in sub-bid form as required by specifications and a column listing the amount paid to each filed subcontractor and Sub-subcontractor as of the date the periodic estimate is filed. The person making payment for the awarding authority shall add the daily interest provided for herein to each payment for each day beyond the due date based on the date of receipt marked on the estimate."

"A certificate of the architect to the effect that the contractor has fully or substantially completed the work shall, subject to the provisions of section thirty-nine J, be conclusive for the purposes of this section."

Section 39L. "Public Construction work by foreign corporations; restrictions and reports." The Commonwealth and every county, city, town, district, board, commission or other public body which, as the awarding authority, request proposals, bids or sub-bids for any work in the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or other public works (1) shall not enter into a contract for such work with, and shall not approve as a subcontractor furnishing labor and materials for a part of any such work, a foreign corporation which has not filed with such awarding authority a certificate of the state secretary stating that such corporation has complied with sections three and five of chapter one hundred and eighty-one and the date of such compliance, and (2) shall report to the state secretary and to the department of corporations and taxation any foreign corporation performing work under such contract or subcontract, and any person, other than a corporation, performing work under such contract or subcontract, and residing or having a principal place of business outside the commonwealth."

Section 39M(b). "Specifications for such contracts, and specifications for contracts awarded pursuant to the provisions of said sections forty-four A to forty-four L of said chapter one hundred and forty-nine, shall be written to provide for full competition for each item of material to be furnished under the contract; except, however, that said specifications may be otherwise written for sound reasons in the public interest stated in writing in the public records of the awarding authority or promptly given in writing by the awarding authority to anyone making a written request therefor, in either instance such writing to be prepared after reasonable investigation. Every such contract shall provide that an item equal to that named or described in the said specifications may be furnished; and an item shall be considered equal to the item so named or described if (1) it is at least equal in quality, durability, appearance, strength and design, (2) it will perform at least equally the function imposed by the general design for or the public work being contracted for or the material being purchased, and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the said specifications."

"For each item of material the specifications shall provide for either a minimum of three named brands of material or a description of material which can be met by a minimum of three manufacturers or producers, and for the equal of any one of said named or described materials."

Section 39N. Every contract subject to section forty-four A of Chapter one hundred and forty-nine or subject to section thirty-nine M of chapter thirty shall contain the following paragraph in its entirety and an awarding authority may adopt reasonable rules or regulations in conformity with that paragraph concerning the filing, investigation and settlement of such claims:

"If, during the progress of the work, the contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly."

Section 39O. Every contract subject to the provisions of section thirty-nine M of this chapter or subject to section forty-four A of chapter one hundred forty-nine shall contain the following provisions (a) and (b) in their entirety....

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

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

Section 39P. "Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter on hundred forty-nine which requires the awarding authority, or any official, its architect or engineer to made a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any even, no later than thirty-days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, architect or engineer shall, within thirty-days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty-day period and the date by which the decision will be made."

Section 39R(a). The words defined herein shall have the meaning stated below whenever they appear in this section:

(1) "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to section thirty-nine M of chapter thirty, sections forty-four A through H, inclusive, of chapter one hundred and forty-nine and sections thirty B through thirty P, inclusive, of chapter seven.

(2) "Contract" means any contract awarded or executed pursuant to sections thirty B through thirty P, inclusive, of chapter seven and any contract awarded or executed pursuant to section thirty-nine M of chapter thirty, or sections forty-four A through H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than on hundred thousand dollars

(3) "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

(4) "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his/her residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

(5) "Audit," when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

(6) "Accountant's Report," when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he/she has made and sets forth his/her opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.

(7) "Management," when used herein, means the chief executive officer, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.

(8) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

(b) Subsection (a)(2) hereof notwithstanding, every agreement or contract awarded or executed pursuant to sections thirty B through thirty P, inclusive, of chapter seven, and pursuant to section thirty-nine M of chapter thirty or to section forth-five A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:

(1) The contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and

(2) Until the expiration of six years after final payment, the awarding authority, office of inspector general, and the deputy commissioner of capital planning and operations shall have the right to examine any books, documents, papers or records of the contractor or of his/her subcontractors that directly pertain to, and involve transactions relating to, the contractor or his/her subcontractors, and

(3) If the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his/her description the date of the change and reasons therefor, and shall accompany said descriptions with a letter from the contractor's independent certified public accountant approving or otherwise commenting on the changes, and

(4) If the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and

(5) If the agreement is a contract as defined herein, the contractor has field prior to the execution of the contracts and will continue to file annually,an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.

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

(1) Transactions are executed in accordance with management's general and specific authorization;

(2) Transactions are recorded as necessary:

i. To permit preparation of financial statements in conformity with generally accepted accounting principles, and

ii. To maintain accountability for assets;

(3) Access to assets is permitted only in accordance with management's general or specific authorization; and

(4) The recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

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

(1) Whether the representations of management in response to this paragraph, and paragraph (b) above are consistent with the result of management's evaluation of the system of internal accounting controls; and

(2) Whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

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

(e) The office of inspector general, the deputy commissioner for capital planning and operations and any other awarding authority shall enforce the provisions of this section. The deputy commissioner of capital planning and operations may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the

provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all awarding authorities. A contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

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

Section 40. "Bonds give to the commonwealth, any county, city, town or political subdivision to secure the performance of contracts for the construction or repair of public buildings or other public works may be discharged or released by the awarding authority, upon such terms as it deems expedient, after the expiration of one year from the time of completion, subject to section thirty-nine K, of the work contracted to be done; provided that no claim filed under said bond is pending, and provided further, that no such bonds shall be discharged or released prior to the expiration of all special guarantees provided for in the contract unless new bonds in substitution therefor specifically relating to the unexpired guarantees shall be taken."

EQUAL EMPLOYMENT OPPORTUNITIES

The Contractor and each Subcontractor shall comply with the provisions of the Governor's "Executive Order No. 74", dated July 20, 1970, entitled the "Governor's Code of Fair Practices", as amended by the Governor's "Executive Order No. 116", dated May 1, 1975; with the Fair Employment Practices Law of Massachusetts, as amended; with the Rules and Regulations of the Massachusetts Commission Against Discrimination, as in force at the date hereof; and with all other applicable municipal, state and federal laws and regulation regarding equal employment opportunity.

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 LOCATION OF WORK

A. The work under this Contract is located in the City of Woburn, Massachusetts and it is bordered by Campbell St., Main St. and Union St.

1.02 SCOPE OF WORK

A. Furnish all labor, equipment, materials and tools necessary to construct a municipal parking lot, complete, as shown on the contact plans and as specified herein.

B. Temporary construction fencing exists at the site. The contractor shall assume the cost of maintain the temporary fencing after a contract is awarded.

1.03 CONTRACTOR'S USE OF PERMISES

A. The contractor shall obtain and pay for use of all storage or work areas required to perform the Work. The Contractor shall be responsible for the disposal of all surplus materials from the work.

B. Toilet facilities are not available at the site. Contractor shall provide portable toilet facilities at the site for use of Contractor's employees.

C. Evidence that Contractor and his employees are not following appropriate sanitary procedures shall be cause for owner to shut down the work until the condition is corrected to Owner's satisfaction.

1.06 POLICE DETAILS

A. The City of Woburn is responsible for the payment of police details used for this contract.

B. The Contractor is responsible for the scheduling of details with the Department of Public Works.

1.07 MUNICIPAL FEES

A. All municipal fees are waived for work associated with the subject project, however permits are still required.

Section 01025
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 A. Lump Sum Item, Municipal Parking Lot Construction

1. The lump sum item for construction of the Municipal Parking Lot in the form of the general bid shall include furnishing all labor, tools, equipment, materials and incidentals required to perform the work in its entirety as shown on the contract drawings and as specified herein.

B. Measurement and Payment

1. Payment of the lump sum item shall be full compensation for furnishing all labor, tools, equipment, materials and incidentals required to perform the work in its entirety as shown on the contract drawings and as specified herein. Payments will be made in accordance with Article 9 of the General Conditions

C. Extra Work

1. Extra work, if any shall be performed in accordance with Article 10 of the General Conditions and will be paid for in accordance with Article 11 of the general Conditions.

SECTION 01046

CONTROL OF WORK

PART 1 GENERAL

1.01 PLANT

A. Furnish plant and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will ensure the completion of the work within the Contract Time. If at any time such plant appears to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, Engineer may order the Contractor to increase the efficiency, change the character or increase the plant equipment and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.

1.02 PRIVATE LAND

A. Do not enter or occupy private land outside of easements, except by permission of the land owner.

1.03 PIPE LOCATIONS

A. Locate pipelines substantially as indicated on the Drawings. The Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

1.04 OPEN EXCAVATIONS

A. Adequately safeguard all open excavations by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. Provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Remove bridges provided for access during construction when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in the street and requiring that the trench shall not remain open overnight.

B. Take precautions to prevent injury to the public due to open trenches. Provide adequate light at all trenches, excavated material, equipment, or other obstacles which could be dangerous to the public at night.

1.05 TEST PITS

A. Excavate test pits, at the direction of the Engineer, to locate underground pipelines or structures in advance of the construction. Backfill test pits immediately after their purpose has been satisfied and restore and maintain the surface in a manner satisfactory to the Engineer.

1.06 MAINTENANCE OF TRAFFIC

A. Unless permission to close a street is received in writing from the proper authority, place all excavated material so that vehicular and pedestrian traffic may be maintained at all times. If the construction operations cause traffic hazards, repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the Engineer.

B. Detours around construction will be subject to the approval of the Owner and the Engineer. Where detours are permitted, provide all necessary barricades and signs as required to divert the flow of traffic. Expedite construction operations while traffic is detoured. Periods when traffic is being detoured will be strictly controlled by the Owner.

C. Take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. Be fully responsible for damage or injuries whether or not police protection has been provided.

1.07 CARE AND PROTECTION OF PROPERTY

A. Be responsible for the preservation of all public and private property and use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, restore such property to a condition similar or equal to that existing before the damage was done, or make good the damage in other manner acceptable to the Engineer.

1.08 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

A. Assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables, whether or not they are shown on the Drawings. Carefully support and protect all such structures and utilities from injury of any kind. Immediately repair any damage resulting from the construction operations.

B. Assistance will be given the Contractor in determining the location of existing services. The Contractor, however, shall bear full responsibility for obtaining all locations of underground structures and utilities (including existing water services, drain lines and sewers). Maintain services to buildings and pay costs or charges resulting from damage thereto.

C. Notify all utility companies in writing at least 72 hours (excluding Saturdays, Sundays and Legal holidays) before excavating in any public way. Also notify Massachusetts Dig Safe, telephone 1-888-344-7233 at least 72 hours prior to start of work.

D. If, in the opinion of the Owner, permanent relocation of a utility owned by the Owner is required, the Owner may direct the Contractor, in writing, to perform the work. Work so ordered will be paid for at the Contract unit prices, if applicable, or as extra work under Article 11 of the Supplementary Conditions. If relocation of a privately owned utility is required, the Owner will notify the Utility to perform the work as expeditiously as possible. Cooperate with the Owner and Utility. No claim for delay will be allowed due to such relocation.

E. Coordinate the removal and replacement of traffic loops and signals, if required for the performance of the work, at no additional cost to the Owner.

1.09 WATER FOR CONSTRUCTION PURPOSES

A. In locations where public water supply is available, the Contractor may be allowed to use water without charge for construction purposes.

B. The express approval of the Owner shall be obtained before water is used. Waste of water shall be sufficient cause for withdrawing the privilege of unrestricted use. Hydrants shall only be operated under the supervision of the Owner's personnel.

1.10 MAINTENANCE OF FLOW

A. Provide for the flow of sewers, drains and water courses interrupted during the progress of the work, and immediately cart away and remove all offensive matter. Discuss the entire procedure of maintaining existing flow with the Engineer well in advance of the interruption of any flow.

1.11 COOPERATION WITHIN THIS CONTRACT

A. All firms or persons authorized to perform any work under this Contract shall cooperate with General Contractor and Subcontractors or trades and assist in incorporating the work of other trades where necessary or required.

B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the Engineer.

1.12 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

A. During the course of the work, keep the site of operations as clean and neat as possible. Dispose of all residue resulting from the construction work and, at the conclusion of the work, remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and leave the entire site of the work in a neat and orderly condition.

B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, comply with all applicable Federal, State and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and in other related Sections.

C. Disposal of excess excavated material in wetlands, stream corridors and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. The Contractor will be required to remove the fill and restore the area impacted at no increase in the Contract Price.

1.13 RESTORATION

A. The Contractor is required to restore all areas to conditions that existed prior to construction. Restoration outside of the pipe trench limits required as a result of the installation of the pipeline

shall be at the Contractor's own expense. Restoration within the pipe trench limits is included in the pipe items in the Bid Form.

B. Existing public and private driveways and sidewalks disturbed by the construction shall be replaced to the limits and thicknesses existing prior to construction.

C. Existing signs, lampposts, mailboxes, fences, and stone walls which may be damaged by the Contractor or removed by the Contractor during the course of project shall be reinstalled in a vertical position at the same location from which they were removed. Damaged items shall be replaced with an item equal to or better than the damaged items. A concrete anchor shall be provided as necessary, at no additional cost, to ensure a rigid alignment. Care shall be exercised in the reinstallation of all items to prevent damage to the newly installed pipelines or vaults.

D. Existing concrete, bituminous, timber, and granite curbing shall be protected. If necessary, curbing shall be removed and replaced after backfilling. Curbing which is damaged during construction shall be replaced with curbing of equal quality and dimension at the Contractor's expense. Granite curbing removed and reset shall conform to Section 580 of the Massachusetts DPW Specifications. Joints between sections shall be pointed as required after resetting. Bituminous berms shall conform to Section 501 of the Mass DPW Specifications.

END OF SECTION

SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.

B. The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.

C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area. Specific requirements for erosion and sedimentation controls are specified in Section 02270.

D. This Section is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.

1.02 APPLICABLE REGULATIONS

A. Comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

1.03 NOTIFICATIONS

A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectional acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or local requirements. After receipt of such notice from the Engineer or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.04 IMPLEMENTATION

A. Prior to commencement of the work, meet with the Owner to develop mutual understandings relative to compliance with these provisions and administration of the environmental pollution control program.

B. Remove temporary environmental control features, when approved by the Engineer and incorporate permanent control features into the project at the earliest practicable time.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EROSION CONTROL

A. Provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented. Ditches around construction area shall also be used to carry away water resulting from dewatering of excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored to original condition.

3.02 PROTECTION OF STREAMS AND SURFACE WATERS

A. Take all precautions to prevent, or reduce to a minimum, any damage to any stream or surface water from pollution by debris, sediment or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Divert such waters through a settling basin or filter before being directed into streams or surface waters.

B. Do not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.

C. Take all preventative measures to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action.

D. Water being flushed from structures or pipelines after disinfection, with a Cl_2 residue of 1mg/l or greater, shall be treated with a dechlorination solution, in a method approved by the Engineer, prior to discharge.

3.03 PROTECTION OF LAND RESOURCES

A. Restore land resources within the project boundaries and outside the limits of permanent work to a condition, after completion of construction, that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Drawings.

B. Outside of areas requiring earthwork for the construction of the new facilities, do not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Engineer. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.

C. Before beginning operations near them, protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping or other operations, by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly.

D. Any trees or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to their original condition. The Engineer will decide the method of restoration to beused and whether damaged trees shall be treated and healed or removed and disposed of.

1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-in in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.

2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer, shall be immediately removed and replaced.

E. The locations of the Contractor's storage and other construction buildings, required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as shown on the Drawings and approved by the Engineer and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted for approval of the Engineer.

F. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval at least ten days prior to scheduled start of such temporary work.

1. A layout of all temporary roads, excavations, embankments and drainage to be constructed within the work area.

2. Details of temporary road construction.

3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.

4. A landscaping drawing showing the proposed restoration of the area. Indicate the proposed removal of any trees and shrubs outside the limits of existing clearing area. Indicate locations of guard posts or barriers required to control vehicular traffic and protect trees

and shrubs to be maintained undamaged. The Drawing shall provide for the obliteration of construction scars as such and shall provide for a natural appearing final condition of the area. Modification of the Contractor's approved drawings shall be made only with the written approval of the Engineer. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.

G. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the Engineer. It is anticipated that excavation, filling and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The disturbed areas shall be prepared and seeded as described in Section 02930, or as approved by the Engineer.

H. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

3.04 PROTECTION OF AIR QUALITY

A. Burning - The use of burning at the project site for the disposal of refuse and debris will not be permitted.

B. Dust Control - Maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others.

C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products is prohibited. The use of chlorides may be permitted with approval from the Engineer.

D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

3.05 NOISE CONTROL

A. Make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

3.06 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

A. Maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

END OF SECTION

SECTION 01170

SPECIAL PROVISIONS

PART 1 GENERAL

1.01 GENERAL OBLIGATIONS OF THE CONTRACTOR

A. General obligations of the Contractor shall be as set forth in the Contract Documents. Unless special payment is specifically provided in Section 01025, all incidental work and expense in connection with the completion of work under the Contract will be considered a subsidiary obligation of the Contractor and all such costs shall be included in the appropriate items in the Bid Form in connection with which the costs are incurred.

1.02 SITE INVESTIGATION

A. The Contractor shall satisfy himself as to the conditions existing within the project area, the type of equipment required to perform the work, the character, quality and quantity of the subsurface materials to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the Drawings and related Sections. Any failure of the Contractor to acquaint himself with the available information will not relieve him from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusions or interpretation made by the Contractor on the basis of the information made available by the Owner.

1.03 COORDINATION WITH LOCAL AGENCIES

A. Supply the Local Police Department, Fire Department, School Department, Conservation Commission and the Public Works Department with the following information:

1. A list of streets and intersections where work will be in progress.

2. Areas where approved detours are in effect.

3. Immediate notification of any drain, gas or water main breaks.

B. Reimburse the Owner for the actual cost of the services of Water Department Personnel required during other than regular working hours. The emergency contact number for the Water Department during non-business hours is (781) 897-5945.

C. Maintain pavement as specified in Division 2 and provide the Public Works Department with an address where the Contractor may be reached when not at the site. Upon notification by the Owner or the Engineer, promptly make such repairs as necessary to paved surfaces.

1.04 PUBLIC UTILITIES

A. Comply with the requirements of the Commonwealth of Massachusetts Statute - Chapter 82, Section 40, for excavations in public and private property. Compliance shall include the following:

1. Notify public utility companies in writing at least 72 hours (excluding Saturdays, Sundays and legal holidays) but not more than 30 days before excavating in areas where underground utility plant (pipes, cables, manholes, etc) exist.

2. Provide the Utility Companies with a schedule of the activities in areas where the utilities exist.

3. Notify utility companies of any damage to their utilities resulting from construction operations.

B. Notify DIGSAFE at 1-888-344-7233 at least 72 hours before digging, trenching, blasting, demolishing, boring, backfilling, grading, landscaping or other earth moving operations in any public ways, rights of way and easements.

1.05 PROGRESS SCHEDULE

A. Submit a progress schedule before starting any work, in accordance with Article 2.6 of the General Conditions.

B. Review the progress schedule with the Engineer on a monthly basis or more frequently as required by the Engineer. The progress schedule shall be adjusted as required in accordance with the General Conditions.

1.06 PROVISIONS FOR CONTROL OF EROSION

A. Portions of the work potentially impact upon restricted wetland areas. Comply with the "ORDER OF CONDITIONS" issued for this project work.

B. Take sufficient precautions during construction to minimize the run-off of polluting substances such as silt, clay, fuels, oils, bitumens and calcium chloride into the supplies and surface waters of the State. Special precautions shall be taken in the use of construction equipment to prevent operations which promote erosion.

B. Disposal of drainage shall be in an area approved by the Owner. Prevent the flow or seepage of drainage back into the drainage area. Drainage shall not be disposed of until silt and other sedimentary materials have been removed. Particular care shall be taken to prevent the discharge of unsuitable drainage to a water supply or surface water body.

C. As a minimum, the following shall apply:

1. In cross country areas brush and stumps shall not be removed until no more than 1 week prior to the start of pipe laying in that area. The existing ground surface shall be disturbed as little as possible until no more than 1 week prior to the start of pipe laying.

2. Staked bales of hay and/or silt fence shall be provided at points where drainage from the work site leaves the site, to reduce the sediment content of the water. Sufficient bales of hay shall be provided such that all flow will filter through the hay. Other methods which reduce the sediment content to an equal or greater degree may be used as approved by the Engineer.

3. Drainage leaving the site shall flow in a manner to prevent erosion.

4. Loaming and seeding or mulching of cross country areas shall take place as soon after laying of the pipeline as practicable. This shall be considered part of the pipeline work and full payment for the pipeline work may not be made until it has been completed.

D. Measures for control of erosion shall be adequate to assure that turbidity in the receiving water will not be increased more than 10 standard turbidity units (s.t.u.), or as otherwise required by the State or other controlling body, in waters used for public water supply or fish unless limits have been established for the particular water. In surface water used for other purposes, the turbidity shall not exceed 25 s.t.u. unless otherwise permitted.

E. When excavating in wetlands or a river floodplain, where no temporary diversion structure is required, place the excavated material on the uphill side of the trench so that the trench serves as a barrier between the excavated material and the wetland or flood plain.

1.07 PERMITS

A. Obtain all necessary permits required for proper execution of the project. Fill out all forms and furnish all drawings required to obtain the permits. A copy of each permit shall be submitted to the Engineer. All fees associated with these permits shall be paid by the Contractor as part of the work. Work shall not commence on any phase of the work requiring a permit until the permit is obtained.

B. Obtain required street opening permits for excavations within streets or sidewalk areas.

C. The Contractor shall abide by all permit requirements imposed by the MA Highway Department permit, MWRA or any other state agency permit issued for this project.

D. Abide by any permit requirements imposed in the wetlands Order of Conditions as issued for the project work.

1.08 DISRUPTIONS TO THE EXISTING WATER SYSTEM

A. The Contractor shall make test excavations to locate existing water mains where shown on the Drawings. If during the course of the excavation, the Contractor for whatever reason causes the existing water main to fail, the Contractor shall restore service in the shortest possible time, working around the clock if necessary. He/She shall cooperate with the Owner in supplying emergency water.

B. The Contractor shall minimize the number of disruptions of the water system for the installation of the new piping. If the work requires the interruption of the water service for more than 10 hours, the Contractor may be directed by the Engineer to provide temporary service to the affected areas at no additional cost.

1.09 CONSUMER NOTIFICATION

A. At least 24 hours prior to a scheduled interruption of water service to any consumer for the purpose of connecting new water mains to old water mains, the Contractor shall, at his own expense, deliver written notification to all premises affected by said interruption of service. The notice shall be similar to the "Notice of Interruption in Water Service" provided in the Appendix.

B. The contractor shall establish and maintain a 24 hour local emergency telephone number. The telephone number shall be printed on the "Notice of Water service Interruption Form" distributed to effected residents and businesses.

1.10 COOPERATION BY THE OWNER

A. The Owner will, within 24-hours of notice from the Contractor, operate all valves for draining or admitting water to the various sections of the main, and at the request of the Contractor, dewater such sections of mains to the extent possible by gravity, but the Contractor shall be responsible for removing the remainder of the water and for dewatering the excavated area. No damage shall be claimed by the Contractor for delays in dewatering pipe lines whether or not such dewatering is done by him or by the Owner nor shall any damage be claimed because of water leaking through closed valves after dewatering is completed.

B. The Owner will refill the mainline and sideline connections in the various sections of the work after all pipe closures have been made by the Contractor. All air must be purged from the mains before they can be re-pressurized, and the Contractor shall have no claim for delay while the Owner accomplishes this. The Owner may take taps for this purpose in the new piping at his discretion.

1.11 SPECIAL CONSTRUCTION SCHEDULE REQUIREMENTS

A. At least one lane of two-way traffic shall be maintained on all roads where work is to be performed.

B. Temporary water service will not be allowed after November 1 or before March 30.

C. No work shall be performed during winter shutdown, November 15 to March 15, except for repair.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

A. This Section specifies the general methods and requirements of submissions applicable to Shop Drawings, Product Data, Samples, Construction Photographs, Construction or Submittal Schedules. Additional general submission requirements are contained in Article 6.17 of the General Conditions. Detailed submittal requirements are specified in the technical Sections.

B. All submittals shall be clearly identified by reference to Section Number, Paragraph, Drawing Number or Detail as applicable. Submittals shall be clear and legible and of sufficient size for presentation of data.

1.02 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

A. Shop Drawings

1. Shop drawings as specified in individual Sections include, custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the work.

2. All shop drawings submitted by subcontractors shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.

3. Check all subcontractor's shop drawings regarding measurements, size of members, materials and details to make sure that they conform to the intent of the Drawings and related Sections. Return shop drawings found to be inaccurate or otherwise in error to the subcontractors for correction before submission thereof.

4. All details on shop drawings shall show clearly the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted.

5. Submittals for equipment specified under Division 2 shall include a listing of all installations where identical or similar equipment has been installed and been in operation for a period of at least one year.

B. Product Data

1. Product data as specified in individual Sections include, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed

performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the work.

C. Samples

1. Samples specified in individual Sections include, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the work.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:

1. Field measurements

2. Field construction criteria

3. Catalog numbers and similar data

4. Conformance with related Sections

B. Each shop drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor: "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements." Shop drawings and product data sheets 11-in x 17-in and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package. Provide to the Resident Project Representative a copy of each transmittal sheet for shop drawings, product data and samples at the time of submittal to the Engineer.

C. Notify the Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.

D. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from the responsibility for the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility therefor.

E. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

F. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.

1.04 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in the Work or in the work of any other contractor.

B. Each submittal, appropriately coded, will be returned within 30 working days following receipt of submittal by the Engineer.

C. Number of submittals required:

1. Shop Drawings: Six copies.

2. Product Data: Three copies.

3. Samples: Submit the number stated in the respective Sections.

D. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.

2. The Project title and number.

3. Contractor identification.

4. The names of:

a. Contractor

b. Supplier

c. Manufacturer

5. Identification of the product, with the section number, page and paragraph(s).

6. Field dimensions, clearly identified as such.

7. Relation to adjacent or critical features of the work or materials.

8. Applicable standards, such as ASTM or Federal Standards numbers.

9. Identification of deviations from Contract Documents.

10. Identification of revisions on resubmittals.

11. An 8-in by 3-in blank space for Contractor and Engineer stamps.

12. Where calculations are required to be submitted by the Contractor, the calculations shall have been checked by a qualified individual other than the preparer. The submitted calculations shall clearly show the names of the preparer and of the checker.

1.05 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES

A. The review of shop drawings, data and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed:

1. As permitting any departure from the Contract requirements;

2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;

3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.

B. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.

C. If the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or Contract Time, the Engineer may return the reviewed drawings without noting an exception.

D. Submittals will be returned to the Contractor under one of the following codes.

Code 1 - "APPROVED" is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.

Code 2 - "APPROVED AS NOTED". This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.

Code 3 - "APPROVED AS NOTED/CONFIRM". This combination of codes is assigned when a confirmation of the notations and comments IS required by the Contractor. The Contractor may, at his own risk, release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the confirmation.

Code 4 - "APPROVED AS NOTED/RESUBMIT". This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the resubmittal.

Code 5 - "NOT APPROVED" is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the Contract Documents.

Code 6 - "COMMENTS ATTACHED" is assigned where there are comments attached to the returned submittal which provide additional data to aid the Contractor.

Codes 1 through 5 designate the status of the reviewed submittal with Code 6 showing there has been an attachment of additional data.

E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall identify all revisions made to the submittals, either in writing on the letter of transmittal or on the shop drawings by use of revision triangles or other similar methods. The resubmittial shall clearly respond to each comment made by the Engineer on the previous submission. Additionally, the Contractor shall direct specific attention to any revisions made other than the corrections requested by the Engineer on previous submissions.

F. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor and will be considered "Not Approved" until resubmitted. The Engineer may at his option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.

G. Repetitive Review

1. Shop drawings and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at times convenient to the Engineer and at the Contractor's expense, based on the Engineer's then prevailing rates. The Contractor shall reimburse the Owner for all such fees invoiced to the Owner by the Engineer. Submittals are required until approved.

2. Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Time.

H. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Engineer at least 7 working days prior to release for manufacture.

I. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

1.06 DISTRIBUTION

A. Distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Engineer. Number of copies shall be as directed by the Engineer but shall not exceed six.

1.07 CONSTRUCTION PHOTOGRAPHS

A. Prior to the start of construction, the Contractor shall have 24 color photographs made of the work locations. The Contractor shall have 36 color photographs per month made of the work during its progress and 24 color photographs of the completed facilities. The photographs shall be of such views and taken at such times as the Engineer directs.

B. All photographic work shall be done by a qualified, established commercial photographer acceptable to the Engineer. Three prints of each photograph shall be furnished promptly to the Engineer, and each print shall have a glossy finish and be mounted in plastic sleeving on a substantial backing. The overall dimensions of each mounted print shall be 8-in by 10-in with 1-1/4-in flexible binding margin on the long top side to permit storage in standard 3-ring binders.

C. The film negatives shall be retained in the files of the photographer until the completion of the project and shall then be turned over to the Owner.

D. Each photograph shall have attached to the backing a paper label, approximately 2-1/4-in wide by 1-3/4-in high containing thereon in neat lettering:

1. Contractor's name

2. Short Description of View

3. Photo Number and Date Taken

4. Photographer's Firm Name

1.08 SCHEDULES

A. Provide all schedules required by Articles 2.05B, 2.07, 14.01, and elsewhere in the General Conditions.

1.09 PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM

A. If specifically required in other related Sections, submit a P.E. Certification for each item required, in the form attached to this Section, completely filled in and stamped.

1.10 GENERAL PROCEDURES FOR SUBMITTALS

A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work of other related Sections, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the Work.

END OF SECTION

P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a professional engineer registered in the [State] [Commonwealth] of _____ and that he/she has been employed by

_____ to design
(Name of Contractor)

_____
(Insert P.E. Responsibilities)

in accordance with Section _____ for the

_____.
(Name of Project)

The undersigned further certifies that he/she has performed the design of the _____

_____, that said design is in conformance
(Name of Project)

with all applicable local, state and federal codes, rules, and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the

_____
(Insert Name of Owner)

or Owner's representative within seven days following written request therefor by the Owner.

_____	_____
P.E. Name	Contractor's Name
_____	_____
Signature	Signature
_____	_____
Address	Title
_____	
Address	

SECTION 01601

CONTROL OF MATERIALS

PART 1 GENERAL

1.01 APPROVAL OF MATERIALS

A. Unless otherwise specified, only new materials and equipment shall be incorporated in the work. All materials and equipment furnished shall be subject to the inspection and approval of the Engineer. No material shall be delivered to the work without prior approval of the Engineer.

B. Submit to the Engineer, in accordance with Section 01300, data relating to materials and equipment proposed to be furnished for the work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the specifications.

C. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the work, submit additional samples or materials for such special tests as may be necessary to demonstrate that they conform to the requirements specified herein. Such samples shall be furnished, stored, packed and shipped as directed at the Contractor's expense. Except as otherwise noted, the Owner will make arrangements for and pay for the tests.

D. Any delay of approval resulting from the Contractor's failure to submit samples or data promptly shall not be used as a basis of a claim against the Owner or the Engineer.

E. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes and surfaces, provide such samples of workmanship or finish as may be required.

F. The materials and equipment used on the work shall correspond to the approved samples or other data.

1.02 HANDLING AND STORAGE OF MATERIALS

A. All materials and equipment to be incorporated in the work shall be handled and stored by the manufacturer, fabricator, supplier and Contractor before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting and any injury, theft or damage of any kind whatsoever to the material or equipment.

B. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous, reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking and spalling to a minimum.

C. All mechanical equipment subject to corrosive damage by the atmosphere if stored outdoors (even though covered by canvas) shall be stored in a building to prevent injury. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the Engineer.

D. All materials which, in the opinion of the Engineer, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the work and no compensation shall be given for the damaged material or its removal.

E. All pipe and other materials delivered to the job shall be unloaded and placed in a manner which will not hamper the normal operation of the existing plant or interfere with the flow of necessary traffic.

END OF SECTION

SECTION 02140

DEWATERING AND DRAINAGE

PART 1 GENERAL

1.00 STATUTORY REQUIREMENTS

A. The contractor shall coordinate his use of the municipal drainage system for dewatering purposes with the Department of Public Works..

1.01 SCOPE OF WORK

A. Furnish, install, operate, monitor, maintain and remove temporary dewatering and drainage systems as required and lower and maintain groundwater levels below subgrades of excavations. Prevent surface water runoff from entering or accumulating in excavations.

B. Furnish the services of a licensed professional engineer, registered in the State in which the work is located, to prepare dewatering and drainage system designs and submittals.

C. Collect and properly dispose of all discharge water from dewatering and drainage systems in accordance with State and local requirements and permits.

D. Repair damage caused by dewatering and drainage system operations.

E. Remove temporary dewatering and drainage systems when no longer needed. Restore all disturbed areas.

1.02 RELATED WORK

A. Earth excavation and backfill are included in Section 02221.

B. Sedimentation and erosion control is included in Section 02270.

1.03 SUBMITTALS

A. Dewatering and drainage system designs shall be prepared by a licensed professional engineer, registered in the State in which the work is located, having a minimum of 5 years of professional experience in the design and construction of dewatering and drainage systems. Submit an original and three copies of the licensed professional engineer's certification, on the PE form specified in Section 01300, stating that the dewatering and drainage system designs have been prepared by the professional engineer and that the professional engineer will be responsible for their execution. Do not submit dewatering and drainage system designs unless requested in writing.

1.11 DEFINITIONS

A. Where the phrase "in-the-dry" is used in this Section, it shall be defined as in situ soil moisture content of no more than two percentage points above the optimum moisture content for that soil.

PART 2 PRODUCTS

(None this Section)

PART 3 EXECUTION

3.01 GENERAL

A. Control surface water and groundwater such that excavation to final grade is made in-the-dry, and bearing soils are maintained undisturbed. Prevent softening, or instability of, or disturbance to, the subgrade due to water seepage.

B. Provide protection against flotation for all work.

C. The impact of anticipated subsurface soil/water conditions shall be considered when selecting methods of excavation and temporary dewatering and drainage systems. Where groundwater levels are above the proposed bottoms of excavations, a pumped dewatering system is expected for predrainage of the soils prior to excavation to final grade and for maintenance of the lowered groundwater level until construction has been completed to such an extent that the foundation, structure, pipe, conduit, or fill will not be floated or otherwise damaged. Type of dewatering system, spacing of dewatering units and other details of the work are expected to vary with soil/water conditions at a particular location.

3.02 SURFACE WATER CONTROL

A. Control surface water runoff to prevent flow into excavations. Provide temporary measures such as dikes, ditches and sumps.

3.03 EXCAVATION DEWATERING

A. Provide and maintain adequate equipment and facilities to remove promptly and dispose of properly all water entering excavations. Excavations shall be kept in-the-dry, so as to maintain an undisturbed subgrade condition throughout construction below grade, including backfill and fill placement.

B. Collect precipitation or surface runoff in shallow ditches around the perimeter of the excavation, drain to sump and pump from the excavation to maintain in-the-dry conditions.

C. Pipe and conduit shall not be installed in water or allowed to be submerged prior to backfilling. Pipe and conduit which becomes submerged shall be removed and the excavation dewatered and restored to proper conditions prior to reinstalling the pipe and conduit.

D. Excavations for foundations and structures shall be maintained in-the-dry for a minimum of 4 days after concrete placement. In no event shall water be allowed to enter an excavation and rise to cause unbalanced pressure on foundations and structures until the concrete or mortar has set at least 24 hours.

E. Dewatering and drainage operations shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade at the bottom of the excavation. If the subgrade becomes disturbed for any reason, the unsuitable subgrade material

shall be removed and replaced with concrete, compacted granular fill, or other approved material to restore the bearing capacity of the subgrade to its original undisturbed condition.

F. Dewatering and drainage operations shall be conducted in a manner which does not cause loss of ground or disturbance to the pipe bedding or soil which supports overlying or adjacent structures.

3.04 DISPOSAL OF DRAINAGE

A. All water discharged from temporary dewatering and drainage systems shall be disposed of in accordance with the sedimentation and control plans as specified in Section 01110. Existing or new sanitary sewer systems shall not be used to dispose of drainage unless the written permission of the utility or owner is obtained.

END OF SECTION

SECTION 02200
EARTHWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all excavation, backfill, fill and grading required to complete the work as shown on the Drawings and as specified herein. The work shall include, but not necessarily be limited to; excavation for structures, footings, manholes, vaults, electrical manholes, handholes, conduits, cables, raceways and ducts, pipes and paving; all backfilling and fill; embankment and grading; disposal of waste and surplus materials; and all related work such as sheeting, bracing and pumping.

B. All excavation, trenching and related sheeting, bracing, etc, shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and to the Massachusetts Department of Labor and Workforce DevelopmeJ1t, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations" (Chapter 454 CMR 10.00 et seq). and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

C. Loam, if any, excavated under this Section may be salvaged by the Contractor for his/her own convenience for use as specified under Section 02930.

1.02 RELATED WORK

A. Site preparation is included in Section 02100.

B. Dewatering and Drainage is included in Section 02140.

C. Sedimentation and Erosion Control is included in Section 02270.

D. Paving and Pavement Repair is included in Section 02576.

E. Loaming and hydro-seeding is included in Section 02930.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C33 - Specification for Concrete Aggregates.

2. ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft- lbf/cu ft [2,700 kN-m/cu m]).

3. ASTM D 1682 - Standard Test Methods for Breaking Load and Elongation of Textile Fabrics.

4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes.

5. ASTM D4751 – Standard Test Method for Determining the Apparent Opening Size of a Geotextile.

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 PROTECTION

A. Sheeting and Bracing

1. Furnish, put in place and maintain such sheeting and bracing as may be required: by Federal, State and local safety requirements; to support the sides of excavations; to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction; and to protect adjacent structures from undermining or other damage. If the Engineer is of the opinion that at any points sufficient or proper supports have not been provided, he/she may order additional supports put in, and compliance with such order shall not relieve or release the Contractor from his/her responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill.

2. Construct the sheeting outside the neat lines of the foundation, unless indicated otherwise, to the extent deemed desirable for the method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressures to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected to provide the necessary clearances and dimensions.

3. Where sheeting and bracing is required to support the sides of excavations for structures, engage a professional engineer, registered in the Commonwealth of Massachusetts, to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design and certification of this shall be provided by the professional engineer. Submit P.E. Certification Form contained in Section 01300 to show compliance with this requirement.

4. Leave in place to be embedded in the backfill all sheeting and bracing not shown on the Drawings but which the Engineer may direct in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures,

utilities, or property, whether public or private. The Engineer may direct that timber used for sheeting and bracing be cut off at any specified elevation. Sheeting directed by the Engineer to be left in place will be paid for in accordance with Article **II** of the General Conditions. All timber sheeting to be left in place within the limits of the structure shall be treated.

5. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed.

6. The right of the Engineer to order sheeting and bracing left in place shall not be construed as creating any obligation on his/her part to issue such orders and his/her failure to exercise his/her right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

7. No sheeting is to be withdrawn if driven below mid-diameter of any pipe and under no circumstances shall any sheeting be cut off at a level lower than l-ft above the top of any pipe.

B. Pumping and Drainage

1. At all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed sub grade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. Submit to the Engineer for review the design of the dewatering systems prior to commencing work.

2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation. Well or sump installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.

3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps and pumped from the excavation to maintain a bottom free from standing water.

4. Take all additional precautions to prevent uplift of any structure during construction.

5. Drainage shall be disposed of in an approved area only so that flow or seepage back into the excavated area will be prevented.

6. Flotation shall be prevented by maintaining a positive and continuous operation of the dewatering system. Be fully responsible and liable for all damages which may result from failure of this system.

7. Remove the dewatering equipment after the system is no longer required.

8. Take all necessary precautions to preclude the accidental discharge of fuel, oil, etc, in order to prevent adverse effects on groundwater quality.

1.05 SOIL TESTING

A. Previous to the general placement of the fill and during such placement, the Engineer may select areas within the limits of the fill for testing the degree of compaction obtained. Cooperate fully in obtaining the information desired.

B. Payment for testing will be made by the Owner. If test results are unsatisfactory, all costs involved in correcting deficiencies in compacted materials to the satisfaction of the Engineer, will be borne by the Contractor.

1.06 DEFINITIONS

A. Where the phrase "in-the-dry" is used in this Section, it shall be defined to mean a soil condition such that the in-place moisture content *of* the soil at that time is no more than two percentage points above the optimum moisture content *of* that soil as determined by the laboratory test *of* the moisture-density relation appropriate to the specified level *of* compaction.

B. Where used in this Section "structures" refers to all buildings, wet wells, manholes and below grade vaults. Stormwater structures and duct banks are not considered structures in this context.

PART 2 PRODUCTS

2.01 MATERIALS

A. Structural Fill

1. Structural Fill (bank run gravel) shall be gravel, sandy gravel, *or* gravelly sand *free of* organic material, loam, wood, trash, snow, ice, frozen soil and other objectionable material and shall be well graded within the following limits:

Sieve Size	Percent Finer by Weight
4-in	100
No.4	20 to 70
No. 40	5 to 35
No. 200	0 to 7

2. Submit to the site a representative sample of proposed structural fill, weighing approximately 50 lbs, at least 5 days prior to the date *of* anticipated use *of* such material.

B. Common Fill shall consist *of* mineral soil substantially *free from* organic materials, loam, wood, trash and other objectionable materials which may be compressible *or* which cannot be properly compacted. Common fill shall not contain stones larger than 6-in in largest diameter and shall have a maximum *of* 75 percent passing the No. 40 sieve and a maximum *of* 20 percent passing No. 200 Sieve. Common fill shall not contain granite blocks, broken concrete, masonry rubble *or* other similar materials. It shall have physical properties such that it can be readily spread and compacted during filling. Snow, ice and frozen soil will not be permitted. Soil excavated *from* the structure areas and which meets the above requirements may be used in embankments.

C. Select Common Fill shall be as specified above *for* Common Fill except that the material shall contain no stones larger than 2-in in largest dimension.

D. Crushed Stone

1. Crushed stone shall conform to the Massachusetts Department *of* Public Works Standard Specifications *for* Highways and Bridges (MDPWSSHB), latest edition and all addenda and supplements thereto. The stone shall be free *of* any organic material, foreign material and angular in shape. The stone shall be maximum size *of* 2-in and a minimum size *of* 1/2-in.

E. Screened Gravel

1. Screened gravel shall be used for pipe bedding as detailed and at other locations indicated on the Drawings.

2. Screened gravel shall consist of hard, durable, rounded or sub-angular particles of proper size and gradation and shall be free from sand, loam, clay, excess fines and deleterious materials. The gravel shall be graded within the following limits:

Sieve Size	Percent Finer by Weight
5/8-in	100
1-1/2-in	40 to 100
3/8-in	15 to 45
No. 10	0 to 5

F Sand

1. Sand shall conform to ASTM C33 for fine aggregate.

G. Processed gravel for pavement subbase shall conform to Ml.03.1 of the MDPWSSHB.

H. Erosion Control Blanket

1. Erosion control blanket shall be used as indicated on the Drawings and shall conform to the following requirements:

   a. Minimum grab strength of 120 lbs per ASTM D1682

   b. Apparent opening size to be equal to or greater than the U.S. Standard Sieve No. 100 (0.210 mm) per ASTM D4751.

   c. Percent open area not to exceed about 25 percent. The percent open area is defined as the ratio of the sum of 20 or more individual open areas (times 100) to the sum of the corresponding 20 or more individual total areas.

   d. Coefficient of permeability shall not be less than 0.2 cm/sec.

   e. Erosion control blanket shall be Mirafi, Type 140N; Dupont, Type PAR, Style 3401 or equal product by Amoco.

PART 3 EXECUTION

3.01 PREPARATION

A. Test Pits

1. Perform exploratory excavation work (test pits) for the purpose of verifying the location of underground utilities and structures and to check for unknown utilities and structures, prior to commencing excavation work.

2. Test pits shall be backfilled as soon as the desired information has been obtained. Backfilled surfaces shall be stabilized in accordance with approved erosion and sedimentation control plans.

B. Dewatering and Drainage Systems

1. Temporary dewatering and drainage systems shall be in place and operational prior to beginning excavation work.

3.02 ROCK AND BOULDER EXCAVATION

A. Rock excavation shall be understood to mean ledge rock which in the opinion of the Engineer requires for its removal, drilling and blasting, wedging, sledging or barring and boulders which in the opinion of the Engineer require blasting for removal. Rock excavation shall be made to the widths and depths directed by the Engineer in the field.

B. Boulder excavation shall be understood to mean only boulders in any kind of excavation exceeding 1 cu yd in volume which can be excavated without resorting to blasting.

C. All blasting operations shall be conducted in full compliance with all the laws of the State, all local ordinances and with all possible care so as to avoid injury to persons and property. The rock shall be well covered and sufficient warning shall be given to all persons in the vicinity of the work before blasting. Care shall be taken to avoid injury to all water pipes, gas pipes, or other structures and to private property. In addition, to observing all municipal and other ordinances relating to the storage and handling of explosives, conform to any further regulations which the Engineer shall deem necessary.

D. If rock below grade is shattered on account of holes having been drilled too deep or too heavy charges of explosives used or for any other reasons due to blasting, and if, in the opinion of the Engineer, said shattered rock is unfit for foundation, the shattered rock shall be removed and the excavation refilled as required by the Engineer at the expense of the Contractor.

E. Where rock is encountered, it shall be uncovered but not excavated until measurements have been made by the Engineer.

F. Payment for rock and boulder excavation shall be in accordance with Article 11 of the General Conditions.

3.03 EXCAVATION BELOW GRADE

A. If the bottom of any excavation is taken out below the limits shown on the Drawings, specified, or directed by the Engineer, it shall be refilled at the Contractor's expense with concrete, 8-in layers of compacted structural fill or other material satisfactory to the Engineer. The type of material to be used shall be at the Engineer's option.

B. If care is not taken for water properly, through failure to postpone final excavation immediately above the subgrade until shortly before placing of the new work thereon, or other failure or neglect to conduct the excavation work properly so that the surface of the subgrade is in proper condition for construction, remove the unsuitable material] and replace it with concrete, compacted structural fill or other approved material at Contractor's own expense so that the condition of the subgrade meets with the approval of the Engineer before any work is placed thereon.

C. If, in the opinion of the Engineer, the material, in its undisturbed natural condition, at or below the normal grade of the excavation as indicated on the Drawings is unsuitable for foundations, it shall be removed to such depth and width as he/she may direct and be replaced with suitable material as directed by the Engineer for which compensation will be made in accordance with Article 11 of the General Condition.

3.04 STRUCTURE EXCAVATION

A. Excavation shall be made to the grades shown on the Drawings and to such widths as will give suitable room for construction of the structures, for bracing and supporting, pumping and draining. The bottom of the excavations shall be rendered firm and dry and in all respects acceptable to the Engineer.

B. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. Exposed subgrade shall be proofrolled with at least two coverages of the specified equipment. (refer to Paragraph 3.08C). The Engineer shall waive this requirement if, in his/her opinion, the sub grade will be rendered unsuitable by such compaction. Sub grade soils which become soft, loose, "quick", or otherwise unsatisfactory for support of structures as a result of inadequate excavation, dewatering, proofrolling, or other construction methods shall be removed and replaced by structural fill as required by the Engineer at the Contractor's expense.

C. Dewatering shall be such as to prevent boiling or detrimental underseepage at the base of the excavation as specified herein.

D. Excavation equipment shall be satisfactory for carrying out the work in accordance with the requirements specified. In no case shall the earth be ploughed, scraped, or dug with machinery so near to the finished subgrade as to result in excavation of, or disturbance of material below grade, the last of the excavated material being removed with pick and shovel just before placing of concrete or working mat thereon.

E. When excavation for foundations has reached prescribed depths, the Engineer shall be notified and will inspect conditions. If materials and conditions are not satisfactory to the Engineer, the Engineer will issue instructions as to the procedures and if additional costs are involved, adjustments of the Contract Price will be made on the basis of unit prices agreed upon by the Owner and the Contractor in accordance with the provisions of the Contract Documents.

F. During final excavation to sub grade level, take whatever precautions are required to prevent disturbance and remolding. Material which has become softened and mixed with water shall be removed. Hand excavation of the final 3 to 6-in will be required as necessary to obtain a satisfactory undisturbed bottom. The Engineer will be the sole judge as to whether the work has been accomplished satisfactorily.

3.05 EXCAVATION AND BACKFILLING FOR FOOTINGS AND UNDERSLAB

A. Excavation for all pipe lines beneath structures and excavation for all footings shall be carried out with the excavating equipment operating from the subgrade for the structure. The excavation shall be carried out "in-the-dry" and in a manner which will preserve the undisturbed state of the sub grade soils. The excavations may be completed with shoring and bracing of open cuts.

B. All excavation beneath structures shall be backfilled with structural fill. Where it is impractical to use large equipment for compaction or when such methods, in the opinion of the Engineer, are disturbing the surrounding natural subgrade, the fill shall be compacted using hand-operated mechanical compactors. The lift thickness shall not exceed 6-in measured before compaction when hand-operated equipment is used.

3.06 TRENCH EXCAVATION AND BACKFJLLING

A. Excavation for all trenches required for the installation of pipes and ducts shall be made to the depths indicated on the Drawings and in such a manner and to such widths as will give suitable room for laying the pipe or installing the ducts within the trenches, for bracing and supporting and for pumping and drainage facilities. Render the bottom of the excavations firm and dry and in all respects acceptable to the Engineer. Pavement, when encountered, shall be cut with pneumatic chisels along straight lines before excavating.

B. Where pipe or ducts are to be laid in gravel bedding or encased in concrete, the trench may be excavated by machinery to, or just below the designated subgrade provided that

the material remaining in the bottom of the trench is no more than slightly disturbed.

C. Where pipe or ducts are to be laid directly on the trench bottom, the lower part of the trenches in each shall not be excavated to grade by machinery, the last of the material being excavated manually in such a manner that will give a flat bottom true to grade so that pipe or duct can be evenly supported on undisturbed material. Bell holes shall be made as required.

D. Meet the following criteria when installation method includes the use of a steel box:

1. When installing rigid pipe (R.C., V.c., A.c., D.L, etc), any portion of the box extending below mid diameter shall be raised above this point prior to moving the box ahead to install the next pipe. This is to prevent the separation of installed pipe joints due to movement of the box.

2. When installing flexible pipe (PVC, ABS solid wall, ABS truss, etc), the bottom of the box shall not extend below mid diameter. This is to prevent loss of soil between the box and the pipe bedding which could result in excessive deflection of the installed pipe.

E. Backfilling over ducts shall begin not less than 3 days after placing concrete encasement

F. Where pipe is to be installed in fill of any type, fill shall be placed and compacted to the total depth required (rough grade elevation) and then re-excavated for pipe installation.

G. As soon as practicable after the pipe has been laid and jointed, backfilling shall begin and thereafter be prosecuted expeditiously. If required, as shown on the Drawings, screened gravel shall be placed around the pipe to mid- diameter. As the screened gravel is placed, it shall be compacted by suitable tools.

H. After the screened gravel bedding (if required) has been placed to the mid-diameter of the pipe, screened gravel or selected common fill as shown shall be placed to a depth of I-ft over the top ofthe pipe. Material shall be thoroughly compacted by hand-tamping as placed with at least one man tamping for each man shoveling material into the trench.

I. Where the pipes are laid in unpaved areas, the remainder of the trench shall be filled with common fill in layers not to exceed 3-ft and thoroughly compacted by rolling ramming or puddling, as the Engineer may direct, sufficiently to prevent subsequent settling. The backfill shall be mounded 6-in above the existing grade or as directed. Wherever a loam or gravel surface exists prior to excavations, it shall be removed, conserved and replaced to the full original depth as part of the work under the pipe items. In some areas it may be necessary to remove excess material during the clean-up process, so that the ground may be restored to its original level and condition. If storage of loam, gravel, or topsoil is not preferred, replace it with material of equal quality and in equal quantity.

J. Where the pipes are laid in streets, or other paved areas, the remainder of the trench above the bedding and up to a depth of loft below the bottom of the specified paving shall be backfilled with common fill in loft layers thoroughly compacted by rolling or ramming as the Engineer may direct. The loft layer below the bottom of the specified paving shall be of bank-run gravel compacted in 6-in layers.

K. Along the length of all pipeline and duct trenches, construct impervious dams or bulkheads of clay or concrete in the trench bottom at 300-ft intervals or at manholes and structures, whichever is less, to obstruct the free flow of groundwater after construction is completed. Install impervious dams at all points where a pipe trench enters an excavated area where a permanent underdrain system is installed.

L. The method and degree of compacting backfill as directed by the Engineer will be governed by the type of material and the extent to which any subsequent settlement can be permitted.

3.07 MISCELLANEOUS EXCAVATION

A. Perform all the remaining miscellaneous excavation. Make all excavations necessary to permit the placing of loam and plants, for constructing roadways and any other miscellaneous earth excavation required under this Contract.

3.08 BACKFILLING - COMMON PILL

A. Common Pill may be used as trench backfill; fill against exterior walls of structures (except water and retention structures) as indicated on the Drawings; as embankment fill; or in other areas as designated by the Engineer. Material conforming to the requirements of common fill shall be placed in layers having a maximum thickness of 3-ft measured before compaction.

B. Common Pill shall be compacted to at least 92 percent of maximum density as determined by ASTM D1557, Method

C. Materials placed in fill areas shall be deposited to the lines and grades shown on the Drawings making due allowance for settlement of the material and for the placing of loam thereon.

D. The surfaces of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the grading plan and no soft spots or uncompacted areas will be allowed in the work.

E. No compacting shall be done when the material is too wet either from rain or from excess application of water. At such times, work shall be suspended until the previously placed and new materials have dried sufficiently to permit proper compaction.

3.09 BACKFILLING - STRUCTURAL FILL

A. Structural fill sha1l be placed in layers having a maximum thickness of 8-in in open areas and 6-in in confined areas including points where conduit and piping join structures, measured before compaction. Each layer of fill shall be compacted to at least 95 percent of maximum dry density determined by the ASTM D1557, Method D by methods approved by the Engineer. The limits of structural fill adjacent to structures shall extend as shown on the Drawings.

B. Structural fill shall not be placed on a frozen surface or one covered by snow or ice, nor shall snow, ice or frozen earth be incorporated in the compacted fill.

C. Compaction of structural fill in open areas shall consist of fully loaded ten-wheel trucks, a tractor dozer weighing at least 30,000 lbs and operated at full speed, a heavy vibratory roller, or any method approved by the Engineer. Compaction of structural fill in confined areas shall be accomplished by hand operated vibratory equipment or mechanical tampers approved by the Engineer. As a minimum, compaction of structural fill shall consist of four coverages of the approved equipment.

D. Working mat is required below all structures, as indicated on the Drawings, it sha1l consist of structural fill (l2-in minimum).

3.10 EARTH EMBANKMENTS-COMMON FILL

A. All organic materials, including peat and loam, and loose inorganic silt material (loess) shall be removed from areas beneath new embankments. If the subgrade slopes are excessive, the subgrade sha1l be stepped to produce a stable surface for the placement of the embankments. The natural subgrade shall then be compacted by at least two coverages of a loaded six-wheel or ten-wheel truck. The Engineer wi1l waive this requirement, if, in his/her opinion, the sub grade will be rendered unstable by such compaction. The prepared subgrade shall be inspected and approved by the Engineer prior to the placement of fill.

3.11 DISPOSAL OF SURPLUS MATERIAL

A. No excavated materials shall be removed from the site of the work or disposed of, except as specified by the Engineer. Materials shall be neatly piled so as to inconvenience as little as possible the public and adjoining property owners until used or otherwise disposed of as specified below.

B. Suitable excavated material sha1l be used for fill embankments or backfi1l on the different parts of the work as required.

C. Surplus fill shall become the property of the Contractor and sha1l be removed and disposed off site.

3.12 GRADING

A. Grading in preparation for placing of loam, planting areas, paved walks and drives and appurtenances shall be performed at all places that are indicated on the Drawings, to the lines, grades and elevations shown and otherwise as directed by the Engineer and shall be performed in such a manner that the requirements for formation of embankments can be followed. All material encountered, of whatever nature, within the limits indicated, shall be removed and disposed of as directed. During the process of grading, the subgrade shall be maintained in such condition that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the prosecution or condition of the work.

B. If at the time of grading it is not possible to place any material in its final location, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated material.

C. The right is reserved to make minor adjustments or revisions in lines or grades if found necessary as the work progresses, in order to obtain satisfactory construction.

D. Stones or rock fragments larger than 4-in in their greatest dimensions will not be permitted in the top 6-in of the finished subgrade of all fills or embankments.

E. In cuts, all loose or protruding rocks on the back slopes shall be barred loose or otherwise removed to line or finished grade of slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings or as directed by the Engineer.

SECTION 02213

ROCK AND BOULDER EXCAVATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and excavate and dispose of rock and boulders as shown on the Drawings and as specified herein.

B. Blasting will not be permitted on this project without prior written authorization of the owner.

1.02 RELATED WORK

A. Earth excavation and backfilling are included in Section 02221.

B. Environmental Protection is included in Section 02270.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, the proposed methods of excavation for the various portions of the work. Submittals shall be for information only. Remain responsible for means, methods and techniques, as well as all safety considerations.

1.04 DEFINITIONS

A. Rock: Any large mass of stone, bedrock, or ledgerock.

B. Boulder: Rock fragments exceeding 1 cu yd in volume.

C. Rock Excavation: The removal of solid rock or rock fragments greater than 1 cu yd in volume which cannot be removed by conventional mechanical excavation equipment or which requires continuous, systematic drilling and blasting, chemical expanders or other special procedures.

D. Boulder Excavation: The removal of boulders exceeding 1 cu yd in volume which can be excavated without resorting to blasting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 ROCK EXCAVATION

A. Rock excavation may be performed by jack hammering, expansive chemical splitting, or other similar process.

3.02 BOULDER EXCAVATION

A. Boulders and rock fragments up to 1 cu yd in volume may be reduced in size by rock excavation methods to simplify its removal.

3.03 DISPOSAL OF ROCK AND BOULDERS

A. Fragmented rock with dimensions not exceeding 6-in in any direction may be mixed with common fill and used as common fill in accordance with Section 02221.

B. Rock and boulders may be crushed and screened for reuse in the work, provided that the resultant materials meet the requirements for gravel, crushed stone, or structural fill as specified in Section 02221.

C. Unused rock and boulders shall be removed and disposed of off-site.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING AND COMPACTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all trenching for pipelines and appurtenances, including drainage, filling, backfilling, disposal of surplus material and restoration of trench surfaces and easements.

B. Excavation shall extend to the width and depth shown on the Drawings or as specified herein and shall provide suitable room for installing pipe, structures and appurtenances.

C. Furnish and place all sheeting, bracing and supports and shall remove from the excavation all materials which the Engineer may deem unsuitable for backfilling. The bottom of the excavation shall be firm, dry and in all respects, acceptable. If conditions warrant, deposit gravel for pipe bedding, or gravel refill for excavation below grade, directly on the bottom of the trench immediately after excavation has reached the proper depth and before the bottom of the trench has become softened or disturbed by any cause whatever. The length of open trench shall be related closely to the rate of pipe laying. All excavation shall be made in open trenches.

D. All excavation, trenching and related sheeting, bracing, etc, shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations" (Chapter 454 CMR 10.00 et. seq.). Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

E. Wherever the requirement for 95 percent compaction is referred to herein for State roadways it shall mean “at least 95 percent of maximum density as determined by ASTM compaction tests, Designation D1557, Method D”. The Contractor shall provide all equipment and incidentals required to perform field tests to verify compaction during work. Compaction tests are required in State Highways and taken at 15 foot intervals in areas where the excavation extends into the traveled way. Wherever the requirement for 92 percent compaction is referred to herein for City roads it shall mean "at least 92 percent of maximum density as determined by ASTM D1557, Method D". Compaction tests shall be performed on the 92 percent compaction if required by Engineer.

F. Prior to the start of work submit the proposed method of backfilling and compaction to the Engineer for review.

1.02 RELATED WORK

A. Rock and boulder excavation is included in Section 02213.

B. Granular fill materials are included in Section 02230.

C. Dewatering is included in Section 02140.

D. Pavement repair and resurfacing is included in Section 02576.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TRENCH EXCAVATION

A. Trench excavation shall include material of every description and of whatever substance encountered, except rock and boulders. Pavement shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating.

B. Strip and stockpile topsoil from grassed areas crossed by trenches. At the Contractor's option, topsoil may be otherwise disposed of and replaced, when required, with approved topsoil of equal quality.

C. While excavating and backfilling is in progress, traffic shall be maintained, and all utilities and other property protected as provided in the General Conditions and General Requirements.

D. Trenches shall be excavated to the depth indicated on the Drawings and in widths sufficient for laying the pipe, bracing and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry and in all respects acceptable to the Engineer. Trench width shall be practical minimum.

E. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of sub grade soils. The trench may be excavated by machinery to, or just below the designated sub grade, provided that material remaining in the bottom of the trench is no more than slightly disturbed. Sub grade soils which become soft, loose, "quick", or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced by screened gravel fill as required by the Engineer at the Contractor's expense.

F. Clay and organic silt soils are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, use a smooth edge bucket to excavate the last 1-ft of depth.

G. Where pipe is to be laid in screened gravel bedding, the trench may be excavated by machinery to the normal depth of the pipe provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

H. Where pipe is to be laid directly on the trench bottom, final excavation at the bottom of the trench shall be performed manually, providing a flat bottom true to grade upon undisturbed material. Bell holes shall be made as required.

3.02 DISPOSAL OF MATERIALS

A. Excavated material shall be stacked without excessive surcharge on the trench bank or obstructing free access to hydrants and gate valves. Inconvenience to traffic and abutters shall be

avoided as much as possible. Excavated material shall be segregated for use in backfilling as specified below.

B. It is expressly understood that no excavated material shall be removed from the site of the work or disposed of, except as directed by the Engineer. When removal of surplus materials has been approved by the Engineer, dispose of such surplus material in approved designated areas.

C. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided. When required, it shall be re-handled and used in backfilling the trench.

3.03 SHEETING AND BRACING

A. Furnish, put in place and maintain sheeting and bracing required by Federal, State or local safety requirements to support the sides of the excavation and prevent loss of ground which could endanger personnel, damage or delay the work or endanger adjacent structures. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he/she may order additional supports placed at the expense of the Contractor. Compliance with such order shall not relieve the Contractor from his/her responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.

B. Where sheeting and bracing is required to support the sides of trenches, engage a professional engineer, registered in the Commonwealth of Massachusetts, to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design and certification of this shall be provided by the professional engineer. Submit P.E. Certification Form contained in Section 01300 to show compliance with this requirement.

C. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the screened gravel backfill.

1. When installing rigid pipe (R.C., V.C., A.C., etc), any portion of the box extending below mid diameter shall be raised above this point prior to moving the box ahead to install the next pipe. This is to prevent the separation of installed pipe joints due to movement of the box.

2. When installing flexible pipe (PVC, etc), trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, screened gravel shall be placed to fill any voids created and the screened gravel and backfill shall be recompacted to provide uniform side support for the pipe.

D. Permission will be given to use steel sheeting in lieu of wood sheeting for the entire job wherever the use of sheeting is necessary. The cost for use of sheeting will be included in the bid items for pipe and shall include full compensation for driving, bracing and later removal of sheeting.

E. All sheeting and bracing shall be carefully removed in such manner as not to endanger the construction of other structures, utilities, or property, whether public or private. All voids left

after withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, by watering or otherwise as directed.

F. No payment will be given for sheeting, bracing, etc, during the progress of the work. No payment will be given for sheeting which has actually been left in the trench for the convenience of the Contractor.

G. Sheeting driven below mid-diameter of any pipe shall remain in place from the driven elevation to at least 1-ft above the top of the pipe.

3.04 TEST PITS

A. Excavation of test pits may be required for the purpose of locating underground utilities or structures as an aid in establishing the precise location of new work.

B. Test pits shall be backfilled as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for travel until resurfaced as specified.

3.05 EXCAVATION BELOW GRADE AND REFILL

A. Whatever the nature of unstable material encountered or the groundwater conditions, trench drainage shall be complete and effective.

B. If the Contractor excavates below grade through error or for the Contractor's own convenience, or through failure to properly dewater the trench, or disturbs the sub grade before dewatering is sufficiently complete, he may be directed by the Engineer to excavate below grade as set forth in the following paragraph, in which case the work of excavating below grade and furnishing and placing the refill shall be performed at his own expense.

C. If the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may work into the screened gravel notwithstanding effective drainage, the sub grade material shall be removed to the extent directed and the excavation refilled with a 6-in layer of coarse sand, or a mixture graded from coarse sand to the fine pea stone, as approved by the Engineer, to form a filter layer preserving the voids in the gravel bed of the pipe. The composition and gradation of gravel shall be approved by the Engineer prior to placement. Screened gravel shall then be placed in 6-in layers thoroughly compacted up to the normal grade of the pipe. If directed by the Engineer, bank run gravel shall be used for refill of excavation below grade.

D. Geotextile filter fabric may be substituted for filter layer if approved by the Engineer. Filter fabric shall be Mirafi 140N; Supac equivalent, or equal.

3.06 BACKFILLING

A. As soon as practicable after the pipe has been laid and jointed, backfilling shall begin and thereafter is prosecuted expeditiously. Bedding gravel, as specified for the type of pipe installed, shall be placed up to 1-ft over the pipe.

B. An impervious dam or bulkhead cutoff of clay or other impervious material shall be constructed in the trench as directed, to interrupt the unnatural flow of groundwater after construction is completed. The dam shall be effectively keyed into the trench bottom and sidewalls. Provide at

least one clay or other impervious material dam in the pipe bedding between each manhole where directed or every 300-ft, whichever is less.

C. Where the pipes are laid cross-country, the remainder of the trench shall be filled with common fill material in layers not to exceed 3-ft and mounded 6-in above the existing grade or as directed. Where a loam or gravel surface exists prior to cross-country excavations, it shall be removed, conserved and replaced to the full original depth as part of the work under the pipe items. In some areas it may be necessary to remove excess material during the clean-up process, so that the ground may be restored to its original level and condition.

D. Where the pipes are laid in streets, the remainder of the trench up to a depth of 1-ft (20-in for State Highways) below the bottom of the specified permanent paving shall be backfilled with common fill material in layers not to exceed 1-ft (6-in for State Highways) and thoroughly compacted. The sub base layer for paving shall be of bank run gravel thoroughly compacted in 6-in layers.

E. To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted until selected material or screened gravel has been placed and compacted to a level 1-ft over the pipe.

F. Backfill shall be brought up evenly on all sides. Each layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping, to 92 percent compaction (to 95 percent compaction in State Highways). If rolling is employed, it shall be by use of a suitable roller or tractor, being careful to compact the fill throughout the full width of the trench. Rolling is the only accepted method in State Highways.

G. Water jetting or puddling may be used unless the refill contains too great a proportion of clay or loam to permit satisfactory drying. Water jetting shall consist of using a suitable length of pipe at least 1-1/4-in in diameter fitted with quick acting valve and sufficient hose to connect to hydrant or pump having adequate pressure and capacity. The full depth of backfill shall be thoroughly inundated by thrusting the pipe into the fill at frequent intervals with the valve open until all slumping ceases. Where backfill is compacted by puddling, it shall be done by depositing in water. Water for jetting or puddling may be obtained from Owner hydrants wherever possible. Water may be furnished by the Owner from these hydrants if reasonable care is exercised in its use and when approved by the Water Department.

H. If water restrictions are in force, obtain water elsewhere, or compact the backfill by other approved methods at no additional cost to this Contract.

I. Where other methods are not practicable, compaction shall be by use of hand or pneumatic ramming with tools weighing at least 20 lbs. The material shall be spread and compacted in layers not greater than 6 inches thick. If necessary, sprinkling shall be employed in conjunction with rolling or ramming.

J. Backfill around structures shall be selected common fill material, may be compacted by puddling where approved by the Engineer. All backfill shall be compacted, especially under and over pipes connected to the structures.

K. Subject to the approval of the Engineer, fragments of ledge and boulders smaller than 6-in may be used in trench backfill providing that the quantity in the opinion of the Engineer is not excessive. Rock fragments shall not be placed until the pipe has at least 2-ft of earth cover. Small stones and rocks shall be placed in thin layers alternating with earth to ensure that all voids are completely filled. Fill shall not be dropped into the trench in a manner to endanger the pipe.

L. Bituminous paving shall not be placed in backfilling unless specifically permitted, in which case it shall be broken up as directed. Frozen material shall not be used under any circumstances.

M. All excavation within State roadways, or when directed by the Engineer, will be backfilled with Controlled Density Fill (CDF), Section 02230, after sand has been placed and compacted to a level 1-ft above the top of the pipe as shown in the Drawings. At no time will flowable fill be allowed to come in contact with the pipe. Trench will be filled to the level of initial pavement. Placement of flowable fill shall be by chute, pumping or other method approved by the Engineer. When placing flowable fill, proper height of application is required to prevent movement of the sand covering the ductile iron pipe. Formed walls or other bulkheads shall be constructed, if deemed necessary by the Engineer to control backfilling, to withstand hydrostatic pressure exerted by the flowable fill. Also necessary means to confine the material within a designated space shall be provided. The temperature for mixing and placing flowable fill must be at least 35 degrees F. or greater. Existing utilities contained in metal pipes located in the trench shall be covered with polyurethane wrap prior to backfilling with flowable fill. Existing utilities within the trench shall be braced to prevent floating. Any pipes or appurtenances made of metal shall be wrapped in polyurethane prior to backfilling trench with flowable fill.

N. All road surfaces shall be broomed and hose cleaned immediately after backfilling. Dust control measures shall be employed at all times.

3.07 RESTORING TRENCH SURFACE

A. Where the trench occurs adjacent to paved streets, in shoulders, sidewalks, or in cross-country areas, thoroughly consolidates the backfill and shall maintain the surface as the work progresses. If settlement takes place, immediately deposit additional fill to restore the level of the ground.

B. In and adjacent to streets, the top 12-in layer (20-in in State Highways without CDF backfill) of trench backfill shall consist of compacted bank run gravel. Should the Contractor wish to use material excavated from the trench as gravel sub base for pavement replacement, the Contractor, at his/her own expense, have samples of the material tested by an independent testing laboratory at intervals not to exceed 500-ft, in order to establish its compliance with the specifications. Only material which has been tested and approved by the Engineer shall be allowed to be incorporated into the work.

C. The surface of any driveway or any other area which is disturbed by the trench excavation and which is not a part of the paved road shall be restored to a condition at least equal to that existing before work began.

D. In sections where the pipeline passes through grassed areas, and at the Contractor's own expense, remove and replace the sod, or loam and seed the surface to the satisfaction of the Engineer.

E. CDF shall be used as backfill along all State Highways unless alternative methods of backfill and compaction are specifically approved and authorized by the state agencies responsible for the

roadways. Trenches backfilled with CDF shall be covered with plates (to allow traffic flow) after backfilling to allow 24-48 hours for material curing before final trench width pavement is placed. Final pavement shall be placed directly over the trenches filled with CDF after the material has cured.

3.08 PROTECTION

A. Curbing and fencing in the vicinity of the Contractor's operations shall be adequately protected, and if necessary, removed and restored after backfilling. All curbing and fencing that are damaged during construction shall be replaced with material fully equal to that existing prior to construction.

END OF SECTION

SECTION 02230

GRANULAR MATERIALS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and obtain materials for filling and backfilling, grading and miscellaneous sitework, for the uses shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Dewatering and Drainage is included in Section 02140.

B. Rock and Boulder Excavation is included in Section 02213.

C. Trenching, Backfilling and Compaction is included in Section 02221.

D. Sedimentation and Erosion Control is included in Section 02270.

E. Paving is included in Section 02576.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, complete product data for materials specified in this Section.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C33 - Standard Specification for Concrete Aggregates.

2. ASTM D476 - Standard Specification for Titanium Dioxide Pigments.

3. ASTM D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft (600kN-m/m)).

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. Laboratory Testing

1. At least 7 days prior to the placement of any backfill or fill materials, deliver a representative sample of the proposed materials weighing at least 50 lbs to the soils testing laboratory as required by the Owner.

2. Engage the soils testing laboratory to perform:

a. Grain size analyses of the samples to determine their suitability for use as backfill or fill material in conformance to the materials requirements specified herein.

b. The appropriate Proctor analyses to determine the maximum dry densities required for compaction testing as specified elsewhere in the Contract Documents.

3. Test results and determinations of suitability shall be delivered to the resident project representative no later than 3 days prior to the placement of backfill or fill materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Backfill and Fill materials shall be suitable excavated materials, natural or processed mineral soils obtained from off-site sources, or graded crushed stone or gravel. Backfill and Fill materials shall be free of all organic material, trash, [snow, ice, frozen soil,] or other objectionable materials which may be compressible or which cannot be properly compacted. Soft, wet, plastic soils which may be expansive, clay soils having a natural, in-place water content in excess of 30 percent, soils containing more than 5 percent (by weight) fibrous organic materials, and soils having a plasticity index greater than 30 shall be considered unsuitable for use as backfill and fill. Backfill and fill materials shall have a maximum of 1 percent expansion when testing is performed on a sample remolded to 95 percent of maximum dry density (per ASTM D698) at 2 percent below optimum moisture content under a 100 lbs/sq ft surcharge.

B. Structural Fill shall be gravel, sandy gravel, or gravelly sand. Material shall have a plasticity index of less than 15 and shall conform to the following gradation limits:

Sieve Size	Percent Finer By Weight
6-in	100
No. 4	20 to 70
No. 40	5 to 35
No. 200	0 to 7

C. Select Common Fill shall conform to the requirements of common fill except that the material shall not contain any materials larger than 2-in in largest dimension.

D. Crushed Stone shall conform to Section M2.01.2 of the Massachusetts Department of Public Works Standard Specifications for Highways and Bridges, current edition, and all addenda and supplements thereto.

E. Common Fill shall not contain granite blocks, broken concrete, masonry rubble, asphalt pavement, or any material larger than 6-in in any dimension. Common Fill shall have a plasticity index of less than 15 and shall conform to the following gradation limits:

Sieve Size	Percent Finer By Weight
No. 40	75
No. 200	20

F. Bank-run gravel shall consist of hard, durable stone and coarse sand, essentially free from frost, frozen lumps, loam and clay, uniformly graded and containing no stone having any dimension greater than 3-in. The grading of sizes and material shall be such that the gravel may be thoroughly consolidated. The grading shall conform to the following requirements:

Sieve	Percent Passing
3/8-in.	70 Maximum
No. 10	50 Maximum
No. 200	5 Maximum

G. Screened Gravel shall be hard, durable, rounded, or subangular particles of proper size and gradation, and shall be free from sand, loam, clay, excess fines, and other deleterious materials. Screened gravel shall be graded within the following limits:

Sieve Size	Percent Finer by Weight
5/8-in	100
1/2-in	40 to 100
3/8-in	15 to 45
No. 10	0 to 5

H. Sand for concrete, grout, and masonry shall conform to ASTM C33 for fine aggregate.

I. Controlled Density Fill (CDF) used as backfill within State Highway Right-of-Way shall be comprised of a mixture of portland cement, fly ash, and water. Materials, methods of preparation, and placement techniques shall comply with the requirements of of Section 03300 as for concrete. Design mix shall result in a flowable material with a 28 day compressive strength of approximately 60 psi. Mix shall allow traffic use within 10 hours of installation. Recommended mix shall be as follows:

Portland Cement	50	lbs/cu yd
Coarse Aggregate	2175	lbs/cu yd
Water	500	lbs/cu yd, or as needed (Approximately 60 gallons.)

Portland cement shall be Type 1 and meet AASHTO M85. Fly ash shall meet AASHTO M-295 Class F and water shall meet M4.02.04.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 02270

SEDIMENTATION AND EROSION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all installation, maintenance, removal and area cleanup related to sedimentation control work as shown on the Drawings and as specified herein. The work shall include, but not necessarily be limited to; installation of temporary access ways and staging areas, silt fences or filter mitts, stone filter boxes, stone filter berms, sediment removal and disposal, device maintenance, removal of temporary devices, temporary mulching, excelsior matting installation and final cleanup.

1.02 RELATED WORK

A. Earthwork is included in Section 02221.

B. Granular fill materials are included in Section 02230.

1.03 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, within 10 days after award of Contract, technical product literature for all commercial products to be used for sedimentation and erosion control.

1.04 QUALITY ASSURANCE

A. Be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to off site areas or into the stream system via surface runoff or underground drainage systems. Measures in addition to those shown on the Drawings necessary to prevent the movement of sediment off site shall be installed, maintained, removed, and cleaned up at the expense of the Contractor. No additional charges to the Owner will be considered.

B. Sedimentation and erosion control measures shall conform to the requirements outlined in the Conservation Commission Order of Conditions issued for this project.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed stone for sediment filtration devices, access ways and staging areas shall conform to Mass DPW "Standards and Specifications for Highway and Bridges" Section M2.01.3.

B. Berm structural stone shall be rip-rap as follows:

1. Rip-rap shall be sound, durable rock which is roughly rectangular shape and of suitable quality to insure permanence in the condition in which it is to be used. Rounded stones, boulders, sandstone or similar soft stone will not be acceptable. Material shall be free from overburden, spoil, shale and organic material, meet the Engineer's approval and be well graded within the following limits:

Weight of Stone	Percent Finer by Weight
40 lb	100
12 lb	50
3 lb	0

C. Silt Fence

1. Steel posts shall be a minimum of 5-ft in length, 2-1/2-in by 2-1/2-in by 1/4-in angle post with self-fastening tabs and a 5-in by 4-in (nominal) steel anchor plate at bottom.

2. Welded wire fabric shall be 4-in by 4-in mesh of 12 gauge by 12 gauge steel wire.

3. Silt fence fabric shall be a woven, polypropylene, ultraviolet resistant material such as Mirafi 100X by Mirafi Inc., Charlotte, NC or equal.

4. Tie wires for securing silt fence fabric to wire mesh shall be light gauge metal clips (hog rings), or 1/32-in diameter soft aluminum wire.

5. Prefabricated commercial silt fence may be substituted for built-in-field fence. Pre-fabricated silt fence shall be "Envirofence" by Mirafi Inc., Charlotte, NC or equal.

D. 1/4-in woven wire mesh shall be galvanized steel or hardware cloth.

E. Straw mulch shall be utilized on all newly graded areas to protect areas against washouts and erosion. Straw mulch shall be comprised of threshed straw of oats, wheat, barley, or rye that is free from noxious weeds, mold or other objectionable material. The straw mulch shall contain at least 50 percent by weight of material to be 10-in or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment.

F. Latex acrylic copolymer, such as Soil Sealant with coalescing agent by Soil Stabilization Co., Merced, CA or equivalent shall be used as straw mulch tackifier.

G. An asphalt tackifier shall only be used when temperatures are too low to allow the use of a latex acrylic copolymer and only with prior written approval from the Engineer.

H. Excelsior matting blanket shall be installed in all seeded drainage swales and ditches as shown on the Drawings or as directed by the Engineer. Excelsior matting shall be AMXCO Curlex Blanket by American Excelsior Company, Arlington, TX or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Silt Fence Installation

1. Silt fences shall be positioned as indicated on the Drawings and as necessary to prevent off site movement of sediment produced by construction activities as directed by the Engineer.

2. Dig trench approximately 6-in wide and 6-in deep along proposed fence lines.

3. Drive metal-stakes, 8-ft on center (maximum) at back edge of trenches. Stakes shall be driven 2-ft (minimum) into ground.

4. Hang 4 by 4 woven wire mesh on posts, setting bottom of wire in bottom of trench. Secure wire to posts with self-fastening tabs.

5. Hang filter fabric on wire carrying to bottom of trench with about 4-in of fabric laid across bottom of trench. Stretch fabric fairly taut along fence length and secure with tie wires 12-in on center both ways.

6. Backfill trench with excavated material and tamp.

7. Install pre-fabricated silt fence according to manufacturer's instructions.

B. Construct filter boxes as detailed on the Drawings, from 1/4-in woven wire mesh or hardware cloth and wood. Fill with crushed stone and place over all drop inlets and manholes to storm drain system as each inlet is completed. This should be done prior to setting casting, if there is a delay between installation of inlet structures or drain manholes and setting of castings. An alternate method is to ring each inlet with a silt fence.

C. Stone Filter Berm Installation

1. Place berm structural stone across channel just below lower sandbag wall at work area. Face upstream side of structural berm with crushed stone.

D. Staging areas and access ways shall be surfaced with a minimum depth of 4-in of crushed stone.

3.02 MAINTENANCE AND INSPECTIONS

A. Inspections

1. Make a visual inspection of all sedimentation control devices once per week and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to offsite areas or into the vent trench, promptly install additional devices as needed. Sediment controls in need of maintenance shall be repaired promptly.

B. Device Maintenance

1. Silt Fences

a. Remove accumulated sediment once it builds up to 1/2 of the height of the fabric.

b. Replace damaged fabric, or patch with a 2-ft minimum overlap.

c. Make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence.

2. Filter Boxes

a. Replace crushed stone when it becomes saturated with silt.

3. Stone Filter Berm

a. Muck out trapped silt from dewatering operations when it has built up to within 6-in of the top of the berm.

b. Replace crushed stone filter when saturated with silt.

4. Add crushed stone to access ways and staging area as necessary to maintain a firm surface free of ruts and mudholes.

3.03 TEMPORARY MULCHING

A. Apply temporary mulch to areas where rough grading has been completed but final grading is not anticipated to begin within 30 days of the completion of rough grading.

B. Straw mulch shall be applied at rate of 100 lbs/1000 sq ft and tackified with latex acrylic copolymer at a rate of 1 gal/1000 sq ft diluted in a ratio of 30 parts water to 1 part latex acrylic copolymer mix.

3.04 EXCELSIOR MATTING

A. Excelsior matting blankets shall be installed in all seeded drainage swales and ditches as shown on the Drawings and as directed by the Engineer in accordance with manufacturer's instructions. The area to be covered shall be properly prepared, fertilized and seeded with permanent vegetation before the blanket is applied. When the blanket is unrolled, the netting shall be on top and the fibers in contact with the soil over the entire area. The blankets shall be applied in the direction of water flow and stapled. Blankets shall be placed a minimum of three rows (of 4-ft) wide (total approx. 12-ft width) within the drainage swale/ditch and stapled together in accordance with manufacturer's instructions. Side overlaps shall be 4-in minimum. The staples shall be made of wire, .091-in in diameter or greater, "U" shaped with legs 10-in in length and a 1-1/2-in crown. The staples shall be driven vertically into the ground, spaced approximately two linear feet apart, on each side, and one row in the center alternately spaced between each size. Upper and lower ends of the matting shall be buried to a depth of 4-in in a trench. Erosion stops shall be created every 25-ft by making a fold in the fabric and carrying the fold into a silt trench across the full width of the blanket. The bottom of the fold shall be 4-in below the ground surface. Staple on both sides of fold. Where the matting must be cut or more than one

roll length is required in the swale, turn down upper end of downstream roll into a slit trench to a depth of 4-in. Overlap lower end of upstream roll 4-in past edge of downstream roll and staple.

1. To ensure full contact with soil surface, roll matting with a roller weighing 100 lbs/ft of width perpendicular to flow direction after seeding, placing matting and stapling. Thoroughly inspect channel after completion. Correct any areas where matting does not present a smooth surface in full contact with the soil below.

3.05 REMOVAL AND FINAL CLEANUP

A. Once the site has been fully stabilized against erosion, remove sediment control devices and all accumulated silt. Dispose of silt and waste materials in proper manner. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated on the Drawings.

END OF SECTION

SECTION 02533

CONNECTIONS TO EXISTING STRUCTURES

PART 1 - GENERAL

1.01 WORK INCLUDED:

The Contractor shall furnish materials, tools, labor and equipment to cut suitable openings into the existing sewer manholes, make connections to existing sewers and all other work necessary to direct the existing sewage flow as indicated on the drawings and as herein specified.

1.02 RELATED WORK:

Section 02631, PRECAST MANHOLES AND CATCH BASINS

1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF THE GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Prior to start of work, submit details of the methods proposed for doing the work and for maintaining the sewage flow as herein specified.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 INSTALLATION:

A. The Contractor shall provide temporary plugs or provide other suitable means for maintaining the new sewer free of sewage flow until such time as it can be inspected and tested for leakage.

B. Connections to the new sewer shall be made when directed by the Engineer and only after the new pipeline has been inspected and has successfully passed the leakage test.

C. The Contractor shall modify each existing structure for installation of the necessary piping, but in so doing shall confine the cutting to the smallest amount possible consistent with the work to be done.

D. All new piping connected to existing structures shall be encased in concrete in a manner satisfactory to the Engineer.

E. All work shall be done with the proper tools and by careful workmen competent to do work.

F. The Contractor shall cut, reshape and fill the existing manhole tables and plug existing outlets as indicated on the drawings and as directed by the Engineer, to accommodate the new connections. Reshaped manhole invert channels shall be smoothly shaped to permit the flow of sewage. Manhole invert channels shall be reconstructed as specified under Section 02631, PRECAST MANHOLES AND CATCH BASINS.

END OF SECTION

170.61 Fine Grinding and Compacting

Before surfacing or sub-base is spread, the subgrade shall be shaped to a true surface conforming to the proposed cross section of the highway and compacted in accordance with the provisions of Subsections 150.60 and 150.62. All depressions and high spots shall be filled with suitable material or removed and such areas again compacted until the surface is smooth and satisfactorily compacted. A tolerance of ½ inch above or below the finished subgrade will be allowed provided that this ½ inch above or below grade is not maintained for a distance longer than 50 feet and that the required crown is maintained in the subgrade. Any portion of the subgrade which is not accessible to a roller shall be thoroughly compacted with the mechanical tampers or by other adequate methods approved as satisfactory by the Engineer.

170.81 Basis of Payment

Payment for the shaping and compacting of the subgrade as specified herein shall be included in the item for Fine Grading and Compacting (in subgrade area). The removal and disposal of material below subgrade will be paid for at the contract unit price per cubic yard for the appropriate Excavation Items in Section 120.

Grading and Finishing other than subgrade areas will be included in the price of the other respective items of work involved.

SECTION 02575

PAVEMENT

1.0 DESCRIPTION

1.1 Scope - Work under this item shall consist of furnishing hot mix asphalt composed of mineral aggregate and asphalt binder, mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and conformance to the lines, grades, thickness and typical cross sections shown on the plans or as directed by the Engineer.

Each course shall be constructed to the depth, typical section, or elevation required by the contract and/or plans and shall be rolled, finished, and approved before the placement of the next course. Each course shall be placed to a smooth, dense and uniform appearance.

Many state agencies are implementing Quality Assurance specifications. It is the intent of these municipal quality-based HMA specifications to move toward the goal of quality assurance implementation but tailored toward the real world of municipal construction. To that end, the Contractor is required to establish, provide, and maintain a Quality Control System (QCS) that will detail the methods and procedures that will be taken to assure that all materials and completed construction conform to project specifications, plans, technical specifications and other requirements, whether manufactured or processed by the Contractor or procured from subcontractors or vendors.

It is the intent of this Contract to use Hot Mix Asphalt (HMA) Marshall design mixes specified in Table No. 6 of the this specification.

2.0 QUALITY ASSURANCE

The Contractor assumes the responsibility of the quality for all materials and construction incorporated into the work and will control all the processes leading to the final result through this function.

Quality Control activities should include:

A. Maintain a Contractor Quality Control System;

B. Attend a Pre-Paving Conference with the City and Paving Contractor;

C. Proficiency testing prior to and during production with Engineer;

D. Inspection and Testing of Base or Reclaimed Base Materials;

E. Inspection and Testing of Hot Mix Asphalt Production;

F. Inspection and Testing of Hot Mix Asphalt Placement.

See Section 7.16 "Contractor Quality Control of HMA Pavement" of these specifications for additional information.

The Town of Belmont or their authorized agent will perform the Quality Acceptance function for this work. All material will be considered for acceptance through a sampling, testing and inspection program performed by the Engineer or their agent.

Quality Acceptance activities include:

A. Attend a Pre-Paving Conference with the Town and Paving Contractor;

B. Proficiency testing prior to/during production with Contractor;

C. Inspection of HMA Production Plant and Testing Laboratory;

D. Production Trials of HMA Products Intended for Use in Belmont;

E. Inspection/Testing for Acceptance of Aggregate Base Materials;

F. Inspection/Testing for Acceptance of Hot Mix Asphalt Production;

G. Inspection/Testing for Acceptance of Hot Mix Asphalt Placement;

H. HMA Quality Acceptance Report of Activities.

3.0 MATERIALS

3.1 Aggregate - Aggregate shall meet the requirements of MASSDOT M3.11.04 latest edition of the Standard Specifications and as further stipulated herein.

A. Coarse Aggregate -

1. The sodium sulfate soundness loss shall not exceed nine (9) percent, nor the magnesium soundness loss exceed twelve (12) percent, after five cycles, when tested in accordance with AASHTO T104.

2. The coarse aggregate shall not contain more than one (1) percent of material such as crusher dust, sand or soft, disintegrated pieces. The coarse aggregate shall not contain more than ten (10) percent, by weight, of flat or elongated pieces, when tested in accordance with ASTM D4791 at a ratio of 5:1.

3. For the Marshall mixes contained in Table 6, the coarse aggregate shall contain a minimum of 75% by weight having at least two or more fractured faces and 85% by weight having at least one fractured face for the base and intermediate courses, when tested in accordance with ASTM D5821. The surface courses in Table 6 shall contain a minimum of 85% by weight having at least two or more fractured faces and 95% by weight having at least on fractured face, when tested in accordance with ASTM D5821. When two fractured faces are continuous, the angle between the planes of fracture shall be as least 30 degrees to count as two fractured faces. For the Superpave mixes contained in Table 5, the coarse aggregate shall conform to the coarse aggregate angularity requirements listed in Table 3 for the traffic level and depth within the pavement structure.

4. The use of steel slag or blast furnace slag shall not be permitted as a coarse aggregate.

B. Fine Aggregate -

1. Fine aggregate shall consist of clean, sound, durable, angular particles produced by crushing natural stone, or gravel that meets the requirements for wear and soundness specified for the coarse aggregate. The aggregate particles shall be free from coatings of clay, silt, or other objectionable matter and shall contain no clay balls. The combined materials that passed the No. 100 mesh sieve

shall not have sufficient plasticity to permit the performing of the plastic limit test using AASHTO T90.

2. Fine aggregates shall have sand equivalent values of 40 or greater when tested in accordance with AASHTO T176. The sand equivalent value shall be determined for the combined mix aggregates, including coarse and fine aggregates and mineral filler portions.

3. Natural (non-manufactured) sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. The amount of sand to be added will be adjusted to produce mixtures conforming to requirements of this specification. The aggregate shall have a fine aggregate angularity value of 40% or greater when tested in accordance with AASHTO T304, Method A. The uncompacted void content shall be evaluated for the combined mix aggregates including both coarse and fine aggregate portions.

C. If filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of AASHTO M17.

HMA mixtures shall contain a dust to effective asphalt ratio by mass between 0.6 and 1.2. For Superpave designed mixtures, mixtures that pass beneath the Primary Control Sieve (PCS) control point established by AASHTO M323 may contain a dust to effective asphalt ratio by mass between 0.8 and 1.6.

D. The use of a maximum of 15% recycled asphalt pavement (RAP) will be allowed in the HMA courses.

The RAP, incorporated into the HMA mixtures, shall be maintained as a separate captive stockpile and shall not be added to without prior approval. RAP shall consist of asphalt pavement recovered by cold milling or other removal techniques. The RAP shall be crushed so that 100 percent passes the maximum aggregate size of the HMA mix in which it will be used. The Contractor's Quality Control system shall assure that the RAP is free from detrimental amounts of contaminating substances such as joint seal compound and, is reasonably uniformly graded from fine to coarse.

The coarse aggregate in the RAP shall be crushed stone and the top-size shall not exceed the maximum aggregate size established by the JMF. The final HMA mixture containing RAP shall conform to all the specification requirements contained herein.

For mixtures containing 15% or less RAP, the asphalt binder shall be a PG 64-28 or PG 64-22. RAP content shall not exceed 15%

The laboratory RAP-virgin binder blend viscosity value established from the RTFO residue at 140°F (60°C) shall establish the maximum viscosity allowed for the binder after discharge from the HMA plant and/or silo storage, if applicable, when recovered by AASHTO T170 and tested in accordance with AASHTO T202 and AASHTO T316.

For design purposes, the specific gravity of the combined aggregate blend with RAP used in a HMA mixture shall be determined in accordance with the attached test method for BULK SPECIFIC GRAVITY OF AGGREGATE BLENDS WITH RAP.

3.1.1 Sampling and Testing - All aggregate samples required for testing shall be furnished by the Contractor when requested. AASHTO-T2 shall be used in sampling coarse aggregate and fine aggregate, and AASHTO T127 shall be used in sampling mineral filler. All tests for initial aggregate submittals necessary to determine compliance with requirements specified herein will be conducted by the Contractor under their Quality Control System. No aggregate shall be used in the production of mixtures without prior approval.

3.1.2 Sources of Supply - Sources of aggregate shall be selected well in advance of the time the materials are required in the work. Preliminary approval may be given when the materials are obtained from a previously approved source or an existing quarry source producing aggregates that has a satisfactory service record in hot mix asphalt construction for at least five years. Samples shall be submitted upon contract award. When time permits, samples shall be submitted fourteen days prior to the start of production. An inspection of the producers operation will be made by the Engineer. When new sources are to be developed, the Contractor shall indicate the sources and submit a plan of operation thirty days in advance of starting production. Samples from test pits, borings and other excavations shall be submitted at the same time. Approval of the source of aggregate does not relieve the Contractor in any way of the responsibility for delivery at the job site of aggregates that meet the requirements specified herein.

3.1.3 Samples - Samples of aggregates shall be furnished by the Contractor at the start of production and at intervals during production of HMA mixtures. The intervals and points of sampling will be designated by the Engineer.

3.2 Asphalt Binder Material - The types, grades, and controlling specifications, the maximum mixing temperatures and compaction temperatures for the asphalt binder materials shall conform to the following:

3.2.1 Performance Graded Asphalt Binder: - The Asphalt Binder shall be a Performance Graded Asphalt Binder (PGAB) which meets the specification requirements of AASHTO M320 and AASHTO R29. Acceptance of the PGAB will be in accordance with AASHTO R26 “Standard Practice for Certifying Suppliers of Performance Graded Asphalt Binders”. PGAB shall be provided by an Approved Supplier (AS) under the Approved Supplier Certification (ASC) system.

THE PGAB GRADE SELECTED FOR THIS WORK IS PG 64-28 or 64-22 - If traffic speed and/or level warrant, the PGAB may be adjusted by the Engineer for the design traffic conditions in accordance with the table below.

NO CHEMICALLY MODIFIED PGAB SHALL BE USED ON THIS PROJECT.

Table 1. SUPERPAVE PGAB Adjustment for Design Traffic Conditions

Traffic Loading	Adjustment to PGAB Grade
Standing <12mph(<20 km/h)	Increase high temperature grade by 2 grades (12° C), or 76-XX. Use low temperature grade as determined by LTTP BIND software.
Slow Transient 12 to 44mph(20 to 70 km/h)	Increase high temperature grade by 1 grade (6° C), or 70-XX. Use low temperature grade as determined by LTTP BIND software.

Traffic Level (ESALs)	Adjustment to PGAB Grade
1×10^7 to 3×10^7	Consideration should be given to increasing high temperature grade by 1 grade (6° C), or 70-XX. Use low temperature grade as determined by LTPP BIND software
$>3 \times 10^7$	Increase high temperature grade by 1 grade (6° C), or 70-XX. Use low temperature grade as determined by LTTP BIND software.

1. A separate JMF with TSR results shall be submitted for each PGAB grade proposed for use on this project;
2. Limit one binder grade per production day unless otherwise adjusted by the Engineer for the Town of Belmont traffic conditions;
3. Documentation of the type of binder used per production day is to be stated on the weigh slips.

The Contractor shall furnish manufacturers' certified test reports for each carload or equivalent of binder shipped to the project as well as applicable Materials Certificates for the shipment of each carload or equivalent to the production plant. The reports shall be delivered to the Engineer before production of the HMA. The furnishing of the vendor's certified test reports and material certificates for the PGAB material can be used as the basis for final acceptance of the bituminous material, or, tested by the Engineer. If the Engineer elects to test the binder material at their costs, then the Contractor shall set aside one (1) 1-qt samples of the asphalt binder material obtained from each truckload, shipment, or equivalent of asphalt binder material shipped to the production facility. Each sample shall be labeled with the PG grade, source and batch number, quantity, project name, plant, date, and the sampling inspector. The Contractor shall maintain documentation in the form of a Materials Certificate of each shipment, with a copy attached to each quart sample.

After receiving the quart samples, obtained by the Contractor, the Engineer may test the samples for verification of the performance grade. Material shall conform to the specification requirements for the applicable performance grade as specified herein. Material not conforming to specification requirements shall be subject to corrective action, production suspension, rejection, removal, or reduced payment as determined by the Engineer.

The blending at the HMA plants of PG binder from different suppliers is strictly prohibited. Contractors may switch to another approved source of PG binder, upon written notification to the Engineer, and by certifying that the tank to be utilized has been drained to an un-pumpable condition. The tank shall not retain more than 0.5% in volume of previous residue source. Contractors who blend PG binders will be reclassified as a supplier and required to certify the binder in accordance with AASHTO M320 and AASHTO R26. Also if any modifications, blending, or addition of additives occurs, the Contractor shall re-certify the material in accordance with AASHTO M320 and AASHTO R26.

A copy of the Certified Test Reports shall be provided in accordance with the frequency requirements established in the latest version of AASHTO M320, and shall include the following:

A. Flash point;

B. Rotational viscosity at 275°F and 329°F;

C. Specific gravity at 77°F;

D. Original G*/sinδ and phase angle at test temperature;

E. RTFO percent mass loss;

F. RTFO - G*/sinδ and phase angle at test temperature;

G. PAV Residue - G*(sinδ) and phase angle at test temperature;

H. Creep stiffness and m-value at test temperature;

I. Direct tension results (when equipment available);

J. Strain sweep in accordance with AASHTO T315 (optional);

K. Physical hardening after 24 hours in accordance with AASHTO T313 (optional).

3.2.2 Asphalt Binder Anti-Stripping Additive - This specification provides for an additive to asphalt to assist in the coating of wet aggregate and to increase the resistance of the binder coating to stripping in the presence of water. The additive shall be chemically inert to asphalt (heat stable) and when blended with asphalt shall withstand storage at a temperature of 400°F (204°C) for extended periods without loss-of effectiveness.

Composition: Anti-stripping compound shall be an organic chemical compound, free from inorganic mineral salts or inorganic mineral soaps. It shall contain no ingredient harmful to the binder material or to the operator, and shall not appreciably alter the specified characteristics of the binder material.

Anti-stripping additive shall be incorporated and thoroughly dispersed in the asphalt binder material in an amount equal to the percent by weight established by the job mix formula. This percent is based on the efficiency of the additive as determined by laboratory tests. The treated composite mixture shall have a minimum tensile strength ratio (TSR) of not less than 80, when tested in accordance with AASHTO T283 with the freeze/thaw cycle. The specimens for the AASHTO procedure shall be 4" (100mm) in diameter, compacted with the Marshall hammer or the Superpave gyratory compactor to the desired air void level of 7.0 ± 1.0%. If the TSR ratio is less than 80, the aggregates shall be treated with an approved antistrip in sufficient quantity to produce acceptable results. The hot mix asphalt materials and asphalt binder material that require antistrip additives (either liquid or mineral) shall continue to meet all requirements specified herein for binder and HMA. The anti-strip agent shall be included in the bid price.

3.2.3 Tack Coat: Emulsified asphalt; AASHTO M140/ASTM D 997 or AASHTO M 208/ASTM D 2397, RS-1 or CRS-1

3.3 PRELIMINARY MATERIAL ACCEPTANCE: Prior to delivery of HMA materials to the job site, the Contractor shall submit certified test reports to the Engineer for the following materials certified under the Contractor's quality control system:

3.3.1 Coarse Aggregate

A. Percent of wear;
B. Soundness;
C. Flat and Elongated;
D. Coarse aggregate angularity.

3.3.2 Fine Aggregate

A. Liquid limit;
B. Plastic index;

C. Sand equivalent;
D. Fine aggregate angularity.

3.3.3 Mineral Filler

3.3.4 Performance Graded Asphalt Binder: The certification(s) shall show the appropriate AASHTO and/or ASTM test(s) for each material, the test results, and a signed statement that the material meets the specification requirement.

3.3.5 The Engineer may request samples for testing, including but not limited to, modifiers, truck coatings, and emulsion, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

4.0 COMPOSITION OF HMA MIXTURES

4.1 Hot Mix Asphalt - HMA plant mix may be composed of a homogeneous mixture of aggregate, filler if required, bitumen, and/or additives, combined to meet the composition limits by weight and other characteristics as specified. The several aggregate fractions shall be sized, uniformly graded and combined in such proportions that the resulting mixture meets the grading requirements of these specifications.

4.2 Hot Mix Asphalt Mix Design - The Contractor shall be responsible for the development of all job mix formulas. All job mix formulas other than for Surface Treatment and Base mix shall be based on and supported by volumetric mix designs, either Marshall Method or Superpave method. Marshall Mix design method, procedures and criteria shall be based on Asphalt Institute MS-2 and AASHTO T245 and the requirements contained herein. At the option of the Contractor, or as specified by the Engineer, Superpave mix designs may be utilized. Superpave mix designs shall be based on Asphalt Institute SP-2 and AASHTO M323, R35, R30, T312, and the requirements contained herein. For the Superpave volumetric mix design, the mixture of asphalt and aggregate shall be oven aged at the mixture's specified compaction temperature in accordance with AASHTO R30.

4.3 JOB MIX FORMULA (JMF) - Work shall not begin nor shall any mixture be accepted until the Contractor has submitted a job mix formula, samples of the existing and new materials intended for use, and has established a separate, job mix formula (JMF) for each mixture. A separate job mix formula shall be submitted for each mixture and each approved RAP stockpile (the stockpile shall be of a uniform quality throughout).

4.3.1 JMF Submittal - The job mix formula shall establish the percentage of each additional aggregate required, a single percentage of aggregate passing each required sieve size, a single percentage and the grade of asphalt binder to be added, the percentage of recycling additive, and a single temperature at which the mixture is to be discharged from the plant, and the number of seconds for dry mixing time and the number of seconds for wet mixing time. AASHO-T195 (Ross Count) with a coating factor of ninety-eight (98) percent will be used when necessary to evaluate proper mixing time. The moisture content of all hot mix asphalt upon discharge from the mixer shall not exceed 0.5 percent when tested in accordance with AASHTO T110. The job mix formula shall also specify a single source or uniform blend of particular sources for fine aggregate, a single source for each nominal size of coarse aggregate, and a single source of supply for mineral filler and for asphalt. The JMF shall be submitted in writing by the Contractor to the Engineer at least 14 days prior to the start of paving operations and shall include as a minimum:

A. Percentage of each individual aggregate and percent passing each sieve Combined percent passing each sieve size and target gradation desired;
B. Percent of asphalt binder;
C. Performance grading test results and Material Certificate certifying the PG grade;
D. Number of gyrations for the estimated design ESAL loading;
E. Mixing temperature;

F. Compaction temperature;

G. Temperature of mix when discharged from the mixer;

H. Plot of the combined gradation on the Federal Highway Administration (FHWA) 0.45 power gradation curve;

I. Percent natural sand;

J. Percent fractured faces;

K. Percent flat or elongated particles;

L. Tensile Strength Ratio (TSR);

M. Antistrip agent – type and quantity;

N. Sand equivalent value;

O. Fine aggregate angularity value;

P. Percentage of wear;

Q. Sulfate soundness loss;

R. Individual and combined aggregate specific gravity;

S. Dust to effective asphalt ratio;

T. Graphical plot of air voids, voids in mineral aggregate (VMA), and voids filled with asphalt (VFA) versus asphalt content. The Superpave mixes shall also show density at $N_{initial}$, density at N_{design}, and density at $N_{maximum}$ versus asphalt content.

The Contractor shall submit samples to the Engineer, upon request, for JMF verification testing.

The JMF for each mixture shall be in effect until modified in writing by the Engineer. Should a change in sources of materials be made, a new JMF must be approved by the Engineer before the new material is used.

4.3.2 JMF Tolerances - The job mix formula, operating within the allowable action limits for individual measurements as specified in Table 7 herein, shall be set within the design master limits specified for each mixture class, either Table 5 for Superpave design or Table 6 for Marshall design except that the Engineer may modify the design limits if they determine this to be necessary and in the best interest of the Town of Belmont.

4.3.3 Plant Trial Mixtures - After receiving the job mix formula prepared by the Contractor, the Engineer will notify the Contractor regarding a verification of the optimum asphalt content and/or pre-production trials and Control Section for those mixtures so designated by the Engineer. A minimum of one trial mix shall be produced at the Contractor's proposed asphalt binder content and aggregate gradation.

4.3.4 JMF Approval - The Contractor will be notified by the Engineer if the JMF submittals are approved for production. The approved job mix formula for the mixture shall be in effect until modified in writing. As indicated in Section 4.3.3, Plant Trial Mixtures, of this specification, the Engineer will notify the Contractor regarding the placement of a Control Section (See Section 5.0). Following placement and testing of the Control Section, the JMF may have to be modified to meet both production and placement requirements of this specification. If warranted, the JMF resubmittal shall follow the applicable requirements of Section 4.3 of this specification. A JMF, once approved, will not be required for further mix approval for the construction season unless a change has occurred that warrants a new JMF approval or as directed by the Engineer. The approval of all JMFs will terminate on December 31st each year, regardless if the work is carried over to the following year. Control strips are required by the contractor for in-place mat thickness, uniformity, longitudinal joint characteristics, and density requirements before approval.

4.4 HMA Mixture Design Criteria

TABLE 2. PERCENT VOIDS IN MINERAL AGGREGATE (VMA)

Nominal Maximum Aggregate Size	Percent Minimum
#4 (4.75mm)	16.0
3/8" (9.5 mm)	15.0
1/2" (12.5 mm)	14.0
3/4" (19.0 mm)	13.0
1.0" (25.0 mm)	12.0
1.5" (37.5 mm)	11.0

TABLE 3: Consensus Properties of Combined Aggregate Structure for Superpave Mixtures.

Traffic Levels	Design ESALs (80 kN)	Coarse Aggregate Angularity [5] ASTM D5821		Fine Aggregate Angularity [5] AASHTO T-304		Flat or Elongated Particles ASTM D-4791	Sand Equivalent AASHTO T-176
	(million)	(Depth from final surface) ≤ 100 mm	(Depth from final surface) > 100 mm	(Depth from final surface) ≤ 100 mm	(Depth from final surface) > 100 mm	> 9.5 mm	
1	< 0.3	55/-	-/-	-	40	-	40
2	0.3 to < 3.0	75/-	50/-	40	40	10	40
3	3.0 to < 30.0	95/90[6]	80/75[6]	45	40	10	45
4	≥ 30.0	100/100	100/100	45	45	10	50
	Design ESALs are the anticipated project traffic level expected on the design lane, projected over a 20-year period, regardless of the actual expected design life of the roadway.	Criteria presented as minimum values. 95/90 denotes that a minimum of 95% of the coarse aggregate, by mass, shall have one fractured face and that a minimum of 90% shall have two fractured faces.		Criteria presented as minimum percent air voids in loosely compacted fine aggregate passing the 2.36 mm sieve.		Criteria presented as maximum Percent by mass of flat or elongated particles of materials retained on the 4.75 mm sieve, determined at 5:1 ratio. Not applicable for the 4.75mm Nominal Max Aggregate size mix	Criteria presented as minimum values for fine aggregate passing the 4.75 mm sieve.

Note 5: If less than 25 % of a given layer is within 100 mm of the anticipated top surface, the layer may be considered to be below 100 mm for mixture design purposes.

Note 6: For Superpave mixtures with design ESALs between **3.0 and 10.0 million**, the coarse aggregate angularity criteria shall be **85/80** for layers < 100 mm depth from final surface and a criteria of **60/- -** for layers >100 mm from final surface.

TABLE 4: Hot Mix Asphalt and Volumetric Properties for Superpave Mixtures.

Traffic Levels	Design ESALs (million)	Number of Gyrations by Superpave Gyratory Compactor			Percent Density of Gmm from HMA specimen			Voids Filled with Asphalt (VFA) Based on Nominal mix size					
		Nini	Ndes	Nmax	Nini	Ndes	Nmax	4.75 mm	9.5 mm	12.5 mm	19.0 mm	25.0 mm	37.5 mm
1	< 0.3	6	50	75	≤ 91.5	95 - 97	≤ 98.0	70 – 80	70 - 80	70 - 80	70 - 80	67 – 80	64 – 80
2	0.3 to < 3.0	7	75	115	≤ 90.5	95 - 97	≤ 98.0	65 – 78	65 - 78	65 - 78	65 - 78	65 - 78	64 - 78
3	3.0 to < 30	8	100	160	≤ 89.0	95 - 97	≤ 98.0	75 – 78	73 - 76	65 - 75	65 - 75	65 - 75	64 - 75
4	≥ 30.0	9	125	205	≤ 89.0	95 - 97	≤ 98.0	75 - 78	73 - 76	65 - 75	65 - 75	65 - 75	64 - 75

TABLE 5. SUPERPAVE HOT MIX ASPHALT MIXTURES

	Percent by Weight Passing Sieves											
Sieve Size in. (mm)	4.75mm		9.5mm		12.5mm		19.0mm		25.0mm		37.5mm	
	Control Points		Control Points		Control Points		Control Points		Control Points		Control Points	
	Min %	Max %	Min %	Max %	Min %	Max %	Min %	Max %	Min %	Max %	Min %	Max %
2" (50.0)									-	-	100.0	
1-1/2" (37.5)	-	-	-	-	-	-	-	-	100	-	90.0	100.0
1" (25.4)	-	-	-	-	-	-	100.0	-	90.0	100.0	-	90.0
3/4" (19.0)	-	-	-	-	100.0	-	90.0	100.0	-	90.0	-	-
1/2" (12.5)	100.0	-	100.0	-	90.0	100.0	-	90.0	-	-	-	-
3/8" (9.5)	95.0	100.0	90.0	100.0	-	90.0	-	-	-	-	-	-
#4 (4.75)	90.0	100.0	-	90.0	-	-	-	-	-	-	-	-
#8 (2.36)	-	-	32.0	67.0	28.0	58.0	23.0	49.0	19.0	45.0	15.0	41.0
#16 (1.18)	30.0	60.0	-	-	-	-	-	-	-	-	-	-
#30 (0.600)	-	-	-	-	-	-	-	-	-	-	-	-
#50 (0.300)	-	-	-	-	-	-	-	-	-	-	-	-
#100 (0.150)	-	-	-	-	-	-	-	-	-	-	-	-
#200 (0.075)	6.0	12.0	2.0	10.0	2.0	10.0	2.0	8.0	1.0	7.0	0	6.0
Dust to Binder Ratio(Note):	0.9	2.0	0.6	1.2	0.6	1.2	0.6	1.2	0.6	1.2	0.6	1.2

Note: The Engineer may increase the Dust to binder ratio from 0.6-1.2 to 0.8-1.6 if the proposed aggregate gradation passes beneath the Primary Control Sieve (PCS) control point established in AASHTO M323.

Table 6. MARSHALL DESIGN MASTER RANGE TOLERANCES

Standard Sieves	Base Course	Dense Binder Course	Modified Arterial Top	Standard Top	Dense Mix	Surface Treatment
2" (50mm)	100					
1-1/2"(38mm)						
1" (25mm)	57 – 87	100				
3/4" (19mm)		80 - 100	100			
1/2" (12.5mm)	40 – 65	65 - 80	90 - 100	100	100	
3/8" (9.5mm)			70 - 90	80 - 100	80 - 100	100
#4 (4.75mm)	20 – 45	48 - 65	45 - 70	50 - 76	55 - 80	80 - 100
#8 (2.36mm)	15 – 33	37 - 51	28 - 55	37 - 54	48 - 63	64 - 85
#16 (1.18mm)			18 - 40	26 - 40	36 - 49	46 - 68
#30 (0.60mm)	8 – 17	17 - 30	10 - 30	17 - 29	24 - 38	26 - 50
#50 (0.30mm)	4 – 12	10 - 22	6 - 23	10 - 21	14 - 27	13 - 31
#100 (0.15mm)			4 - 15	5 - 16	6 - 18	7 - 17
#200 (.075mm)	0 – 4	0 - 6	2 - 7	2 – 7	4 - 8	3 - 8
Asphalt Content	4.0 - 5.0	5.0 - 6.0	5.0 - 7.0	5.5 - 7.0	7.0 - 8.0 (a)	7.0 - 8.0
Temp. Mix (F)	255 – 295	265 - 325	265 - 325	265 - 325	265 - 325	275 - 325
Temp. Mix (C)	124 – 146	129 - 163	129 - 163	129 - 163	129 - 163	135 - 163
Marshall Blows	N/A	50	75	50	50	N/A
Stability, lbs. min		1000	1500	1000	1000	
Stability, Newtons		4500	6750	4500	4500	
Flow,0.01"(.25mm)		8 - 16	8 - 16	8 - 16	8 - 16	
Air Voids,%		3.0 - 6.0	3.0 - 5.0	3.0 - 6.0	3.0 - 6.0	

Table 6 Notes:

(a) Dense mix including approved anti-stripping compound shall be furnished and used for protective (bottom) courses of pavement on bridges, and elsewhere shown on the plans.

The asphalt content of all mixtures shall be calculated on the percentage basis by weight of the total mix.

4.5 Additional HMA Criteria - In addition to the above HMA design requirements, the HMA mixtures shall also conform to the following:

A. Stripping - Each mixture shall be evaluated for stripping by performing indirect tensile tests on compacted mixtures. If the Tensile Strength Ratio (TSR) of the composite mixture, as determined by AASHTO T283 with freeze/thaw, is less than 80, the aggregates shall be rejected or the asphalt treated with an approved anti-stripping agent. The amount of anti-stripping agent added to the asphalt shall be sufficient to produce a TSR of not less than 80. If an antistrip agent is required, it will be provided by the Contractor at no additional cost;

B. Aggregate Composition - The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in either Table 5 or Table 6, whichever is applicable, when tested in accordance with AASHTO Standards T27 and T11. The gradations in either Table 5 or 6, whichever is applicable, represent the limits which shall determine the suitability of aggregate for use from the sources of supply. The aggregate, as selected (and used in the JMF) and blended, shall have a gradation within the limits designated in either Table 5 or 6, whichever is applicable, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa, but shall be well graded from coarse to fine;

C. JMF Deviations - Deviations from the final approved mix design for asphalt binder content and gradation of aggregates shall be within the action limits for individual measurements as specified in Table 7. The limits still will apply if they fall outside the master grading band in Table 5 or 6, whichever is applicable;

D. Minimum Lift Thickness Consideration - The maximum size aggregate used shall not be more than one-half of the compacted thickness of the course being constructed on a prepared surface or that which can be placed to achieve specification requirements. The maximum size is defined as one sieve size larger than the nominal maximum size. The nominal maximum size is defined as one sieve size larger that the first sieve to cumulatively retain more than 10 percent;

E. HMA may be stored in surge or storage bins provided that the mixture used from the bins is of a uniform quality and meets the following requirements:

Temporary Storage of Bituminous Mixture - Use of surge bins or storage bias for temporary storage of hot mix asphalt will be permitted as follows:

1. The hot mix asphalt mixture may be stored in surge bins for a period of time not to exceed three hours;

2. The hot mix asphalt mixture may be stored in insulated and heated storage bins for a period of time not to exceed twelve hours, provided an inert gas atmosphere is maintained in the bin during the storage period;

3. If the Engineer determines that there is an excessive amount of heat loss, segregation and/or oxidation of the mixture due to temporary storage, use of surge bins or storage bins will be discontinued.

In addition, the recovered asphalt from the mix samples obtained 30 days after production shall meet the following requirements:

RECOVERED ASPHALT
ASTM D1856
ABSON METHOD

Test Property	Min.	Max.
Viscosity, poises @ 140F.	-	6000
Penetration, dmm @ 77F.	45	100
Ductility, cm @ 77F	75	-
T_{max} for G*/Sin (d) DSR (RTFO Aged)	-	One Grade Higher

5.0 HMA CONTROL SECTION

If required by the Engineer and prior to full production for the Town, the Contractor shall place a quantity of hot mix asphalt according to the JMF and the project specifications. The amount of mixture should be sufficient, at a minimum, to construct a test section 300 feet long and 20 to 30 feet wide placed in two lanes, with a longitudinal joint, and shall be of the same depth specified for the construction of the course which it represents. The underlying grade or pavement structure upon which the Control Section is to be constructed shall be the same as the remainder of that project course represented by the Control Section. The equipment used in construction of the Control section shall be the same type and weight to be used on the remainder of the course represented by the Control Section. The control strip may be as large as one production day on a Town street as long as a longitudinal joint has been constructed.

Two Random sample(s) shall be taken at the plant by the Engineer and tested for air voids in accordance with the Section 8.10, Plant-Produced Material. One random sample of mixture shall be taken at the plant and tested for aggregate gradation and asphalt binder content in accordance with the Section 8.10 Plant-Produced Material.

Three randomly selected cores shall be taken from the finished pavement mat in the Control Section, and three randomly selected cores from the longitudinal joint in the Control Section, and tested in accordance with Section 8.2, Field Placed HMA Material. Random sampling shall be in accordance with procedures contained in ASTM D3665.

Mat density and air voids shall be evaluated in accordance with Section 8.2, Field Placed HMA Material. Joint density will be evaluated in accordance with Section 8.2, Field Placed HMA Material.

The Control Section shall be considered acceptable if the uniformity, thickness, tack coat application rate and coverage, and 1) plant air voids, mat density, and joint density are within the requirements of this specification and 2) gradation and asphalt binder content are within the action limits specified herein for individual Measurements. If mat and joint density are below the 100% minimum payment, but above 90% payment for mat and longitudinal joint density, the Control Strip will remain in place and paid for at the reduced price in accordance with these specifications; however, a new Control Strip must be constructed that meets the minimum 100% payment criteria. A maximum of three Control Strips will be allowed.

If the initial Control section should prove to be unacceptable, the necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made. A second Control section shall then be placed. Additional Control sections up to three, as required, shall be constructed and evaluated for conformance to the specifications. Any sections that are rejected according to these specifications shall be removed at the Contractor's expense. Full production shall not begin until an acceptable section has been constructed, meeting the minimum 100% payment criteria, and accepted by the Engineer. Any Control section that meets specification requirements shall be paid for in accordance with the Section 10.0 PAYMENT.

Job mix formula quality control testing is to be performed by the Contractor at the start of plant production and in conjunction with the calibration of the plant for the JMF. It should be recognized that the aggregates produced by the plant might not satisfy the gradation requirements or produce a mix that exactly meets the JMF. In those instances, it will be necessary to re-evaluate and re-design the mix using plant-produced aggregates. Specimens should be prepared and the optimum asphalt binder content determined in the same manner as for the original design tests. A revised JMF will need to be submitted and a test section constructed prior to approval and full production. The test section and JMF submittal shall conform to all the specification requirements contained herein.

6.0 EQUIPMENT

6.1 Hot Mix Asphalt Mixing Plant - Shall meet MASSDOT M3.11.07. Sufficient storage space shall be provided for each size of aggregate. The different aggregate sizes shall be kept separated until they have been delivered to the cold elevator feeding the drier. The storage yard shall be neat and orderly, and separated stockpiles shall be readily accessible for sampling.

A. Sampling Platform: A safe and adequate platform or catwalk with stairway and railing shall be provided to accommodate the inspector while checking temperatures and obtaining samples of the mixture from haul vehicles. The height of the platforms and raised platforms shall be adequate to accommodate safe acquisition of mix samples from the type of hauling unit(s) being utilized on the project.

B. Testing Laboratory: The Contractor or producer shall provide a testing laboratory at the production plant for quality control and quality acceptance functions during periods of mix production, sampling, and testing, and whenever materials subject to the provisions of these specifications are being supplied or tested. The laboratory shall contain adequate equipment, space, and utilities as required for the performance of the specified tests.

It shall be available for joint use by the Contractor for quality control testing, if applicable, and by the Engineer for acceptance testing. The testing laboratory must have adequate equipment for the performance of the tests required by these specifications and the requirements of NETTCP. The Engineer shall have priority in use of the equipment necessary for acceptance testing. All the necessary testing equipment shall be located at the HMA plant supplying material to the project. In addition, all ancillary and miscellaneous equipment needed to perform the testing in accordance with these specifications shall be provided by the Contractor at no additional cost.

The effective working area of the laboratory shall be a minimum of 150 square feet with a ceiling height of not less than 7.5 feet. Lighting shall be adequate to illuminate all working areas. It shall be equipped with heating and air conditioning units to maintain a temperature of 70°F $\pm$ 5°F.

The plant laboratory shall further contain and be kept supplied with the following laboratory equipment:

Scale (digital) - 20,000gm capacity minimum, sensitivity 0.1gm.

Marshall Equipment - Automatic hot mix asphalt compactor mounted in accordance with ASTM D1559 and conforming to specifications for AASHTO T-245 which consists of totally enclosed, rigidly mounted operated frame, a standard circular-foot compaction hammer assembly designed to ensure an eighteen (18) inch drop regardless of specimen height, a one third (1/3) horsepower motor with belt guard and controls, an automatic counter that shuts off the power after the set number of hammer drops, and a standard compaction pedestal with guide pins for centering one standard (4 inch diameter) bituminous mold at a time. The Contractor shall also provide two (2) stability compaction molds conforming to ASTM D1559 and suitable for use with the automatic bituminous compactor.

NOTE: The Soil test Model AP-800 automatic bituminous compactor and AP-166 stability compaction molds have been found suitable.

Superpave Gyratory Compactor - (For plants supplying materials contained in Table 5) conforming to the requirements of AASHTO R30, R35, M323, T312 and the Asphalt Institute Manual SP-2.

Bulk specific gravity determination equipment (AASHTO T166), and theoretical maximum specific gravity equipment (AASHTO T209).

Laboratory facilities shall be kept clean and all equipment shall be maintained in proper working condition. The Engineer shall be permitted unrestricted access to inspect the Contractor's laboratory facility and witness

quality control activities, if applicable. The Engineer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

6.2 Hauling Equipment - Trucks used for hauling hot mix asphalt mixtures shall have tight, clean smooth metal beds which have previously been cleaned of all foreign material. To prevent the mixture from adhering to them, the beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, soluble oils or other approved material. When coating is applied, truck bodies shall be raised immediately prior to loading to remove any excess coating material in the truck bed. Containment of the excess anti-adhesive material may be required for environmental concerns depending on the type of anti-adhesive agent used. Each truck shall have a securely fastened, both front and rear, waterproof cover to protect the mixture at all times. **The use of mesh type tarps will not be permitted.** When necessary, so that the mixture will be delivered to the site at the specified temperature within 25^{o}F of the approved JMF, truck beds shall be insulated.

6.3 Pavers - Pavers shall be self-contained, heated, power-propelled units with an automated controlled screed, and shall be capable of spreading and finishing courses of hot mix asphalt material which will meet the specified thickness, smoothness, and grade. Pavers used for shoulders and similar construction shall be capable of spreading and finishing courses of hot mix asphalt material in widths shown on the plans.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed. The hopper shall be maintained in excess of 25% volume of hot mix during normal paving operations thereby eliminating exposure of the drag slat conveyor. The screed assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, segregating or gouging the mixture.

The paver shall be capable of operating at forward speeds consistent with satisfactory laying of the mixture. The paver shall be maintained with non-worn reverse augers or kickback paddles at the center of the screed at the auger bearing box.

The paver shall be equipped with hoppers and distributing screws of the reversing type to place the mixture evenly in front of adjustable screeds. They shall be equipped with a quick and efficient steering device and shall have reverse as well as forward traveling speeds.

The paver shall employ mechanical devices such as equalizing runners, straight edge runners, evener arms or other compensating devices to adjust the grade and confine the edges of the mixture to true lines. **To construct tight longitudinal paving joints, the end gate, or an edge plate must be down just off the surface to ensure a light compaction and setup of the material on the joint.** The paver shall be capable of spreading the mixture without segregation in layers to the depths and widths required. They shall be equipped with a single joint automated tracker device for proper matching of the elevation of longitudinal joints between adjacent strips or courses of the same thickness. **Extensions are required and shall contain auger and tunnel extensions if the end gate exceeds 18" from the end of the auger shaft on a consistent basis.**

An approved device will be required for heating the screed to the temperature required for the laying of the mixtures without pulling or marring.

The term "screed" includes any device operated by cutting, crowding, or other practicable action, which is effective on the mixtures at permissible workable temperatures without tearing, shoving, or gouging and which produces a finished surface of the evenness and texture required.

The pavers employed on Belmont projects shall operate by the use of an automated joint matcher for joints, and an automatic grade control device for profile. The paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or

devices which will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent.

The controls shall be capable of working in conjunction with any of the following attachments:

A. Ski-type device of not less than 30 feet (9.14 m) in length;
B. Taut stringline (wire) set to grade;
C. Short ski or shoe;
D. Laser control;
E. Sonic control.

The paver screed may be equipped with a Longitudinal Notched - Wedge Joint paver attachment or Straight Wedge Joint paver attachment and screed mounted roller attachment. When placing HMA pavement courses at a thickness of 1.5" or greater, the notched wedge is recommended; when placing HMA pavement courses less than 1.5", the straight wedge is recommended. The notched wedge joint includes a variable notched vertical edge (the notch vertical height to be equal to the mixture's maximum aggregate size). The sloped surface of the diagonal wedge joint shall not exceed a 6:1 slope.

6.4 Rollers - Rollers of the vibratory, steel wheel, oscillatory, and pneumatic-tired type may be used. They shall be in good condition, capable of reversing direction without backlash, and operating at slow speeds to avoid displacement of the hot mix asphalt. Static rollers shall be operated at speeds not to exceed 3 mph and vibratory rollers shall be operated at a minimum of 10 to 12 impacts/ft in vibratory mode. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition.

The use of equipment which causes excessive crushing of the aggregate or that which does not produce a smooth, dense and uniform HMA mat will not be permitted.

The Contractor shall exercise great caution when using vibratory rollers so as not to cause damage to buried infrastructure or adjacent infrastructure. Damage to buried or adjacent infrastructure will be the responsibility of the Contractor. The new Oscillation type rollers are acceptable for use for intermediate compaction and back rolling of HMA in the Town of Belmont.

The Contractor is required to use a vibratory and/or oscillatory roller for breakdown rolling and an pneumatic square edge-tired compaction roller (either one or both axles) and an Oscillatory roller for all intermediate and finish rolling of hot mix in the Town of Belmont.

7.0 HMA CONSTRUCTION

7.1 Weather Limitations - The hot mix asphalt shall not be placed when weather conditions of fog or rain prevail or when the pavement surface or base shows signs of free moisture (film of water). When the surface temperature of the underlying course is less than 50°F, the estimated time available for compaction shall be provided by the Contractor to the Engineer. The Engineer and the Contractor shall determine if there is an adequate amount of time available to compact the mixture. The Contractor assumes responsibility for constructing the pavement to meet compaction and specification requirements. The estimated time available for compaction can be calculated with computer programs, e.g., Pave Cool Tool 2.4.

This program is available at the following web location:
http://www.dot.state.ia.us/construction/hot_mix_asphalt.htm

HMA Pavement Course	**Lift Thickness** Inches (mm)	**Minimum Air Temperature** °F (°C)	**Minimum Surface Temperature** °F (°C)

Surface Course	≤ 1¾ (45)	50 (10)	55 (13)
Surface Course	> 1¾ (45)	40 (4)*	45 (7)
Intermediate Course	All	40 (4)*	45 (7)
Base Course	All	40 (4)*	45 (7)
Leveling Course	As Specified	50 (10)	55 (13)

** When the surface temperature of the underlying course is less than 50°F, the estimated time available for compaction shall be provided by the Contractor to the Engineer using Pave Cool Software.*

The Engineer will not permit work to continue when overtaken by sudden storms until the pavement surface shows no signs of free moisture. The material in transit at the time of shutdown will not be placed until the pavement surface shows no signs of free moisture, provided the mixture is within temperature limits as specified.

The construction of hot mix asphalt concrete pavements shall terminate on October 15 and shall not be resumed prior to April 15 except as determined and directed in writing by the Engineer.

7.2 Thermometer - The Town will utilize an approved dial type thermometer with a temperature range of 50ºF to 500ºF and an infrared pistol thermometer for use during HMA placement. The infrared pistol thermometer shall be Fahrenheit or Celsius selectable and conform to the following requirements:

A. Portable and battery operated;
B. Accuracy of +/- 2%;
C. Repeatability of +/- 3ºC;
D. Emissivity preset at 0.95;
E. LCD Display to nearest 1º;
F. Temperature operating range of 4ºF to 752ºF.

7.3 Pre-Paving Conference - Prior to the placing of any HMA, a pre-paving conference (approximately 4 hours in length) shall be held to discuss and approve the paving schedule, source of HMA, job mix formula approvals, type and amount of equipment to be used, sequence of paving pattern, rate of HMA supply, all sampling, testing and reporting procedures to be used, traffic control, safety, and general continuity of the operation. Engineer's representatives, Contractor's plant, quality control and field representatives and Engineer's testing and inspection agents shall attend this meeting. All equipment used shall be approved on the project site prior to starting up each day. **It will be mandatory for the Contractor and the paving subcontractor, if utilized, to attend this conference.** The Contractor will be responsible for all costs associated with additional training.

The Engineer, upon 48 hours notice, may be able to hold this conference preferably on the forecast of an inclement day.

7.3.1 Notification of Paving – The contractor shall provide the Town of Belmont a minimum of 48 hours prior to anticipated paving, and provide the street(s) and limit(s) of paving. The notification shall include paving course, mix type, plant location, shipping time, placement time, and anticipated tonnage.

7.4 Preparation of the Underlying Surface - Immediately before placing the hot mix asphalt, the underlying course shall be thoroughly cleaned of all dust and debris by a self-propelled sweeper. Areas inaccessible by power sweepers shall be broom swept until the pavement surface is clean. Extra care shall be required during fall leaf season, and around utility structures.

Proof roll prepared base material surface, if applicable, to identify areas requiring removal and recompaction, and to provide a uniform degree of compaction over the entire pavement area.

Do not begin paving work until deficient base material areas and utility trenches have been corrected and are ready to receive paving. Paving shall not be applied until the Engineer inspects and approves the finished base.

When an existing surface or new base upon which the lower course is to be placed contains unsatisfactory irregularities, in the Engineer's judgment, such irregularities may be eliminated by an adequate placing and compaction of HMA mixture so as to furnish a surface with true contour and grade before placing any specified course of mixture.

Check all frames, covers, grates, water valve boxes and other miscellaneous castings that are located in the proposed pavement areas to ensure that all have been correctly positioned and set to the proper slope and elevation. All covers and grates shall be set flush with the required finished surface. No depressions or mounds will be permitted in the pavement to accommodate inaccuracies in the setting of castings.

For Reclaimed base, reconstruction or where new base is graded, the Contractor shall furnish, set, and maintain all line and grade stakes necessary to guide the automated grade control equipment. Where required these control stakes shall be maintained by the Contractor and used throughout the operations, from the grading of the subbase material up to and including the final layers of the pavement.

Adequate artificial lighting shall be provided during night placements. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to an internal temperature of 140°F minimum.

Proper precautions shall be taken to prevent damage by construction operations to edges adjacent to the hot mix asphalt. These edges may be, but are not limited to, gutters, catch basins, curbs, concrete structures, and hot mix asphalt concrete. If damage occurs, repairs shall be made to the satisfaction of the Engineer with no additional payment.

7.5 Tack Coat – Vertical contact surfaces of all structures (manholes, drains, catch basins, gas and water gates, etc…), vertical pavement edges including driveway aprons and HMA curb shall be painted with a thin, uniform tack coat just before the material is placed against them unless Hot Poured Rubber Sealant is required.

Tack coat is required on all surfaces to be paved; this includes leveling, base or intermediate layers of HMA, unless the underlying HMA layer was placed during the same day. **Particular attention should be made during the application that the longitudinal joint areas be treated with no bare spots.** Missing areas adjacent to the longitudinal joint, along the curb line or around structures will require either re-application or localized hand work application as directed by the Engineer.

Tack coat shall be applied at a residual binder amount on the pavement between 0.03 to 0.05 gallons per square yard. Use the lower application amount between new lifts and the higher application rate on milled or Portland cement surfaces. This amounts to a very thin application that needs to be carefully applied. Massachusetts uses RS-1 and CRS-1 type asphalt emulsions for tack coating. These can be applied, as an emulsion, between 0.05 to 0.08 gallons per square yard. Tack coat shall be supplied as part of the HMA operation.

Allow tack coat to 'break' which requires it to change from a brown color to a black color prior to paving.

The asphalt emulsion temperature and application rate shall be periodically measured and properly recorded by the Contractor on NETTCP Inspection Report Forms. If the temperature or application rate is determined to not be in conformance with the specification requirements above, the Contractor shall make appropriate adjustments to the tack application operations.

The Town of Belmont requires the use of an automated tack distribution truck during all paving operations, including control strips and partial day production. Tack coat application and coverage will be monitored and calculated based on yield and Quality Assurance testing.

7.6 HMA Production - The aggregates and the asphalt binder material shall be weighed or metered and introduced into the mixer in the amount specified by the JMF and within the allowable action limits as stated in Table 7 HMA PRODUCTION LIMITS. These limits shall be applied to the target values established in the JMF. Corrective action shall be taken by the Contractor when the calculated individual result for gradation or asphalt content falls outside the target JMF value beyond the action limit listed in Table 7. The Contractor shall take the appropriate action when results indicate the material is out of tolerance. The Contractor shall be required to suspend production when the calculated individual result for gradation or asphalt content falls outside the target JMF value beyond the suspension limit listed in Table 7, or when the asphalt binder content is below the minimum values stated in Table 6 for Marshall mixes. The Contractor shall be required to suspend production if two points in a row fall outside the Action Limits for individual measurements or if three nonconsecutive samples fall outside the Action limits. The Contractor shall be required to suspend production if one point falls outside the Suspension Limits for individual measurements. The Contractor shall also be required to suspend production if one point falls outside the Suspension Limits for range, Table 8.

7.6.1 Plant Trials - If production is suspended, the production facility shall be required to produce material on a trial basis for testing purposes without shipment to the project. No payment will be made for material and labor employed for nonconforming plant trials. The Engineer or his representative shall pay for acceptance sampling and testing for the first set of trials necessary to determine conformance with the specification requirements. If the first set of trials does not conform to specification requirements, the Contractor shall pay for any additional trial sampling and testing for acceptance. When trials have been approved, the plant will return to its normal operation.

Failure to stop production and make adjustments when required due to an individual test(s) not meeting the specified requirements may subject all of the mix from the stop point to be considered unacceptable.

The temperature of the mixture shall be in accordance with the Performance Graded Asphalt Binder (PGAB) allowable mixing and compaction temperature range. The temperature of the mixture when discharged from the mixer or silo shall be $\pm$ 20°F (-6°C) from the value stated in the job mix formula. Mixtures exceeding these limits shall be subject to rejection.

RAP VERIFICATION - The Town will randomly test HMA mixtures from the production plant or storage silos to determine the quality of the PG binder. For non-modified binder mixtures, the absolute viscosity of the recovered asphalt shall be no greater than 6,000 poises at 140ºF. If the absolute viscosity is greater than 6,000 poises, then a full PG binder test verification will be run for conformance to the PG grade specified. For modified asphalt binder mixtures, a full PG binder test verification will be run for conformance to the PG grade specified. Failure of the PGAB to conform to specification requirements may be cause for rejection of the Lot. Further PGAB tests may be conducted on previous Lots; all costs for the PGAB tests will be the responsibility of the Producer if the results do not meet specifications [T_{MAX} for G*/Sin (d) DSR (RTFO Aged] for PG 64-28 or 64-22 (whichever is applicable) recently placed.

7.7 Transporting, Placing and Finishing - HMA deliveries shall be scheduled so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver.

Upon arrival, the mixture shall be placed to the full width by a hot mix asphalt paver. It shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the hot mix asphalt mat. Unless otherwise permitted, placement of the mixture shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The mixture shall be placed in consecutive adjacent strips having a minimum width of 10 feet except where edge lanes require less width to complete the area. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least one (1) foot, however, the joint in the top layer shall be at the centerline of the pavement. Transverse joints

in one layer shall be offset by at least two feet from transverse joints in the previous layer. The placement of the material along the longitudinal joint may be performed by setting the screed to overlap the first mat. The elevation of the screed above the surface of the first mat should be equal to the amount of roll-down expected during compaction of the new mat. The overlapped material shall be bumped by the lutes, if necessary, to optimize the density along the longitudinal joint. Under no circumstances should the overlapped material be broadcast across the mat. Excess material should be removed by hand. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools. When hand spreading is permitted, the mixture shall be distributed into place by means of hot shovels and spread with lutes in a loose layer of uniform density and correct depth. The use of rakes to spread the hot mix asphalt shall not be permitted. Loads shall not be dumped any faster than they can be properly handled by the shovelers and the shovelers shall not distribute the dumped load any faster than it can properly be handled by the luters. The luting shall be carefully and skillfully done to avoid segregation and so that, after the first passage of the roller over the luted mixture, no back patching will be necessary. Compaction must immediately follow hand spreading such that specification density is achieved while the mixture temperature is above the manufacturers recommended compaction temperature for the performance graded binder.

The mixtures shall be placed and compacted only at such times as to permit the proper inspection and checking by the Engineer.

The mixtures shall only be placed in the work when they can be efficiently and satisfactorily placed, compacted, smoothed, and made uniform in accordance with these specifications. Unless otherwise permitted by the Engineer for special particular conditions, only machine methods of placing shall be used.

No mixture shall be placed unless the breakdown and intermediate rolling can be completed by the time the material has cooled to 150^{o}F, or that minimum compaction temperature specified by the binder manufacturer and provided that the density and uniformity of the completed pavement attains specification compliance.

No traffic of any kind shall be permitted on the HMA intermediate or HMA base when dirt or any other foreign substance may be tracked thereon.

Immediately after any course is screeded and before roller compaction is started, the surface shall be checked, any irregularities adjusted, any accumulation from the screed removed by rake or lute, and all fat spots in any course removed and replaced with satisfactory materials. Irregularities in alignment and grade along outside edges shall be corrected by the addition or removal of mixture before the edges are rolled. Indiscriminate casting of mix on the new screeded surface, where irregularities are not evident, shall not be permitted.

All hot mix shall be placed and compacted in such a manner as to ensure a continuous bond between the tacked hot mix pavement surfaces and obtain the required density.

7.7.1 Second Control Strip Requirement - If it is determined, during the performance of the contract, that the pavement does not conform to the surface tolerance, density and uniformity requirements, the Engineer may order the Contractor to cease all operations and construct an HMA CONTROL SECTION consisting of a sufficient quantity of surface course mixture. The Contractor shall construct a control section as directed by the Engineer either: a minimum of 100 feet long by 12 feet wide, or a minimum of 50 feet long by a minimum of 24 feet wide depending upon the problem. A control section may be required each time a change is made in the Job Mix Formula, sources of supply or paving and rolling equipment.

The mixture shall be prepared, placed, and compacted in accordance with this specification. When the control section pavement has cooled sufficiently, a total of six (6) samples of the finished pavement shall be taken and tested in accordance with the requirements of Section 5.0.

If the tests by the Engineer indicate that pavement does not conform to specification requirements, necessary adjustment to plant operation and placement/rolling procedures shall be made.

Where the average density of the core samples for either the mat or longitudinal joint does not conform to specification requirements, the pavement shall be removed at no cost to the Engineer. No payment will be made for material and labor employed, either in placement or removal of the nonconforming control section.

The second control strip may be removed at the direction and at no cost to the Engineer if the test result of any one mat core density falls below 90% of theoretical maximum laboratory density and/or any one longitudinal joint density falls below 88% of theoretical maximum laboratory density.

The Contractor shall not be permitted to place surface course pavement until a control section is approved by the Engineer.

7.8 Joints - The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade. When abutting a previously placed lane, the longitudinal joint should be rolled first followed by the regular rolling procedure.

Hot-poured rubberized asphalt sealer is required on all transverse and longitudinal joints of the surface course whose surface temperature falls below 200 degrees Fahrenheit prior to adjacent paver passes. Vertical joints at granite curbing and utility structures shall receive a coating of tack coat prior to placement of the surface course material.

7.8.1 Transverse Joints - The roller shall not pass over the unprotected end of the freshly laid mixture except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by temporarily tapering the course, in which case the edge shall be cut back to its full depth and width on a straight line to expose a vertical face. In both methods, all contact surfaces shall be given a coat of hot-pour rubberized asphalt sealer before placing any fresh mixture against the joint.

7.8.2 Longitudinal Joints - All longitudinal joints shall be constructed with the first paver pass in a neat straight line. Deviation from trueness will negate the ability to form a properly compacted longitudinal joint.

The paver screed may be equipped with a Longitudinal Notched - Wedge Joint or Straight Wedge Joint paver attachment and screed mounted roller attachment when placing HMA pavement courses. Use the Notched Wedge Joint for thicknesses of 1.5" or greater and use the Straight Wedge Joint for thicknesses less than 1.5". The notched wedge joint shall include a variable notched vertical edge (the notch vertical height to be equal to the mixture's maximum aggregate size). The sloped surface of the diagonal wedge joint shall not exceed a 6:1 slope. The notched wedge joint shall also include a variable vertical edge at the lower end of the diagonal plate (the vertical height to be equal to the mixture's maximum aggregate size). Prior to placing the adjacent paver pass for sloped joints, all joint contact surfaces shall be given a tack coat prior to placing any fresh mixture against the joint.

Vertical, conventional, confined-edge butt joints which are not constructed straight, or are not constructed with an edge restraining device (either a commercial paver screed attachment or by dropping the end gate down to the surface), or are damaged or otherwise defective shall be cut back 3 inches to expose a clean, sound surface for the full depth of the course. All contact surfaces shall be given a coat of hot-pour rubberized asphalt sealer or tack coat (as described in section 7.5 – Tack Coat and section 7.8 – Joints) prior to placing any fresh mixture against the joint. The sealer shall be applied as a bead approximately 1/8" thick at the middle of the overlay thickness on the vertical edge. Hot-pour sealant shall be paid for as a separate pay item.

7.9 Compaction of HMA Mixture After Placing - The mixture shall be thoroughly and uniformly compacted by rolling. The surface shall be compacted as soon as possible when the mixture has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and

the type of rollers used shall be at the discretion of the Contractor. Rolling shall be initiated with the drive roll or wheel towards the paving machine. When rolling on steep grades, the previous procedure may need to be altered.

The speed of the roller shall, at all times, be sufficiently slow and of uniform speed to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained. The number of rollers and passes required shall be governed by the compaction results; however, at least two rollers shall be provided for each paver employed on the paving operation. The Town of Belmont is requiring the use of pneumatic and oscillation rollers. If one of the selected rollers is pneumatic, it shall be equipped with the European square edge tires. This will allow the pneumatic roller to handle both the intermediate compaction as well as the back rolling responsibilities on two-roller trains. An alternate to a full pneumatic European tired roller would be a combination 10-ton steel vibratory with large pneumatic square edge rear wheels. An acceptable alternative to the vibratory roller would be the "Hamm" Oscillatory roller. Each roller shall be operated by a competent, experienced roller operator and shall be kept in as nearly continuous operation as practicable while work is underway. A plate shall be attached to each roller showing the ballasted and unballasted weight per length-width of tread.

To prevent adhesion of the mixture to the steel roller, the drums or shall be kept properly moistened, cocoa mats kept clean and scrapers used, but excessive water will not be permitted. Pneumatic rollers shall be operated on adjacent pavement surfaces to get the tires warm to hot from friction, then moved to the fresh mat.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with hand tampers and vibratory plate compactors.

Any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

Along any adjoining edge such as curb, gutter or an adjoining pavement, and after the HMA is placed by the paver, just enough of the hot HMA shall be placed by hand method to fill any space left open. These joints shall be properly 'set up' with the back of a lute at the proper height and level to receive the maximum compaction. Any areas where the rollers cannot access shall be hand tamped or plate compacted.

7.9.1 Shaping Edges - While the surface is being compacted and finished, the Contractor shall carefully trim the outside edges of the pavement to the proper alignment. Edges so formed shall be beveled while still hot with the back of a lute or smoothing iron and thoroughly compacted by tampers or by other satisfactory methods.

7.10 Surface Smoothness - The finished surfaces of the pavement shall be uniform in appearance, free from irregularities in contour and texture and shall present a smooth-riding surface. Smoothness evaluation applies to all hot mix asphalt concrete roadways receiving 1.5" or more in plan (compacted) thickness of HMA pavement.

Tests for conformity with the specified crown and grade shall be made by the Contractor immediately after initial compaction. Any variation shall be corrected by the removal or addition of materials and by continuous rolling.

The finished surface of the pavement, when measured with a 10-foot straightedge, shall not vary more than 1/4 inch for the surface course and 3/8 inch for the intermediate course measured perpendicular and parallel to the centerline. If, in the opinion of the Engineer, the surface visually appears wavy, but meets the surface tolerance test with the 10-foot straightedge, the Engineer reserves the right to additionally test with the use of Inertial Profile Equipment which records cumulative vertical deviations per unit length using a statistic called International Roughness Index (IRI). Town of Belmont street upset limit for IRI is set at 135 in/mile using similar equipment that MASSDOT specifies in their Quality Assurance HMA projects.

After the completion of final rolling, the smoothness of the course shall again be tested; humps or depressions exceeding the specified tolerances shall be immediately corrected by removing the defective work and replacing with new material, as directed by the Engineer. This shall be done at the Contractor's expense.

Skin patching will not be permitted.

When profile corrections are required, the Contractor shall use one or more of the following corrective methods approved by the Engineer or the Town:

A. Removing and replacing the entire pavement thickness;
B. Diamond grinding or micro milling;
C. Overlaying (not patching) with the specified surface course;
D. Removing the surface by milling and applying a lift(s) of the specified course(s);
E. Use of other methods that will provide the desired results.

The corrective method(s) chosen by the Contractor shall be performed at the Contractor's expense, including all necessary equipment and traffic control. Areas of removal and replacement shall be removed the full width of the lane. The removal areas shall begin and end with a transverse butt joint which shall be constructed with a transverse sawcut perpendicular to the centerline. Replacement materials shall be placed in sufficient quantity so the finished surface will conform to grade and smoothness requirements. The corrective area shall conform to all material and density specification requirements. When the corrective work consists of an overlay, the overlay shall cover the full width of the pavement including shoulders. The area overlaid shall begin and end with a transverse butt joint which shall be constructed with a transverse sawcut and asphalt removal. All materials shall meet contract requirements. The overlay shall be placed so the finished surface will conform to grade and smoothness requirements. The overlayed area shall be compacted to the specified density.

The Engineer shall retest any sections where corrections were made to verify that the corrections produced a surface that conforms to the grade and smoothness requirements

7.11 Uniformity- The HMA mat shall be smooth, dense, and uniform. Uniformity is generally affected by Thermal and/or Aggregate segregation.

If segregation is evident and discernable by either the Contractor or the Engineer, the Contractor shall immediately cease production and take steps to correct and eliminate the cause(s) of the segregation to the satisfaction of the Engineer.

The Contractor shall review all potential causes of segregation as it relates to its operation, including but not limited to HMA Plant issues, loading and transportation issues, placement issues, thermal segregation, and hand work. The Contractor shall employ additional investigation methods and make the necessary changes in their operation such that segregation is eliminated and mat uniformity is acceptable.

The Engineer shall obtain two (2) six inch diameter cores from the identified (segregated) area and two (2) six inch diameter cores from the non-segregated area. The cores may be evaluated for resilient modulus, dry tensile strength, change in air voids, maximum in place air voids, aggregate gradation and binder content. The results of the data obtained on the cores from the segregated area will be compared to the results of tests performed on the cores from the non-segregated area.

If any mix property is beyond the tolerance limits stated in the table below, that area shall be considered segregated and shall be repaired by the contractor.

SEGREGATION LIMITS

Change in Mix Properties Expressed as a Percentage of the Properties in the Non-Segregated Areas

Property	Limits
Resilient Modulus, psi @ 77°F	<80%
Dry Tensile Strength, psi @ 77°F	<90%
Aggregate Gradation and Binder Content	Refer to Table 7 (Action Limits)
Change in Air Voids	>2.5%

The samples for the segregation analysis will be considered separately from the mat and joint cores tested for acceptance.

Segregated areas not meeting the requirements stated above or areas having more than 13% air voids shall be removed and replaced for the entire pavement thickness and lane width, or as directed by the Engineer. All corrective methods shall be performed at the Contractor's expense. The removal areas shall begin and end with a transverse butt joint which shall be constructed with a transverse sawcut perpendicular to the centerline. The corrective area shall conform to all grades, smoothness, material, and density specification requirements. The Engineer may retest any areas where corrections were made to verify that the material meets specification requirements.

7.12 Thickness - The thickness requirements contained herein shall apply only when each pavement layer is specified to be a uniform compacted thickness of 1 inch or greater. Thickness shall be evaluated for acceptance by the Engineer to the requirements shown on the plans. Measurements of thickness may be checked periodically by the Contractor in following their QC system for field operations. Measurements of thickness for acceptance shall be made by the Engineer using four-inch minimum diameter pavement cores removed also for subsequent density measurement.

The finished surfaces of each HMA pavement course shall not vary from that specified or cross sections shown on the contract drawings by more than one-quarter (1/4) of an inch. The Contractor shall correct pavement areas varying in excess of this amount by removing and replacing the defective work or as ordered by the Engineer. Skin patching will not be permitted.

7.13 Grade - The finished surface of the pavement shall not vary from the gradeline elevations as shown on the plans by more than 1/2 inch. The Contractor shall remove deficient areas and replace with new material. Sufficient material shall be removed to allow at least 1.5 inches of hot mix asphalt to be placed. Skin patching for correcting low areas shall not be permitted. High points may be ground off.

7.14 Leveling Course - Any HMA used for truing and leveling shall meet the requirements of the mix design methods and the requirements of the TABLE 6 or TABLE 3, 4, and 5 specifications for the applicable mixtures. Leveling courses shall not be subject to density requirements. The thickness of the Leveling Course shall be measured off the interface with the existing milled or un-milled pavement surface. The leveling course shall be compacted with the same effort used to achieve placement and density of the test section. The truing and leveling course shall not exceed a nominal thickness of 1.5 inches.

7.15 Opening to Traffic

No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate stability has been attained and the material has cooled sufficiently to an internal temperature of 140°F or less. If the climatic or other conditions warrant, or if the PGAB manufacturer recommends, the period of time before opening to traffic may be extended at the discretion of the Engineer. Road closures shall be accomplished through the use of traffic cones, police details, and yellow caution tape.

7.16 Contractor Quality Control of HMA Pavement

7.16.1 General - Although guidelines are established and certain requirements are shown, they are suggested at this time. The QC system addresses all elements which affect the quality of the pavement including, but not limited to:

A. Mix Design;
B. Aggregate Grading;
C. Quality of Materials;
D. Stockpile Management;
E. Proportioning;
F. Mixing and Transportation;
G. Placing and Finishing;
H. Joints;
I. Compaction;
J. Surface smoothness and uniformity;
K. Thickness and grade.

The Contractor shall be prepared to discuss and present, at the pre-paving conference, their understanding of quality control for this contract.

7.16.2 Control Charts - Contractor should develop production control charts and post for visual reference in the testing laboratory. The control charts should identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the production test results. If the project data during production indicates a problem and the Contractor is not taking satisfactory corrective action, then the Engineer may suspend production or acceptance of the material, in accordance with these specifications:

A. Individual Measurements - Control charts for individual measurements may be established to indicate production quality control within given tolerances for aggregate gradation and asphalt binder content. The control charts will use the JMF target values as the indicator of central tendency for the following test parameters with associated Action and Suspension Limits;

TABLE 7 HMA PRODUCTION LIMITS FOR INDIVIDUAL MEASUREMENTS

Sieve Size	Action	Suspension
1-1/2" (37.5mm)	0%	0%
1" (25.0 mm)	±6%	±9%
3/4" (19.0 mm)	±6%	±9%
1/2" (12.5 mm)	±6%	±9%
3/8" (9.5 mm)	±6%	±9%
#4 (4.75 mm)	±6%	±9%
#8 (2.36 mm)	±5%	±7.5%
#16 (1.18 mm)	±5%	±7.5%
#30 (0.600 mm)	±4%	±5.5%
#50 (0.300 mm)	±3%	±4.5%
#100 (0.150 mm)	±3%	±4.5%
#200 (0.075 mm)	±2%	±3%
Asphalt Binder Content	±0.4%	±0.70%
Design Air Voids (4.0%)	±1%	±1.7%

When evaluating the production limits, the sieve sizes above the maximum size aggregate should be deleted from the Individual Measurements Chart and the maximum aggregate sieve size Action and Suspension Limits should be changed to 0%.

B. Range - Control charts for range may be established to indicate production variability for the test parameters and Suspension Limits listed below. The range may be computed as the difference between the high and low test results per lot for each control parameter. The Suspension Limits specified below are based on a sample size of n = 2. If more than two tests per lot were used, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for n = 3 and by 1.27 for n = 4.

Table 8 CONTROL CHART LIMITS BASED ON RANGE (based on n=2)

Sieve	Suspension Limit
1-1/2" (37.5 mm)	11 percent
1" (25.0 mm)	11 percent
3/4" (19.0 mm)	11 percent
1/2" (12.5 mm)	11 percent
3/8" (9.5 mm)	11 percent
#4 (4.75 mm)	11 percent
#8 (2.36 mm)	10 percent
#16 (1.18 mm)	9 percent
#50 (0.30 mm)	6 percent
#200 (0.075 mm)	3.5 percent
Asphalt Binder Content	0.8 percent
Design Air Void Content	2.0 percent

C. Corrective Action - The Contractor should review the control charts on a continuous basis making adjustments to the process when necessary to keep the product consistent. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

(1) One point falls outside the Suspension Limit line for individual measurements or range;

(2) Two points in a row fall outside the Action Limit line for individual measurements;

(3) Three nonconsecutive samples fall outside the Action Limit line for individual measurements;

(4) Two consecutive streets or two consecutive 1,000 ton lots of material tested for mat density or longitudinal joint density falls below the threshold density for 100% adjustment, as noted in Table 9 and Table 10.

The Contractor's Quality Control system shall include an appropriate action to be taken when the process is believed to be out of tolerance. The Contractor should review the control charts on a continuous basis making adjustments to the process when necessary to keep the product consistent.

The contractor shall provide timely reporting of QC plant and field testing including copies of all official test reports. Final signed test reports are required before subsequent material layers can be placed including but not limited to gravel and hot mix asphalt.

Acceptance testing requirements are the responsibility of the Engineer.

8.0 QUALITY ACCEPTANCE OF HMA

All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the Engineer at no cost to the Contractor, unless otherwise stated herein. Testing organizations performing these tests shall meet the requirements of ASTM D 3666. All equipment in Contractor furnished laboratories shall be calibrated and verified by a testing organization prior to the start of operations. Such verification/certification shall be furnished to the Engineer prior to production. Engineer's testing personnel shall be certified by the New England Transportation Technician Certification Program (NETTCP). This function does not relieve the Contractor from performing their daily quality control tasks as part of their normal operating business.

The Engineer or their agent shall have access at any time to all parts of the producing plant for:

A. Inspection of the condition and operations of the yard, plant and laboratory;

B. Confirmation of the adequacy of equipment in use;

C. Verification of the character and proportions of the mixture;

D. Determination of temperatures being maintained in the preparation of the mixtures;

E. Inspection of incidental related procedures.

Samples of all material including compacted specimens and certified copies of all reports and printouts shall be made available to the Engineer or its agent as often as requested including: asphalt binder; virgin aggregates; modifiers, loose and compacted mixture specimens; and combined aggregate samples.

8.1 Plant-Produced Material - Plant-produced material shall be sampled and tested for VMA, gradation, asphalt binder content, and air voids (Marshall or Superpave at N_{design}), on a lot basis. The Engineer's testing personnel shall be certified by the New England Transportation Technician Certification Program (NETTCP), as HMA Plant Technicians. Sampling shall be from material deposited into trucks at the plant or from trucks at the job site. A lot will consist of:

One day's production and shall be divided into 300 ton sublots. A minimum of one sample shall be obtained for each lot.

Where more than one plant is simultaneously producing material for, the job, the lot sizes shall apply separately for each plant.

8.1.1 Sampling - Sufficient material for analysis and preparation of test specimens will be sampled by the Engineer on a random basis, in accordance with the procedures contained in ASTM D 3665. A minimum of one set of laboratory compacted specimens will be prepared for each lot in accordance with AASHTO T312, at the number of gyrations required by Table 4 herein (for Superpave only), or in accordance with Marshall design criteria, Table 6. Each set of laboratory compacted specimens will consist of two test portions prepared from the same field sample.

The sample of hot mix asphalt may be put in a covered metal tin and placed in an oven for not more than 30 minutes to maintain the heat. The compaction temperature of the specimens should be as specified in the JMF.

In addition to the hot mix asphalt samples, the Contractor shall take one, one-quart sample of the PG binder used to produce the hot mix asphalt at the start of the work. The PG sample shall be turned over to the Engineer on the first day of project production.

8.1.2 Testing -

A. Bulk Specific Gravity - Two (2) laboratory fabricated sample specimens shall be tested for bulk specific gravity per sublot in accordance with AASHTO T166 or T275, whichever is applicable, for use in computing air voids and density. Air voids shall be computed in accordance with AASHTO T269;

B. Gradation and Asphalt Binder Content - The gradation and asphalt binder content of the mixture shall be measured for each sublot in accordance with the following:

1. Asphalt Binder Content – An extraction test be performed in accordance with AASHTO T164 or AASHTO T308 for determination of asphalt content. The weight of ash portion of the extraction test, as described in AASHTO T164, shall be determined as part of the first extraction test performed at the beginning of plant production; and as part of every tenth extraction test performed thereafter, for the duration of plant production. The last weight of ash value obtained shall be used in the calculation of the asphalt content for the mixture. If utilizing AASHTO T308 for asphalt content determination, the calibration process and calibration factor, as described in AASHTO T308, shall be determined as stated, prior to acceptance testing. A verification shall be performed as part of every twentieth test performed thereafter or when changes in the mix are apparent;

2. Gradation - Aggregate gradations shall be determined from mechanical analysis of extracted aggregate in accordance with AASHTO T 30 and AASHTO T27 (Dry Sieve).

C. The Dust-to-Effective Asphalt ratio shall be determined once for each sublot from the mechanical analysis of extracted aggregate and the asphalt binder content. The Dust-to-Effective Asphalt ratio shall be determined by the Engineer in accordance with AASHTO R35;

D. The Theoretical Maximum Specific Gravity of the mixture shall be measured for each sublot in accordance with AASHTO T209, Type C, D, or E container. Samples shall be taken on a random basis in accordance with ASTM D 3665. The value used in the field placed void computations shall be the average of the maximum specific gravity measurements for the lot;

E. Temperatures of the HMA shall be checked in the first three (3) haul units departing the production facility for each production day, and additionally once for each sublot. Additionally, temperatures may be checked to determine the temperatures of the dryer, the asphalt binder in the storage tank, the mixture at the plant, and the mixture at the job site for specification conformance;

F. VMA and air voids, for each plant sample, will be determined by the Engineer in accordance with the applicable AASHTO test method. The VMA, and air voids for each sublot shall be computed by averaging the results of the two test specimens representing that sublot.

8.1.3 Acceptance of Plant Produced HMA - Acceptance of plant produced HMA material will be based upon plant air voids, Marshall stability and flow (if applicable), VMA, gradation, asphalt binder content, and temperature, and shall be determined by the Engineer in accordance with these specifications.

8.2 Field Placed HMA Material - HMA material placed in the field shall be tested for mat and longitudinal joint density on a completed street or public facility basis. The Engineer's testing personnel shall be certified by the New England Transportation Technician Certification Program (NETTCP), as HMA Paving Technicians or HMA Plant Technicians. The Engineer may conduct any necessary testing to monitor the specified density, uniformity and smoothness. A properly correlated density gauge may be used to monitor the pavement density in accordance with ASTM D2950 or ASTM 7113. Monitoring density with density gauges by the Engineer does not imply acceptance or rejection; the Contractor is ultimately responsible to meet the requirements of the specification.

8.2.1 Sampling - Density gauges may be used by the Engineer to determine density of the paving course mat and/or longitudinal joints. Cores of the material shall be minimized and only taken at the direction of the Engineer and approval of the Town. Mat and longitudinal joint density tests will be located by the Engineer or their representative on a stratified random sampling basis for each street or facility paved within three days of construction. The length of the longitudinal paving joint will be divided into sub-lots for sampling and testing purposes. If more than one longitudinal joint is formed on a street, then the random sample length will be the total lineal feet of longitudinal joint placed. A mat and longitudinal joint test will be taken by the Engineer randomly from each of these sub-lot intervals. Sub-lots will be determined on the basis of five (5) sub-lots per one thousand (1,000) tons of material placed or a minimum of five (5) sub-lots from each street or facility paved. Sampling and testing for density will be conducted in the following manner:

Paving courses will tested with the density gauge (for correlation), then sampled by coring the mat and the centerline of the longitudinal joint for confined edge joint construction, or on the hot side of the longitudinal joint when using notched wedge joint construction. A 6 inch diameter wet-core bit specifically designed for cutting pavement shall be used. The cores will be tested for density and thickness.

When sampling of the longitudinal joint for density determinations by coring, the core will be taken directly over the joint for confined edge construction, on the hot side of the longitudinal paving joint, or adjacent to the vertical edge of an existing longitudinal joint, or as directed by the Engineer.

A density sample will be tested from each sub-lot segment. The total width of the paved surface (curb to curb) will be determined at the longitudinal sub-lot location to sample and test for mat density. A transverse off-set distance from the centerline of the roadway will be established for mat density sampling and testing. The location, either right or left of centerline, will be based on whether a random number is “odd or even” (odd=left; even=right). When the offset location is within 2 foot of the pavement edge, curb, catch basin or structure, or 1 foot off a longitudinal joint, or 10 foot off a transverse joint, the sample shall be relocated.

For nuclear gauge test locations, four 60 second readings will be taken with the gauge turned 90 degrees for each increment. The average of the four readings will be reported as the density value for each location. For non-nuclear density tests, five readings will be taken, after the first reading is taken the gauge will be moved up and to the right approximately 2” (the 2 o’clock position), three more readings will then be taken at the 4 o’clock, 8 o’clock, and 10 o’clock positions using the manufacturers operating procedures. The average of the five density values will be reported for each location.

If the results of the average density gauge readings for a street or pavement facility are below the threshold for 100% adjustment as indicated in Table 9 or Table 10, pavement cores may be removed as per this specification, and used for determining the actual pavement density.

In the event that a new density gauge needs be correlated for this project, cores should be taken from the mat and longitudinal joint representing the test locations. If previous core locations are available, the new density gauge should be correlated in accordance with the “re-correlation” procedure. If “re-correlation” is necessary, take four tests at quarter points around each of five previously cored and tested locations; making sure that the side of the nuclear or non-nuclear gauge is at the edge of the patched core location and firmly seated. Each test must be the average of four test increments turning the gauge 90 degrees.

All core samples shall be neatly cut with a core drill and water cooled bit where the cutting edge of the core drill bit shall be of hardened steel or other suitable material with diamond chips embedded in the metal cutting edge. The minimum diameter of the sample shall be 6 inches. Samples that are clearly defective, as a result of sampling, shall be documented and retained, then another sample taken for testing. The Contractor, Engineer or the Owner’s agent shall furnish all tools, labor, and materials for cutting samples and filling the cored pavement. Cored holes shall be filled in a manner acceptable to the Engineer and within one day after sampling.

The average density will be used to determine the percent payment.

Resampling of the pavement shall be in accordance with applicable provisions of the NETTCP Quality Assurance Technologist Manual, latest edition and these specifications.

With the exception of any Control Strips, if the Contractor is concerned about the test results obtained by the Engineer, the Contractor may request up to one time per street, that an equal number of random core samples be obtained and tested to supplement (not replace) the original core samples (or density gauge samples when bonus applies). The coring, patching and testing of the additional samples will be the responsibility of the Contractor. Cores for the mat and/or longitudinal joint density tests will be located by the Engineer and witnessed by the Contractor. Cores locations will be based on a new stratified random sampling plan for each street or facility paved in accordance with the procedures stated above. Upon approval of the coring operation, the Contractor will notify the Engineer 48 hours in advance of the cores being taken such that the Engineer can witness the sampling. The additional cores must be tested by a NETTCP certified HMA plant technician in the presence of the Engineer or his designated representative.

Only one (1) set of additional mat and/or longitudinal joint cores will be allowed on a street or lot.

8.2.2 Testing - The bulk specific gravity of each cored sample will be measured by the Engineer's NETTCP certified technician in accordance with AASHTO T166 or T275, whichever is applicable. The theoretical maximum specific gravity shall be the average maximum specific gravity for the lot in accordance with the plant-produced material section. The percent density of each sample will be determined in accordance with AASHTO T269, using the bulk specific gravity of each sample and the average theoretical maximum specific gravity. Retesting of pavement shall be in accordance with applicable provisions of the NETTCP Quality Assurance Technologist Manual, latest edition.

8.2.3 Adjustment Pay Schedule for Mat Density - The pay factor based on the density adjustment schedule will be applied to the bid price per ton for compacted mixtures greater than or equal to 1-1/2 inches thickness as shown in the contract award.

Table 9. HOT MIX ASPHALT MAT DENSITY ADJUSTMENT SCHEDULE

Average Percent of Maximum Density (minimum 5 samples)	Percent Payment
100.0 - 98.1	98
98.0 - 95.0	102
94.9 - 92.0	100
91.9 – 89.0	90
88.9 – 87.0	75
86.9 or less	rejection

8.2.4 Adjustment Pay Schedule for Longitudinal Joint Density - The pay factor based on the joint density adjustment schedule will be applied to the bid price per ton for compacted mixtures greater than or equal to 1-1/2 inches thickness as shown in the contract award.

Table 10. HOT MIX ASPHALT LONGITUDINAL-JOINT DENSITY ADJUSTMENT SCHEDULE

Average Percent of Maximum Density (minimum 5 samples)	Percent Payment
100.0 - 98.1	98
98.0 - 95.0	102
94.9 - 90.0	100
89.9 - 89.0	90
88.9 - 88.0	80
87.9 - 87.0	70
86.9 or less	50% or rejection

The total hot mix asphalt adjustment will be based on the weighted sum as follows:

0.60 Mat Adjustment + 0.40 LJ Adjustment = Total HMA Adjustment

When the construction of the pavement does not include the construction of a longitudinal joint, the payment adjustment will be based on Table 9 only, no weighted sum will be calculated. If the Agency does not test, for whatever reason, payment for that quality characteristic will be 100%. Sidewalk and patching work shall be paid for in accordance with the bid price with no density adjustments; however, production plant action limits for mixture quality will still apply. Any bonus will first be credited against any payment adjustment in the contract for HMA.

8.2.5 Rejection of Inferior HMA - The Engineer may at any time, not withstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of hot mix asphalt which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or improper mix temperature. Such rejection may be based on only visual inspection or temperature measurements. Similarly, the Engineer may at any time, not withstanding field acceptance for mat density, reject and require the Contractor to correct any HMA pavement that was placed with unacceptable mat uniformity or paving joints due to low density, segregation, improper elevation, or tearing. In the event of such rejection, the Contractor and Engineer may take random split samples of the area(s) in question in the presence of the Engineer, and if it can demonstrate in the laboratory, in the presence of the Engineer, that such material/pavement was erroneously rejected, payment will be made for the material at the contract unit price.

8.3 Rounding - Numbers used in all calculations shall be carried to the correct significant figures and rounded as follows:

A. When the first digit after those you want to drop is 4 or less, that digit and all others to the right are dropped. Ex. 62.9437 to 3 significant digits = 62.9;

B. When the first digit after those you want to retain is 5 or greater, that and all others to the right are dropped and the last digit retained is increased by one. Ex. 1.955234 to 3 significant digits = 1.96;

C. All Intermediate calculations should not be rounded and shall be reported to two more significant figures than the least number of significant figures in the data values;

D. Test Standards and technical look-up tables serve as first priority over these rounding rules.

8.4 Outliers - Due to the extremely low probability of an outlier occurring in a small number of samples representing the Lot, no outliers will be considered. If a result is suspect, it would be prudent to take the time to investigate the sampling, testing, equipment calibration, production, and construction operation to identify the cause of the suspect reading.

9.0 MEASUREMENT

9.1 Method of Measurement - the quantity of hot mix asphalt to be paid for shall be the measured by the ton complete in place. The quantity of each truck load shall be obtained from printed tickets indicating the recorded batch weights or certified truck scale weights that have been properly countersigned by an authorized representative of the Engineer at the time of delivery. HMA quantities shall be verified by the Engineer using HMA yield calculations which will include the in-place bulk specific gravity and actual area and nominal depth for the mixture placed.

10.0 PAYMENT

10.1 Basis of Payment - Payment shall be made at the contract unit prices per ton complete in place with any applicable adjustments. Note: no density adjustment shall be applied to HMA used for sidewalks or patching. This payment shall be full compensation for furnishing and placing all quality hot mix asphalt materials, mechanical sweeping of streets and for all labor, tools, equipment, materials, and all incidentals necessary to complete the work.

10.2 Adjustment for Density - Adjustment for mat and joint density shall be made when the HMA material varies from the specification target limits, but is within the tolerances stated in Sections 8.2.3 and 8.2.4 "Adjustment Pay Schedule for Density", respectively; the material will be allowed to remain in place with the specified adjustment in payment with the exception of mixtures placed with mat density below 86.9 percent of maximum. Any bonus (102% payment for 95.0% to 98.0% density) will be first credited against any payment adjustments in the contract for HMA.

PAY ITEM	DESCRIPTION	PAY UNIT
460.211	Hot Mix Asphalt – Standard Top Course	TON
460.311	Hot Mix Asphalt – Dense Binder Course	TON

11.0 TESTING REQUIREMENTS

AASHTO T104	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
AASHTO T11	Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
AASHTO T96	Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
AASHTO T27	Sieve Analysis of Fine and Coarse Aggregates
AASHTO T127	Sampling and the Amount of Testing of Hydraulic Cement
AASHTO T255	Total Moisture Content of Aggregate by Drying
AASHTO T2	Sampling of Aggregates
AASHTO M17	Mineral Filler for Bituminous Paving Mixtures
AASHTO T170	Recovery of Asphalt from Solution by Abson Method
AASHTO T275	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
AASHTO T110	Moisture or Volatile Distillates in Bituminous Paving Mixtures
AASHTO T245	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
AASHTO T209	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
AASHTO T164	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
AASHTO T176	Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
AASHTO T195	Determining Degree of Particle Coating of Bituminous-Aggregate Mixtures
AASHTO T166	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
AASHTO T269	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D 2950	Density of Bituminous Concrete in Place by Nuclear Method
ASTM D 3665	Random Sampling of Paving Materials
ASTM D 3666	Inspection and Testing Agencies for Bituminous Paving Materials
AASHTO T287	Asphalt Cement Content of Asphalt Concrete Mixtures by the Nuclear Method
AASHTO T89	Determining the Liquid Limit of Soils
AASHTO T90	Determining the Plastic Limit and Plasticity Index of Soils
ASTM D 4791	Flat or Elongated Particles in Coarse Aggregate
ASTM E 178	Practice for Dealing With Outlying Observations

ASTM D5821	Determining the Percentage of Fractured Particles in Coarse Aggregate
AASTHO T304	Uncompacted Void Content of Fine Aggregate
AASHTO T30	Mechanical Analysis of Extracted Aggregate
AASHTO T202	Viscosity of Asphalts by Vacuum Capillary Viscometer
AASHTO T240	Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin Film Oven Test)
AASHTO T283	Resistance of Compacted Bituminous Mixture to Moisture Induced Damage
AASHTO T308	Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method

The Asphalt Institute's Mix Design Methods for Asphalt Concrete Manual No. 2 (MS-2).

ADDITIONAL REQUIREMENTS

AASHTO M320	Standard Specification for Performance Graded Asphalt Binder
AASHTO MP2	Standard Specification for Superpave Volumetric Mix Design
AASHTO R30	Standard Practice for Mixture Conditioning of Hot Mix Asphalt (HMA)
AASHTO R29	Grading or Verifying the Performance Grade of an Asphalt Binder
AASHTO R26	Standard Practice for Certifying Suppliers of Performance Graded Asphalt Binders
AASHTO R35	Standard Practice for Superpave Volumetric Design of Hot Mix Asphalt (HMA)
AASHTO T312	Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the SHRP Gyratory Compactor
AASTHO T315	Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)
AASHTO T316	Viscosity Determinations of Unfilled Asphalts Using the Brookfield Thermosel Apparatus

11.1 METHOD OF TEST FOR BULK SPECIFIC GRAVITY OF AGGREGATE BLENDS WITH RAP

Scope

This test method covers the procedure to determine the bulk specific gravity (Gsb) of a combined aggregate blend with RAP used in a HMA mixture.

This test method may involve hazardous materials, operations, and equipment. This test method does not purport to address all of the safety problems associated with the test method's use. The test method user's responsibility is to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

Referenced Documents

AASHTO Standards:

T-2 Sampling Aggregates
T-84 Specific Gravity and Absorption of Fine Aggregates
T-85 Specific Gravity and Absorption of Coarse Aggregate
T-100 Specific Gravity of Soils
T-164 Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
T-170 Recovery of Asphalt From Solution by Abson Method
T-209 Maximum Specific Gravity of Bituminous Paving Mixtures
T-228 Specific Gravity of Semi-Solid Bituminous Materials (Pycnometer Method)

Other References

MS-2 Mix Design Methods for Asphalt Concrete by the Asphalt Institute

Terminology

Terms and Abbreviations. Definitions for terms and abbreviations shall be in accordance with the Standard Specifications.

Significance And Use

This test method is used to determine the bulk specific gravity of a combined aggregate blend with RAP used in HMA mixture.

The bulk specific gravity (Gsb) of a combined aggregate blend is calculated using an estimate of the bulk specific gravity of the aggregate in the RAP and the actual bulk specific gravity of the other aggregates.

The bulk specific gravity of an aggregate blend is used to perform a volumetric analysis on compacted HMA in accordance with the Mix Design Methods for Asphalt Concrete by the Asphalt Institute.

Apparatus

Apparatus shall be as stated in the referenced test methods.

Sampling

Sampling shall be as stated in the referenced test methods.

Procedure

Identify the coarse aggregate(s), fine aggregate(s) and RAP selected for use in the mix designs.

Identify and record the actual percentages for each of the aggregate components used in the combined aggregate blend of the mix design.

Obtain a representative sample of the coarse aggregate, fine aggregate mineral filler and RAP in accordance with the AASHTO procedures.

Determine and record the bulk specific gravity of each of the coarse aggregate(s) in accordance with AASHTO T-85.

Determine and record the bulk specific gravity of each of the fine aggregate(s) in accordance with AASHTO T-84.

Determine and record the maximum specific gravity of the RAP in accordance with AASHTO T-209, Type C, D, or E container.

Determine and record the asphalt content of the RAP using AASHTO T164.

Calculate and record the effective specific gravity of the RAP aggregate in accordance with the following:

$$Gse = (100 - Pbrap)/((100/Gmmrap) - (Pbrap/Gbrap))$$

Where:

Gse = Effective specific gravity of the RAP aggregate

Pbrap = Percent binder of the RAP

Gmmrap = Maximum specific gravity of the RAP

Gbrap = Specific gravity of asphalt in the RAP (AASHTO T228)

Calculate and record the effective specific gravity of the combined aggregate blend as follows:

$$GsbBlend = \frac{\%CA1 + \%CA2 + \%FA1 + \%FA2 + \%BHF + \%RAP}{\frac{\%CA1}{Gsb} + \frac{\%CA2}{Gsb} + \frac{\%FA1}{Gsb} + \frac{\%FA2}{Gsb} + \frac{\%BHF}{Gsb} + \frac{\%RAP}{Gse}}$$

Where:

GsbBlend = Bulk specific gravity of the combined aggregate blend.

Gsb = Bulk specific gravity of each respective aggregate.

Gse = Effective specific gravity of the RAP.

%CA1 = Percent of aggregate blend that is coarse aggregate #1.

%CA2 = Percent of aggregate blend that is coarse aggregate #2.

%FA1 = Percent of aggregate blend that is fine aggregate #1.

%FA2 = Percent of aggregate blend that is fine aggregate #2.

%BHF = Percent of aggregate blend that is bag house fines.

%RAP = Percent of aggregate blend that is RAP.

Report

Report the Gsb of the combined aggregate blend to the nearest 0.001.

SECTION 02576

TRENCH PAVEMENT REPAIR AND RESURFACING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, material, equipment and incidentals required and replace all pavement removed over trenches or otherwise disturbed by the Contractor's operations.

B. New pavement in city streets shall consist of initial (temporary) pavement over trenches and other excavations and final bituminous concrete pavement placed either over trenches and other excavations as directed by the Owner. All edges of final bituminous trench pavement shall be heat treated using infrared treatment.

C. New pavement in the State Highways (MDC and MHD) shall consist of permanent trench width bituminous concrete pavement and infrared treatment over trenches backfilled with CDF, to the limits shown on the Drawings. All pavement repair and resurfacing shall be in accordance with the requirements of the Mass. Highway Department permits.

D. Streets, driveways, parking areas or sidewalk pavements damaged or disturbed by the Contractor's operations shall be repaired, replaced or restored in accordance with the requirements specified herein and as directed for the respective type of pavement replacement and in a manner satisfactory to the Owner.

1.02 RELATED WORK

A. Trimming edges of existing pavement is included in Section 02221.

1.03 REFERENCE STANDARDS

A. Except as otherwise specified herein, the current Standard Specifications for Highways and Bridges, including all addenda, issued by the Commonwealth of Massachusetts, Department of Public Works, shall apply to materials and workmanship required for the work of this Section.

B. American Association of State Highways and Transportation Officials (AASHTO)

1. AASHTO M144 - Standard Specification for Calcium Chloride.

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 MAINTENANCE

A. All pavement placed shall be maintained for a period of 1 year. During this period all areas which have settled or are unsatisfactory for traffic shall be refilled and replaced at Contractor’s expense.

PART 2 PRODUCTS

2.01 MATERIALS

A. Calcium chloride shall conform to AASHTO M144, Type I or Type II.

B. Initial (temporary) trench width pavement shall be Binder Course, conforming to the referenced standard, Section M3.11, Class I, Type I-1 bituminous concrete.

C. Final trench pavement shall consist of Binder Course and Top Course, conforming to the referenced standard, Section M3.11, Class I, bituminous concrete.

PART 3 EXECUTION

3.01 GENERAL

A. Materials for pavement shall be mixed, delivered, placed and compacted in accordance with the referenced standard, Sections M3.11 and 460 and as specified herein.

B. Whenever the sub base becomes dry enough to cause dust problems, spread calcium chloride uniformly over the gravel surface in sufficient quantity to eliminate the dust.

C. When the air temperature falls below 50 degrees F, extra precautions shall be taken in drying the aggregates, controlling the temperatures of the materials and placing and compacting the mixtures.

D. No mixtures shall be placed when the air temperature is below 40 degrees F, nor when the material on which the mixtures are to be placed contains frost or has a surface temperature not suitable to the Engineer.

E. No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate stability has been attained and the material has cooled sufficiently to prevent distortion or loss of fines. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Engineer.

3.02 INITIAL TRENCH WIDTH PAVEMENT

A. Temporary pavement shall be placed wherever existing pavement has been removed or disturbed as soon as practical, but in no case more than two days after backfilling is completed.

1. The bank run gravel sub base shall be excavated to a depth of 2-in below the existing pavement, shaped and compacted.

2. The 2-in initial pavement shall be placed and compacted by steel-wheeled rollers of sufficient weight to thoroughly compact the bituminous concrete without damaging the existing pavement. The new pavement shall be rolled smooth and even with the existing pavement.

3. Hose clean all road surfaces adjacent to the trench area to be paved. No paving is to be placed until subsurface is dry.

4. Initial pavement shall be maintained in a condition suitable for traffic until replaced or overlaid by final pavement. Defects shall be repaired within 3 days of notification of such defects.

3.03 PERMANENT TRENCH WIDTH PAVEMENT

A. Raise all manhole and catch basin frames, gate valve and curb stop boxes, gas drips and valves, and any other pavement penetrations to finished elevation of the new trench width pavement. All raised appurtenances shall be grouted with concrete or otherwise as approved by the Engineer to firmly support them flush with the surface of the new trench width pavement.

B. Permanent trench width pavement in State Highways with CDF shall not be placed over trenches until water main is in service and part of the water distribution system, unless otherwise directed in writing by the Engineer and shall be constructed as follows:

1. Cut out existing pavement using pavement saw or other approved method. The pavement removed shall extend 1-ft outside the trench on each side as shown in the Drawings. Edges of the pavement shall be straight and sound. Broom and tack coat all edges with emulsified or cutback asphalt.

2. Place binder course over concrete slab and compact to appropriate thickness by steel-wheeled roller. The appropriate thickness in State roadways is 1-1/2-inches.

3. Broom and tack coat edges of existing pavement and Binder Course with emulsified or cutback asphalt.

4. Place Top Course and infrared treat to appropriate thickness, finish smooth, dense and flush with surface of existing pavement. The appropriate thickness in State roadways is 1-1/2-inches.

C. Final pavement in city streets shall not be placed over trenches in less than 90 days after completion of the backfilling unless otherwise directed in writing by the Engineer.

1. Final pavement over trenches shall be constructed as follows:

a. Remove initial pavement and sub base to 3-in below existing pavement. Shape and compact sub base to 92 percent of maximum dry density as determined by ASTM D1557, Method D.

b. Trim loose edges of existing pavement. Broom and tack coat all edges with emulsified or cutback asphalt.

c. Place Binder Course and compact to 1-1/2-in. thickness by steel-wheeled roller.

d. Broom and tack coat edges of existing pavement and Binder Course with emulsified or cutback asphalt.

e. Place Top Course and compact to 1-1/2-in. thickness, finish smooth, dense and flush with surface of existing pavement. .

D. All pavement seams shall be infrared treated as follows:

a. Areas to be repaired shall be swept clean to remove all loose and foreign materials.

b. An approved infrared heater not to exceed 15,000 BTU's per square foot per hour shall be positioned over the area to be repaired for a period of time required to soften the existing pavement to a depth of two or more inches. Oxidation of the pavement, caused by excessive heat as determined by the Engineer, shall be avoided. The Contractor shall remove all unsuitable material in the event of oxidation and replace same with new bituminous concrete at his own expense.

c. A recycling proprietary in the amount approved by the Engineer shall be added to the softened area after scarification and shall be raked to a workable condition.

d. Any necessary additional bituminous concrete mix must be obtained from a suitable infrared heated storage unit required to keep asphalt at near constant temperature throughout the working day. Under no circumstances is any asphalt mix to be used that registers a temperature of under 200 deg. F.

e. After the paving mixture has been properly admixed and raked to grade, compaction shall be obtained by use of a steel wheeled roller of sufficient weight to establish a uniform density comparable to that of adjacent surface within the work area. Finished patch shall be level with no depression retaining water on any of its surface.

f. Edges of the finished area shall be sealed with a suitable asphalt emulsion RS-1 or equal, conforming to AASHTO-M140 conforming to AASHTO-M208, around the perimeter of the newly repaired area.

g. A cationic asphalt emulsion sealant, conforming to AASHTO-M208, shall then be hand sprayed on the patched area and adjacent edges at the rate of approximately one tenth (0.1) gallon per square yard to seal the entirely newly treated area. Sand will be spread over the newly sealed area.

3.04 EXISTING CURBING AND ISLANDS

A. Existing concrete, bituminous, timber, or granite curbing and/or islands shall be protected. If necessary, curbing shall be removed and replaced after backfilling. Curbing and islands which are damaged during construction shall be replaced with curbing and islands of equal quality and dimension at the Contractor's expense. Granite curbing removed and reset shall conform to Section 580 of the Massachusetts DPW Specifications. Joints between sections shall be pointed as required after resetting.

3.05 PAVEMENT MARKINGS

A. Reline all streets with pavement markings equal in type and location where existing prior to paving.

B. Pavement markings shall be painted within 10 days of installation of final pavement as directed by Engineer.

END OF SECTION

SECTION 02605

PRECAST CONCRETE MANHOLES, CATCH BASINS AND STRUCTURES

PART I GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment required and install precast concrete manholes, structures, frames and covers, access hatches, manhole rungs, ladders and appurtenances as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Earthwork is included in Section 02200.

B. Cast-in-place concrete is included in Section 03300.

1.03 SUBMITI'ALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings, product data, materials of construction, and details of installation. Submittals shall include at least the following:

1. Base sections, riser sections, eccentric and concentric conical top sections, flat slab tops, grade rings with notarized certificate indicating compliance with ASTM C478.
2. Pipe connection to manhole.
3. Manhole rungs, including method of installation and notarized certificate indicating compliance with pull-out resistance test specified herein.
4. Manhole frame and cover with notarized certificate indicating compliance with ASTM A48, Class 30.
5. Method of repair for minor damage to precast concrete sections.
6. Sewer brick with notarized certificate indicating compliance with ASTM C32, Grade 55.
7. Building brick with notarized certificate indicating compliance with ASTM C62.

B. Design Data

1. Precast concrete structures:

a. Six copies of sectional plan(s) and elevations showing dimensions and reinforcing steel placement.
b. Six copies of structural calculations including assumptions.
c. Six copies of concrete design mix.

C. Test Reports

1. Precast concrete structures:

a. Six copies of concrete test cylinder reports from an approved testing laboratory certifying conformance with this Section.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
4. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
5. ASTM C32 - Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).
6. ASTM C33 - Standard Specification for Concrete Aggregates.
7. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
8. ASTM C150 - Standard Specification for Portland Cement
9. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes
10. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
11. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
12. ASTM D4101 - Standard Specification for Propylene Plastic Injection and Extrusion Materials.

B. American Concrete Institute (ACT)

1.ACI 318- Building Code Requirements for Structural Concrete
2.ACT 350R - Environmental Engineering Concrete Structures

C. American Association of State Highway and Transportation Officials (AASHTO)

1. Standard Specifications for Highway Bridges

D. American Welding Society (AWS)

1.AWS D1.2 - Structural Welding Code - Aluminum.

E. Occupational Safety and Health Administration (OSHA)

F. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. All material shall be new and unused.

B. Materials' quality, manufacturing process and finished sections are subject to inspection and approval by Engineer or other Owner representative. Inspection may be made at place of manufacture, at work site following delivery, or both.

C. Materials will be examined for compliance with ASTM standards, this Section and approved manufacturer's drawings. Additional inspection criteria shall include: appearance, dimensions(s), blisters, cracks and soundness.

D. Materials shall be rejected for failure to meet any requirements specified herein. Rejection may occur at place of manufacture, at work site, or following installation. Mark for identification rejected materials and remove from work site immediately. Rejected materials shall be replaced at no cost to Owner.

E. Repair minor damage to precast concrete sections by approved method, if repair is authorized by Engineer.

PART 2 PRODUCTS

2.01 GENERAL

A. Reference to a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

B. Like items of materials/equipment shall be the end products of one manufacturer in order to provide standardization for appearance, operation, maintenance, spare parts and manufacturer's service.

C. Provide lifting lugs or holes in each precast section for proper handling.

2.02 PRECAST CONCRETE MANHOLE SECTIONS

A. Precast concrete base sections, riser sections, transition top sections, flat slab tops and grade rings shall conform to ASTM C478 and meet the following requirements:

1. Bottom slab thickness shall equal the riser wall thickness or flat slab top thickness, whichever is greater.

2. Top section shall be eccentric cone where cover over pipe exceeds 4-ft. Top section shall be a flat slab where cover over top of pipe is 4-ft or less. Top section shall be a plastic lined flat slab where manhole riser sections are to be plastic lined.
3. Base, riser and transition top sections shall have tongue and groove joints.
4. Sections shall be cured by an approved method.
5. Precast concrete sections shall be shipped after concrete has attained 3,000 psi compressive strength.
6. Design precast concrete base, riser, transition top, flat slab top and grade ring for a minimum 11-20 loading plus earth load. Calculate earth load with a unit weight of 130 pcf.
7. Mark date of manufacture, name and trademark of manufacturer on the inside of each precast section
8. Construct and install precast concrete base as shown on the Drawings.
9. Provide integrally cast knock-out panels in precast concrete manhole sections at locations, and with sizes shown on Drawings. Knock-out panels shall have no steel reinforcing.

2.03 PRECAST CONCRETE STRUCTURES

A. Precast reinforced concrete structures shall be as manufactured by Chase Precast Concrete Systems, Inc.; Rotondo Company, Inc.; American Precast Corp. or equal. Refer to Drawings for inside dimensions, headroom requirements and minimum thickness of concrete.

B. Manufacturer shall notify Engineer at least 5 working days prior to placing concrete during manufacturing process. Engineer may inspect reinforcing steel placement prior to placing concrete.

C. Structural design calculations and Drawings shall be prepared and stamped by a professional engineer registered in the Commonwealth of Massachusetts.

D. Design Criteria:

1. Precast concrete
   a. Minimum compressive strength shall be 5,000 psi at 28 days.
   b. Maximum water-to-cement ratio shall be 0.40 by weight.
   c. Minimum cement content shall be 600 lbs of cement per cubic yard of concrete.

2. Manufactured products
   a. Conform to ACT 318 and ACT 350R.
   b. When "b" exceeds 40,000 psi, "z" (ACI 3T8) shall not exceed 95,000 psi. **"fs"** shall not exceed 50 percent of "fy".
   c. Products shall support their own weight, weight of soil at 130 pcf, and a live load equal to AASHTO HS-20 applied to top slab.

   d. Cast base slab and walls together to form a monolithic base section.
   e. Structure walls shall withstand an equivalent lateral fluid pressure of 90 psf. Originate pressure diagram at finished ground surface. Include lateral pressure from vehicles in accordance with AASHTO.
   £ Consider discontinuities in structure produced by openings and joints. Provide additional reinforcing around openings. Frame openings to carry full design loads to support walls.
   g. Prevent flotation, with ground water level at finished ground surface, by dead weight of structure and soil load above structure. Do not consider skin friction, soil friction, or weight of equipment in structure.
   h. Locate horizontal wall joints 18-in minimum from horizontal centerline of wall openings.
   i. Structures shall have a minimum number of joints. Maximum number of structure sections, including top slab, shall be four.
   j. Top slab shall be removable. Provide lifting hooks for top slab.
   k. Locate access openings, wall sleeves and pipe penetrations as shown on Drawings.
   I. Wall sleeves shall be provided by the precast concrete manufacturer in accordance with Section 01172.

2.04 BRICK MASONRY

A. Bricks shall be sound, hard, uniformly burned, regular and uniform in shape and size. Underburned or salmon brick shall not be acceptable. Only whole brick shall be used.

   I. Bricks for channels and shelves shall conform to ASTM C32, Grade SS except that

the mean of five tests for absorption shall not exceed 8 percent and no individual brick exceed 11 percent.

2. Bricks for raising manhole frames to finished grade shall conform to ASTM C62.

B. Mortar used in the brickwork shall be composed of 1 part portland cement to 2 parts sand to which to which a small amount of hydrated lime, not to exceed 10-lbs to each bag of cement, shall be added. Portland cement shall conform to ASTM C150, Type U. Sand shall be washed, cleaned, screened, sharp and well graded with all particles passing a No. 4 sieve and conform to ASTM C33. Hydrated lime shall conform to ASTM C207.

2.05 MANHOLE FRAMES AND COVERS, AND CATCH BASIN GRATES

A. Manhole frames and covers, and catch basin grates shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind which render them unfit for the service for which they are intended. Seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30.

B. Manhole covers shall have a diamond pattern, pick holes and the words indicated below cast in 3m letters. Manhole frames, covers and grates shall be Neenah Foundry, LeBaron Foundry, Vulcan Foundry or equal.

C. Manhole frames and covers, and catch basin grates shall be as follows:

	Neenah	LeBaron	Vulcan	Wording
Sewer	R-l270	LC-328		Sewer
Catch Basin	R-3433	LF-246	V-5626-1	
Electrical	R-1640-C1	LE-320	V-7045-1	Electrical

2.06 JOINTING PRECAST MANHOLE SECTIONS AND STRUCTURES

A. Seal tongue and groove joints of precast manhole and structure sections with either rubber 0-ring gasket or preformed flexible joint sealant. 0-ring gasket shall conform to ASTM C443. Preformed flexible joint sealant shall be Kent Seal No.2 by Hamilton-Kent; Ram-Nek by K.T. Snyder Company; Con Seal or equal.

B. Completed joint shall withstand 15 psi internal water pressure without leakage or displacement of gasket or sealant.

2.07 MANHOLE RUNGS

A. Manhole rungs shall be steel reinforced, copolymer polypropylene, 14-in wide, M.A. Industries mc, Type PS2-PF-SL or equal. Copolymer polypropylene shall conform to ASTM D4101, Classification PP0344 B33534 Z02. Steel reinforcing shall be 1/2-in diameter, conforming to ASTM A615, Grade 60 and shall be continuous throughout

rung. The portion of the legs to be embedded in the precast section shall have fins and be tapered to insure a secure bond.

2.08 ACCESS HATCHES

A. Access hatches for precast concrete structures shall have double leaf doors, and shall be sized and located as shown on the Drawings. The doors shall be 1/4-in aluminum diamond pattern plate with welded stiffeners, as necessary, to withstand an AASHTO 1120 wheel load with a maximum deflection of 1/150th of the span. Hatches shall have a 1/4-in aluminum channel frame with a perimeter anchor flange or strap anchors for concrete embedment around the perimeter. Hatches shall open to 90 degrees. Pivot torsion bars for counterbalance or spring operators shall be provided for easy operation along with automatic door hold open. Hardware shall be durable and corrosion resistant with Type 316 stainless steel hardware used throughout. Provide two removable key wrenches and plugs for each hatch. Finish shall be the factory mill finish aluminum with bituminous coating on the exterior of the frames in contact with concrete. Hatches shall be watertight and have a 1-1/2-in drainage coupling from the channel frame and drain to the exterior of the structure. Access hatches shall be as manufactured by Bilco Company; U.S. Foundry and Manufacturing Company; Halliday Products, Inc. or equal.

2.09 SHIPS LADDERS

A. Ships ladders for precast concrete structures shall have a 63 degree pitch and shall be located as shown on the Drawings. The ladders shall be manufactured of aluminum, alloy 6063-T6. Treads shall have a minimum 24-in width and shall be designed to withstand a minimum loading of 200 lbs per tread. Ladders shall have two handrails of minimum 1-1/4-in diameter and shall be designed to meet OSHA requirements. Ladders shall be as manufactured by Precision Ladders, O'Keeffe's Inc., Aluminex, Inc. or equal.

2.10 PIPE CONNECTIONS TO MANHOLES AND STRUCTURES

A. Connect pipe to manholes and structures in one of the following ways:

1. Grout in place - Precast manhole section shall have a formed, tapered circular opening larger than the pipe outside diameter. Grout shall be non-shrink and waterproof equal to Hallemite, Waterplug or Embeco. Plastic pipe shall have a waterstop gasket secured to pipe with a stainless steel clamp.
2. Flexible sleeve - Integrally cast sleeve in precast manhole section or install sleeve in a formed or cored opening. Fasten pipe in sleeve with stainless steel clamp(s). Coat stainless steel clamp(s) with bituminous material to protect from corrosion. Flexible sleeve shall be Lock Joint Flexible Manhole Sleeve; Kor-N-Seal Connector; PSX PressSeal Gasket or equal.

3. Compression gasket - Integrally cast compression gasket in precast manhole section. Insert pipe into compression gasket. Compression gasket shall be A-Lok or equal.

2.11 DAMPPROOFING

A. Dampproofing shall be Hydrocide 648 by Sonneborn Building Products; Dehydratine 4 by A.C. Horn Inc; MW Marine Liquid by Toch Brothers or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Manhole and Structure Installation.

1. Manhole and structure shall be constructed to the dimensions shown on the Drawings and as specified herein. Protect all work against flooding and flotation.
2. Place manhole base on a 12-in bed of screened gravel as shown on the Drawings. Set manhole base grade so that a maximum grade adjustment of 8-in is required to bring the manhole frame and cover to final grade.
   a. Use precast concrete grade rings or brick and non-shrink mortar to adjust manhole frame and cover to final grade.

3. Set precast concrete barrel sections and structures plumb with a 1/4-in maximum out of plumb tolerance allowed. Seal joints of precast barrel sections and structures with either a rubber 0-ring set in a recess or preformed flexible joint sealant in sufficient quantity to fill 75 percent of the joint cavity. Fill the outside and inside joint with non-shrink mortar and finished flush with the adjoining surfaces. Caulk the inside of any leaking barrel section joint with lead wool or non-shrink grout to the satisfaction of the Engineer.
4. Allow joints to set for 24 hours before backfilling unless a shorter period is specifically approved by the Engineer.
5. Plug holes in the concrete barrel sections required for handling with a non-shrinking grout or non-shrinking grout in combination with concrete plugs. Finish flush on the inside.
6. Cut holes in precast sections to accommodate pipes prior to setting manhole sections in place to prevent jarring which may loosen the mortar joints.
7. Backfill carefully and evenly around manhole sections.

B. Manhole Pipe Connections

1. Construct manhole pipe connections, including pipe stubs, as specified above. Close or seal pipe stubs for future connections with a gasketed watertight plug.C.

Manhole Rung Installation

1. Steel Reinforced Polypropylene Plastic Manhole Rungs

    a. Preform holes for manhole rungs during casting of the riser and cone sections, using tapered form pins specifically made for preforming manhole rung holes.
    b. Drive manhole rungs into preformed holes after concrete has developed a compressive strength of 3,000 psi.
    c. Alternatively, cast manhole rungs into riser and cone sections when concrete is placed.
    d. Drilling holes for manhole rungs may be used to accommodate field conditions when approved by the Engineer. Drill holes of diameter, spacing and depth required by manhole rung manufacturer.

3. Pull-out resistance test

    a. All manhole rung installation methods shall withstand a pull-out resistance test of 1,500 pounds.

D. Access Hatches

1. Access hatches shall be installed in each precast structure before pouring of concrete in
accordance with the manufacturer's instructions.

E. Ships Ladders

1. Ships ladders shall be installed in each precast structure after curing in accordance with the manufacturer's instructions. Installation shall be plumb, square and level and securely anchored to the structure.

F. Brickwork

1. Mix mortar only in such quantity as may be required for immediate use. Use mortar before initial set has taken place. Mortar shall be used within 1-1/2 hours and shall be constantly worked with hoe or shovel until used. Anti-freeze mixtures shall not be included in the mortar. Install masonry when the outside temperature is above 40 degrees F unless provisions are made to protect the mortar, bricks and finished work from frost by heating and enclosing the work with tarpaulins or other suitable material. Engineer's decision regarding the adequacy of protection against freezing shall be final.

2. Construct channels and shelves of brick and concrete as shown on the Drawings. Brick lined channels shall correspond in shape with the lower half of the pipe. Set shelf elevation at crown of highest pipe and slope 1-in/ft to drain toward the flow through channel. Construct brick surfaces exposed to sewage flow with nominal 2-

in by 8-in face exposed (i.e. bricks on edge).

G. Setting Manhole Frame and Cover

1. Set manhole covers and frames in a full mortar bed. Utilize bricks or precast concrete grade rings, a maximum of 8-in thick, to assure frame and cover are set to the finished grade. Set manhole frame and cover to final grade prior to placement of permanent paving.

H. Dampproofing

1. Paint outer surfaces of precast and cast-in-place manholes and structures with two coats of bituminous dampproofing at the rate of 30 to 60 sq ft per gallon, in accordance with manufacturer's instructions.

3.02 LEAKAGE TESTS

A. Test each manhole for leakage. Engineer shall observe each test. Perform exfiltration test as described below.

B. Assemble manhole in place; fill and point all lifting holes and exterior joints within 6-ft of the ground surface with an approved non-shrinking mortar. Test prior to placing the shelf and invert and before filling and pointing the horizontal joints below 6-ft of depth. Lower ground water table below bottom of the manhole for the duration of the test. Plug all pipes and other openings into the manhole and brace to prevent blow out.

C. Fill manhole with water to the top of the cone section. If the excavation has not been backfilled and no water is observed moving down the surface of the manhole, the manhole is satisfactorily water-tight. If the test, as described above is unsatisfactory as determined by the Engineer, or if the manhole excavation has been backfilled, continue the test. A period of time may be permitted to allow for absorption. Following this period, refill manhole to the top of the cone, if necessary and allow at least 8 hours to pass. At the end of the test period, refill the manhole to the top of the cone again, measuring the volume of water added. Extrapolate the refill amount to a 24-hour leakage rate. The leakage for each manhole shall not exceed one gallon per vertical foot for a 24-hour period. If the manhole fails this requirement, but the leakage does not exceed three gallons per vertical foot per day, repairs by approved methods may be made as directed by the Engineer. If leakage due to a defective section of joint exceeds three gallons per vertical foot per day, the manhole shall be rejected. Uncover the rejected manhole as necessary and to disassemble, reconstruct or replace it as directed by the Engineer. Retest the manhole and, if satisfactory, fill and paint the interior joints.

D. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc. It will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete.

E. An infiltration test may be substituted for an exfiltration test if the ground water table is above the highest joint in the manhole. If there is no leakage into the manhole as

determined by the Engineer, the manhole will be considered water-tight. If the Engineer is not satisfied, testing shall be performed as described hereinbefore.

F. Leakage Tests for Structures

1. The Engineer will visually inspect structures for possible leaks before backfilling of structures is allowed. Seal all joints to the satisfaction of the Engineer.

2. The Engineer may require an exfiltration test as described for manholes on any structure for which he/she deems the test appropriate.

3.03 CLEANING

A. Thoroughly clean all new manholes of all silt, debris and foreign matter of any kind, prior to final inspections.

SECTION 02624

HIGH DENSITY POLYETHYLENE PIPE FOR DRAINAGE

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This Section covers furnishing, handling, laying, joining and installation of High Density Polyethylene (HDPE) pipe, fittings and appurtenances.

B. The Contractor shall furnish and install the various pipelines and appurtenant work as indicated on the Contract Drawings and as specified herein, or as reasonably required to produce a complete, proper, and functional installation in accordance with the intent of these Contract Documents.

1.02 RELATED WORK:

A. Section 02300, EARTHWORK

B. Section 02631, PRECAST DRAINAGE STRUCTURES

C. Section 02085, POLYVINYL CHLORIDE GRAVITY PIPE & FITTINGS

1.03 REFERENCES:

A. The following standards form a part of this specification as referenced:

American Water Works Association (AWWA)

AWWA - C906-90, Polyethylene PE Pressure Pipe and fittings, 4 in. through 63 in., for Water Distribution

American Society for Testing and Materials (ASTM)

ASTM - D1248, Specifications for Polyethylene Plastics Molding and Extrusion Materials.

ASTM - D2837, Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.

ASTM - F714, Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

Plastic Pipe Institute (PPI)

PPI - TR-3, Policies and Procedures for Developing Hydrostatic Design Stresses for Thermoplastic Pipe Materials.

1.04 QUALITY ASSURANCE:

A. All pipe and fittings shall be inspected and tested at the factory as required by the standard specifications to which the material is manufactured. The Contractor shall furnish in duplicate to the Engineer sworn certificates providing evidence of such tests.

B. The Owner reserves the right to have any or all pipe, fittings, and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Owner's expense.

C. Deflections in horizontal alignment will not be permitted at joints without written consent of the Engineer. If approved, deflections shall not exceed one-half the manufacturer's recommendation.

D. When requested by the Engineer, the Contractor shall ensure that a qualified representative of the manufacturer shall be present at the jobsite for the first day of pipe laying, to assure that proper procedures are followed.

E. The Engineer shall be notified in advance when the location of an existing pipeline conflicts with the proposed location of the Work.

F. Pipe and fittings of the same type shall be products of a single manufacturer.

G. All piping shall be of the type and size shown on the drawings and described in this section of the Specifications.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Pipes and fittings shall be carefully handled when loading and unloading. Pipes shall be lifted by hoists or lowered on skidways in such a manner as to avoid shock.

B. HDPE pipe shall be protected from exposure to sunlight (unless restrained in racks) to prevent bowing of the pipe due to expansion and contraction. Such protection shall consist of canvas covering, or other material, as recommended by the manufacturer. Plastic sheets, which may allow excessive temperatures to develop where the pipe is stored, shall not be used.

1.06 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Shop drawings shall consist of manufacturer's scale drawings or catalog cuts including descriptive literature and complete characteristics, specifications, and code requirements. Shop drawings shall be submitted for the HDPE pressure pipe, type of joints, fittings, and couplings, in accordance with the specifications.

PART 2 - PRODUCTS

2.01 HIGH-DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS:

A. All HDPE pipe and fittings shall be manufactured from virgin polyethylene resin, PE 3408, and shall conform to ASTM D3350.

B. All polyethylene fittings shall have a pressure rating equal to or higher than the pressure rating of the pipe.

B. All HDPE fittings at the manholes shall have ANSI Class 150 316 stainless steel backing rings.

D. Unless noted otherwise, all pipe and fittings shall be SDR 21 rated at 80 psi.

D. All piping and valves shall be supported by the size and style supports shown in the drawings, or an approved equal.

F. Pipe shall be homogeneous throughout; free from voids, cracks, and other defects; as uniform as commercially practicable in color, density, and other physical properties.

G. Pipe surfaces shall be free from nicks, scratches, and other blemishes. The joining surfaces of pipe shall be free from gouges and other imperfections that could cause leakage at joints.

PART 3 - EXECUTION

3.01 INSPECTION BEFORE INSTALLATION:

A. Each length of pipe and each fitting shall be carefully inspected prior to being lowered into the trench. All materials not meeting the requirements of these specifications, or otherwise found defective or unsatisfactory by the Engineer, shall be rejected and immediately marked and removed from the jobsite by the Contractor.

B. Bedding, sub-bedding, and other trench conditions shall be carefully inspected prior to laying pipe. All conditions shall be made available to the Engineer for inspection.

3.02 PIPE INSTALLATION:

A. Pipe interiors, fitting interiors, and joint surfaces shall be thoroughly cleaned prior to installation. Pipes and fittings shall be maintained clean. For HDPE pipe, a clean cotton cloth shall be employed for cleaning; polyester-type materials shall not be used as they may melt during fusion procedures.

B. Pipes shall be installed in the locations and to the required lines and grades shown on the drawings and provided in these Specifications, using an approved method of control.

C. Excavations shall be maintained free of water during the progress of the Work. No pipes shall be laid in water, nor shall there by any joints made up in water.

D. If any defective pipe is discovered after being placed, removal and replacement with sound pipe will be required at no additional cost to the Owner.

3.03 HDPE PIPE JOINING:

A. HDPE pipe should be joined by butt-fusion methods, having a completely uniform and monolithic pipe interior according to the fusion joining procedures as instructed by the manufacturer.

B. Each individual performing fusion joining shall have had at least one year of experience in the use of the fusion procedure.

C. Inspection of joints shall be performed by a person qualified by training or experience to evaluate the acceptability of HDPE joints made under the applicable joining procedures.

D. The pipe sections shall be joined at ground level to a length recommended by the manufacturer, such that when pulling the pipe into position alongside the trench, maximum allowable stress is not exceeded. Use appropriate materials and equipment, as recommended by the HDPE pipe manufacturer, when pulling butt-fused pipe sections alongside the trench, to prevent pipe damage.

E. HDPE pipe boots shall be provided on all entrance piping in manholes.

~~3.04. DISINFECTION AND FLUSHING:~~

~~A. The Contractor shall disinfect the lines carrying potable water.~~

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~~B. The Contractor shall furnish all equipment and materials necessary to do the work of disinfecting, and shall perform the work in accordance with the procedure outlined in AWWA C651 and all amendments thereto.~~

~~C. In general, the procedure of disinfecting the main shall be to apply the chlorine through a tap in one end of the section and bleed it off through a tap at the other end.~~

~~D. The applied dosage shall be such as to produce a chlorine concentration of not less than 10 mg/l after a contact time of not less than 24 hours.~~

~~E. During the disinfection period, care shall be exercised to prevent contamination of water in existing mains.~~

~~F. Any temporary connection to the mains or other facilities required to accomplish the disinfection of the mains shall be at the Contractor's expense.~~

~~G. After treatment, the main shall be flushed with clean water until the residual chlorine concentration is less than 0.2 mg/l.~~

~~H. Before disposing of the water used in disinfecting and flushing water mains the Contractor shall thoroughly neutralize it through the application of a reducing agent, as referenced in AWWA C651.~~

~~I. Bacteriological sampling and testing shall be done in accordance with AWWA C651 for each main and each branch. Sampling shall be accomplished with sterile bottles treated with sodium thiosulfate, as required by Standard Methods. No hose or fire hydrants shall be used in collection of samples. A corporation stop installed on the main, with a removable copper tube gooseneck assembly, is the recommended method.~~

~~J. Bacteriological sampling and testing shall be conducted by a state certified laboratory certified for total and fecal coliform analyses of potable water.~~

~~K. Testing shall be done by a laboratory approved by the Engineer, in accordance with Standard Methods, and shall show the absence of coliform organisms. A standard plate count may be required at the option of the Engineer.~~

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SECTION 02625

DRAINAGE PIPE

PART I GENERAL

1.01 SCOPE OF WORK

a. Under this Section the Contractor shall furnish all materials, equipment, labor, transportation, facilities and all operations and adjustments required for the installation of drainage and subdrain pipe and all incidentals thereto.

b. Drainage and subdrainage pipe shall be placed in the sizes and lengths indicated on the plans.

c. Provide all coordination and pay all fees associated with installation of the sewer connection.

1.02 SHOP DRAWINGS/MANUFACTURER'S CUTS AND SPECIFICATIONS

a. The Contractor shall submit to the Landscape Architect for approval six (6) copies of all materials and equipment proposed for use indicating manufacturers' names and addresses, identifying data and expected delivery dates. No consideration will be given to partial lists submitted from time to time. Intention of using specified materials and equipment shall not relieve the Contractor from submitting the above list, nor shall submission of the list relieve him from submission of shop drawings. Any item of material or of equipment not submitted for approval on the list will not be approved unless of the exact make and characteristics specified. Refer to Submittal Section of these Specifications.

b. If the material or equipment is installed before it is approved, the Contractor shall be liable for the removal and replacement at no extra charge to the Owner, if, in the opinion of the Landscape Architect, the material or equipment does not meet the intent of the Contract Documents.

c. The Contractor shall submit the following information with all equipment shop drawings:

1. Manufacturer's certified scale drawings, cuts or catalogs, including installation details.

2. Manufacturer's specifications, including certified performance characteristics and capacity ratings.

1.03 SAMPLES

a. The Contractor shall submit all samples as requested in accordance with the provisions of the GENERAL CONDITIONS. Samples accepted will be returned to the Contractor within five (5) days and may be incorporated into the work. Samples not accepted will be returned for disposition by the Contractor.

1.04 CODES, ORDINANCES AND PERMITS

a. All work shall be performed in strict accordance with local and state codes and regulations.

1. Site utilities work shall be done in strict accordance with the Commonwealth of Massachusetts State Plumbing Code, latest edition, and all revisions thereto.

2. Any material or workmanship called for in the above-mentioned requirements, which are not specified or shown on the drawings, shall be furnished and installed by the Contractor as though same has been specifically mentioned or indicated. If the drawings and specifications are at variance with any regulations, the bidder shall notify the Landscape Architect ten (10) days before the date for submitting his bid. In many cases the drawings are in excess of the requirements in the codes and these shall be followed to the fullest. If the Contractor fails to notify the Landscape Architect at this time and installs work in variance with the above-mentioned codes and regulations, he shall assume the responsibility and the expense to rectify the installation.

3. Before commencing work, the Contractor shall obtain all permits necessary in connection with the installation of this equipment and pay fees required for same. He shall include the cost and backcharge of installing any portion of the work where performed by municipal departments or utility companies.

1.05 SUBSTITUTIONS

a. Any reference to a particular device, product, material, article or system shall be interpreted as establishing a standard of quality, design, performance, or function, and shall not be construed as limiting competition.

1.06 RECORD DRAWINGS

a. The Contractor shall submit record drawings as specified in the GENERAL CONDITIONS.

1.07 SITE VISITATION

a. It is recommended that all prospective bidders visit the job site to acquaint themselves with the general and special conditions that may be encountered which will have a bearing on labor, transportation, cutting and patching, material handling and storage, and similar items, during the prosecution of the work. Failure to do so shall not relieve him of his responsibility for properly estimating the difficulties involved in the work to be performed under this section.

1.08 REFERENCE STANDARDS

a. References herein to any technical society, organization, group or body is made in accordance with the following abbreviations.
ASTM American Society for Testing Materials

AWWAAmerican Water Works Association

Massachusetts Standard Specifications.

1.09 MATERIALS AND WORKMANSHIP

a. It is the intent of these specifications to establish quality standards for all material and equipment incorporated in the work of this section. All material and equipment installed hereunder shall be new and shall be the best of each respective kind and type. Proper care shall be exercised in handling all equipment and materials herein specified.

b. The installation shall be as indicated on the drawings and in accordance with the manufacturer's recommendations as approved by the Landscape Architect. The installation shall be accomplished by workmen skilled in this type of work.

c. All conduits, pipes, structures, etc. in use and which are damaged during excavation, whether uncovered or not and whether or not they are shown on the plans, shall be repaired at the expense of the Contractor.

d. Storage of materials by the Contractor for incorporation into the work shall be off the site for other than material that is scheduled to be installed in the time span of two (2) working days. The storage site selected by the Contractor shall be made accessible to the City inspection forces at all times during normal working hours.

PART 11-MATERIALS

2.01 GENERAL

a. Drawings and specifications are intended to supplement and explain each other. Materials not specifically mentioned in the specifications shall be as indicated on the drawings. Where conflicts occur between the drawings and/or specifications, or within either document itself, the item or arrangement of better quality, greater quantity or higher cost shall be included in the Contractor's bid. Where no specific kind of quality of material is given, a first-class standard article shall be furnished.

2.02 DRAINAGE PIPE

a. PVC Pipe for use as storm drainage lines shall contain integrally belied and spigot joints. The standard dimension ratio (SDR) of all pipe and fittings shall not exceed 35. Standard pipe lengths shall be twenty (20) feet unless otherwise approved. All necessary glues, gaskets and fittings shall be furnished in order to make the work complete and acceptable to the Engineer.

b. Furnish pipe in the sizes indicated on the plans and/or details.

2.03 CRUSHED STONE

a. Refer to Specification Excavation, Borrow and Backfill Section of these specifications.

2.04 APPURTENANCES

a. Provide all appurtenance and incidentals necessary to make the sewer pipe installation and connection complete and acceptable, including all materials necessary for the excavation, backfill, compaction and restoration of right-of-way pavements, sidewalks and curblines.

PART III - EXECUTION

3.01 PIPE INSTALLATION

a. Prior to excavating trenches the Contractor shall field verify all existing inverts and inform the Landscape Architect of any discrepancies. Record these inverts on Record Drawings.

b. The trench for the pipe shall be excavated to the required line and grade and be of sufficient width to permit thorough tamping of the fill material under the haunches and around the pipe. Soft or unsuitable material encountered below the normal bedding line of the pipe shall be removed as directed, replaced with selected

material, gravel or crushed stone and thoroughly compacted. The bottom of the trench shall be shaped to conform to the curvature of the pipe. This bed shall also be excavated to accommodate the bells of pipes.

c. The pipe shall be laid true to the specified lines and grades where shown on the plans and as directed. The bell end shall be toward rising grade and each section of pipe shall have a firm bearing throughout its length. Material placed around and under the pipe shall be free of stones larger than three (3) inches in diameter.

d. No load greater than three (3) tons shall be moved over any pipe until a fully-compacted backfill of at least two (2) feet has been placed over the top of the pipe. This minimum will be increased to three and one-half (3-1/2) feet for a forty thousand (40,000) pound single wheel load and to four (4) feet for a sixty thousand (60,000) pound single wheel load. The required fully-compacted backfill cover shall be placed a minimum of fifty (50) feet on both sides of the pipe crossing. However, compliance with this requirement is not to be construed as relieving the Contractor of any responsibility concerning damage to the pipe.

e. Backfill for pipes shall conform to Sections 2.04 of these Specifications and shall be placed between the pipe and the walls of the trench in layers not exceeding six (6) inches in depth and thoroughly compacted. Each layer, if dry, shall be moistened and then compacted by rolling or by tamping with mechanical rammers. Compaction with iron hand tampers having a tamping face not exceeding twenty-five *(25)* square inches in area may be allowed only after permission has been given by the Landscape Architect. Special care shall be taken to thoroughly compact the fill under the haunches of the pipe. This method of filling and compacting shall be continued until the material is level with the top of the pipe. The remainder of the filling shall consist of suitable material placed in successive layers not more than six (6) inches in depth. Each layer shall be thoroughly compacted in accordance with AASHTO-T99 Standard Proctor Test.

f. Any pipe showing settlement after laying or which is not in true alignment or is otherwise unsatisfactory before final acceptance of the work shall be taken up and replaced or relayed by the Contractor without additional compensation.

3.02 WATER REMOVAL

a. If water is encountered during construction, provisions must be made to remove the water by sheeting and pumping as required, or laying the pipe with a crushed stone bed so that the laying of pipe and other work can be done under stable conditions, all in accordance with Section 2.04 of these Specifications.

END OF SECTION

SECTION 02632

ADJUSTMENT OF STRUCTURES (IF REQUIRED)

PART I - GENERAL

1.01 SCOPE OF WORK

a. The work under this section shall consist of removing the castings, adjusting the masonry, and resetting the castings of existing structures, six (6) inches or less in grade. The contractor shall furnish all labor, materials, equipment and transportation required to adjust existing manholes, catch basins, and other surface structures to be set at new grades.

PART II - MATERIALS

1.01 BLOCKS FOR CIRCULAR STRUCTURES

a. Blocks for circular structures shall conform to ASTM C-l39. Minimum thickness shall be eight (8) inches. Block surfaces shall be curved to the required radius to produce cylindrical structures. The minimum compressive strength for an average of three block units shall be 2,500 psi and the maximum water absorption rate shall be ten pounds per cubic foot.

1.02 BRICK FOR ADJUSTMENT COURSES

a. Brick for adjustment courses and other application shall conform to ASTM C-32.
b. Brick for inverts and shelves shall be graded SS. Brick for other purposes shall be grade MS and better.
c. Size of brick shall be eight inches (8”) long by three and three-quarter inches (3 **%“)** wide, by two and one-quarter inches (2 ¼”) deep. All dimensions shall be nominal.

1.03 MORTAR

a. See Section 02630 – Drainage Structures for Mortar specifications.

PART II - EXECUTION

a. Structures to be adjusted shall be carefully excavated to the depth required to achieve the proper adjustments or to receive the appropriate filler pieces as required and securely held in place during backfilling operations. The backfill shall be thoroughly tamped in placed and the cover set to finished grade.

b. The Contractor shall be held responsible for the protection of all castings and valves or other mechanical items. Any frames, grates or covers or operating items damaged in any manner during the progress of the construction shall be replaced by the Contractor at his expense.

c. Transportation, delivery and/or installation of all salvaged castings or mechanical items shall be included in the contract price.

END OF SECTION

SECTION 02657

STREET PLATES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish, install, maintain, and remove street plates over street openings where, in the opinion of the Engineer, traffic requires unrestricted use of the street. At such locations work may be suspended during periods of heavy traffic, to insure the public safety.

B. All street openings ordered decked by the Engineer shall be sheeted and braced regardless of depth unless otherwise instructed by the Engineer. The Contractor shall furnish, put in place, and maintain such sheeting and bracing required to support the sides of the excavation and prevent loss of ground which could damage or delay the work or endanger adjacent structures. If the Engineer is of the opinion that at any points sufficient or proper supports have not been provided, he may order additional supports placed at the expense of the Contractor. Compliance with such orders shall not relieve the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed they shall be immediately filled and rammed.

C. If street plates is placed by the Contractor over any opening when not so ordered by the Engineer, all costs of street plates at such locations, maintaining traffic and safeguarding open excavations shall be included in the price bid for cleaning and lining water mains.

D. Before the street plates and supporting systems are placed, the Contractor shall submit to the Engineer detailed plans showing the structure he proposes to use. The construction shall be steel. The street plates and supports shall be of sufficient strength to carry a load of 200 psi over the entire deck area or 10 tons on axle with wheels five (5) feet on centers without exceeding the allowable stress specified in the ASSHTO Standard Specifications for Highway and Bridges.

E. Street plates placed at an opening shall remain over the open excavation until backfilling is complete except to provide access while cleaning or lining the pipe, or for the removal and replacement of valves, or for other work under this Contract directed by the Engineer.

1.02 RELATED WORK NOT INCLUDED

A. Do not enter or occupy private land outside of easements, except by permission of the land owner.

PART 2 PRODUCTS

A. Materials and structures shall conform to the requirements of Paragraph 1.01 Scope of Work, this section.

PART 3 EXECUTION

A. Execution of street plates work shall conform to the requirements of Paragraph 1.01 Scope of Work, this section.

END OF SECTION

SECTION 02900

LANDSCAPING

PART! GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and service required and complete all planting and related landscaping work indicated on the Drawings and as specified herein, including but not necessarily limited to the following:

1. Supplying of loam for all plant pits. Be responsible for all topsoil preparation, testing, conditioning and fertilization and shall ensure the overall quality of the material. Loam stockpiled from other construction operations under this Section may be used.

2. Excavation of pits for trees.

3. Furnishing and planting trees as shown on the Drawings.

4. Supplying accessory materials including guying and staking of all trees.

5. Pruning of plant materials as specified and as approved by the Engineer

6. Supplying and spreading mulch for tree pits as specified herein.

7. Maintenance and guarantee.

8. Final cleanup and all other work required to complete the job in accordance with the Drawings and as specified herein.

B. The planting work shall be performed by a landscape contractor who is fully experienced in projects of this scope and whose main business is landscaping. Selection of the landscape contractor shall be subject to the approval of the Engineer.

1.02 RELATED WORK

A. Site preparation is included in Section 02100

B. Learning and seeding is included in Section 02930.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, samples of all materials for inspection and approval.

L04 REFERENCE STANDARDS

A. American Association of Nurseryman (AAN), American Standard for Nursery Stock, latest edition.

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

PART 2 PRODUCTS

2.01 LOAM

A. Loam shall be as specified in Section 02930.

B. No loam shall be delivered or spread in a frozen or muddy condition.

2.02 FERTILIZER, SOIL. AND PLANT C0NDITIONERS

A. Fertilizer shall be commercial mixed free flowing granules or pelleted fertilizer, 10-10-10 (N-P2O5-K2O) with at least 40 percent of the nitrogen in the fertilizer to be slowly available (organic) form. Fertilizer shall be delivered to the site in original unopened containers each showing the manufacturer's guaranteed analysis conforming to applicable state fertilizer laws.

B. Peat Moss: Shall be domestic brown sphagnum peat, free of woody materials and of mineral matter such as sulfur and iron and shall have a pH value between 4 and 5. Deliver air dry.

C. Weed Retarder: Shall be "Garden Weed " by Am. Chem. Products Inc. or equal, delivered in manufacturer's containers and used according to manufacturer's instructions.

D. Anti-desiccant: Shall be an emulsion which provides a protective film over plant surfaces to help retain moisture, but permeable enough to permit transpiration. Anti-desiccant shall be delivered in the manufacturer's containers and shall be mixed with water in proportions recommended by manufacturer. Anti-desiccant shall be "WILT-PRUF' available from Nursery Specialty Products Inc, Greenwich, CT or equal.

E. Bone Meal: Shall be commercial raw bone meal$_1$ finely ground, having a minimum analysis of 4 percent nitrogen and 20 percent phosphoric acid.

F. Mulch: Shall be Shredded Pine Bark Mulch consisting of pine bark strips no longer than 2-in in any dimension, free of wood chips, stones or other undesirable matter with a pH range between 4 and 5.

G. Water used in this work shall be furnished by the Owner at a nearby location and shall be suitable for irrigation and free from ingredients harmful to plant life. Hose, portable tank storage, and other watering equipment required for the work shall be furnished by the Contractor. Contractor shall not waste water.

2.03 ACCESSORY MATERIALS

A. Stakes: Shall be used for supporting all trees and shall be of sound wood, uniform in size, reasonably free of knots and capable of standing in the ground at least 2 years. Stakes shall be treated with a non-toxic preservative stain with a rich dark brown color. A sample shall be provided for approval by the Engineer. Stakes shall be 2 by 4 and not less than 8-ft in length.

B. Wire: For tree staking shall he Double No. 10 gauge galvanized soft steel wire, twisted.

C. Hose: To encase wires shall be two-ply fiber-bearing black rubber garden hose, not less than 1/2-in inside diameter and a minimum of 8-in in length.

2.04 PLANT MATERIALS

A. Furnish and install trees as shown on the Drawings. Plants shall be nursery grown under climatic conditions similar to those in the locality of the project and shall conform to the variety and sizes indicated. Plants shall conform also to the indicated botanical names and standards of size, culture and quality for the highest grades and standards as adopted by the AAN in the American Standard for Nursery Stock

B. All plants shall he freshly dug. No heeled-in plants or plants from cold storage shall be used All plants shall be typical of their species or variety and shall have a normal habit of growth. Plants shall be sound, healthy and vigorous, well-branched and densely foliated when in leaf; shall be free of disease, insect pests, eggs or larvae and shall have healthy, well-developed root system. All parts of the plant shall tie moist and shall show active green cambium when cut.

C. The height of the trees, measured from the crown of the roots to the top of the top branch, shall not be less than the minimum size designated. The trunk of each tree shall he a single trunk growing from a single unmutilated crown of roots. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety. The trunk shall be free from sun-scald, frost cracks, or wounds resulting from abrasions, fire, or other causes. No pruning wounds shall be present having a diameter of more than 2-in and such wounds must show vigorous bark on all edges.

2.05 INSPECTION OF PLANT MATERIALS

A. Inspection of plants before digging shall be at the option of the Engineer. Be present if requested by Engineer, for inspection of plants at nursery.

B. Plants shall be subjected to inspection and approval upon delivery for conformity to specified requirements as to quality, size and variety. Such approval shall not impair the right of inspection and rejection during the progress of the work.

C. Plants shall be accompanied by State Nursery inspection certificates,

PART 3 EXECUTION

3.01 DIGGING, HANDLING AND PROTECTION OF PLANTS

A. Plants shall be with firm, natural bath of earth, of sufficient diameter and depth to include most of the fibrous roots and conforming to the standards of AAN. No plants will be accepted with plastic burlap or if the ball is cracked or broken except upon special approval of the Engineer.

B. Roots or balls of plants shall be adequately protected at all times from sun and from drying winds.

C. Plains which cannot be planted immediately upon delivery shall be set on the ground and be well-protected with soil, wet moss, bark mulch, or other acceptable material.

D. No plant shall be bound with wire or rope at any time so as to damage the bark or break branches.

3.02 PLANTING SEASONS

A. Planting shall only be done during the periods within the seasons which sic normal for such work as determined by weather and by locally acceptable practice and which are approved by the

Engineer. If planting occurs between June 15th and August 15th or during periods of drought, irrigation shall be furnished as directed by the Engineer

3.03 PLANTING OPERATIONS

A. Planting: Shall be done by experienced workmen familiar with planting procedures under the supervision of a qualified foreman.

B. Stake out locations of and secure the Engineer's approval before excavating plant pits.

C. All plant pits shall be excavated with sloping sides as shown on the Drawings.

D. Tree Pits: Shall be 2-ft greater in diameter and the root ball of the tree and sufficiently deep to allow for a 1-ft thick layer of compacted loam and peat moss beneath the ball.

E. Plant backfill mixture: Loam for backfilling all tree pits shall have 3 lbs of fertilizer and 1 lb of bone meal per tree and 1 lb of fertilizer and 1/2 lb of bone meal per shrub, incorporated with peat moss at a ratio of 2 parts loam to 1 part peat moss.

F. Plants shall be set in center of pits plumb and straight and at such a level that after settlement the crown of the plant ball will be at the surrounding finished grade.

1. When balled and burlapped plants are set, loam shall be compacted around bases of balls to fill all voids All burlap, ropes or wires shall be removed from the top 1/3 of [be balls. Plastic burlap shall be completely removed.

G. Loam shall be backfilled in layers of not more than 9-in and each layer watered sufficiently to settle before the next layer is put in place.

H. Loam around balls shall be thoroughly compacted and watered. Immediately after the plant pit is backfilled, a saucer or shallow basin slightly larger than pit shall be formed with a ridge of soil to facilitate and contain watering.

I. Spray all plants with anti-desiccant, including trunk, branches, foliage and buds. Follow manufacturer's instructions and recommendations for application of anti-desiccant.

J. Relocated plants shall be removed and relocated according to AAN standards and guaranteed for 1 year after installation.

3.04 GUYING ANDSTAKING

A. Trees shall be inspected by the Engineer for injury to trunks, evidence of insect infestation and improper pruning before guying and staking.

B. All evergreen trees 510 6-li in height and larger shall be staked in accordance with the tree staking detail.

3.05 PRUNING AND MULCHING

A. Each plant shall be pruned at the time of planting in accordance with AAN Standards to preserve the natural character of the plant and as directed by the Engineer

B. Pruning shall be done with clean, sharp tools.

C. Immediately after planting operations are completed, all tree pits shall be covered with a 3-in layer of the specified mulch and shrub and ground cover beds shall be treated with weed retardant in accordance with manufacturer's instructions and covered with 3-in layer of mulch as indicated on the Drawings.

3.06 OBSTRUCTIONS BELOW GROUND

A. In the event that underground boulders, underground construction work, or obstructions are encountered in any pit excavation work tinder this Contract, alternate locations may be selected by the Engineer at no additional cost to the Owner.

3.07 WATERING

A. Plantings must be flooded with water twice within the first 24 hours of the time of planting and not less than twice per week until provisional acceptance.

B. Transporting and applying suitable water for planting and maintenance will be the responsibility of the Contractor. The Contractor shall furnish his/her own hose connections, water storage tank and other watering equipment.

3.08 MAINTENANCE

A. Maintenance shall begin immediately after each plant is installed. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated and otherwise maintained and protected until provisional acceptance. Settled plants shall be reset to proper grade and position, planting saucer restored and dead material removed. Guys shall be tightened and repaired. Defective work shall be corrected as soon as possible after it becomes apparent and as weather and season permit.

B. Upon completion of planting and prior to provisional acceptance, remove from the site excess soil and debris and repair all damage resulting from planting operations

C. An 8 week maintenance period for all plantings shall begin after the final tree is installed. The maintenance period shall occur during the growing season, May 1 to October 15.

3.09 INSPECTION AND PROVISIONAL ACCEPTANCE

A. The Engineer will inspect all work for provisional acceptance, at the end of the S week maintenance period, upon the written request of the Contractor received at least 10 days before the anticipated date of inspection.

B, Furnish full and complete written instructions for maintenance of the planting to the Owner at the time of provisional acceptance

C. After all necessary corrective work has been completed and maintenance instructions have been received by the Owner, the Engineer will certify in writing the provisional acceptance of the planting.

3.10 GUARANTEE PERIOD AND REPLACEMENTS

A. All plants, including relocated material shall be guaranteed for not less than one full year from the time of provisional acceptance.

B. At the end of this period, any plant that is missing, dead, not true to name or size as specified, or not in satisfactory growth, as determined by the Engineer, shall be replaced. In case of any question regarding the condition and satisfactory establishment of a rejected plant, the Engineer's decision is final. Furnish a guarantee for all replacement plants for at least one full growing season.

C. All replacements shall be plants of the same kind and size as specified. They shall be furnished and planted as specified herein. The cost of replacement shall be borne by the Contractor except where it can be definitely shown that loss resulted from vandalism.

3.11 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the guarantee period, inspection will be made by the Engineer upon written request submitted by the landscape contractor at least 10 days before the anticipated date

B. After all necessary corrective work has been completed, the Engineer will certify in wilting the final acceptance of the planting.

END OF SECTION

SECTION 02901

MISCELLANEOUS WORK AND CLEANUP

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform the miscellaneous work not specified in other sections but obviously necessary for the proper completion of the work as shown on the Drawings.

B. When applicable, perform the work in accordance with other related Sections. When no applicable specification exists, perform the work in accordance with the best modern practice and/or as directed by the Engineer.

C. The work of this Section includes, but is not limited to, the following:

1. Crossing and relocating existing utilities.

2. Restoring driveways and sidewalks.

3. Cleaning up.

4. Incidental work.

5. Job photographs.

6. Protection and/or removal and reinstallation of signs, lampposts and mailboxes.

7. Restoration and replacement of curbing.

8. Connection to work by others

9. Protection and bracing of utility poles.

10. Restoring easement and right-of-ways.

11. Temporary facilities

12. Traffic control plans and devices

13. Traffic control loops

14. Complying with construction permits

D. Submit to the Engineer, in accordance with Article 2.05B of the General Conditions, a breakdown of the lump sum for miscellaneous work and cleanup including the above items as a minimum. This breakdown shall be subject to the approval of the Owner and when so approved

shall be the basis for determining progress payments and for negotiations of change orders, if required.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials required for this Section shall be the same quality of materials that are to be restored. Where possible, re-use existing materials that are removed.

PART 3 EXECUTION

3.01 CROSSING AND RELOCATING EXISTING UTILITIES

A. Perform any extra work required in crossing culverts, water courses, including brooks and drainage ditches, storm drains, gas mains, water mains, electric, telephone, gas and water services and other utilities. This work shall include: bracing, hand excavation, backfill (except screened gravel) and any other work required for crossing the utility or obstruction not included for payment in other items in the Bid Form. Notification of Utility Companies shall be as specified in Section 01046.

B. In locations where existing utilities cannot be crossed without interfering with the construction of the work as shown on the Drawings, remove and relocate the utility as directed by the Engineer or cooperate with the Utility Companies concerned if they relocate their own utility.

C. At pipe crossings and where designated by the Engineer, furnish and place screened gravel bedding so that the existing utility or pipe is firmly supported for its entire exposed length. The bedding shall extend to the mid-diameter of the pipe crossed. Payment for screened gravel at pipe crossings will be made according to the unit price bid established in the Bid Form.

3.02 RESTORING DRIVEWAYS AND SIDEWALKS

A. Existing public and private driveways disturbed by the construction shall be replaced. Paved drives shall be repaved to the limits and thicknesses existing prior to construction.

B. Existing public and private sidewalks disturbed by the construction shall be replaced with sidewalks of equal quality and dimension.

3.03 CLEANING UP

A. Remove all construction material, excess excavation, buildings, equipment and other debris remaining on the job as a result of construction operations and restore the site of the work to a neat and orderly condition.

3.04 INCIDENTAL WORK

A. Do all incidental work not otherwise specified, but obviously necessary to the proper completion of the work as shown on the Drawings and as specified herein.

3.05 PHOTOGRAPHS OF PROJECT

A. Prior to the excavation in any street or cross country area, document existing conditions using construction photographs as detailed in Section 01300.

B. The photographs shall be retained in a secure location throughout the duration of the project and shall then be turned over to the Owner.

3.06 REMOVAL AND REPLACEMENT OF SIGNS, LAMPPOSTS AND MAILBOXES

A. Existing signs, lampposts and mailboxes which may be damaged or removed during the course of installing the new pipelines shall be reinstalled in a vertical position at the same location from which they were removed. Replace damaged items with items of equal or better quality than the damaged items. Provide a concrete anchor as necessary, to ensure a rigid alignment. Exercise care in the reinstallation of all items to prevent damage to the newly installed pipelines.

3.07 RESTORATION AND REPLACEMENT OF CURBING

A. Existing concrete, bituminous, timber or granite curbing shall be protected. If necessary, curbing shall be removed and replaced after backfilling. Curbing which is damaged during construction shall be replaced with curbing of equal quality and dimension at the Contractor's expense. Granite curbing removed and reset shall conform to Section 580.64 of the Massachusetts DPW Specifications. Joints between sections shall be pointed as required after resetting. Bituminous berms shall conform to Section 501 of the Mass DPW Specifications.

3.08 CONNECTION TO WORK BY OTHERS

A. The Owner may utilize City personnel to connect existing water services to the new pipe. It will be necessary for the Contractor to plan his/her work and cooperate with the Owner insofar as connections required to each other's work and to prevent any interference and delay for which he/she shall receive no other compensation than that agreed upon for this Item.

3.09 PROTECTION AND BRACING OF UTILITY POLES

A. Make all arrangements with the proper utility companies for bracing and protection of all utility poles that may be damaged or endangered by the operations. Work under this item shall include the related removal and reinstallation of guy wires, or support poles whether shown on the Drawings or not.

3.10 RESTORING EASEMENTS AND RIGHT-OF-WAYS

A. Be responsible for all damage to private property due to the operations. Protect from injury all walls, fences, cultivated shrubbery and vegetables, fruit trees, pavement, underground facilities, such as water pipe, or other utilities which may be encountered along the route. If removal and replacement are required, it shall be done in a workmanlike manner so that replacement is equivalent to that which existed prior to construction.

B. Existing lawn and sod surfaces damaged by construction shall be replaced. Cut and replace the lawn and sod, or restore the areas with an equivalent depth and quality of loam, seed and fertilizer as necessary to produce a stand of grass at least equal to that existing prior to construction. These areas shall be maintained and reseeded, if necessary, until all work under

this Contract has been completed and accepted. Any additional work required to restore property to the original condition shall be performed.

C. Existing trees, shrubs, plants and bushes outside of easements shall be fully protected as specified in Section 01046. The work shall also include removing and replacing those trees, shrubs and bushes as indicated on the Drawings. It shall include the careful excavation of the root ball which shall be wrapped with burlap while out of the ground. Replant them after backfilling the trench, stake them in an upright position and shall periodically water replanted trees, bushes and shrubs. Be fully responsible for ensuring that any and all trees, bushes and shrubs removed and replanted "take" and return to a viable state. Any replanted item that fails to "take" or that is so damaged as to be unsuitable for replanting shall be replaced, at no additional cost to the Owner, with a tree, bush or shrub equal to the one removed.

D. The Engineer will inspect all work for provisional acceptance upon the written request received at least 10 days before the anticipated date of inspection.

1. After all necessary corrective work has been completed, the Engineer will certify in writing the provisional acceptance of the planting.

E. All plants shall be guaranteed for not less than 1 full year from the time of provisional acceptance.

1. At the end of this period, any plant that is missing, dead, or not in satisfactory growth, as determined by the Engineer, shall be replaced.

2. All replacements shall be plants of the same kind and size. They shall be furnished and planted as specified herein. The cost of replacement shall be borne by the Contractor except where it can be definitely shown that loss resulted from vandalism or the Owner's failure to maintain planting as instructed.

3. At the end of the guarantee period, inspection will be made by the Engineer upon written request submitted by the landscape contractor at least 10 days before the anticipated date.

4. After all necessary corrective work has been completed and tree staking has been removed, the Engineer will certify in writing the final acceptance of the planting.

3.11 TEMPORARY FACILITIES

A. Furnish, install, maintain and remove all temporary facilities required for construction or called for in this Section.

3.12 TRAFFIC CONTROL PLAN AND DEVICES

A. The Contractor shall develop, implement and furnish and install a traffic control plan and devices that meet the requirements of the appropriate state agencies on State roadways and as specified in Section 1046.

3.13 TRAFFIC LOOPS

A. The Contractor shall replace all traffic loops detectors and conduits disturbed by construction during this project. The loop detector lead shall be encased by metallic shield and insulated, and

all conduit openings shall be filled with duct seal as approved by the Engineer.

3.14 PERMITS

A. The Contractor is responsible for complying with all permits associated with the project.

END OF SECTION

SECTION 03301

CONCRETE AND REINFORCING STEEL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform all concrete work as ordered by the Engineer, as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01300, shop drawings showing locations of all joints and accessories. Submit full shop drawings and bar schedules for reinforcing steel. Submit technical data on all materials and components. Submit other data specified herein when required.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

2. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

3. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

4. ASTM C33 - Standard Specification for Concrete Aggregates

5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

6. ASTM C150 - Standard Specification for Portland Cement.

7. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cement shall be domestic portland cement conforming to ASTM C150, Type II.

B. Fine aggregate shall be washed natural sand conforming to ASTM C33.

C. Coarse aggregate shall be well graded crushed stone conforming to ASTM C33, size No. 67 unless otherwise directed.

D. Water shall be potable, clean, and free from deleterious amounts of acids, alkalis, oils, or organic matter.

E. No admixtures shall be used unless approved by the Engineer in writing.

F. Reinforcing steel shall be deformed, intermediate grade, steel bars conforming to ASTM A615, Grade 40. Rail-steel bars will not be permitted in the work.

G. Welded steel wire fabric shall be sized as shown and be in accordance with ASTM A185.

H. Concrete aggregates which have been shown by test or actual service to produce concrete of the required strength, durability, watertightness and wearing qualities may be used where authorized by the Engineer.

I. Chemical hardener shall be Lapidolith by Sonneborn; Hornolith by A.C. Horn; Penalith by W.R. Meadows or equal fluosilicate base material.

J. Nonshrink grout shall be Masterflow 713 by the Master Builders Company; Euco N-S by Euclid Chemical Co.; Five Star Grout by U.S. Grout Corp. or equal.

K. Bonding compound shall be Sikadur Hi Mod by Sika Corp., similar by Euclid Chemical Corporation; Master Builders or equal.

L. Sealant shall be Sikaflex 1a by Sika Corp.; Vulkem 116 by Master Mechanics or equal.

M. Premolded joint filler shall be self-expanding cork conforming to ASTM D1752, Type III, by A.C. Horn, Inc; W.R. Meadows, Inc. or equal.

N. Bond Breaker. Provide tape or coating (except where tape is specifically shown) as approved.

1. Bond breaker tape adhesive-backed glazed butyl or polyethylene tape which will satisfactorily adhere to the premolded joint filler or concrete surface as required. The tape shall be the same width as the joint.

2. Bond breaker coating - a nonstaining type bond prevention coating, Williams Tilt-up Compound by Williams Distributors, Inc.; Silcoseal 77, by SCA Construction Supply Division; Superior Concrete Accessories or equal.

2.02 CONCRETE QUALITY

A. Unless otherwise specified or directed, concrete shall be designed for a minimum allowable compressive strength of 3,500 psi at 28 days. Slump shall preferably be between 2 and 4-in and shall not exceed 5-in. Water shall be kept to a minimum to obtain concrete which is as dense and watertight as possible. The maximum water content shall be 6 gallons per 94 lb sack and the minimum cement factor shall be 5.7 (94 lb) sacks per cubic yard. The above ratios shall be revised for sacks of cement weighing different from 94-lbs per sack.

B. Concrete required for State Highways shall be Class F (3500 psi) High Early Strength in accordance with the Standard Specifications for Highways and Bridges, 1973 Edition, by the Commonwealth of Massachusetts Department of Public Works.

2.03 MIXING CONCRETE

A. Ready-mix concrete shall conform to ASTM C94 and the requirements herein, or as otherwise approved by the Engineer. If ready-mix concrete is to be used, the manufacturer shall furnish a statement to the Engineer for his approval giving the dry proportions to be used, with evidence that these will produce concrete of the quality specified.

B. Concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged. The mixer shall be rotated at a speed recommended by the mixer manufacturer and mixing shall be continued for at least 1-1/2 minutes after all the materials are in the mixer. Concrete shall be placed within 1-1/2 hours of the time at which water was first added, otherwise it shall be rejected. Concrete which has been remixed or retempered, or to which an excess amount of water has been added, shall also be rejected.

2.04 FORMS

A. Forms shall be free from roughness and imperfections, substantially watertight and adequately braced and tied to prevent motion when concrete is placed. No wooden spreaders will be allowed in the concrete.

B. Wire ties will not be allowed. Metal ties or anchorages which are required within the forms shall be so constructed that the metal work can be removed for a depth of at least 1-in from the surface of the concrete without injury to such surface by spalling or otherwise. Forms shall be thoroughly cleaned before using and shall be treated with oil, or other approved material.

PART 3 EXECUTION

3.01 REINFORCING STEEL

A. Reinforcement shall be accurately fabricated to the dimensions shown. Stirrups and tie bars shall be bent around a pin having a diameter not less than two times the minimum thickness of the bar. Bends for other bars shall be made around a pin having a diameter not less than six times the minimum thickness except for bars larger than 1-in, in which case the bends shall be made around a pin of 8-bar diameters. All bars shall be bent cold.

B. Reinforcement shall be shipped to the work with bars of the same size and shape fastened in bundles with metal identification tags giving size and mark securely wired on. The identification tags shall be labeled with the same designation as shown on submitted bar schedules and shop drawings.

C. All bars shall be stored off the ground and shall be protected from moisture and be kept free from dirt, oil, or injurious coatings.

D. Unless otherwise shown, splices in reinforcement shall be lapped not less than 24 diameters. All bar splices shall be staggered wherever possible. When splicing bars of different diameters, the length of lap is based on the larger bar.

E. Splices in welded wire fabric shall be lapped not less than 1-1/2 courses or 12-in, whichever is greater. Wire fabric splices shall be tied together with wire ties spaced no more than 24-in on center.

F. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt and other coatings, including ice, that reduce or destroy bond. Where there is delay in depositing concrete after reinforcement is in place, bars shall be reinspected and cleaned when necessary.

G. Reinforcement which is to be exposed for a considerable length of time after being placed shall be painted with a heavy coat of cement grout, if required.

H. In no case shall any reinforcing steel be covered with concrete until the amount and position of the reinforcements have been checked by the Engineer and his permission given to proceed with the concreting.

3.02 PREPARATION OF SURFACES

A. All surfaces to receive bonding compound shall be prepared in accordance with the manufacturer's recommendations before the application of the bonding compound.

3.03 PLACING CONCRETE

A. Reinforcement, where required, shall be accurately placed in exact positions shown, shall be secured against displacement with annealed iron wire ties or suitable clips at intersections and shall have a clear space of 2-in between the steel and face of forms unless otherwise indicated. Wire ties passing through the forms for the purpose of holding the steel in proper position will not be allowed. Concrete blocks with wire ties cast therein may be used where approved by the Engineer for the purpose of maintaining the clearance between reinforcement and forms. Reinforcing bars shall be free from rust, scale, dirt, grease and injurious contaminants.

B. No concrete shall be placed until forms and method of placement have been approved by the Engineer. Before depositing concrete, all debris, foreign matter, dirt and water shall be removed from the forms. The surface of concrete previously placed, such as manhole base or horizontal construction joint, shall be cleaned and brushed with cement paste. Concrete shall not be placed in water or submerged within 24 hours after placing, nor shall running water be permitted to flow over the surface of fresh concrete within 4 days after its placing.

C. High frequency mechanical vibrators shall be used to the extent necessary to obtain proper consolidation of the concrete. Care shall be taken to avoid segregation of aggregates by excessive vibration. Concrete adjacent to forms and around pipe stubs shall be carefully spaded or rodded.

D. Concrete walls shall be deposited in one continuous operation with concrete brought up evenly on all sides. Chutes shall be of metal, "U" shaped, and provided with a baffle plate at the end, if necessary, to prevent segregation of materials. Chutes shall be placed at an angle of not less than 25 degrees, nor more than 45 degrees from horizontal and they shall be kept clean and free from hardened concrete.

E. No concrete shall be mixed or placed during freezing weather without explicit permission. When placing concrete when air temperature is below 40 degrees F, the water, sand and gravel shall be heated so that the temperature of the concrete will be at least 50 degrees F. This temperature shall be maintained for 72 hours after placing. No concrete shall be placed on frozen ground.

3.04 CONCRETE ENCASEMENTS AND THRUST BLOCKS

A. Concrete encasements shall be placed as shown and as directed by the Engineer. Backfill shall not be placed on the concrete until permitted by the Engineer.

B. The backs of thrust block anchors shall be placed against undisturbed earth. The sides of thrust blocks shall be formed. Minimum bearing area shall be as called out on the Drawings or as determined by the Engineer. Felt roofing paper shall be placed to protect pipe joints. Concrete shall not be placed over bolts or nuts, or to prevent the removal of joints.

3.05 GROUTING

A. Perform grouting as shown and elsewhere as required.

3.06 SEALANT

A. Sealant shall be installed in clean recesses at the locations shown. The application of the sealant shall conform to all the manufacturer's recommendations including temperature, moisture, primer, primer cure time and joint and recess preparation. Masking tape shall be applied to each side of the joint prior to the installation of the sealant and removed afterwards along with any spillage to leave a sealant installation with straight edges and a neat orderly appearance. Gray colored sealants shall be used unless otherwise specified as shown.

3.07 BONDING COMPOUND

A. Bonding compound shall be applied to the locations shown. The application of the bonding compound shall conform to all manufacturer's recommendations.

3.08 PREMOLDED JOINT FILLER

A. Premolded joint fillers shall be installed at all locations shown.

3.09 BOND BREAKER

A. Bond breakers shall be provided at the locations shown. Bond breaker tape shall be used at joints to separate the sealant from premolded joint filler and to separate the sealant from concrete at the bottom of the sealant. Tape for these installations shall be the same width as the joint or sealant recess.

3.10 MISCELLANEOUS WORK

A. All bolts, anchors, miscellaneous metals or other sleeve steel work required to be set in the concrete forms for attachment of masonry, structural and mechanical equipment shall be set or installed under this Division. Be fully responsible for the setting of such materials, in the forms and shall correct all such not installed in a proper location or manner at his own expense.

B. Electric conduits shall be installed in the concrete as required by the Drawings and as specified herein. Outlet boxes and fixtures shall be located in reference to the final floor, wall or ceiling finish and shall be so secured that they will not be displaced by concrete placing.

C. Pipes or conduits for embedment, other than those merely passing through shall not be larger in outside diameter than 1/3 the thickness of the slab, wall or beam in which they are embedded, unless indicated on the Drawings, nor shall they be spaced closer than 3 diameters on center, nor so located as to unduly impair the strength of the construction. The Engineer shall approve the location of all conduits and fixtures.

END OF SECTION