The City of Waltham

Invites
Interested Parties
To propose the best offer and or bid
For the service or product herewith described:

STORM DRAIN IMPROVEMENTS PROJECT-WESTON/VERNON STREET AREA
(BID ISSUE #2)
WALTHAM, MASSACHUSETTS

The bid opening will be held: October 1, 2014 at 10:00 AM

Phone: 781-314-3244, Fax: 781-314-3245

Invitation to Bid

The City of Waltham
Purchasing Department

REQUEST FOR BID (RFB)

Under the rules of M.G.L. Chapter 30, 39M the Chief Procurement Officer of the City of Waltham Purchasing Department hereby requests sealed bids for:

STORM DRAIN IMPROVEMENTS PROJECT-WESTON/VERNON STREET AREA WALTHAM, MASSACHUSETTS

Price Proposals will be received at the office of the Purchasing Agent, City Hall, 610 Main Street, Waltham MA 02452, until,

OCTOBER 1, 2014 at 10:00 AM

At which time and place the bids will be publicly opened and read.

Specifications and information available on line by visiting the Waltham Purchasing Department web site at www.city.waltham.ma.us/open-bids

BIDS MUST BE SIGNED AND ENCLOSED IN A SEALED ENVELOPE AND MARKED:

BID FOR: STORM DRAIN IMPROVEMENTS PROJECT - WESTON/VERNON STREET AREA

A 5% Bid Bond or Certified Check must accompany each bid submitted and made payable to, and become the property of the City of Waltham, if the successful bidder refuses or neglects to comply with the terms of the Contract.

If the Bidder is a corporation, state your correct corporate name and State of incorporation. If Bidder is a partnership, state names and addresses of partners. If Bidder is a trust or other legal entity, state correct names and addresses of trustees or names and address of those legally authorized to bid and enter into contracts.

EXCEPTION OR ALTERNATES TO SPECIFICATIONS, TERMS OF SALE, AND DISCOUNTS AVAILABLE, MUST BE INCLUDED IN THE BID PRIOR TO OPENING DATE.

The following is a tentative schedule:

1. Copies of plans and specs available – September 10, 2014 (after 4 PM)
2. Pre-bid meeting/Site walk with Contractors – September 17, 2014 10 AM (Meet at intersection of Weston and Vernon Streets)
3. Written Questions Deadline – September 24, Noon
4. Bid Opening - October 1, 2014 10:00 AM
5. Bid award/Notice to Proceed - Up to 90 days from bid opening

Questions concerning this RFB must be submitted in writing to:
Joseph P. Pedulla, Chief Procurement Officer, 610 Main Street, Waltham, MA 02452
The City shall endeavor to distribute written answers via e-mail to all interested parties of record.

Intent of Project

To remove and replace existing drain mains and catch basin laterals to improve drainage in the Weston Street and Vernon Street Area.

AGREEMENT

CITY OF WALTHAM

ARTICLE 1. This agreement, made this _____ day of _____, 2014 by and between the CITY OF WALTHAM, party of the first part, hereinafter called the CITY, by its MAYOR, and

_____

_____

hereinafter called the CONTRACTOR.

ARTICLE 2. Witnesseth, that the parties to this agreement, each in consideration of the agreement on the part of the others herein contained, do hereby agree, the CITY OF WALTHAM for itself, and said contractor for his heirs, executors, administrators and assigns as follows:

To furnish all equipment, machinery, tools and labor, to furnish and deliver all materials required to be furnished (except as otherwise specified) and deliver in and about the project and to do and perform all work in strict conformity with the provisions of this Contract and of the Notice to Bidders, bid, Project Manual, and Drawings hereto annexed. The said Notice to Bidders, bid, Project Manual, and Drawings are hereby made a part of this contract as fully and to the same effect as if the same had been set forth at length and incorporated in the contracts.

ARTICLE 3. In consideration of the foregoing premises the CITY agrees to pay and the CONTRACTOR agrees to receive as full compensation for everything furnished and done by the CONTRACTOR under this contract, including all work required by not included in the items herein mentioned, and also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any unforeseen obstruction or difficulty encountered in the prosecution of the work, and for all expenses incurred by or in consequence of the suspension or discontinuance of the work specified, and for well and faithfully completing the work, and the whole thereof, as herein provided, such prices as are set forth in the accompanying bid.

Date for final completion of the project is 60 Days from the date of the Notice to Proceed (NTP).

This Agreement entered into as of the day and year first written above.

CITY OF WALTHAM, MASSACHUSETTS

FOR THE CITY

_____
Jeannette A. McCarthy, MAYOR,
City of Waltham
Date: _____

_____
John B. Cervone, City Solicitor
Date: _____
APPROVED AS TO FORM ONLY

_____
Stephen Casazza, City Engineer
Date: _____

_____
Joseph Pedulla, Purchasing Agent
Date: _____

_____
Paul Centofanti, Auditor
Date: _____

I CERTIFY THAT SUFFICIENT FUNDS
ARE AVAILABLE FOR THIS CONTRACT

FOR THE COMPANY

_____
CONTRACTOR (Signature),
Date: _____

_____
Company

_____
Address

Instructions

INSTRUCTIONS FOR BIDDERS

1. **READ ALL DOCUMENTS.**

   Bidders should familiarize themselves with all the documents contained herein; it is mandatory that all Bids be in compliance with all the provisions contained in said documents.

2. **FORMS AND ATTACHMENTS.**

   Bids are to be completed on the forms provided ONLY and enclosed in a sealed envelope marked on the outside "BID (title)" and the name and address of bidder. Attachments submitted in addition to the Waltham Purchasing Department produced forms may not be considered.

3. **PRINTED OR TYPED RESPONSE.**

   All information must be typewritten or printed in ink, including the price the bidder offers in the space as provided on the bid form.

4. **CORRECTIONS.**

   Bids that are submitted containing cross outs, white outs or erasures, will be rejected. All corrections or modifications to the original bid are to be submitted in a separate envelope, properly marked on the outside, "CORRECTION/ MODIFICATION TO BID (title)" and submitted prior to the bid opening.

   ALL DOCUMENTS SUBMITTED WITH YOUR RESPONSE WILL BE INCORPORATED INTO THE CONTRACT.

5. **PRICE IS ALL INCLUSIVE.**

   Bid prices shall encompass everything necessary for furnishing all items, materials, supplies or services as specified, and in accordance with the specifications, including proper packing, cost of delivery, and in the case of services, completion of same, as per specifications.

6. **PRICE DISCREPANCY.**

   In the event of a discrepancy between the Unit Price and the Extension, the Unit Price shall prevail.

7. EXPLANATIONS, EXCEPTIONS

Explanations, exceptions or other information pertinent to the specifications may be made in writing and included in the same envelope with the bid.

8. BID DEPOSITS.

Bid deposits are to be made payable to the City of Waltham. In the event that the successful bidder fails to execute a Contract within (10) days of the receipt of said contract, such security shall be retained by the city as liquidated damages. Unsuccessful bidders' deposits will be returned immediately following the award to said successful bidder.

9. WITHDRAW.

A Bid may be withdrawn by written request prior to the schedule for the Bid Opening. No withdrawals are permitted after the bid opening date and time. Withdrawals after the bid opening date will cause the forfeit of the bid Deposit.

10. AWARD.

Bids will be awarded not later than (90) ninety days after the scheduled bid opening date, unless otherwise stated, in the specifications. Unless otherwise specified, bids will be evaluated on the basis of, completeness of your RFP response, responsiveness, responsibility, best price and experience.

11. AWARD CRITERIA.

Qualified and responsive proposals will be evaluated based on Price, Technical, and Compliance requirements.

12. DISCOUNTS.

Discounts for prompt payments will be considered when making awards.

13. TAX EXEMPT.

Purchases by the City of Waltham is exempt from any Federal, State or Massachusetts Municipal Sales and/or Excise Taxes.

14. SAMPLES.

The City of Waltham may require the submission of samples either before or after the awarding of a contract. Samples are to be submitted, at no charge to the City, so as to ascertain the product's suitability. If specifically stated in the

Bid that samples are required, said samples must be submitted with the Bid prior to the Official Bid Opening. Failure to submit said samples would be cause for rejection of Bid. All samples must be called for and picked up within (30) thirty days of award or said samples will be presumed abandoned and will be disposed of.

15. **ACTIVE VENDOR LIST.**

    Vendors who wish to remain on the Active Bid List must either submit a Bid, No Bid, or a letter requesting same, no later than the Official Bid Opening. This is applicable to those vendors who have received the Invitation to Bid.

16. **FUNDS APPROPRIATION.**

    THE CONTRACT OBLIGATION ON BEHALF OF THE CITY IS SUBJECT TO PRIOR APPROPRIATION OF MONIES FROM THE GOVERNMENTAL BODY AND AUTHORIZATION BY THE MAYOR. THE CONTRACT MAY BE EXECUTED UPTO 90 DAYS FROM THE BID OPENING DATE.

17. **THE AWARDING AUTHORITY RESERVES THE RIGHT TO REJECT ANY OR ALL BIDS, OR ANY PART OF ANY BID, WHICH IN THE OPINION OF THE AWARDING AUTHORITY, IS IN THE BEST INTERESTS OF THE CITY OF WALTHAM.**

18. **THE TAX ATTESTATION CLAUSE, CERTIFICATION OF NON-COLLUSION AND THE CERTIFICATE OF VOTE AUTHORIZATION, are required by statute and are an integral part of the Invitation for Bid and must be completed and signed by the person submitting the Bid, or by the person/persons who are officially authorized to do so. Failure to do so may disqualify the bid.**

19. **STANDARD OF QUALITY.**

    Where, in the specifications, one certain kind, type, catalog number, brand or manufacturer of material is named, it shall be regarded as the required standard of quality. Where two or more are named, these are presumed to be equal and the Bidder may select one or the other. If the Bidder proposes to offer a substitute as an equal, he shall so indicate on the Bid Form, the kind, type, catalog number, brand, or manufacturer of material that is offered as an equal, and describe where it differs from the specifications. Substituted items must be capable of performing all the functions and/or operational features

described or indicated in the specifications. Failure to indicate the description of any substitute item on the Bid will be interpreted to mean that the Bidder will furnish the item or service as specified.

20. MODIFICATION.

No agreement, understanding, alteration or variation of the agreement, terms or provisions herein contained shall bind the parties, hereto unless made and executed in writing by the parties hereto.

21. ASSIGNMENT.

The final payment for work done under this Contract shall be made only after the Contractor has signed a statement under the penalty of perjury, certifying that he has completed the work described in the final estimate. Neither party hereto shall assign this Contract or sublet it in part or as a whole without the prior written consent of the other party hereto. The Contractor shall not assign any sum or sums due or becoming due to him hereunder without the prior written consent of the City.

22. DELIVERIES:

a) The Contractor shall pay all freight and delivery charges. TheWaltham Purchasing Department does not pay for shipping and packaging expenses. Items must be delivered as stipulated in the specifications. All deliveries must be made to the inside of city buildings. Sidewalk deliveries will not be accepted. City personnel are not required to assist in the deliveries and contractors are cautioned to notify their shippers that adequate assistance must be provided at the point of delivery, when necessary.

b) All items of furniture must be delivered inside the building, set up, in place and ready for use. Deliveries are to be made between the hours of 8:30 a.m. and 3:00 p.m., Monday through Friday, except on holidays.

c) All damaged items, or items which do not comply with specifications will not be accepted and title therefore will not vest to the Waltham Purchasing Department until such items are accepted and signed for, in good order, by the receiving department.

d) The contractor must replace, without further cost to theWaltham Purchasing Department, such damaged or non-complying items before payment will be made.

23. LABELING.

All packages cartons or other containers must be clearly marked with (a) building and room destination; (b) description of contents of item number from specifications; (c) quantity; (d) City of Waltham Purchase Order Number and (e) Vendor's name and order number.

24. GUARANTEES.

Unless otherwise stipulated in the specifications, furniture, equipment and similar durable items shall be guaranteed by the contractor for a period of not less than one year from the date of delivery and acceptance by the receiving department. In addition, the manufacturer's guarantee shall be furnished. Any items provided under this contract which are or become defective during the guarantee period shall be replaced the contractor free of charge with the specific understanding that all replacements shall carry the same guarantee as the original equipment. The contractor shall make such replacement immediately upon receiving notice from the Purchasing Agent.

25. SINGLE VENDOR.

The Waltham Purchasing Department desires to award a single contract based on the Grand Total Price. However, where applicable, the City reserves the right to make multiple awards on a unit price basis if, in the opinion of the Waltham Purchasing Department, it is in the best interest of theWaltham Purchasing Department.

26. CHANGE ORDERS.

Change orders are not effective until, if, as and when signed by the Mayor and no work is to commence until the change orders are fully executed.

28. BID OPENING INCLEMENT WEATHER

If, at the time of the originally scheduled bid opening, City Hall is closed to inclement weather or another unforeseeable event, the bid opening will be

extended until 2:00 PM on the next normal business day. Bids will be accepted until that date and time.

GENERAL CONDITIONS

GENERAL CONDITIONS

1. INFORMATION

All information shall come from the Office of the City Purchasing Agent. The Contractor shall inquire at this office for any information needed. Wherever the words "or equal as approved" are used, it is to be understood that the opinion of the City Purchasing Agent shall govern.

2. SUITS

The Contractor shall assume defense of and shall indemnify and hold the City and its agents harmless from all suits and claims against the City and its sub-contractors arising from the use of any invention, patent right labor or employment, or from any act of omission or neglect of the City, its agents, employees or any subcontractor in performing the work, under this contract.

3. LAWS AND REGULATIONS

The Contractor shall conform to all the applicable rules, regulations, laws and ordinances of the City of Waltham, the Commonwealth of Massachusetts, the United States of America and all agencies having jurisdiction over this contract.

4. PROTECTION OF PROPERTY

The Contractor shall take all proper precautions to protect the City's property from damage and unnecessary inconvenience. Any City property damaged by the Contractor in carrying out the provisions of this contract shall be restored to its original condition, by and at the expense of the Contractor.

5. PROTECTION OF PERSONS

The Contractor shall take all proper precautions to protect persons from injury, unnecessary inconvenience, and shall be responsible for his failure to do so. The Contractor agrees to hold the City harmless from any and all liabilities of every nature and description, which may be suffered through bodily injury, including death, to any person, by reason of negligence of the Contractor, his agents or employees, or any subcontractor.

6. CONTRACT DURATION.

This contract is for the period required to complete the project to the satisfaction of the City.

7. INSURANCE

A. WORKMAN'S COMPENSATION: The Contractor shall provide insurance for the payment of compensation and furnishing of other benefits under Chapter 152 of the General Laws of the Commonwealth of Massachusetts to all persons to be employed under this contract, the premiums for which shall be paid by the Contractor. Contractors shall provide insurance on a primary basis and the contractor's policy shall be exhausted before resorting to other policies. The contractor's policy is the primary one not the contributory.

B. COMPREHENSIVE GENERAL LIABILITY

Bodily Injury:	**$1,000,000 Each Occurrence**
	$2,000,000 Aggregate
Property Damage:	**$1,000,000 Each Occurrence**
	$2,000,000 Aggregate

C. AUTOMOBILE (VEHICLE) LIABILITY

Bodily Injury	**$2,000,000 Each Occurrence**
Property Damage	**$1,000,000 Aggregate**

D. UMBRELLA POLICY

General liability	**$1,000,000**

Your bid response must include a Certificate of Insurance with the above limits as a minimum. In addition, the Certificate of Insurance must have the following text contained in the bottom left box of the Certificate: *"The City of Waltham is a named additional insured for all insurances under the contract, excluding Automobile and Workers Compensation coverage".* Failure by the contractor to provide a current and updated insurance policy, during the entire duration of the contract, may result in additional legal liability. The Certificate of Insurance must be mailed directly to:

Office of the Purchasing Agent
Purchasing Department
City of Waltham
610 Main Street
Waltham, MA 02452

8. LABOR AND MATERIALS BOND

The Contractor agrees to execute and deliver to the City, a Labor and Materials or Payment Bond equal to 50% of the contract value. This contract shall not be in force until said bond has been delivered and accepted by the City. Bond to be issued by a company licensed by the Commonwealth of Massachusetts.

A LETTER FROM A SURETY COMPANY CERTIFYING THAT THE CONTRACTOR IS QUALIFIED AND CAPABLE OF OBTAINING THE ABOVE BONDS MUST BE INCLUDED WITH HIS/HERS BID.

9. PERSONNEL:

The Contractor shall employ a competent supervisor and all properly licensed personnel necessary to perform the services required in this contract. The City Purchasing Agent shall have the right to require the Contractor to remove and/or replace any of the personnel for nonperformance or for unprofessional behavior. The City Purchasing Agent may require the Contractor to submit a weekly performance record of the areas and of the work performed, on forms approved by the City Purchasing Agent. The Contractor or his supervisor shall be available to inspect such work as required by the City Purchasing Agent.

10. PREVAILING WAGES

The Contractor is required to pay the prevailing wages as determined under the provisions of Chapter 149, Sections 26 and 27D of the Massachusetts General Laws, including the submission of weekly payrolls to the awarding authority. The Prevailing Wage Schedule is too large to attach here. It will be found at www.city.waltham.ma.us/open-bids.

11. MATERIALS

The City or its Agent reserves the right to approve or reject any supplies, material or equipment used by the Contractor. The Contractor agrees to replace any supplies, material or equipment used by the Contractor. The Contractor agrees to replace any rejected supplies, materials or equipment, to the satisfaction of the City or its Agents.

12. TERMINATION OF CONTRACT

This contract may be terminated by the City upon deliverance to the Contractor of a five-day written notice of said termination.

13. CONTRACT OBLIGATIONS

Contract obligations on behalf of the City are subject to an annual appropriation to cover the contract obligation.

14. BIDDER EXPERIENCE EVALUATION

Each bidder shall submit with his bid, all the information relative to their experience and qualifications in performing the work required under this contract and shall have been in business for a minimum of five (5) years, in order for their bid to be considered.

15. NOT-TO-EXCEED AMOUNT

The bid amount proposed in your company's response is a "not-to-Exceed" amount unless the City makes changes, in writing, to the scope of work to be performed. The Change Order must be signed and approved by the City's Purchasing Agent, City Auditor, Law Department and the Mayor prior to the commencement of the change order work. No work is to begin until the proper approvals have been obtained. A change order will be priced at the unit price. Failure to comply with this procedure will result in the cancellation of the contract and the non-payment of services provided

16. FINANCIAL STATEMENTS.

The City may require, within five (5) days after the bid opening, a complete and detailed Financial Statement prepared by a Certified Public Account, to determine a bidder's financial stability.

17 BREACH OF CONTRACT/ NON PERFORMANCE

If the Contractor shall provide services in a manner, which is not to the satisfaction of the City, the City may request that the Contractor refurnish services at no additional cost to the City until approved by the City. If the Contractor shall fail to provide services, which are satisfactory to the City, the City in the alternative may make any reasonable purchase or Contract to purchase services in substitution for those due from the Contractor. The City may deduct the cost of any substitute Contract for nonperformance of services together with incidental and consequential damages from the Contract price and shall withhold such damages from sums due or to become due to the Contractor. If the damages sustained by the City exceed sums due or to become due, the Contractor shall pay the difference to the City upon demand. The Contractor shall not be liable for any damages sustained by the City due to the Contractor's failure to furnish services under the terms of this Contract if such failure is in fact caused by the occurrence of a contingency the nonoccurrence of which was a basic assumption under which this Contract was made, including a state of war, embargoes, expropriation of labor strike or any unanticipated federal, state or municipal governmental regulation of order, provided that the Contractor has notified the City in writing of such cause within seven (7) days after its occurrence.

18 RIGHT TO AUDIT

The City of Waltham has the right to review and audit documents related to this contract. This right extends to any subcontractor, supplier or other entity used by the prime contractor to fulfill the obligations under this contract.

19. CITY ORDINANCE. APPROVAL OF CONTRACTS BY MAYOR, SEC. 3-12 OF THE CITY ORDINANCES.

All contract made by any department, board or commission where the amount involved is two thousand dollars ($2,000) or more shall be in writing, and no such contract shall be deemed to have been made or executed until the approval of the Mayor is affixed thereto. Any construction contract shall, and all other contracts may, where the contract exceed five thousand dollars

($5,000) be required to be accompanied by a bond with sureties satisfactory to the Mayor.

NOTE

Failure to submit any of the required documents, in this or in other sections, with your bid response package may cause the disqualification of your proposal

Specifications

1. PROJECT SCOPE:

1. Work shall conform to the attached plans and details.
2. The work shall include but not limited to the following:
   a. traffic management plan and work schedule
   b. saw cut existing bituminous/asphalt roadway
   c. catch basin lateral replacement work
      - CB lateral on Fiske Avenue to DMH on Weston Street
      - CB lateral at #115 Weston Street to DMH on Weston Street
      - CB lateral at #89 Weston Street to DMH on Weston Street
      - CB lateral at #98 Weston Street to DMH on Weston Street
      - CB lateral at #120 Weston Street to DMH on Weston street
      - CB lateral at #102 Weston Street to DMH on Weston street/Fiske Avenue
      - #12/#13 Cabot Street - Remove two(2) 8-inch CB laterals and replace with 12-inch RCP
   d. catch basin replacement work
      - replace existing CB with new CB with double grate at #98 Weston Street.
   e. catch basin hoods
      - replace existing hoods and install nine (9) new CB hoods
   f. main storm drain replacement work
      - main from DMH at #85/#89 Weston Street (Eddy Street) to DMH at Cabot Street
      - main from DMH at Fiske Avenue to DMH at 102 Weston Street
      - main from DMH at 102 Weston Street to DMH at Cabot Street
      - replace existing 15-inch main drain from DMH on Weston Street at Cabot Street to DMH in the sidewalk just west of #112 Vernon Street and replace with 24-inch PVC SDR 35 pipe
   g. new special drain manhole structure
      - replace existing storm drain manhole with a special concrete storm drain manhole to accommodate six (6) pipe connections at intersection of Weston, Cabot Vernon Streets.
   h. suitable backfill
   i. trench backfill compaction
   j. adequate support and protection of adjacent utilities and other subsurface facilities and features.
   k. temporary pavement for trench repair per MassDOT specifications.
   l. permanent pavement resurfacing at a later date per MassDOT specifications
   m. site restoration of any areas damaged during construction including but not limited to sidewalks, walkways, loam and seed as directed by the Engineer.
   n. install traffic markings, utilize safety signage and required traffic management devices.
   o. The Contractor shall install identification tape 18-inches below finished grade in trench for installation of all PVC pipe sections that shall state "PVC Drain Pipe Installed Below".
3. All trenches must be backfilled at the end of the day. Roads plates pinned and perimeter mix may be left overnight within public ROW on side streets but not along Weston Street.
4. Traffic police shall be paid by the contractor and reimbursed dollar for dollar following proof of payment. Proposal shall include an $ 10,000 allowance for police details. Additional police details above the allowance must be requested in writing and approved by Engineering Department.
5. The City of Waltham will perform the digsafe mark outs for water, sewer and drain and will perform inspections of work activities.
6. Equipment and material storage can be temporarily placed within the public ROW on side streets but not along Weston Street.
7. Coordination with utility companies.

8. Coordination with and obtaining all required permits from City/State agencies and private utilities companies.

2. AWARD OF CONTRACT

Selection of a contractor shall be based on price, experience, availability of crew and equipment, and references. Prevailing wage rates apply for this project.

3. PROJECT SPECIFICATIONS / MATERIALS:

See attached design drawings, details and specifications.

a. Weston Street (State Route 20) is a State Highway. Temporary and permanent pavement restoration work shall be in accordance with the MassDOT specifications and requirements.
b. The Contractor shall maintain at least two lanes of traffic (one in each direction) at all times.
c. Traffic Management Plan shall be prepared and submitted for review at least one week prior to the commencement of any work. Two Electronic Traffic Message Boards must be installed for 8 weeks.
d. All work will be subject to restricted work hours. Contractor may propose night/weekend work.
e. The test pits shown on the drawing must be completed prior to commencement of work.

f. **Utility Companies Coordination:** Dig Safe must be contacted to mark-out all utilities in the area of proposed excavation work. It will be the Contractor's responsibility to contact those utilities that have conflict with the proposed work and arrange for assistance prior to excavation.

A list of contacts for each utility company is provided for informational purposes. The contractor is responsible for ensuring that proper person for each utility is contacted and this effort is coordinated with the Engineer.

Agency/Utility Co.	Contact	Telephone Number
Verizon Communications	Penny Cane	(781) 849-6320
NSTAR	Maria Anderson	(617) 541-6190
National Grid	Andrew Fleming	(617) 719-3251
Comcast	Robert Glynn	(617) 765-4790
RCN	Ken Bates	(781) 652-8957

g. The Contractor shall discuss utility, traffic, emergency and safety issues and coordination with the City Officials at the Pre-Construction meeting.
h. Public notice shall be provided to all abutters at least one week prior to any work.
i. All proposed main drain pipes shall be PVC SDR 35 pipe unless otherwise noted on the drawings or as directed by the Engineer.
j. All proposed catch basin laterals shall be ductile iron pipe unless otherwise noted on the drawings or as directed by the Engineer.
k. The Contractor shall plug the existing 15" pipe opening connection to the 39-inch x 42-inch concrete Masters Brook Culvert (MBC). This work will be considered incidental to the installation of the proposed 24-inch main drain and no additional compensation will be made.
l. The Contractor shall core the existing 39-inch x 42-inch concrete Masters Brook Culvert (MBC) to connect the proposed 24-inch PVC drain. This work will be considered incidental to the installation of the proposed 24-inch main drain and no additional compensation will be made.

m. The quantities of the Pavement Striping required for the project are listed under Bid Form Section 00301. The Contractor must coordinate with the City of Waltham Traffic Engineering Department for Pavement Striping Plans required. No separate payment will be made.

4. PAYMENT

Payment shall be made following completion of the work and receipt of an invoice to the City Engineer.

5. TIME CONSTRAINTS:

Weston Street is a restricted street work can only be performed from 9 am to 4 pm according to Traffic Rules Article 4 Section 4 per City of Waltham Traffic Regulations Revised June 30, 2010.

6. PERMITS:

Permits for the work will be required from the following but not limited to: the Engineering Department, a Street Opening Permit from the Consolidated Public Works Department and MassDOT.

7. POLICE DETAIL ALLOWANCE:

This bid contains a police details allowance of $10,000.00 (ten thousand dollars).

8. WINTER PAVEMENT MORATORIUM:

Please note the following winter moratorium requirements/limitations for asphalt paving:

Temporary Asphalt Binder Installation - October 1, 2014

The Contractor must plan his construction activities accordingly. Permanent asphalt paving will be required in Spring 2015 in accordance with MassDOT specifications.

BID PRICE FORM

(Follows)

SECTION 00301

BID FORM

To the City of Waltham, Massachusetts, acting through its Mayor:

The Undersigned, as Bidder, declares as follows:

- The only parties interested in this BID as Principals are named herein;
- this BID is made without collusion with any other person, firm, or corporation;
- no officer, agent, or employee of the Owner is directly or indirectly interested in this BID;
- the Bidder has carefully examined the site of the proposed Work and fully informed and satisfied himself as to the conditions there existing, the character and requirements of the proposed Work, the difficulties attendant upon its execution and the accuracy of all estimated quantities stated in this BID, and has carefully read and examined the Drawings, the annexed proposed AGREEMENT and the Specifications and other Contract Documents therein referred to and knows and understands the terms and provisions thereof;
- understands that information relative to subsurface and other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) has been furnished only for his information and convenience without any warranty or guarantee, expressed or implied, that the subsurface and/or other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) actually encountered will be the same as those shown on the Drawings or in any of the other Contract Documents and agrees that the Bidder shall not use or be entitled to use any such information made available to him through the Contract Documents or otherwise or obtained by him in his own examination of the site, as a basis of or ground for any claim against the Owner or the Engineer arising from or by reason of any variance which may exist between the aforesaid information made available to or acquired by him and the subsurface and/or other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) actually encountered during the construction work, and has made due allowance therefore in this BID;
- and the Bidder understands that the quantities of work tabulated in this BID or indicated on the Drawings or in the Specifications or other Contract Documents are only approximate and are subject to increase or decrease as deemed necessary by the Engineer;
- and agrees that, if this is accepted will contract with the Owner, as provided the copy of the Contract Documents deposited in the office of the Engineer, this BID form being part of said Documents, that the will perform all work and all the materials and equipment, and provide all labor, services, plant, machinery, apparatus, appliances, tools, supplies all other required by Contract Documents the manner within the therein prescribed according to the requirements the

Engineer as therein set forth, and that the Bidder will take in full payment therefore the lump sum or unit price applicable to each item of the Work as stated in the following schedule:

Bidders must bid on each item of the Base Bid. All entries in the entire BID must be made clearly and in ink; prices bid must be written in both words and figures. In case of discrepancy, the amount shown in words will govern.

Bidders shall insert extended item prices obtained from quantities and unit prices. In case of discrepancy between the product obtained by multiplying the estimated quantity by the unit price, the actual product shall apply. In case of discrepancy between the sum of the total figure of the items and the total amount listed, the actual sum shall apply.

Receipt of Addenda numbered_____to_____ , inclusive, is acknowledged.

(Bidder) _____

(by) _____

(Title) _____

BASE BID

Storm Drain Improvements Project - Weston Street/Vernon Street Area

Refer to Section 01024 - Measurement and Payment for Item Descriptions. The work of the General Bidder, being all work covered by items 1 through 10, inclusive.

Item No.	Item Description Unit Price in Words	Units	Estimated Quantity	Unit Price (In Figures)	Extended Amount (In Figures)
1	Mobilization and Demobilization _____ Dollars and Cents	LS	1		
2	Traffic Management _____ Dollars and Cents	LS	1		
3	Test Pits _____ Dollars and Cents	CY	75		
4	Storm Drain Piping (15" PVC), & Appurtenances _____ Dollars and Cents	lf	350		
4A	Storm Drain Piping (24" PVC), & Appurtenances _____ Dollars and Cents	lf	320		
5	Catch Basin Lateral Piping (12" DI) _____ Dollars and Cents	lf	325		
6	Catch Basin with Double Frame and Grate _____ Dollars and Cents	ea.	1		
7	Catch Basin Hoods _____ Dollars and Cents	ea.	9		
8	Special Precast Concrete Manhole _____ Dollars and Cents	ea.	1		
8A	5-foot Diameter Precast Concrete Manhole _____ Dollars and Cents	ea.	1		
9	Temporary Pavement Restoration (MassDOT) _____ Dollars and Cents	TON	120		
10	Permanent Pavement Restoration (MassDOT) _____ Dollars and Cents	TON	300		
11	Reflectorized White Thermoplastic Pavement Arrows and Legends (MassDOT 860.040) _____ Dollars and Cents	SF	100		
11A	Reflectorized White Thermoplastic Crosswalks and Stop Lines (MassDOT 865.100) _____ Dollars and Cents	SF	900		

11B	4 Inch Reflectorized White Line Thermoplastic (MassDOT 866.040) _____ Dollars and Cents	LF	80		
12	4 Inch Reflectorized Yellow Line Thermoplastic (MassDOT 867.040) _____ Dollars and Cents	LF	400		
13	Watermain Relay Allowance _____ Dollars and Cents	ea.	2		
14	Sewer Service Lateral Relay Allowance _____ Dollars and Cents	ea.	4		
15	Concrete Sidewalk/Handicap Ramp _____ Dollars and Cents	SY	100		
16	Remove and Reset Granite Curb _____ Dollars and Cents	LF	175		
17	Police Detail Allowance _____ Dollars and Cents	hr	200	$50/hr	$10,000
18	Miscellaneous Work and Cleanup _____ Dollars and Cents	LS	1		

TOTAL FOR BASE BID

Total Amount of Base Bid (**Basis of Award**) (Items 1 through 10 inclusive).

$_____
(Amount in figures)

_____
(Amount in words)

The bidder understands that the Owner reserves the right to reject any and all bids and to waive any informality in the bidding.

The undersigned agrees that for extra work, if any, will be performed in accordance with Article 10 of the General Conditions of the Contract and will be paid for in accordance with Article 11 of the General Conditions of the Contract.

The bid security accompanying this BID shall be in the amount of 5 percent of the BID payable to the City of Waltham.

The time for completion of this contract is 150 calendar days. Liquidated damages specified in this contract are $1,000 per day for each calendar day beyond the contract completion date that work remains uncompleted.

Bids shall be valid for ninety (90) days and cannot be withdrawn until after the 90-day period has expired.

The undersigned agrees that if the Owner accepts this BID, the bidder will duly execute and acknowledge the AGREEMENT and furnish, duly executed and acknowledged, the required CONTRACT BONDS within ten (10) days, Saturdays, Sundays, and legal holidays excluded, after notification that the AGREEMENT and other Contract Documents are ready for signature.

A performance bond in an amount equal to 100 percent of the total amount of the bid with a surety company qualified to do business in the Commonwealth of Massachusetts will be required for the faithful performance of the contract, as well as a labor and materials bond in an amount equal to 100 percent of the total bid amount.

Should the bidder fail to fulfill any of his agreements as hereinabove set forth, the Owner shall have the right to retain as liquidated damages the amount of the bid check or cash which shall become the Owner's property. If a bid bond was given, it is agreed that the amount thereof shall be paid as liquidated damages to the Owner by the Surety.

The bidder, by submittal of this BID, agrees with the Owner that the amount of the bid security deposited with this BID fairly and reasonably represents the amount of damages the Owner will suffer due to the failure of the bidder to fulfill his agreements as above provided.

The undersigned bidder hereby certifies he/she will comply with the minority workforce percentage ratio and specific affirmative action steps contained in the EEO/AA provisions of this Contract, including compliance with the Minority/Woman Business Enterprise as required under these contract provisions. The Contractor receiving the award of the contract shall be required to obtain from each of its subcontractors a copy of the certification by said subcontractor, regardless of tier, that it will comply with the minority workforce ratio and specific affirmative action steps contained in these contract provisions and submit it to the contracting agency prior to the award of such subcontract.

The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Section Twenty-Nine F of Chapter Twenty-Nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.
Pursuant to M.G.L. Ch. 62C, sec. 49A, I certify under the penalties of perjury that I, to my best knowledge and belief, have filed all state tax returns and paid all state taxes required under law.

The attached Minority Business Participation and Women Business Participation Form (Form EEO-BMF-190) and the attached Minority Business Participation and the Women Business Participation Letters of Intent (Form EEO-BMF-191) must be completed and submitted as part of the Bid Proposal.

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work and that he will comply fully with all laws and regulations applicable to awards made subject to MOL Ch. 30, Section 39M. The bidding and award of the contract will be in full compliance with Section 39M inclusive of Chapter 30 of the General Laws of the Commonwealth of Massachusetts as last revised.

The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The attached CERTIFICATE OF NON-COLLUSION must be signed and submitted as part of the Bid Proposal.

_____

(Name of General Bidder)

By_____ Date_____

(Signature and title of authorized representative)

SEAL

_____ _____

(Telephone) (Business address)

_____ _____

(Fax Number) (City, State, Zip)

The following documents are attached to and made a condition of the bid, and shall be filed with the bid:

- Bid Security (5%)
- Completed and signed Bid Proposal (Section 00301)
- Contractor's Certification (Attached to Section 00301)
- MBE/WBE Participation and Vendor Information Forms (Attached to Section 00301)
  1. Schedule of Participation for SRF Construction (EEO-DEP-190C)
  2. Letter of intent for SRF Construction (EEO-DEP-191C)
  3. Vendor Information Form- SRF Construction (EEO-DEP-VIF-C)
- Completed Certificate of Non-Collusion (Section 00480)
- Completed Certificate of Corporate Vote (Corporation Only) (Section 00481)
- Completed Certificate as to Payment of State Taxes (Section 00482)
- Completed State "Debarment Disclosure Form for Public Contracts" (Section 00484)

The Bidder is requested to list four or more of your firm's recent projects of a similar character as required for acceptable bid. References will enable the Owner to judge his experience, skill, and business standing.

Project Name:_____

Project Location:_____

Contract Amount: $_____Completion Date_____

Owner:_____

Contact Name: _____Telephone: _____

Architect/Engineer: _____

Contact Name: _____Telephone: _____

Project Name:_____

Project Location:_____

Contract Amount: $_____Completion Date_____

Owner:_____

Contact Name: _____Telephone: _____

Architect/Engineer: _____

Contact Name: _____Telephone: _____

Project Name:_____

Project Location:_____

Contract Amount: $_____Completion Date_____

Owner:_____

Contact Name: _____Telephone: _____

Architect/Engineer: _____

Contact Name: _____Telephone: _____

Project Name:_____

Project Location:_____

Contract Amount: $_____Completion Date_____

Owner:_____

Contact Name: _____Telephone: _____

Architect/Engineer: _____

Contact Name: _____Telephone: _____

Add supplementary page if necessary.

END OF SECTION 00301

LIST OF ATTACHMENTS

ATTACHMENT A
Drawing

ATTACHMENT B
Technical Specifications

ATTACHMENT C
Details

ATTACHMENT D
Record Drawing Information

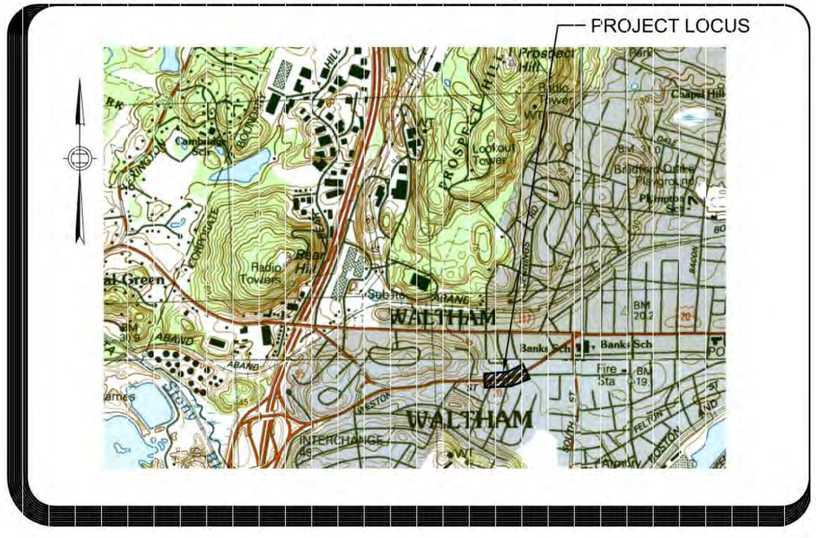
ATTACHMENT E
Utility Company Coordination (For Informational Purposes Only)

APPENDIX A
Drawings

CITY OF WALTHAM, MASSACHUSETTS

STORM DRAIN IMPROVEMENTS PROJECT
WESTON / VERNON STREET
WALTHAM, MASACHUSETTS

AUGUST 25, 2014



INDEX OF DRAWINGS

G-001 TITLE SHEET AND INDEX OF DRAWINGS
G-002 LEGEND AND GENERAL NOTES
C-100 EXISTING CONDITIONS PLAN
C-101 PLAN AND PROFILE
C-102 PLAN AND PROFILE
C-103 CB AND DMH SCHEDULE

SSV ENGINEERING INC.
609 WINTER STREET
FRAMINGHAM, MA

GENERAL NOTES

1. EXISTING CONDITIONS BASEPLAN SHOWN HEREIN ARE THE RESULT OF AN ON THE GROUND SURVEY PERFORMED IN AUGUST 2014.
2. THE HORIZONTAL REFERENCE DATUM IS THE NAD 83. ELEVATIONS ARE REFERENCED TO THE NGVD 29 VERTICAL DATUM.
3. ALL EXISTING STATE, COUNTY, CITY, AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATION IS NOT GUARANTEED.
4. THE UTILITY INFORMATION SHOWN IS COMPILED BASED ON FIELD SURVEY INFORMATION AND RECORD INFORMATION. THE LOCATIONS OF UNDERGROUND PIPES AND CONDUITS HAVE BEEN DETERMINED FROM RECORD PLANS AND ARE APPROXIMATE ONLY. LOCATIONS OF UNDERGROUND STRUCTURES MAY VARY FROM LOCATIONS SHOWN HEREON. ADDITIONAL BURIED UTILITIES/STRUCTURES MAY BE ENCOUNTERED. BEFORE PLANNING FUTURE CONNECTIONS, THE PROPER UTILITY ENGINEERING DEPARTMENT/COMPANY SHOULD BE CONSULTED AND THE ACTUAL LOCATIONS OF SUBSURFACE STRUCTURES SHOULD BE DETERMINED IN THE FIELD. SEVENTY-TWO HOURS PRIOR TO EXCAVATION, BLASTING, GRADING, AND/OR PAVING, CONTACT THE DIG SAFE CALL CENTER AT 1-888-344-7233.
5. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
6. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS AND PAYMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE, SEWER, WATER AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES.
7. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
8. EXISTING SITE FEATURES AND SUBSURFACE UTILITIES WITHIN THE LIMITS OF WORK SHALL BE REMOVED AS REQUIRED TO PERFORM PROPOSED WORK EXCEPT WHERE OTHERWISE NOTED. AREAS WITHIN THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION.
9. EXISTING GRAVEL BORROW DETERMINED TO BE SUITABLE SHALL REMAIN, AS DIRECTED BY THE ENGINEER.
10. CONTRACTOR SHALL MAINTAIN ALL EXISTING UTILITY SERVICES AND ROADWAY LIGHTING THROUGHOUT CONSTRUCTION, EXCEPT NOTED OTHERWISE.
11. ALL WORK SHALL BE IN ACCORDANCE WITH REGULATIONS FOR ACTIVITIES INVOLVING WETLANDS, WATERCOURSES AND/OR EROSION CONTROLS, AND AS DIRECTED BY THE ENGINEER. ALL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS, MARCH 1997 AND THE U.S.D.A. SCS'S EROSION AND SEDIMENT CONTROL IN SITE DEVELOPMENT, MASSACHUSETTS CONSERVATION GUIDE, SEPTEMBER 1983.
12. TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE COMMENCEMENT OF WORK..
13. CONTRACTOR SHALL REMOVE ALL SEDIMENTATION CONTROL SYSTEMS, REMOVE ALL ACCUMULATED SEDIMENTS, AND SEED THE DISTURBED AREAS, WHEN THE CONTROL SYSTEMS ARE NO LONGER REQUIRED. CONTRACTOR WILL REQUEST AND RECEIVE PERMISSION FROM THE ENGINEER PRIOR TO REMOVING ANY CONTROL SYSTEM.
14. CONTRACTOR SHALL COORDINATE THE FULL ROADWAY CLOSURE AND MAINTENANCE OF TRAFFIC WITH THE ENGINEER. NO WORK SHALL OCCUR UNTIL ALL TRAFFIC CONTROL DEVICES FOR FULL ROADWAY CLOSURE AND DETOUR ARE IN PLACE.
15. WESTON STREET (STATE ROUTE 20) IS A STATE HIGHWAY. ALL WORK SHALL CONFORM TO THE MASSDOT SPECIFICATIONS AND REQUIREMENTS.
16. THE CONTRACTOR SHALL MAINTAIN AT LEAST TWO LANES OF TRAFFIC (ONE IN EACH DIRECTION) AT ALL TIMES.
17. TRAFFIC MANAGEMENT PLAN SHALL BE PREPARED AND SUBMITTED FOR REVIEW AT LEAST ONE WEEK PRIOR TO THE COMMENCEMENT OF ANY WORK.
18. ALL WORK WILL BE SUBJECT TO RESTRICTED WORK HOURS. CONTRACTOR MAY PROPOSE NIGHT/WEEKEND WORK.
19. THE TEST PITS SHOWN ON THE DRAWING MUST BE COMPLETED PRIOR TO COMMENCEMENT OF WORK.
20. THE CONTRACTOR SHALL COORDINATE WITH ALL PRIVATE UTILITY COMPANIES AND SUBMIT A PLAN FOR REVIEW ONE WEEK PRIOR TO COMMENCEMENT OF WORK.
21. THE CONTRACTOR SHALL DISCUSS UTILITY, TRAFFIC, EMERGENCY AND SAFETY ISSUES AND COORDINATION WITH THE CITY OFFICIALS AT THE PRE-CONSTRUCTION MEETING.
22. PUBLIC NOTICE SHALL BE PROVIDED TO ALL ABUTTERS AT LEAST ONE WEEK PRIOR TO ANY WORK.
23. TWO ELECTRONIC TRAFFIC MESSAGE BOARDS MUST BE INSTALLED FOR 8 WEEKS.
24. INSTALL NEW CB HOODS WHEN REPLACING CB LATERAL PIPING.
25. ALL PVC PIPES SHALL BE SDR-35.
26. INSTALL IDENTIFICATION TAPE 18 INCHES BELOW FINISHED GRADE ALONG ALL PVC STORM DRAIN PIPE.
27. REMOVE AND DISPOSE OFF EXISTING HOODS AND INSTALL NEW HOODS FOR CATCH BASINS WITH PROPOSED LATERALS.

SYMBOLS

EXISTING	PROPOSED	
□ CB	□ CB	CATCH BASIN (GUTTER INLET)
		CURB (OR BERM)-TYPE NOTED
		EDGE OF ROAD
○ EHH	● EHH	ELECTRIC HANDHOLE
○ EMH	● EMH	ELECTRIC MANHOLE
○ TMH	● TMH	TELEPHONE MANHOLE
○ WMH	● WMH	WATER MANHOLE
○ SMH	● SMH	SEWER MANHOLE
○ DMH	◎ DMH	DRAINAGE MANHOLE
○ GG	● GG	GAS GATE
○ WG	◉ WG	WATER GATE AND GATE BOX
○ CS	● CS	CURB STOP
Hyd		HYDRANT
LP		STREET LIGHT
UP		UTILITY POLE
GUY		GUY POLE
X" RCP D		DRAIN PIPE
X" VCP S	S	SEWER MAIN
E	UE	ELECTRIC DUCT
X" G	G	GAS MAIN
X" W	W	WATER MAIN

SSV ENGINEERING INC.
SSV ENGINEERING
609 WINTER STREET,
FRAMINGHAM, MA

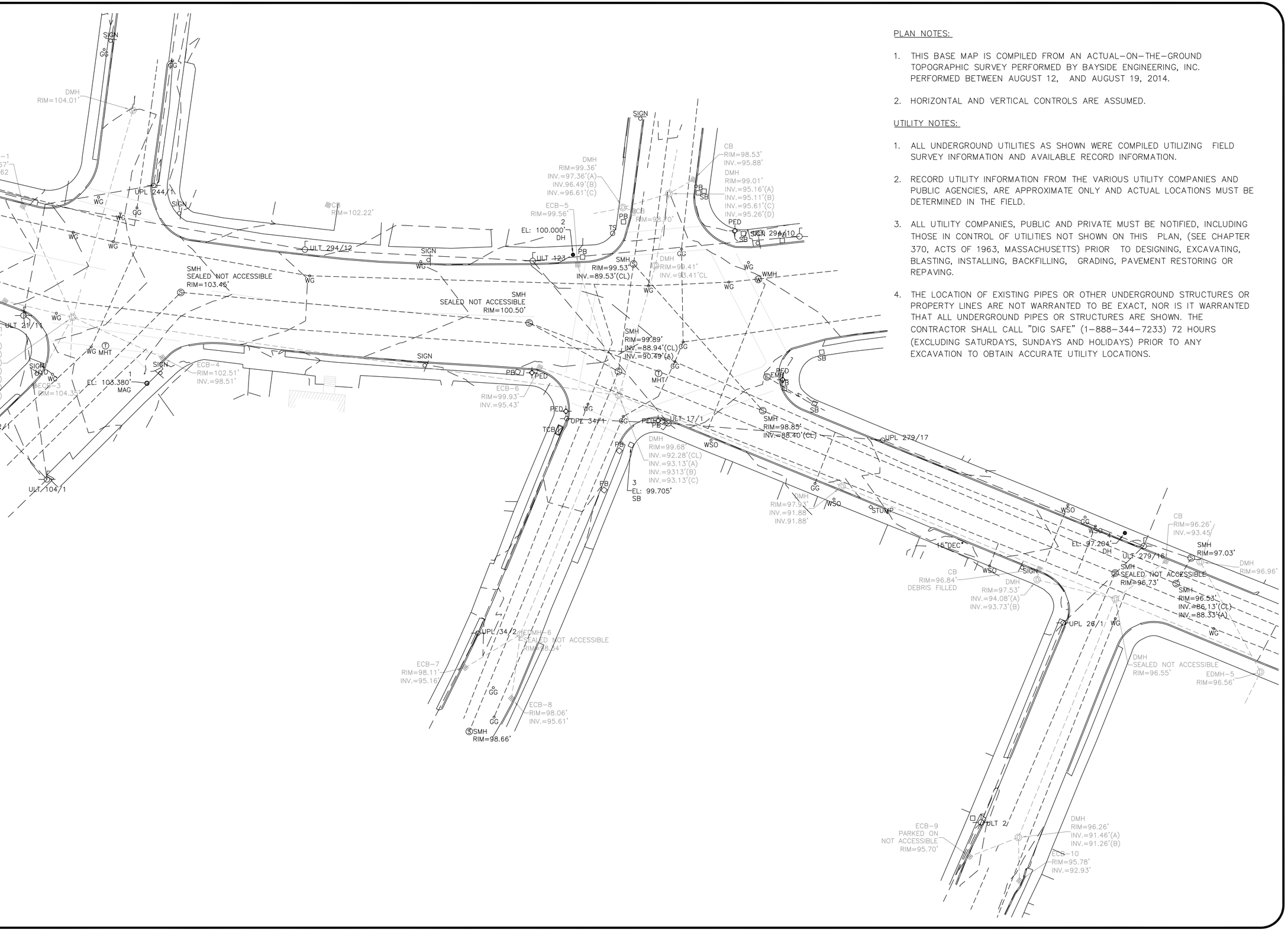
No.	Revision/Issue	Date
1	ADDENDUM #2	08/25/14

ENGINEERING DEPARTMENT
CITY OF WALTHAM
MASSACHUSETTS

STORM DRAIN
IMPROVEMENTS PROJECT
WESTON / VERNON STREET
WALTHAM, MASSACHUSETTS

GENERAL NOTES & LEGENDS

Project	Sheet
Date: AUG 2014	G-002
Scale: 1" = 20'	



PLAN NOTES:

1. THIS BASE MAP IS COMPILED FROM AN ACTUAL-ON-THE-GROUND TOPOGRAPHIC SURVEY PERFORMED BY BAYSIDE ENGINEERING, INC. PERFORMED BETWEEN AUGUST 12, AND AUGUST 19, 2014.

2. HORIZONTAL AND VERTICAL CONTROLS ARE ASSUMED.

UTILITY NOTES:

1. ALL UNDERGROUND UTILITIES AS SHOWN WERE COMPILED UTILIZING FIELD SURVEY INFORMATION AND AVAILABLE RECORD INFORMATION.

2. RECORD UTILITY INFORMATION FROM THE VARIOUS UTILITY COMPANIES AND PUBLIC AGENCIES, ARE APPROXIMATE ONLY AND ACTUAL LOCATIONS MUST BE DETERMINED IN THE FIELD.

3. ALL UTILITY COMPANIES, PUBLIC AND PRIVATE MUST BE NOTIFIED, INCLUDING THOSE IN CONTROL OF UTILITIES NOT SHOWN ON THIS PLAN, (SEE CHAPTER 370, ACTS OF 1963, MASSACHUSETTS) PRIOR TO DESIGNING, EXCAVATING, BLASTING, INSTALLING, BACKFILLING, GRADING, PAVEMENT RESTORING OR REPAVING.

4. THE LOCATION OF EXISTING PIPES OR OTHER UNDERGROUND STRUCTURES OR PROPERTY LINES ARE NOT WARRANTED TO BE EXACT, NOR IS IT WARRANTED THAT ALL UNDERGROUND PIPES OR STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL CALL "DIG SAFE" (1-888-344-7233) 72 HOURS (EXCLUDING SATURDAYS, SUNDAYS AND HOLIDAYS) PRIOR TO ANY EXCAVATION TO OBTAIN ACCURATE UTILITY LOCATIONS.

No.	Revision/Issue	Date
1	ADDENDUM #2	08/25/14

ENGINEERING DEPARTMENT
CITY OF WALTHAM
MASSACHUSETTS

STORM DRAIN
IMPROVEMENTS PROJECT
WESTON / VERNON STREET
WALTHAM, MASSACHUSETTS

EXISTING CONDITIONS

Project	Sheet
Date: AUG 2014	C-100
Scale: 1" = 20'	

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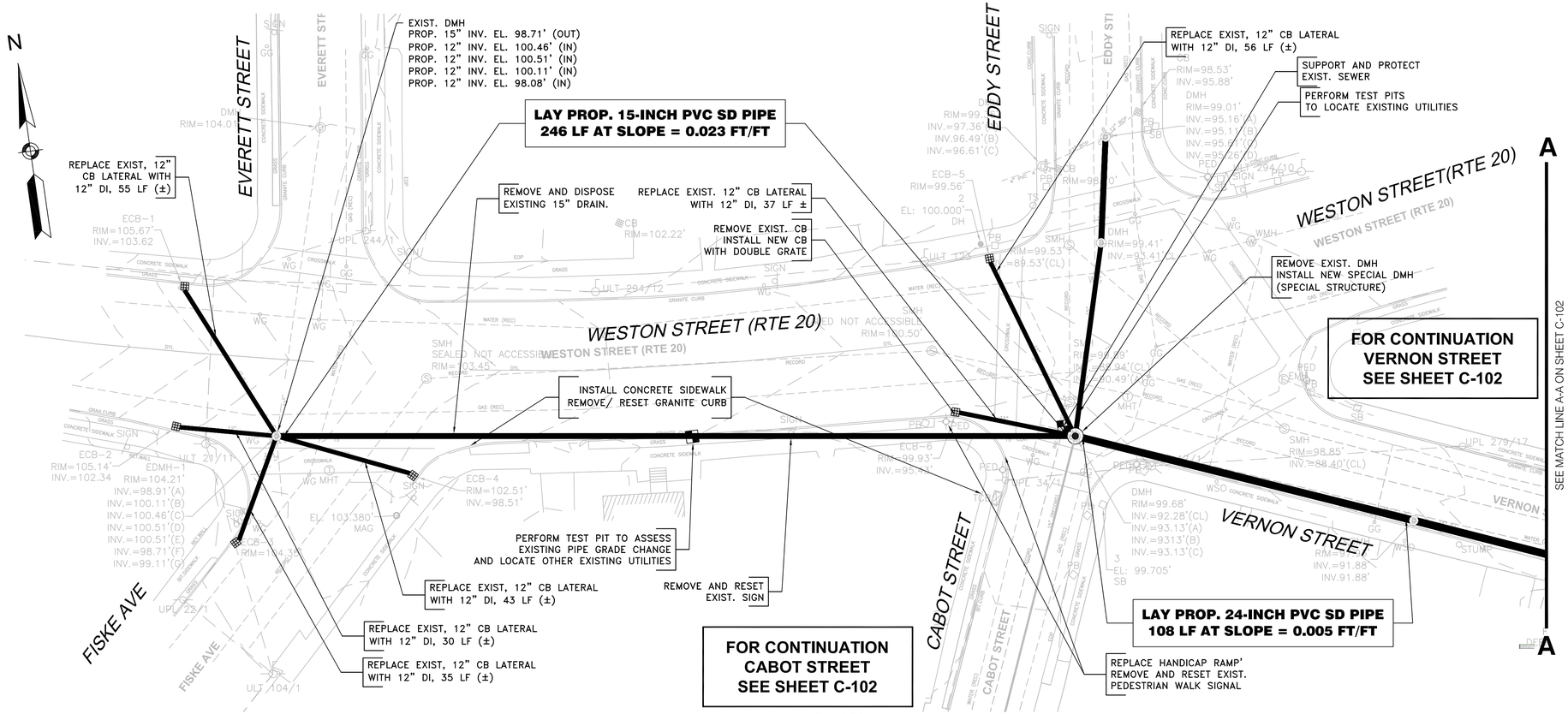
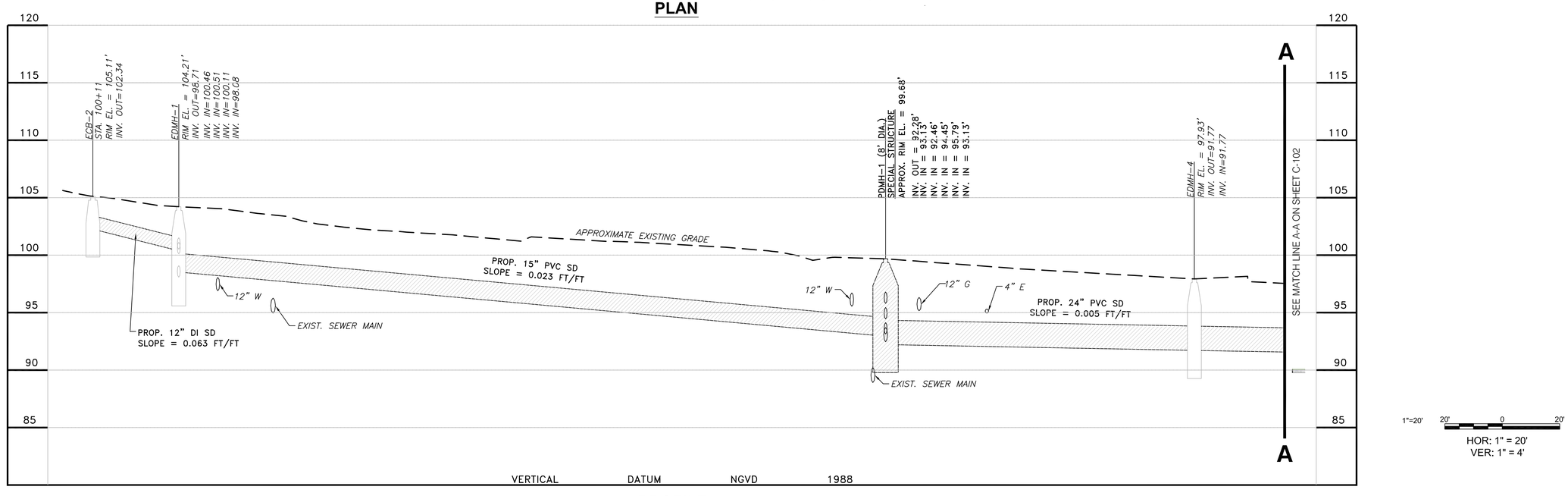


PLAN



PROFILE

1"=20' 20' 0 20'

HOR: 1" = 20'
VER: 1" = 4'

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SSV ENGINEERING INC.
SSV ENGINEERING
609 WINTER STREET,
FRAMINGHAM, MA

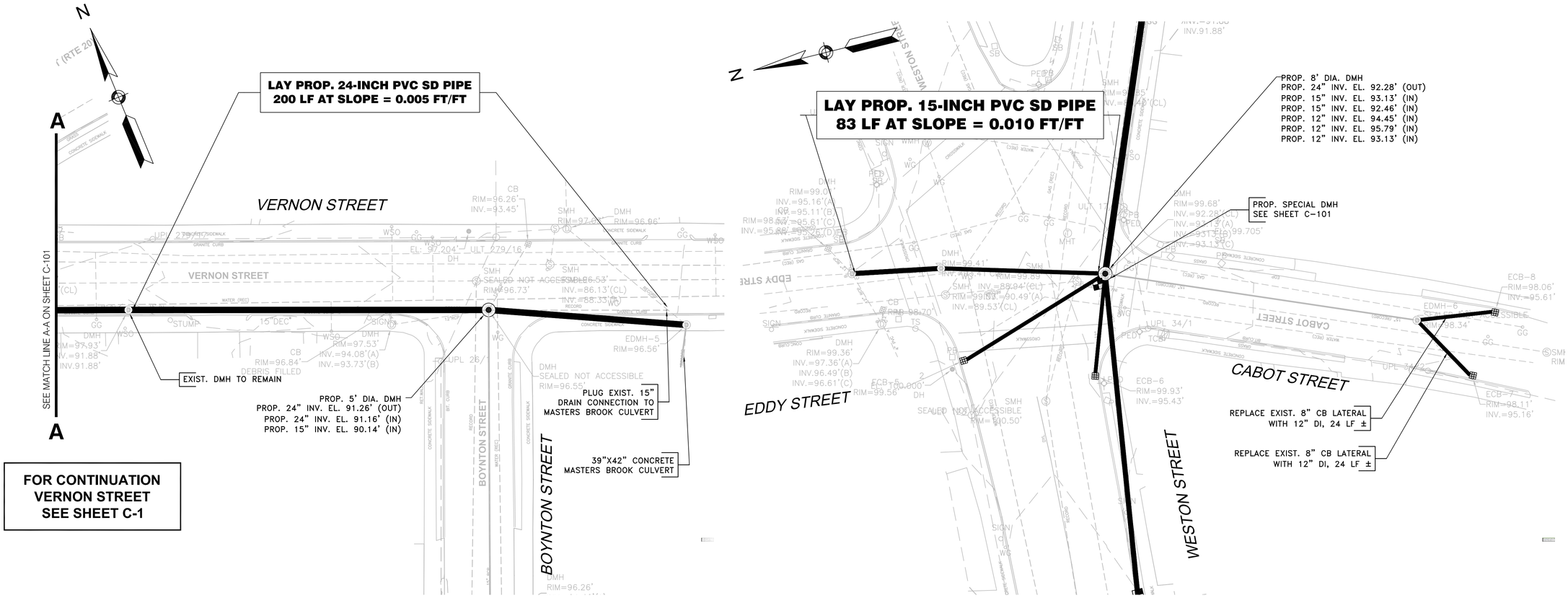
No.	Revision/Issue	Date
1	ADDENDUM #2	08/25/14

ENGINEERING DEPARTMENT
CITY OF WALTHAM
MASSACHUSETTS

STORM DRAIN
IMPROVEMENTS PROJECT
WESTON / VERNON STREET
WALTHAM, MASSACHUSETTS

PLAN AND PROFILE

Project	Sheet
Date: AUG 2014	C-101
Scale: 1" = 20'	



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SSV ENGINEERING INC.
SSV ENGINEERING
609 WINTER STREET,
FRAMINGHAM, MA

No.	Revision/Issue	Date
1	ADDENDUM #2	08/25/14

ENGINEERING DEPARTMENT
CITY OF WALTHAM
MASSACHUSETTS

STORM DRAIN
IMPROVEMENTS PROJECT
WESTON / VERNON STREET
WALTHAM, MASSACHUSETTS

PLAN AND PROFILE

Project	Sheet
Date: AUG 2014	C-102
Scale: 1" = 20'	

CATCH BASIN SCHEDULE		
STRUCTURE	RIM	INVERT
ECB-1	105.68	INVERT OUT = 103.62 (EDMH-1)
ECB-2	105.11	INVERT OUT = 102.34 (EDMH-1)
ECB-3	104.34	INVERT OUT = 100.45 (EDMH-1)
ECB-4	102.68	INVERT OUT = 98.51 (EDMH-1)
ECB-5	99.62	INVERT OUT = 93.73 (PDMH-1 (8' DIA.))
ECB-6	99.93	INVERT OUT = 95.43 (PDMH-1 (8' DIA.))
ECB-7	98.13	INVERT OUT = 95.16 (EDMH-6)
ECB-8	98.09	INVERT OUT = 95.61 (EDMH-6)
ECB-9	95.76	INVERT OUT = 92.93 (EDMH-7)
ECB-10	95.83	INVERT OUT = 92.93 (EDMH-7)

DRAIN MANHOLE SCHEDULE		
STRUCTURE	RIM	INVERT
EDMH-1	104.21	INVERT IN = 100.46 (ECB-2) INVERT IN = 100.51 (ECB-1) INVERT IN = 100.11 (ECB-3) INVERT IN = 98.08 (ECB-4) INVERT OUT = 98.71 (PDMH-1 (8' DIA.))
EDMH-2	99.01	INVERT OUT = 95.47 (EDMH-3)
EDMH-3	99.41	INVERT IN = 95.15 (EDMH-2) INVERT OUT = 95.05 (PDMH-1 (8' DIA.))
EDMH-4	97.93	INVERT IN = 91.77 (PDMH-1 (8' DIA.)) INVERT OUT = 91.77 (PDMH-2 (5' DIA.))
EDMH-5	96.56	INVERT IN = 90.90 (PDMH-2 (5' DIA.)) INVERT OUT = 90.90 (MASTERS BROOK CULVERT)
EDMH-6	98.34	INVERT IN = 94.88 (ECB-7) INVERT IN = 95.33 (ECB-8) INVERT OUT = 93.61 (PDMH-1 (8' DIA.))
EDMH-7	96.26	INVERT IN = 91.46 (ECB-9) INVERT IN = 91.46 (ECB-10) INVERT OUT = 91.29 (PDMH-2 (5' DIA.))
PDMH-1 (8' DIA.)	99.68	INVERT IN = 93.13 (EDMH-1) INVERT IN = 92.46 (EDMH-6) INVERT IN = 94.45 (EDMH-3) INVERT IN = 95.79 (ECB-6) INVERT IN = 93.13 (ECB-5) INVERT OUT = 92.28 (EDMH-4)
PDMH-2 (5' DIA.)	96.55	INVERT IN = 91.16 (EDMH-4) INVERT IN = 90.14 (EDMH-7) INVERT OUT = 91.26 (EDMH-5)

SSV ENGINEERING INC.
SSV ENGINEERING
609 WINTER STREET,
FRAMINGHAM, MA

No.	Revision/Issue	Date
1	ADDENDUM #2	08/25/14

ENGINEERING DEPARTMENT
CITY OF WALTHAM
MASSACHUSETTS

STORM DRAIN
IMPROVEMENTS PROJECT
WESTON / VERNON STREET
WALTHAM, MASSACHUSETTS

CB AND DMH SCHEDULE

Project	Sheet
Date: AUG 2014	C-103
Scale	

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APPENDIX B
Technical Specifications

ATTACHMENTS

SECTION 01024

MEASUREMENT AND PAYMENT

PART I-GENERAL

1.1 SUMMARY

A. Under the price specified to be paid for each item, the Contractor shall furnish all materials and equipment, furnish all labor and plant and perform all operations to complete all work as indicated and specified. Provide all supervision, overhead items, insurance, bond and permit costs, protection and precautions and all other costs, incidental to the construction work, complete, and as specified, are also included.

B. A complete, finished, working job, as intended by the general nature of these Specifications, shall be produced whether or not any particular wording or direction is omitted or inadvertently not clearly stated.

C. Measurement for payment shall be by the Engineer, except where noted elsewhere in this Specification. Measurement for payment for lump sum items shall be on the basis of percentage of work complete and in place.

D. Each unit or lump sum price stated in the Bid shall constitute full compensation as herein specified for each item of work completed in accordance with the Drawings and Specifications.

E. The prices for those items which involve excavation shall include compensation for disposal of surplus excavated material, dewatering, earth support, and handling and disposal of water.

F. The prices for all pipe items shall constitute full compensation for furnishing, laying, jointing, and testing of pipe; excavation and backfill; and clean up.

G. In all items involving excavation, the price shall be based on doing the entire excavation in earth. Where rock is excavated, the price thereof shall be in addition to the cost of excavating earth, and no deduction will be made in the amount for earth excavation.

H. Unit prices submitted for various items of work will be utilized for determining prices of any additional work necessary during construction.

I. Final payment shall not be issued until the Contractor submits record drawings and the Engineer approves these drawings. .

1.2 ITEM DESCRIPTIONS-BASE BID

Item 1: Mobilization and Demobilization

1. For the Lump sum bid price for this Item, the Contractor shall mobilize and demobilize to and from the site all labor, materials, and equipment to complete all work associated with this contract. Demobilization from the site includes, but is not limited to: removal of all equipment and final cleanup to the satisfaction of the City.

2. Payment for the mobilization and demobilization shall be by lump sum. Fifty percent of the lump sum price shall be paid to the Contractor upon completing mobilization activities, and the remaining fifty percent shall be paid upon demobilization from the site.

Item 2: Traffic Management

1. For the Lump sum bid price for this Item, the Contractor shall prepare Traffic Management Plans in conformance with all current and applicable requirements and implement the plan throughout the execution of the project. This will include all the signs, electronic displays, safety devices, labor, materials, and equipment to complete all work associated with this contract.

2. Payment for the mobilization and demobilization shall be by lump sum.

Item 3: Test Pits

1. The Contractor shall conduct test pits as identified on the drawings and as directed by the Engineer to obtain information on the location and elevations of existing utilities.

2. Payment for this item shall be by Cubic Yard of excavation.

Item 4: Storm Drain Piping (15" PVC) and Appurtenances

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. Payment for this item shall be made based on the percentage of work completed as determined by the Engineer.

3. The Contractor shall provide all necessary materials, equipment and labor to furnish and install the storm drain pipe and appurtenances. Work shall include scheduling and coordinating the work, verification of existing pipe sizes, coring, cutting and patching at the connection to the existing system, grouting of openings and corings, protection of private and public property and utilities, excavation, dewatering, backfill and compaction; disposal of any water; and maintenance of flow during construction. Work shall include disposal of excess material and debris; and resetting any disturbed curbs, walkways, driveways, retaining walls, landscaping or any other site features disturbed during construction.

4. Full payment shall not be made until the piping is tested to the satisfaction of the Engineer and the property is restored to its pre-construction condition.

5. Payment shall be per unit as listed on the Bid Form.

Item 4A: Storm Drain Piping (24" PVC) and Appurtenances

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. Payment for this item shall be made based on the percentage of work completed as determined by the Engineer.

3. The Contractor shall provide all necessary materials, equipment and labor to furnish and install the storm drain pipe and appurtenances. Work shall include scheduling and coordinating the work, verification of existing pipe sizes, coring, cutting and patching at the connection to the existing system, grouting of openings and corings, protection of private and public property and utilities, excavation, dewatering, backfill and compaction; disposal of any water; and maintenance of flow during construction. Work shall include disposal of excess material and debris; and resetting any disturbed curbs, walkways, driveways, retaining walls, landscaping or any other site features disturbed during construction.

4. Full payment shall not be made until the piping is tested to the satisfaction of the Engineer and the property is restored to its pre-construction condition.

5. Payment shall be per unit as listed on the Bid Form.

Item 5: Catch Basin Lateral Piping (12" DI)

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. Payment for this item shall be made based on the percentage of work completed as determined by the Engineer.

3. The Contractor shall provide all necessary materials, equipment and labor to furnish and install the piping. Work shall include scheduling and coordinating the work, verification of existing pipe sizes, coring, cutting and patching at the connection to the existing system, grouting of openings and corings, protection of private and public property and utilities, excavation, dewatering, backfill and compaction; disposal of any water; and maintenance of flow during construction. Work shall include disposal of excess material and debris; and resetting any disturbed curbs, walkways, driveways, retaining walls, landscaping or any other site features disturbed during construction.

4. Full payment shall not be made until the piping is tested to the satisfaction of the Engineer and the property is restored to its pre-construction condition.

5. Payment shall be per unit as listed on the Bid Form.

Item 6: Catch Basin with Double Frame and Grate

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. Payment shall be per unit as listed on the Bid Form.

Item 7: Catch Basin Hoods

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. Payment shall be per unit as listed on the Bid Form.

Item 8: Special Precast Concrete Drain Manhole

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. Payment shall be per unit as listed on the Bid Form.

Item 8A: 5-Foot Diameter Precast Concrete Drain Manhole

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. Payment shall be per unit as listed on the Bid Form.

Item 9: Temporary Pavement Restoration (MassDOT)

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. The quantity of pavement to be paid for under this item shall be the actual amount of square yards after compaction measured in place by the engineer.

3. Payment for this item shall include full compensation for furnishing, placing, compacting and maintaining all paved surfaces.

Item 10: Permanent Pavement Restoration (MassDOT)

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. The quantity of pavement to be paid for under this item shall be the actual amount of square yards after compaction measured in place by the engineer.

3. Payment for this item shall include full compensation for furnishing, placing, compacting and maintaining all paved surfaces.

Item 11: Reflectorized White Thermoplastic Pavement Arrows and Legends (MassDOT 860.040)

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. Payment shall be per unit as listed on the Bid Form.

Item 11A: Reflectorized White Thermoplastic Crosswalks and Stop Lines (MassDOT 865.100)

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. Payment shall be per unit as listed on the Bid Form.

Item 11B: 4 Inch Reflectorized White Line Thermoplastic (MassDOT 866.040)

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. Payment shall be per unit as listed on the Bid Form.

Item 12: 4 Inch Reflectorized Yellow Line Thermoplastic (MassDOT 867.040)

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as specified and as shown on the drawings.

2. Payment shall be per unit as listed on the Bid Form.

Item 13: Watermain Relay Allowance

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as necessary as specified and as shown on the drawings.

2. The quantity to be paid for under this item shall be the actual number of watermain relays completed.

Item 14: Sewer Service Lateral Relay Allowance

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as necessary specified and as shown on the drawings.

2. The quantity to be paid for under this item shall be the actual number of sewer service lateral relays completed.

Item 15: Concrete Sidewalk/Handicap Ramp

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as necessary specified and as shown on the drawings.

2. The quantity to be paid for under this item shall be the actual number of sewer service lateral relays completed.

Item 16: Remove and Reset Granite Curb

1. Under the unit bid price for this Item, the Contractor shall provide all necessary materials equipment and labor to execute the work as necessary specified and as shown on the drawings.

2. The quantity to be paid for under this item shall be the actual number of sewer service lateral relays completed.

Item17: Police Detail Allowance

1. Police officers if necessary shall be authorized by the City and the Engineer and used for traffic management around construction zones.

2. Payment shall be on a unit basis (per hour).

Item 18: Miscellaneous Work and Cleanup

1. Under the lump sum price for this Item, the Contractor shall provide all general construction services, labor, materials, supplies, consumables, and equipment necessary to complete all work required to construct the work identified on the Drawings and in the Specifications, which is not included in all other Bid Items. This shall include, but is not limited to, the following:

    a. Attending the pre-construction conference and all required job progress and community meetings, and coordination of all construction activities with the appropriate local authorities and utilities. Submission of construction photographs of completed work at each property
    b. Submission of all schedules, lists, laboratory test results, materials and sources, and shop drawings, photographs before and after construction, as required, in a timely manner to the Engineer for review and approval.
    c. Maintenance and repair of all work for one (1) year period.
    d. Providing a Site-Specific Health and Safety Plan for the Contractor's employees in accordance with the minimum standards set forth in OSHA 29 CFR 1910.120 and 29 CFR 1926.
    e. Implementation of the Health and Safety Plan.
    f. Construction, maintenance, and removal of equipment from any staging or wash down areas.
    g. Erosion Control measures to prevent exposed fill, excavated material, or other materials from washing away or otherwise eroding from slopes or into wetlands.

h. Coordination of all construction activities with the City of Waltham.
i. All other project related direct and indirect costs not described above.

2. Payment for this lump sum item will be based on a percentage of the work completed, as determined by the Engineer.

END OF SECTION 01024

SECTION 01170

SPECIAL PROVISIONS

PART 1-GENERAL

1.1 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 the payment paragraphs of the specifications, 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.

1.2 SITE INVESTIGATION

A. The Contractor shall satisfy himself/herself 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 Specifications. Any failure of the Contractor to acquaint himself/herself with the available information will not relieve him/her 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.

1.3 CONTRACTOR'S EMERGENCY CONTACT AND RESPONSE REQUIREMENT

A. The Contractor will be required to designate a contact person as well as an emergency response crew who can be notified by the City of Waltham and the Engineer during Contract related emergencies, 7 days a week, 24 hours a day throughout the length of this Contract.

B. The name of the designated person, a daytime contact telephone number, an evening contact telephone number, and a portable cellular telephone number must be furnished to the City of Waltham at the pre-construction meeting. In addition, the contact person will be required to carry a City of Waltham approved paging device (beeper) at all times during the Contract. The beeper number shall also be supplied at the pre construction meeting. The Contractor must also provide a mobile cellular telephone that will remain at the construction site during the hours of construction. The phone will be in a location that will allow the Contractor to respond to calls as well as the Owner or Engineer.

C. The contact person shall be required to respond to any City of Waltham notification in this regard within one hour of such notice by calling (781) 314-3844 Upon being

advised by the City of Waltham of the location and nature of the emergency, the Contractor will be required to provide an emergency coordinator or contact at the site within one hour of the initial notification and to mobilize the necessary response crew(s) and have them at the site of the emergency within two hours of the initial notification.

D. The Contractor's failure to comply with the above notification and response requirements shall result in a five-hundred dollar ($500.00) fine for each failure to respond as indicted in 1.3.C. In addition the Contractor shall be liable for any and all damages, liabilities and costs which result from his/her failure to respond to any emergency within the designated time periods. The City of Waltham assumes no responsibility or costs for the Contractor's negligence in complying with these requirements. If the subject fine or other liabilities are not paid by the Contractor upon request, it shall be deducted from any payment(s) which may be due the Contractor by the City of Waltham, solely at the discretion of the City of Waltham.

E. The Contractor shall not use any City of Waltham personnel to fulfill these requirements.

F. This requirement shall be considered an incidental part of the Contract, no matter how many times the Contractor is alerted during this Contract, and no payment will be made for any costs incurred or associated with the emergency contact and response requirements.

1.4 PUBLIC UTILITIES

A. The Contractor shall 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. The Contractor shall 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. The Contractor shall be responsible for providing the Utility Companies with a schedule of his/her activities in areas where the utilities exist.

3. The Contractor shall immediately notify utility companies of any damage to their utilities resulting from construction operations.

4. The express approval of the Owner shall be obtained before public water is used. Hydrants shall only be operated under the supervision of the Owner's personnel. The water is to be metered. A meter must be attained by the Water Division. The Contractor will be responsible for all associated fees and charges for water use.

B. The Contractor shall notify DIGSAFE at 1-800-322-4844 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.

1.5 PERMITS

A. The Contractor shall be required to obtain all necessary permits for proper execution of certain phases of the project. The Contractor shall fill out all forms and furnish all drawings required to obtain the permits. A copy of the approved permit shall be submitted to the Engineer. All fees associated with these permits shall be paid by the Contractor as part of the project. Work shall not commence on any phase of the work requiring a permit until the permit is obtained.

B. The Contractor shall obtain the required street opening permit from the Department of Public Works for excavations within the street or sidewalk area.

1.6 TRAFFIC AT STREET INTERSECTIONS

A. The Contractor shall minimize interferences with the normal flow of traffic. The Contractor shall take all actions ordered by the Engineer to minimize the disruption of normal traffic flow.

1.7 SPECIAL CONCRETE MANHOLE STRUCTURE

A. The Contractor is made aware that a new special concrete manhole is required to be installed at the intersection of Weston and Cabot Streets to replace the existing one.

B. A total of 6 pipe connections connect to this manhole. The Contractor must submit his proposed precast concrete manhole design identifying the proposed invert connections and piping orientations to the Engineer for review.

C. The live traffic design load for the manhole is HS-20.

1.8 WORK IN CLOSE PROXIMITY TO RESIDENCES

A. The proposed storm drain replacement along Weston Street from Fiske Avenue to Cabot Street will require work to be performed in close proximity to #98 and #102 Weston Street.

B. This work may require proper protection and/or removal and replacement of existing hedges. The driveways to these residences will be impacted. The Contractor shall coordinate his work with the residents and maintain vehicular access.

C. The coordination and scheduling with the residents, means and method to provide and maintain access, complete site restoration of all disturbed areas on private properties will be considered incidental to the installation of the drain pipe and no separate payment will be made.

1.9 TRAFFIC LOOP DETECTORS

A. The Contractor must locate any existing traffic loop detectors and conduits/ducts or other wiring related to traffic signals.

B. The Contractor must coordinate this information with Mr. Timothy Kelly at the City Wires Department.

C. The Contractor must provide adequate protection of the traffic loop detectors at all times during his construction activities. Any damage to the existing traffic loop detectors or related facilities must be repaired/replaced to the satisfaction of the City Wires Department. This work will be considered incidental to the installation of the drain pipe and no separate payment will be made.

PART 2 -PRODUCTS (NOT USED)

PART 3- EXECUTION (NOT USED)

END OF SECTION 01170

SECTION 01200

PROJECT MEETINGS

PART 1-GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

1.2 COORDINATION WITH THE CITY

A. As part of this Contract, the Contractor shall coordinate his activities with the City. In addition, the Contractor will give the City significant notice on any work that may be required to meet the contract schedule.

1.3 PRECONSTRUCTION CONFERENCE

A. A pre-construction conference will be held between the Contractor, the Engineer, the Owner, and applicable agency representatives to review the Contractor's proposed methods of complying with the requirements of the Contract Documents.

B. Contractor will be notified of the time, date and place where the pre-construction conference will be held.

1.4 PROGRESS MEETINGS WITH ENGINEER

A. In addition to other regular project meetings for other purposes (as indicated elsewhere in the Contract Documents), hold general progress meetings twice each month with times coordinated with preparation of payment requests. Meeting dates shall be established by the Engineer. Require every entity then involved in the planning, coordination or performance of work to be properly represented at each meeting. Include (when applicable) consultants, separate contractors (if any), principal subcontractors, suppliers/ manufacturers/fabricators, governing authorities, insurers, special supervisory personnel and others with an interest or expertise in the progress of the work Review each entity's present and future needs including interface requirements, time, sequence, deliveries, access, site utilization, temporary facilities and services, hours of work, hazards and risks, housekeeping, submittals, change orders, and documentation of information for payment requests. Discuss whether each element of current work is ahead of schedule. Determine how behind-time work will be expedited, and secure commitments from the entities involved in doing so. Discuss whether schedule revisions are required to ensure that current and subsequent work will be completed within the Contract Time. Review everything of significance which could affect the progress of the work.

B. Within seven days after each progress meeting date, the Engineer will forward copies of the minutes-of-the-meeting, to the Contractor.

C. Immediately following each progress meeting where revisions to the Progress Schedule/Critical Path Schedule have been made or recognized (regardless of whether agreed to by each entity represented), revise the Schedule. Reissue revised Schedule within 10 days after meeting. At intervals matching the preparation of payment requests, revise and reissue the Schedule to show actual progress of the work in relation to the latest revision of the Schedule.

PART 2- PRODUCTS (NOT USED)

PART 3- EXECUTION (NOT USED)

END OF SECTION 01200

SECTION 01300

SUBMITTALS

PART 1- GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. This Section specifies the general methods and requirements of submissions applicable to the following work-related submittals: Shop Drawings, Product Data, Samples, Construction Photographs, and Construction Schedules. Additional general submission requirements are contained in Paragraphs 6.24 and 6.25 of the General Conditions. Detailed submittal requirements will be specified in the technical specifications sections.

B. All submittals shall be clearly identified by reference to Specification Section, Paragraph, Drawing No. or Detail as applicable. Submittals shall be clear and legible and of sufficient size for sufficient presentation of data.

1.2 SHOP DRAWINGS PRODUCT DATA, SAMPLES

A. Shop Drawings

1. Shop drawings, as defined in the General Conditions, and as specified in individual work Sections include, but are not necessarily limited to, custom-prepared data such as fabrication and erection/installation (working) 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 for approval 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. The Contractor shall check all subcontractor's shop drawings regarding measurements, size of members, materials, and details to satisfy himself that they conform to the intent of the Drawings and Specifications. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission thereof.

4. All details on shop drawings submitted for approval 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 for approval.

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, but are not necessarily limited to, 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 compliance's 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, but are not necessarily limited to, 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.

1.3 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall 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 the Specifications

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 submittal transmittal sheet for shop drawings, product data and samples at the time of submittal of said drawings, product data and samples to the Engineer.

C. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from his/her responsibility with regard to 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.

D. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on- site construction accomplished which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

E. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.

1.4 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 as defined in Paragraph 1.2 A: Six copies.

2. Product Data as defined in Paragraph 1.2 B: Three copies.

3. Samples: Submit the number stated in the respective Specification 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 specification 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 Specification numbers.

9. Identification of deviations from Contract Documents.

10. Identification of revisions on resubmittals.

11. An 8-in x 3-in blank space for Contractor and Engineer stamps.

1.5 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 time for performance, 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 - "NO EXCEPTION TAKEN" 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 - "MAKE CORRECTIONS 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 - "SUBMIT SPECIFIED ITEM". This combination of codes is assigned when a confirmation of the notations and comments IS required by the Contractor. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the Engineer within I 0 calendar days of the date of the Engineer's transmittal requiring the confirmation.

Code 4 - "REVISE AND 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 I 0 calendar days of the date of the Engineer's transmittal requiring the resubmittal.

Code 5 - "REJECTED" 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.

E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing on the letter of transmittal and on resubmitted shop drawings by use of revision triangles or other similar methods, to revisions other than the corrections requested by the Engineer, on previous submissions. Any such revisions which are not clearly identified shall be made at the risk of the Contractor. The Contractor shall make corrections to any work done because of this type revision that is not in accordance to the Contract Documents as may be required by the Engineer.

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 "Rejected" until resubmitted. The Engineer may at his/her option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.

G. 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 seven working days prior to release for manufacture.

H. 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.

1.6 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 6.

1.7 CONSTRUCTION PHOTOGRAPHS

A. Where directed by the Engineer, the Contractor shall have an average of 20 color photographs per month made of the work during its progress and 20 color photographs of the completed facilities. The photographs shall be of such views and taken at such times as the Engineer directs. Photographs shall be taken at each property.

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 x 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 2-114-in wide by 1-3/4-in high containing thereon in neat lettering;

1. Contractor's name

2. Short Description of View

3. Photo No. and

4. Photographer's Firm Name

1.8 SCHEDULES

A. Provide all schedules required by Articles 2.6, 2.9, 14.1, and elsewhere in the General Conditions.

B. The Contractor shall submit a progress schedule before starting any work, in accordance with Article 2.6 of the General Conditions. The Contractor shall review the progress schedule with the Engineer periodically. Such review shall be made on a monthly basis or

more frequently as required by the Engineer. The progress schedule shall be updated as required by the Engineer.

1.9 "OR EQUAL"

A. Should the Contractor seek approval of a product other than the brand or brands named in these specifications, it shall furnish written evidence that such product conforms in all respects to the specified requirements, and that it has been used successfully elsewhere under similar conditions. Where the specified requirements involve conformance to recognized codes or standards the Contractor shall furnish evidence of such conformance in the form of test or inspection reports, prepared by a recognized agency, and baring an authorized signature.

B. Manufacturers' standard data and catalog cut sheets will not be considered sufficient in themselves, and the Engineer will not be responsible for seeking further data from the manufacturer, or for otherwise researching the product. Failure to provide complete data will be cause for rejection of the product.

C. The Contractor shall be responsible for all additional costs including license fees, foundation, piping and electrical work necessary to accommodate the proposed "or equal" equipment. Items which result in a cost reduction shall be presented and a change order reflecting 65% of the cost savings will be prepared and the contract price modified.

1.10 PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM

A. If specifically required in other Sections of these Specifications, the Contractor shall submit a P.E. Certification for each item required, in the form attached to this Section, completely filled in and stamped.

1.11 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 sections, of the Specifications, 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.

PART 2- PRODUCTS (NOT USED)

PART 3- EXECUTION (NOT USED)

END OF SECTION 01300

SECTION 01576

POLICING

PART 1- GENERAL

1.1 SUMMARY

A. When, in the opinion of the Owner, public safety or convenience requires the services of police, the Owner may direct the Contractor to provide manpower to direct traffic within the location of work under this Contract.

B. When so directed, the Contractor shall make all arrangements in obtaining the manpower and all invoices for policing will be made to the Owner, the Owner shall approve the Daily Police Billing Verification Form, and the Owner shall pay all expenses incurred, including the salaries of the assigned personnel. Forms are available from Owner.

C. The intent is to insure public safety by police direction of traffic. Police are not to serve as watchmen to protect the Contractor's equipment and materials, or to warn pedestrians of such hazards as open tranches.

D. Nothing contained herein shall be construed as relieving the Contractor of any of his responsibilities for protection of persons and property under the terms of the Contract.

E. All payments to police for work under this Contract shall be in accordance with Section 34B of Chapter 149 of the General Laws of the Commonwealth of Massachusetts which states that reserve police officers shall receive the same prevailing wage rates as paid to the regular police officers.

F. The Policing shall be paid for on a weekly basis in accordance with an invoice from the Police Department, with payment sent directly to the Police Department.

END OF SECTION 01576

SECTION 01710

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for contract closeout, including, but not limited to:

1. Inspection procedures.
2. Project record document submittal.
3. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Division 2.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before the Contractor requests inspection for Certification of Substantial Completion of the project, the Contractor shall complete the following items. Exceptions to the listed items will be noted in the request.

B. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the work claimed as substantially complete. Include supporting documents for completion, as indicated in these Contract Documents, and a statement showing an accounting of changes to the Contract Sum.

1. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the work is not complete.

2. Advise the Engineer and Owner of pending insurance change over requirements if applicable.

3. Submit specific Warranties, Workmanship Bonds, Maintenance Agreements, Final Certifications, As-Built Plans, and similar documents.

C. Complete final cleanup requirements.

D. Inspection Procedures: On receipt of a request for inspection, the Engineer will either proceed with inspection or advise the Contractor of unfulfilled requirements. The Engineer will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Engineer will repeat inspection when requested and assure that the work has been substantially completed.

2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for Certification of Final Acceptance and Final Payment, complete the following. List exceptions in the request.

1. Submit the Final Payment Request with releases and supporting documentation not previously submitted and accepted.

2. Include Certificates of Insurance for Products and Completed Operations, where required.

3. Submit an updated final statement, accounting for final additional changes to the contract sum, if any.

4. Submit a certified copy of the Engineer's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Engineer. This will include acceptance by the Engineer of any seeded areas.

B. Submit Consent of Surety to Final Payment.

1. Submit a final liquidated damages settlement statement, if applicable.

2. Submit evidence of final, continuing insurance for one year’s coverage complying with insurance requirements.

C. Re-inspection Procedure: The Engineer will re-inspect the work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has delayed because of circumstances acceptable to the Engineer.

1. Upon completion of re-inspection, the Engineer will prepare a Certificate of Final Acceptance, or advise the Contractor of work that is incomplete, or of obligations that have not been fulfilled, but are required for Final Acceptance.

2. If necessary, re-inspection will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS

A. Record Drawings: Submit As-Built Drawings of the piping, storm drainage structures and all appurtenances. Drawings will be submitted to the Engineer at the completion of the job as specified in Section 01300. Drawings shall be neat, accurate and thorough and submitted in hard copy format (8 1/2 x 11 sheets) and electronically as AutoCAD files.

PART 2- PRODUCTS (NOT USED)

PART 3 -EXECUTION

3.1 FINALCLEANING

A. During its progress, the work and the adjacent areas affected thereby shall be cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.

B. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes structures, work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.

C. On or before the completion of the work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Town's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

F. The Contractor shall restore or replace, when and as directed, any public or private property damaged by his work, equipment, or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor

shall do as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.

END OF SECTION 01710

SECTION 02140

DEWATERING AND DRAINAGE

PART I-GENERAL

1.1 SCOPE OF WORK

A. Furnish, install, operate, monitor, maintain, and remove temporary dewatering and drainage systems as necessary to lower and maintain groundwater levels below subgrades of excavations and prevent surface water runoff from entering or accumulating in excavations, to permit construction in the dry.

B. Collect and properly dispose of all discharge water from dewatering and drainage systems in accordance with local requirements and permits.

C. Repair any damage caused by dewatering and drainage system operations.

D. Remove temporary dewatering and drainage systems when no longer needed, and restore all disturbed areas.

1.2 RELATEDWORK

A. Trenching, backfilling, and compacting included in Section 02221.

1.3 SUBMITTALS

A. Submit the proposed temporary dewatering and drainage system designs. Contractor shall remain responsible for adequacy and safety of construction means, methods, and techniques.

1.4 DEFINITIONS

A. Where the phrase "in-the-dry" is used in these specifications, it shall be defined as soil conditions that are no more than two percentage points above the optimum moisture content for that soil.

1.5 QUALITY ASSURANCE

A. Provide in accordance with Section 01400 and as specified.

B. Employ the services of a dewatering specialist or firm having the following qualifications:

1. Have completed at least five (5) successful dewatering projects of equal size and complexity and with equal systems within the last five (5) years.

2. Retain the services of a Registered Professional Engineer (in the state where the project is located) having a minimum of five (5) years experience in the design of well points, deep wells, recharge systems, or equal systems.

3. Retain the services of a field representative having a minimum of 5 years experience in installation of well points, deep wells, recharge systems, or equal systems.

B. If subgrade soils are disturbed or become unstable due to dewatering operation or an inadequate dewatering system, notify the Engineer, stabilize the subgrade, and modify system to perform as specified at no additional cost to the Owner.

C. Notify the Engineer immediately if any settlement or movement is detected on structures. If the settlement or movement is deemed by the Engineer to be related to the dewatering, take actions to protect the adjacent structures and submit a modified dewatering plan to the Engineer within 24 hours. Implement the modified plan and repair any damage incurred to the adjacent structures at no additional cost to the Owner.

D. If oil and/or other hazardous materials are encountered after dewatering begins, immediately notify the Engineer.

PART 2- PRODUCTS

2.1 MATERIALS

A. Piping, pumping equipment and all other materials required to dewater excavations shall be suitable for the intended purpose. Standby pumping units shall be maintained at the site to be used in case of failure of the normal pumping units. Do not excavate until the dewatering system is operational

B. Provide and store auxiliary dewatering equipment, consisting of pumps and hoses on the site in the event of breakdown, a minimum of one (1) working auxiliary pump is required, and an additional one (1) pump for every five (5) used.

C. Provide and maintain erosion/sedimentation control devices as indicated or specified and in accordance with the dewatering plan.

D. Provide temporary pipes, hoses, flumes, or channels for the transport of discharge water to the discharge location.

E. Provide cement grout having a water cement ratio of 1 to 1 by volume.

PART 3- EXECUTION

3.1 GENERAL

A. Surface water and groundwater shall be controlled such that excavation to final grade is made in-the-dry, the bearing soils are maintained undisturbed, and softening or instability of, or disturbance to, the subgrade due to the presence or seepage of water does not occur.

B. All work shall be protected from flotation.

C. The impact of anticipated subsurface soil/water conditions shall be factored into the selection of methods of excavation and proposed dewatering and drainage systems. Where groundwater levels are above the proposed bottoms of excavations, it is expected that some type of pumped dewatering system will be required for predrainage of the soils prior to excavation to final grade and for maintaining 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. It is further expected that the type of system, spacing of dewatering units, and other details of the work will vary depending on soil/water conditions at a particular location.

3.2 SURFACE WATER CONTROL

A. Surface water control measures shall be constructed to prevent flow of surface waters into excavations. Such measures may include dikes, ditches, and sumps.

3.3 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. Water entering excavations from precipitation or surface runoff shall be collected in shallow ditches around the perimeter of the excavation; drained to sump, and pumped from the excavation to maintain in-the-dry conditions.

C. Pipe and conduit shall not be laid in water or allowed to be submerged prior to backfilling. Pipe and conduit which becomes submerged shall be removed and 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 four days after concrete placement. In no event shall water be allowed to enter an excavation and rise to cause unbalanced pressure on foundations 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 natural 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.

3.4 DISPOSAL OF DRAINAGE

A. All water discharged from temporary dewatering and drainage systems shall be disposed of in accordance with approved sedimentation and control plans and methods. Existing or new sanitary sewer systems or private on-site septic systems shall not be used to dispose of drainage.

END OF SECTION 02140

SECTION 02200

EARTHWORK

PART 1- GENERAL

1.1 SUMMARY

A. This Section includes excavations of normal depth in earth for trenches and structures; backfilling such excavations to the extent required; filling; rough grading;; constructing embankments; miscellaneous earth excavation; the removal, hauling and stockpiling of suitable excavated material for subsequent re-use in the work; all rehandling, hauling and placing of stockpiled materials for use in refilling, filling, backfilling, grading and such other operations; the removal and satisfactory disposal off site of unsuitable material; and appurtenant work, complete, in accordance with the Drawings and Specifications, and as directed.

RELATED SECTIONS

A. Drawings and general provisions of the Contract including General and Supplemental Conditions and Division 1 Specification Sections, apply to this section.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Backfill Materials Source Verification: Submit 50 pound sample for each proposed source of backfill materials. Submit a grain size analysis and curve performed in accordance with ASTM D422 for each proposed source of backfill for review by the Engineer. The grain size analysis shall indicate that the backfill material conforms to the specified gradation requirements. Material obtained from the cuts on the site can be used for backfill provided that it meets the spec for Common Fill or Gravel Borrow contained herein.

C. Submit a moisture-density curve indicating the maximum dry density and optimum moisture content as determined by ASTM D1557 for each proposed source of compacted backfill for review of the Engineer.

A. Filter fabric: Submit the manufacturer's information and a one square foot representative sample of the filter fabric (Section 02273) to the Engineer for review.

E. Within one week of a field change, resubmit revised working drawings as necessary to reflect changes required by field conditions.

F. Submit reports from the geotechnical testing laboratory documenting all earthwork activity and field testing. The field reports shall include as a minimum the following:

1. A description of the day's activities.

2. The results of in-place density testing including in-place dry density, moisture content, percent compaction, elevation of test and a description of the soil.

3. A sketch indicating the extent of each day's work and the location of testing.

G. Submit the qualifications of the certified independent geotechnical testing laboratory performing soil testing and inspection services during earthwork operations. The geotechnical testing laboratory must demonstrate to the Engineer's satisfaction, based on evaluation of laboratory submitted criteria conforming to ASTM D3740, that it has the experience and capability to conduct required field and laboratory geotechnical testing. In addition, the laboratory shall be supervised by a Registered Professional Engineer.

1.4 EXCAVATION CLASSIFICATIONS

A. Earth Excavation or "Excavation" consists of removal of materials encountered to the subgrade elevations indicated and subsequent reuse or disposal of the materials removed. All excavation is classified as earth excavation unless it otherwise meets the classifications provided below for unauthorized excavation, additional excavation, or rock excavation.

B. Unauthorized Excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at Contractor's expense.

1. Under footings, foundations bases, concrete slabs, retaining walls or other structures, fill unauthorized excavations to the proper elevations with lean concrete. Elsewhere, backfill and compact unauthorized excavations as specified for excavations of the same class, otherwise directed by the Engineer.

C. Additional Excavation.

1. When excavation has reached required subgrade elevations, notify the Engineer who will review subgrade conditions..

2. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by the Engineer.

1.5 ROCKEXCAVATION

A. Rock excavation in trenches and pits includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42-inch wide bucket on track-mounted power excavator equivalent to Caterpillar Model 215, rated at not less than 90 HP flywheel power and 30,000 lb. drawbar pull Trenches in excess of 10 foot 0-inches in width and pits in excess of 30 feet 0-inches in either length or width are classified as open excavation.

B. Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered which cannot be dislodged and excavated with modem track-mounted heavy-duty excavation equipment without drilling, blasting or ripping. Rock excavation equipment is defined as Caterpillar Model No. 973 or No. 977K, or equivalent track-mounted loader, rated at not less than 170HP flywheel power and developing 40,000 lb. break-out force (measured in accordance with SAE J732C).

C. Determination of rock excavation classification will be made by the Engineer. Typical of materials classified of rock are boulders 1.0 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits. Intermittent drilling, blasting or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation. Do not perform rock excavation work until material to be excavated has been cross-sectioned and classified by Engineer. If the area to be excavated is pre-blasted prior to the excavation of overburden soils, the Engineer shall be notified at least two days in advance to allow observation of the pre-blast drilling by the Engineer in order to classify the excavation. Visual observation of the completed excavation may be made by the Engineer to modify the excavation classifications. Removal of rock excavation prior to classification by the Engineer shall be considered as earth excavation unless accepted by the Engineer in writing. Such excavation will be paid on the basis of contract unit rates for this classification. If site rock or trench rock is encountered, the contractor must submit a plan for its removal to the Engineer for approval. Excess boulder and rocks must be removed from the site.

D. Rock payment lines are limited to the following:

1. Two feet outside of concrete work for which forms are required, except footings.

2. One foot outside the perimeter of footings.

3. Rock in pipe trenches shall be measured from its surface to 6-inches below the outside of the pipe and with a width of two (2) feet greater than the inside diameter of the pipe but not less than 3 feet minimum trench width. Any rock excavated to a depth or width greater than the above shall be removed and backfilled with ordinary borrow at the Contractor's expense.

1.6 EXCAVATION

A. The Contractor shall perform all excavations of every description and of whatever substances encountered, in a manner as required to allow for placing of temporary earth support, forms, installation of pipe and other work, and to permit access to the Engineer for the purpose of observing the work Excavations shall be to such widths as will give suitable space for the required work. Bottoms of trenches and excavations shall be protected from frost and shall be firm, dry and in an acceptable condition to receive the work; work shall not be placed on frozen surfaces nor shall work be placed on wet or unstable surfaces.

B. All excavations made in open cut will be controlled by the conditions existing at the various locations and shall always be confined to the limits as designated by the Engineer. In no case shall earth be excavated or disturbed by machinery so near to the finished subgrade for structures and pipelines as to result in the disturbance of the earth below the subgrade. The final excavation to subgrade should be accomplished with a smooth faced bucket or by hand if directed by the Engineer.

1.7 GROUNDWATERCONTROL

A. The Contractor shall provide, at his own expense, adequate pumping and drainage facilities to maintain the excavated area(s) sufficiently dry from groundwater and/or surface runoff so as not to adversely affect construction procedures nor cause excessive disturbance of underlying natural ground. The drainage of all water resulting from pumping shall be managed so as not to cause damage to adjacent down-gradient property or resource areas.

B. Any damage resulting from the failure of the dewatering operations of the Contractor, and any damage resulting from the failure of the Contractor to maintain all the areas of work in a suitable dry condition, shall be repaired by the Contractor, as directed by the Engineer, at no additional expense to the Owner. The Contractor's pumping and dewatering operations shall be carried out in such a manner as to prevent damage to the Contract work and so that no loss of ground will result from these operations. Precautions shall be taken to protect new work from flooding during storms or from other causes. Pumping shall be continuous where directed by the Engineer to protect the work and/or to maintain satisfactory progress.

C. All pipelines or structures not stable against uplift during construction or prior to completion shall be thoroughly braced or otherwise protected. Water from the trenches, excavations and drainage operations shall be disposed of in such a manner as to avoid public nuisance, injury to public health or the environment, damage to public or private property, or resource areas, or damage to the work completed or in progress.

D. The Contractor shall control the grading in the areas surrounding all excavations so that the surface of the ground will be properly sloped to prevent water from running into the excavated area. Where required, temporary ditches shall be provided for drainage. Upon completion of the work and when directed, all areas shall be restored by the Contractor in a satisfactory manner and as directed.

PART 2- PRODUCTS

2.1 BACKFILL MATERIALS

A. Ordinary Borrow: Ordinary Borrow (MHD M1.01.0) shall be soil containing no stone greater than 2/3 loose lift thickness. The materials shall be free of trash, ice, snow, tree stumps, roots and other organic and deleterious materials. Ordinary Borrow shall not contain more than 30 percent by weight of soil material passing the number 200 sieve. It shall be of such a nature and character that it can be compacted to the specified densities in a reasonable length of time. Topsoil and subsoil shall not be considered Ordinary Borrow. Ordinary Borrow shall be used for general subgrade fill areas.

B. Structural Fill: Structural Fill shall be used beneath foundations and slabs and as backfill of foundations and other load bearing structures. Structural Fill shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The gradation shall meet the following requirements:

SIEVE DESIGNATION	NOMINAL PERCENT PASSING BY WEIGHT
6 inch	100
3 inch	70-100
¾ inch	40-95
No. 4	30-90
No. 10	25-80
No. 40	10-50
No. 200	0-12

C. Processed Gravel for Subbase: Processed gravel for subbase shall be used where specified as sidewalk and pavement subbase material and shall consist of inert material that is hard, durable stone and coarse sand free from frost, frozen lumps, loam and clay, surface coatings, and deleterious materials.

Gradation requirements for Processed gravel for subbase shall be as designated by MHD M1.03.1 and shall conform to the following:

SIEVE DESIGNATION	NOMINAL PERCENT PASSING BY WEIGHT
3 inch	100
1 ½"	70-100
1/4"	50-85
No. 4	30-60
No. 200	0-10

D. ¾" Crushed Stone: ¾" Crushed stone should be used where specified as bedding under pipes and structures, as a working mat, as a filter around perforated drain pipe or as backfill behind retaining walls. Crushed stone shall consist of durable crushed rock or durable crushed gravel stone, free from ice and snow, sand, clay, loam, or other deleterious or organic material. The crushed stone gradation requirement shall be as

designated by MHD M2.01.4 and shall be uniformly blended and shall conform to the following requirements.

SIEVE DESIGNATION	NOMINAL PERCENT PASSING BY WEIGHT
1 inch	100
¾-inch	70-100
1/2-inch	10-50
3/8-inch	0-20
No. 4	0-5

E. 1 1/2" Crushed Stone: 1 1/2" Crushed stone should be used where specified as bedding under pipes and structures, as a working mat, as a filter around perforated drain pipe or as backfill behind retaining walls. Crushed stone shall consist of durable crushed rock or durable crushed gravel stone, free from ice and snow, sand, clay, loam, or other deleterious or organic material. The crushed stone gradation requirement shall be as designated by MHD M2.01.1 and shall be unifom1ly blended and shall conform to the following requirements.

SIEVE DESIGNATION	NOMINAL PERCENT PASSING BY WEIGHT
2 inch	100
1 ½ inch	95-100
1 inch	35-70
3/4-inch	0-25

F. Dense Graded Crushed Stone for Subbase: Dense graded crushed stone for subbase should be used where specified as pavement and sidewalk sub-base material, only if a deficit of reclaimed material occurs. Dense graded crushed stone shall consist of durable crushed rock or durable crushed gravel stone combined with fine aggregates of natural sand or stone screenings uniformly premixed with a predetermined quantity of water. The composite material shall be free from ice and snow, clay, loam, or other deleterious or organic material. The dense graded crushed stone for subbase gradation requirement shall be as designated by MHD M2.0 I.7 and shall be uniformly blended and shall conform to the following requirements.

SIEVE DESIGNATION	NOMINAL PERCENT PASSING BY WEIGHT
2 inch	100
1 ½ inch	70-00
3/4-inch	50-85
No. 4	30-55
No. 50	8-24
No. 200	3-10

G. Gravel borrow: Gravel borrow shall consist of inert material that is hard, durable stone and coarse sand free from frost, frozen lumps, loam and clay, surface coatings, and deleterious materials.

Graduation requirements for gravel shall be determined by AASHTO-T11 and

T27 and shall conform to the following:

SIEVE DESIGNATION	NOMINAL PERCENT PASSING BY WEIGHT
1/2 inch	50-85
No. 4	40-75
No. 50	8-28
No. 200	0-10

Maximum size of stone in gravel shall be as follows:

6 inches largest dimension Type a

3 inches largest dimension Type b

2 inches largest dimension Type c

H. Bank-run gravel: Bank run gravel shall be obtained from approved natural deposits and unprocessed except for the removal of deleterious materials and stones larger than the maximum size permitted.

Bank-run gravel shall be unfrozen and substantially free from vegetation, roots, loan1 and other organic 1natter, clay, snow, frozen particles and other fine or harmful substances.

Bank-run gravel: Inorganic granular material meeting the following gradation:

SIEVE DESIGNATION	NOMINAL PERCENT PASSING BY_WEIGHT
6 inch	100
2 inch	80-100
No. 4	20-65
No. 200	00-12

PART 3 EXECUTION

3.1 FILLING AND BACKFILLING

A. Verify locations and elevations of existing utilities. Maintain and protect utilities which are to remain.

B. Verify that survey bench marks, horizontal control points, and intended elevations for the work are as shown on the Drawings. Protect survey control points and existing structures.

C. Sequence the work such that work associated with lower elevations and utilities are completed before placing higher elevations and utilities.

D. Stockpiles shall be neatly trimmed and graded to provide drainage from surfaces and to prevent depressions where water may become impounded. Stockpiles shall

be protected and shall not be disturbed. Unsuitable soils shall be segregated and legally disposed by the contractor at no additional cost to the Owner.

E. Subgrade Preparation: After the subgrade has been shaped to line, grade, and cross-section, it shall be thoroughly compacted. This operation shall include any required reshaping and wetting to obtain proper compaction. All soft or otherwise unsuitable material shall be removed and replaced with suitable material from excavation or borrow. The resulting area, and all other low sections, holes, or depressions shall be brought to the required grade with accepted material and the entire subgrade shaped to line, grade and cross-section and thoroughly compacted.

F. Backfill Material Selection: Unless otherwise specified or directed, material used for filling and backfilling shall meet the requirements specified under Backfill Materials (Part 2). In general, the material used for backfilling utility trench excavations shall be material removed from the excavations provided that the reuse of these materials result in the required trench con1paction and meets the requirements specified for common fill. All backfill placed beneath concrete slabs shall be structural fill unless otherwise specified. In areas where the bottom of the excavation is in fine sand and silt, and is below the groundwater table, the first lift of backfill shall be 12-inches of compacted sand and gravel (Gravel Borrow) to provide a working mat and drainage layer.

Place backfill to a maximum loose lift thickness of 12 inches. Maintain backfill material with a uniform moisture content, with no visible wet or dry streaking, between plus 2 percent and minus 3 percent of optimum moisture content. The final filled soil mass shall be as unifom1 as possible in lift thickness, moisture content, and effort required to compact soil mass.

G. Trench Backfill:

1. The trenches shall be backfilled as soon as practicable with suitable material. All trench backfilling shall be done with special care, in the following manner and as directed by the Engineer.

2. Backfill material for pipe bedding shall be deposited in the trench, uniformly on both sides of the pipe, for the entire width of the trench to the springline of the pipe. The selected backfill material shall be placed by hand shovels, in layers not more than 12-inches thick in loose depth, and each layer shall be thoroughly and evenly compacted by tamping on each side of the pipe to provide uniform support around the pipe, free from voids.

3. The balance of backfill shall be spread in layers not exceeding 12-inches in loose depth. Each layer shall be thoroughly compacted by mechanical methods and shall contain no rock, stones or boulders larger than 4-inches in their greatest dimension.

4. All trench backfilling shall be done with special care and must be carefully placed so as not to disturb the work at any time; if necessary, a timber grillage or other suitable method shall be used to break the fall of material. The moisture content of the backfill material• shall be such that proper compaction will be obtained. Puddling of backfill with water will not be permitted. Backfill within areas to receive topsoil or pavement construction shall be made to grades required to establish the proper subgrade for the placement of topsoil or pavement base courses.

5. In backfilling trenches, each layer of backfill material shall be n1oistened and compacted to a density at least equal to that of the surrounding undisturbed earth, and in such a manner as to permit the rolling and compaction of the filled trench or excavation with the adjoining earth to provide the required bearing value, so that paving or foundation construction of the excavated and disturbed areas, where required, can proceed immediately after backfilling is completed.

6. Any trenches or excavations improperly backfilled or where settlement occurs shall be reopened, to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and condition, at no additional expense to the Owner.

7. During filling and backfilling operations, pipelines will be checked by the Engineer to determine whether any displacement of the pipe has occurred. If the observation of the pipelines shows poor alignment, displaced pipe or any other defects they shall be remedied in a manner satisfactory to the Engineer at no additional cost to the Owner.

H. Backfilling Against Structures:

1. Backfilling against masonry or concrete shall not be done until permitted by the Engineer. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking or other damage. As soon as practicable after the structures are structurally adequate and other necessary work has been satisfactorily completed, special leakage tests of the structures shall be made by the Contractor, as required by the Engineer. After the satisfactory completion of leakage tests and the satisfactory completion of any other required work in connection with the structures, the backfilling around the structures shall proceed using suitable and approved excavation material. The best of the backfill material shall be used for backfilling within 2 feet of the structure. Just prior to placing backfill, the areas shall be cleaned of all excess construction material and debris and the bottom of excavations shall be in a thoroughly compacted condition.

2. Symmetrical backfill loading shall be maintained. Special care shall be taken to prevent any wedging action or eccentric loading upon or against the structures. During backfilling operations, care shall be exercised that the equipment used will not overload the structures in passing over and compacting these fills.

Except as otherwise specified or directed, backfill shall be placed in layers not more than 12-inches in loose depth and each layer of backfill shall be compacted thoroughly and evenly using approved types of mechanical equipment. Each pass of the equipment shall cover the entire area of each layer of backfill.

3. In compacting and other operations, the Contractor shall conduct his operations in a manner to prevent damage to structures due to passage of heavy equipment over, or adjacent to, structures, and any damage thereto shall be made good by the Contractor at no additional expense to the Owner.

I. After backfilling trenches and excavations, the Contractor shall maintain the surfaces of backfill areas in good condition so as to present a sn1ooth surface at all times level with adjacent surfaces. Any subsequent settling over backfilled areas shall be repaired by the Contractor immediately, in a manner satisfactory to the Engineer, and such maintenance shall be provided by the Contractor for the life of this Contract, at no additional expense to the Owner.

J. The finished subgrade of the fills and filled excavations upon which topsoil is to be placed, or pavements are to be constructed, or footings or slabs are to be constructed shall not be disturbed by traffic of other operations and shall be maintained in a satisfactory condition until the finished courses are placed. The storage or stockpiling of n1aterials on finished subgrade will not be permitted.

K. Uniformly smooth grading of all areas to be graded, as indicated and as directed, including excavated and filled sections, embankments and adjacent transition areas, and all areas disturbed as a result of the Contractor's operations, shall be accomplished. The finished surfaces shall be reasonably smooth, compacted and free from surface irregularities.

3.2 COMPACTION

A. Compaction Requirements: The degree of compaction is expressed as a percentage of the maximum dry density at optimum moisture content as determined by ASTM Test D1557, Method C. The compaction requirements are as follows:

AREA	ASTM DENSITY DEGREE OF COMPACTION
Below Footings & Slabs	95%
Pavement sub-base and access roads	95%
Root zone areas	85%-88%
Trench Backfill -below pavements -below general landscaped Areas -below structures and walls	 95% 92% 95%
Other Areas	92%

B. Moisture Control:

1. Fill that is too wet for proper compaction shall be disced, harrowed, or otherwise dried to a proper moisture content to allow coMpaction to the required density. If fill cannot be dried within 24 hours of placement, it shall be removed and replaced with drier fill.

2. Fill that is too dry for proper compaction shall receive water uniformly applied over the surface of the loose layer. Sufficient water shall be added to allow compaction to the required density.

C. Unfavorable Conditions:

1. In no case shall fill be placed over material that is frozen. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until the moisture content and the density of the previously placed fill are as specified.

2. In freezing weather, a layer of fill shal1 not be left in an uncompacted state at the close of the day's operations. Prior to terminating work for the day, the final layer of compacted fill shall be rolled with a smooth wheeled roller to eliminate ridges of soil left by compaction equipment.

D. Compaction Control:

1. In-place density tests shall be made in accordance with ASTM D1556, D2922 or D2167 as the work progresses, to determine the degree of compaction being attained by the Contractor. Any corrective work required as a result of such tests, such as additional compaction, or a decrease in the thickness of layers, shall be performed by the Contractor at no additional expense to the Owner. Testing shall be made at the Contractor's expense by the geotechnical testing laboratory.

2. The Engineer's duties do not include supervision or direction of the actual work by the Contractor, his employees or agents. Neither the presence of the Engineer nor any observation and testing performed by him shall excuse the Contractor from defects discovered in his work at that time or subsequent to the testing.

3. In-place density tests shall be performed as a minimum according to the following frequency:

   a. One test per lift under spread footings, or slabs.
   b. One test per lift for every 100' length of strip footings or wall foundations.
   c. A minimum of every 50 cubic yards of backfill in trenches or around structures, or beneath pavement
   d. One test every 500 cubic yards of material placed for general fill areas

4. Minimum laboratory testing requirements for granular fill and backfill materials are as follows:

Type of Test	Frequency	Testing Method
Grain Size Analysis (to the No. 200 Sieve)	1 test/1500 cy	ASTM D-422
Proctor Compaction Test	One test/source	ASTM D-1557

a. The results of the initial tests shall be submitted to the Engineer for review at least 15 days prior to beginning of construction. The testing results shall indicate that the material meets the specified requirements.

b. All other tests shall be performed during construction at the specified intervals or in the opinion of the Engineer, if the gradation of the materials changes. The samples obtained for testing shall be the newly placed backfill soils. The results shall be submitted to the Engineer for review prior to placement of overlay backfill material The testing results shall indicate that the material meets the specific requirements.

c. The rerun of the initial tests due to change of gradation of the backfill soils shall be performed by the Contractor at no additional expense to the Owner.

E. Placement:

1. Where the subgrade surface has an inclination of less than 4:1 (H:V), fill shall be placed in horizontal layers. Fill shall not be placed following the natural contours of the ground. Fill shall be placed starting in the lowest areas working up to finish grades in horizontal layers in the manner specified herein. Each layer of fill should be benched into the existing slope in order to avoid the formation of a shear plane.

2. When placing materials on slopes, the material can be compacted following the natural contours provided the materials are compacted to the requirements given in Paragraph 3.03.A of these specifications. Care should be exercised to avoid the formation of a smooth surface between layers of compacted soil. This may require that the Contractor scarify the top 2 to 3 inches of previously compacted material to permit shear transfer with the subsequent layer.

3.2 FINAL QUALITY CONTROL REPORT

A. The Contractor shall submit a final quality control report presenting all of the results of the materials testing. The Contractor is responsible for compiling all of the quality control testing data into a formal report. The report shall be submitted within 15 days after the completion of all earthwork operations. The report shall include all test results including laboratory compaction, field density, grain size analysis, and plans showing field density testing locations. The report shall be prepared and sealed by a Professional Engineer registered in the Commonwealth of Massachusetts.

3.4 FINE GRADING

A. Before surface or subbase is spread, the subgrade shall be shaped to a true surface conforming to the Drawings. All depressions and high spots shall be filled with suitable n1aterial or removed and such areas again compacted until the surface is smooth and properly 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 which is not accessible to a roller shall be thoroughly compacted by other mechanical methods.

END OF SECTION 02200

SECTION 02221

TRENCHING, BACKFILLING AND COMPACTION

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals necessary to 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 and or as specified and shall provide suitable room for installing pipe, structures and appurtenances.

C. The Contractor shall 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 to receive the work. Work shall not be placed on frozen ground nor shall work be placed on wet unstable ground. If conditions warrant, the Contractor may be ordered to 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 State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

E. Wherever the requirement for 92 percent compaction is referred to herein it shall mean "at least 92 percent of maximum density as determined by ASTM D1557, Method C". Backfilling operations shall be such that material is compacted in 6 inch lifts, including the trench around the barrel of the pipe. Care shall be taken as to not place excessive pressure on the new pipe, such as using heavy rubber tire equipment as a compaction method directly over the new pipe.

F. Contractor will hand dig around existing utilities.

G. Excavation shall be protected each day by either backfilling or steel plates as required.

H. Abandoned pipes and structures are to be completely removed or sealed.

1.2 RELATED WORK

A. Granular fill materials is included in Section 02200.

C. Dewatering and Drainage is included in Section 02140.

D. Pavement repair and resurfacing is included in Section 02576.

1.3 DEFINITIONS

A. Percentage of compaction is defined as the ratio of the field dry density, as determined by ASTM Dl556 or ASTM D2922 to the maximum dry density determined by ASTM D1557 Method C, multiplied by 100.

B. Proof Roll: Compaction with a minimum of 4 passes of a vibratory steel drum or rubber tire roller. Vibratory plate compactors shall be used in small areas where vibratory steel drum or rubber tire roller cannot be used.

C. Acceptable Material: Material which does not contain organic silt or organic clay, peat, vegetation, wood or roots, stones or rock fragments over 6-inch [15 cm] in diameter, porous biodegradable matter, loose or soft fill, excavated pavement, construction debris, or refuse. Stones or rock fragments shall not exceed 40 percent by weight of the backfill material.

D. Unacceptable Materials: Materials that do not comply with the requirements for the acceptable material or which cannot be compacted to the specified or indicated density.

1.4 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:

1. Qualifications of the Contractor's Independent Testing Laboratory as specified in Paragraph 1.5 I, two (2) weeks prior to the execution of any earth excavation, backfilling, filling, or compaction process.

2. Submit an excavation, backfilling, and filling plan at least one week prior to start of any earth moving activities. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include, but not be limited to the following items:

a. Detailed sequence of work.

b. General description of construction methods.

c. Numbers, types, and sizes of equipment proposed to perform excavation and compaction.

d. Details of dust control measures.

e. Proposed locations of stockpiled excavation and/or backfill materials.

f. Proposed surplus excavated material off-site disposal areas and required permits.

g. Details of erosion and sedimentation control measures which will prevent erosion and sedimentation during the earth moving activities.

3. The following material submittals shall be submitted to the Engineer prior to backfilling and filling:

a. Gravel Borrow as specified in Section 02230.

b. Bank-run Gravel as specified in Section 02230.

c. Crushed Stone as specified in Section 02230.

d. Other Acceptable Materials: Laboratory testing results of gradation and moisture-density relationship. Submittal shall include specific location of the source and the date when sample was taken.

4. During Construction, submit written confirmation of fill lift thickness, in- place soil moisture content, and percentage of compaction to the Engineer before placing the next lift or constructing foundations.

5. Controlled Density Fill Mix Design:

a. Prior to beginning the work the Contractor shall submit for review, flowable fill mix designs which shall show the proportions and gradations of all materials for each class and type of flowable fill specified

1.5 QUALITY ASSURANCE

A. Provide in accordance with Section 01400 and as specified.

B. Dewatering and Groundwater Control: Provide and maintain as specified in Section 02140.

C. Excavations shall be performed in the dry, and kept free from standing water, snow and ice during construction. Bedding and backfill material shall not be placed in water. Water shall not be allowed to rise upon or flow over the bedding and backfill material

D. The Contractor shall be solely responsible for making all excavations in a safe manner. All excavation, trenching, and related sheeting, bracing, etc. shall con1ply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

E. Do not excavate, construct embankments, or fill until all the required submittals have been reviewed by the Engineer.

F. Formulate excavation, backfilling, and filling schedule and procedures to eliminate possibility of undermining or disturbing foundations of partially and completed structures, pipelines and embankments or existing structures and pipelines.

G. Employ an independent testing laboratory to perform particle size and gradation analyses in accordance with ASTM D422, and to determine compactibility in accordance with ASTM D1557 for all the proposed backfill and fill materials, and monitoring field compaction operations. The independent testing laboratory shall have the following qualifications:

1. Be accredited by the American Associates of State Highway and Transportation Officials (AASHTO) Accreditation Program.

2. Have three (3) years experience in sampling, testing and analysis of soil and aggregates, and monitoring field compaction operations.

3. Able to provide three (3) references from previous work.

H. Field Testing and Inspections:

1. By (Owners testing laboratory or Contractor's independent testing laboratory, acceptable to the Engineer, at Contractor's expense) as specified.

2. Location of tests mutually acceptable to testing laboratory and the Engineer or as directed by the Engineer.

3. In the event compacted material does not meet specified in-place density, recompact material and retest this area until specified results are obtained at no additional cost to the Owner.

4. Testing laboratory to perform inspection at least once daily to confirm lift thickness and compaction effort for entire fill area.

I. Methods of Field Testing:

1. In-Place Density: ASTM D1556, ASTM D2167, or ASTM D2922.

2. In-Place Moisture Content: ASTM D3017, ASTM D4944, or ASTM D4959.

J. Material Testing Frequency: The following testing frequencies are minimum required for all structural and non-structural fill, grading and embankment

1. Field In-Place Density and Moisture Content - Screened gravel and crushed stone shall be compacted as specified and indicated. For other backfill and fill materials, minimum test frequency shall be as follows, and no less than one test per lift:

a. Trenches under structures foundation preparation or roadways subbase: Every 100 lin. ft. [30 m.] per lift.

b. Trenches in areas without structures or roadways: Every 250 lin. ft. [60 m.] per alternate lift.

c. Paved Roadways: Every 100 lin. ft. [30 m.] per lift.

d. Paved Areas: 2,000 sq. ft. [185 sq. m.] per lift.

e. Under Structure: 1,000 sq. ft. [100 sq. m.] per lift.

f. Around Structures: 1,500 sq. ft. [150 sq. m.] per lift.

g. Embankment Fills: 5,000 sq. ft. [465 sq. m.] per lift.

2. Moisture Density - One per source, except for screened gravel and crushed stone. Repeat the moisture density test for every 1,000 cubic yard of material use, and whenever visual inspection indicates a change in material gradation as determined by the Engineer.

3. Gradation Analysis – A minimum of one per source and for each moisture density test and whenever visual inspection indicates a change in material gradation.

4. Liquid Limit, Plastic Limit and Plasticity Index - Minimum of one test per 500 cubic yard [382cubic meter] of soil for use as fill material and whenever classification of material is in doubt as determined by the Engineer.

K. Construction Tolerances

1. Construct finished surfaces to plus or minus 1 inch [2.5 cm] of the elevations

2. Grade cut and fill areas to plus or minus 0.20 foot [6.0 cm] of the grades indicated.

3. Complete embankment edges to plus or minus 6 inches [15 cm] of the slope lines indicated.

4. Provide the Engineer with adequate survey information to verify compliance with above tolerances.

L. Cut pavement with a saw or pneumatic tools to prevent damage to remaining pavement without extra compensation. Where pavement is removed in large pieces, dispose of pieces before proceeding with excavation.

M. Pipes, drains, and other utilities may exist in certain locations not indicated on drawings. No attempt has been made to show all services. Completeness or accuracy of information given is not guaranteed.

N. Carefully support and protect from damage, existing pipes, poles, wires, fences, curbings, property line markers, and other structures, which the Engineer determines must be preserved in place without being temporarily or permanently relocated. Should such items be damaged, restore without compensation therefor, to at least as good condition as that in which they were found immediately before the work was begun.

O. Whenever certain existing structures, as described below, are encountered, and the Engineer so directs, change the location, remove and later restore, or replace such structures, or assist the Owner in doing so. Such work to be paid for under applicable items of work, otherwise as Extra Work.

P. In removing existing pipes or other structures, include for payment only those new materials which are necessary to replace those unavoidably damaged as determined by the Engineer.

Q. The preceding two paragraphs apply to pipes, wires, and other structures which meet the following: (a) are not indicated on the drawings or otherwise provided for, (b) encroach upon or are encountered near and substantially parallel to the edge of the excavation, and (c) in the opinion of the Engineer, will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.

R. Restore existing property or structures as promptly as practicable.

S. If material is unacceptable for foundation support (in the opinion of the Engineer) is found at or below the grade to which excavation would normally be carried in

accordance with the drawings and/or specifications, remove such material to the required width and depth as directed by the Engineer and replace it with gravel borrow, crushed stone, or concrete.

T. Do not remove excavation materials from the site of the work or dispose of except as directed or permitted by the Engineer.

U. Provide suitable and safe bridges and other crossings where required for accommodation of travel, and to provide access to private property during construction, and remove said structures thereafter.

PART 2 PRODUCTS

2.1 GENERAL

A. Use only acceptable materials from excavations or borrows, as determined by the Engineer.

B. Provide 3,000 psi [20 MPa] concrete, bank-run gravel, gravel borrow, and crushed stone.

C. Provide Fine Aggregate conforming to ASTM C33.

D. Provide erosion/sedimentation control devices as indicated, including geotextile fabric in accordance with Section 01110.

E. Provide geotextile fabric and silt fence as indicated, .

F. Provide erosion/sedimentation control devices as indicated, including geotextile fabric in accordance with Section 01110.

PART3 EXECUTION

3.1 TRENCH EXCAVATION

A. Pavement shall be cut with a saw, or wheel along straight lines before excavating.

B. Trenches shall be excavated to sufficient depths and to sufficient widths for installing new pipe/components where required, placing and removing of decking, sheeting and 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 a practical minimum, as needed for proper execution for the work.

C. Trench excavation shall include material of every description and of whatever substance encountered, except rock and boulders. Trench excavation shall also include removal of existing reinforced concrete subbase, if encountered.

D. The Contractor shall strip and stockpile excavated trench materials. Any bushes that are removed shall be protected and replanted in the same location. Removed curbing shall be

stockpiled in a safe manner. Where grassed areas are disturbed by stockpiled materials, the Contractor shall rake out the area and loam and re-seed at his expense.

E. Stockpiling of materials shall be included in the pay items for excavating and no Allowances shall be made for any stripping and stockpiling requirements.

F. 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.

G. 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.

H. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. The trench may be excavated by machinery to, or just below the designated subgrade, provided that material remaining in the bottom of the trench is no more than slightly disturbed. Subgrade 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 gravel borrow as required by the Engineer at the Contractor's expense.

I. Clay and organic silt soils are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, the Contractor shall use a smooth-edge bucket to excavate the last one foot of depth.

J. Where pipe is to be laid in crushed stone, the trench may be excavated by machinery to the normal depth of the pipe plus the depth of the stone, provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

K. 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.

L. Excavate trenches to depths so as to permit pipe to be laid at elevations, slopes, or depths of cover indicated on drawings, and at uniform slopes between indicated elevations. .

M. Make pipe trenches as narrow as practicable and do not widen by scraping or loosening materials from the sides. Make every effort to maintain sides of trenches firm and undisturbed until backfilling has been placed and compacted.

N. Excavate trenches with approximately vertical sides between springline of pipe and elevation 1 ft. [30 cm] above top of pipe.

3.2 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 by the Contractor except as directed by the Engineer. When removal of surplus materials has been approved by the Engineer, the Contractor shall dispose of such surplus material in approved areas designated by the Contractor.

C. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided by the Contractor. When required, it shall be re-handled and used in backfilling the trench.

D. All cost of handling, storing and rehandling excavated materials shall be included in the respective unit bid in the Bid Form for the installation of new water main.

3.3 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. When moveable trench bracing such as trench boxes; manhole 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.

C. When installing pipe; 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. All excavations within the right-of-way of streets shall be sheeted and braced. Sheeting and bracing shall be adequate to support decking and to meet the requirements of applicable general laws and regulations.

E. The Contractor will be permitted 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.

F. 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.

G. The Contractor shall receive no payment, for sheeting, bracing, etc., during the progress of the work. The Contractor shall receive no payment for sheeting which has actually been left in the trench for the convenience of the Contractor.

H. 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.

3.4 TEST PITS

A. The Contractor may be required to excavate test pits 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.

3.5 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 his/her own convenience, or through failure to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, he/she 1nay be directed by the Engineer to excavate below grade as set forth in the following paragraph, in case the work of excavating below grade and furnishing and placing the refill shall be performed at his/her own expense.

If the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may work into the screened gravel notwithstanding effective drainage, the subgrade material shall be removed to the extent directed and the excavation refilled with a 6-in layer of crushed 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.

3.6 BACKFILLING

A. As soon as practicable after the pipe has been laid and jointed and inspected by the Engineer, backfilling shall begin and thereafter be 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 feet, whichever is less.

C. Where the pipes are laid in streets, the remainder of the trench up to a depth of 1-ft below the bottom of the specified permanent paving shall be backfilled with common fill material in layers not to exceed 1-ft and thoroughly compacted. The subbase layer for paving shall be of bank-run gravel thoroughly compacted in 6-in layers.

D. 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.

E. Backfill shall be brought up evenly on all sides. Each layer of backfill material shall be thoroughly compacted by rolling, tan1ping, or vibrating with 1nechanical compacting equipment or hand tamping, to 92 percent compaction. If rolling is employed, it shall be by use a suitable roller or tractor, being careful to compact the fill throughout the full width of the trench.

E. Backfilling and filling operations shall be suspended in areas where test are being Made until tests are completed and the testing laboratory has advised the Engineer That adequate densities are obtained.

E. 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 slun1ping 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.

G. If water restrictions are in force, the Contractor shall obtain his/her own water elsewhere, or compact the backfill by other approved methods at no additional cost to this Contract.

H. 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 being spread and compacted in layers not over 6-in thick. If necessary, sprinkling shall be employed in conjunction with rolling or ramming.

I. 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.

J. 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 insure that all voids are completely filled. Fill shall not be dropped into the trench in a manner to endanger the pipe.

K. 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.

L. All road surfaces shall be broomed and hose-cleaned immediately after backfilling. Dust control measures shall be employed at all times.

3.7 RESTORING TRENCH SURFACE

A. Where the trench occurs adjacent to paved streets, in shoulders, sidewalks, or in cross-country areas, the Contractor shall thoroughly consolidate the backfill and shall maintain the surface as the work progresses. If settlement takes place, he/she shall immediately deposit additional fill to restore the level of the ground.

B. In and adjacent to streets, the top 12-in layer of trench backfill shall consist of compacted bank-run gravel. Should the Contractor wish to use material excavated from the trench as gravel subbase for pavement replacement, the Contractor shall at his/her own expense have samples of the material tested by an independent testing laboratory at intervals not to exceed 500 feet, in order to establish its compliance with the specifications. Only material which has been tested by the Contractor 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 by the Contractor to a condition at least equal to that existing before work began.

3.8 PROTECTION

A. Curbing, fencing, sign posts, utility poles, mailboxes, etc. in the vicinity of the Contractor's operations shall be adequately protected, and if necessary removed and restored after backfilling. All items which are damaged during construction shall be replaced with material fully equal to that existing prior to construction. Where curbing or

throatstones are to be removed and not replaced, the curb pieces shall be brought to the Waltham Department of Public Works yard and deposited near the curbing laydown area.

B. Enclose uncut tree trunks adjacent to work in wooden boxes of such height as may be necessary for protection from injury from piled material, equipment, operations, or otherwise due to work. Operate excavating machinery and cranes of suitable type with care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.

C. Cut all branches, limbs, and roots smoothly and neatly without splitting or crushing. Neatly trim, cut the injured portions and cover with an application of grafting wax or tree healing paint as directed.

D. Protect cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations by suitable means or dig up and temporarily replant and maintain. After construction operations have been substantially completed, replant in original positions and care for until growth is reestablished. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish in their beauty or usefulness, replace by items of equal kind and quality existing at the start of the work.

E. Do not use or operate tractors, bulldozers, or other power-operated equipment on paved surfaces when their treads or wheels which are so shaped as to cut or otherwise damage such surfaces.

F. Restore surfaces damaged by the Contractor's operations to a condition at least equal to that in which they were found immediately before work commenced. Use suitable Materials and methods for such restoration.

3.9 DUST CONTROL

A. Calcium Chloride shall be uniformly applied by hand methods or by approved spreading devices as directed by the Engineer. The Contractor shall have a nominal supply of Calcium Chloride on hand at all times.

END OF SECTION 02221

SECTION 02273

GEOTEXTILE FABRIC

PART 1 -GENERAL

1.1 SUMMARY

A. This section includes the following:

l. Providing geotextile fabric in foundation preparation for separation of existing soil from screened gravel or crushed stone beneath structures.

2. Placing the geotextile fabric beneath the crushed stone or rip rap at tank overflow or storm drain outlets.

3. Providing geotextile fabric for silt fence as indicated or specified.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section, and.

1. Section 02200 - Earthwork

1.3 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300-SUBMITTALS:

1. At least two weeks prior to shipment, submit manufacturer's certificate of compliance and physical property data sheet indicating that requirements for materials and manufacture are in conformance as specified.

2. For informational purposes only, submit manufacturer's printed installation instructions.

1.4 QUALITY ASSURANCE

A. GENERAL

1. Producer of geotextile fabric to maintain competent laboratory at point manufacture to insure control in accordance with ASTM testing procedures. Laboratory to maintain records of quality control results.

2. Do not expose geotextile fabric, except the geotextile fabric for silt fence, to ultraviolet radiation (sunlight) for more than 14 days total in period of time

following manufacture until geotextile fabric is installed and covered with fill or backfill material.

3. Take all precautions to protect geotextile fabric from damage resulting from any cause. Either repair or replace geotextile fabric to Engineer's satisfaction at no additional cost to the Owner.

1.5 DELIVERY, STORAGE AND HANDLING

A. Provide in accordance with manufacturer's recommendations.

B. Provide geotextile fabric in rolls wrapped with protective covering to protect geotextile fabric from mud, dirt, dust, and debris. Label each roll of geotextile fabric with number or symbol to identify production run.

C. Protect geotextile fabric from sunlight during transportation and storage. Do not leave geotextile fabric exposed to sunlight for more than two weeks during installation operations.

PART 2 -PRODUCTS

2.1 MANUFACTURERS

A. Provide the following nonwoven (4.5 ounce per square yard) geotextile fabric, Model# US 120NW as manufactured by US Fabrics or approved equal.

B. Provide the following woven geotextile fabric for silt fence:

1. Amoco 2122 as manufactured by Arnoco Fabrics and Fibers Co., Atlanta, GA.

2. Mirafi 1OOX as manufactured by Mirafi, Pendergrass, GA.

3. Geotex 91OSC as manufactured by Synthetic Industry, Chattanooga, TN.

4. Or acceptable equivalent product.

2.2 MATERIAL

A. Geotextile fabric shall conform to test requirements for minimum average roll value (weakest principle direction) for strength properties of any individual roll tested from manufacturing lot or lots of particular shipment in excess of minimum average value (weakest principle direction) as specified hereafter:

B. Physical Properties of Minimum Average Roll of the 4.5-ounce per square yard Nonwoven geotextile fabric shall be.

	Property	ASTM Test Method	Units	Value
1.	Tensile Strength	D4632	lbs.	120
2.	Elongation at Break	D4632	%	50
3.	Trapezoidal Tear Strength	D4533	lbs.	50
4.	Puncture Strength	D4833	lbs.	70
5.	Permittivity	D4491	Sec-1	1.5
6.	Apparent Opening Size	D4751	Sieve#	70
7.	Mullen Burst Strength	D3786	Psi	230
8.	UV Resistance %Retained	D4355	%	70
9.	Flow Rate	D4491	Gal/min/sf	120

C. Physical Properties of Minimum Average Roll of the woven geotextile fabric for silt fence shall be:

	Property	ASTM Test Method	Units	Value
1.	Grab Strength	D4632	lbs.	100
2.	Permittivity	D4491	sec- 1	0.10
3.	Apparent Opening Size	D4751	Sieve#	20-30
4.	Ultraviolet Stability	D4355	%	70

PART 3- EXECUTION

3.1 INSTALLATION

A. Install geotextile fabric in accordance with manufacturer's printed instructions.

B. Place geotextile fabric on the foundation subgrade prior to placing the screened gravel or crushed stone. Use low ground pressure equipment to spread soil over the filter fabric to protect against tearing.

C. Overlap geotextile fabric 18 inches minimum for unsewn lap joint.

D. Do not permit traffic or construction equipment to travel directly on geotextile fabric.

E. Place geotextile fabric in relatively smooth condition to prevent tearing or puncturing. Lay geotextile fabric loosely but without wrinkles or creases so that placement of the backfill materials will not stretch or tear geotextile fabric. Leave sufficient slack in geotextile fabric around irregularities to allow for readjustments.

F. Patch all tears in geotextile fabric by placing additional section of geotextile fabric over tear with a minimum of 3 feet overlay.

G. Extend the geotextile fabric and wrap around the screened gravel or crushed stone along the perimeter of foundations and slabs.

3.2 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01700.

END OF SECTION 02273

SECTION 02510

HOT MIX ASPHALT PAVEMENT

PART 1 GENERAL

1.01 DESCRIPTION:

A. Furnish all labor, materials, equipment and incidentals required to install permanent hot mix asphalt pavement for roadways.

1.02 RELATED SECTIONS

A. Section 02200 – Earthwork

B. Section 02221 - Trenching, Backfilling, and Compaction

1.03 REFERENCES

A. Reference is made herein to the Commonwealth of Massachusetts, Department of Public Works, Standard Specifications for Highways and Bridges, 1988, (MHD Standard Specifications) and latest Supplemental Specifications and Standard Special Provisions.

1. All references to method of measurement, basis of payment, and payment items in the MHD Standard Specifications are hereby deleted.

2. References made to particular sections or paragraphs in the MHD

1.04 SUBMITTALS:

A. Job mix formula, including complete data on all materials, source, location, percentages, temperatures and all other pertinent data.

PART 2 PRODUCTS

2.01 MATERIALS TO BE FURNISHED BY CONTRACTOR

A. Hot mix asphalt paving material in accordance with MHD Standard M3.11.00 for Class I binder and top courses.

B. Tack coat shall consist of either emulsified asphalt, Grade MS-1 conforming to section M3.03.0, or cutback asphalt, Grade MC-70 or MC-250 conforming to

Section M3.02.0 of the above referenced specifications.

C. Hot poured rubberized asphalt sealer shall conform to MassDOT Section M3.05.0

PART 3 EXECUTION

3.01 INSTALLATION:

A. Install hot mix asphalt pavement in accordance with MHD, Section 460.

B. Hot mix asphalt paving at railroad track crossings shall be placed in accordance with the rubber rail seal manufacturer's instructions.

C. Place binder course as soon as possible after the subgrade and track have been prepared.

D. Place and compact binder and top courses by steel-wheeled rollers of sufficient weight to thoroughly compact the hot mix asphalt.

E. All pavement thickness referred to herein is compacted thickness. Place sufficient mix to ensure that the specified thickness of pavement occurs as indicated on the Contract Drawings.

F. The contact surfaces of existing pavement, castings, and other structures shall be painted with a tack coat prior to placement of paving.

G. All hot mix asphalt pavement shall be placed to the grades and in accordance with the cross sections and details shown on the Contract Drawings.

H. Existing drainage patterns shall not be altered by the new pavement construction unless otherwise indicated on the Contract Drawings.

I. After binder course has been installed, place and compact top course.

J. At both ends of railroad crossings, taper pavement down to top of ties at a slope not to exceed 2 horizontally to 1 vertically.

K. Apply tack coat at a rate of 0.05 to 0.10 gallons per square yard over the bottom course.

L. Top joint between existing sawcut pavement and new pavement shall be sealed using hot poured rubberized asphalt sealer.

END OF SECTION

SECTION 02515

CONCRETE SIDEWALKS, WALKWAYS AND DRIVEWAY APRONS

PART 1-GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment and incidentals required and install concrete sidewalks, walkways and sidewalk aprons as specified herein.

B. Damaged concrete sidewalks, walkways and driveway aprons as a result of construction shall be replaced to the nearest existing undisturbed concrete panel on all sides of construction disturbance.

1.2 RELATEDWORK

A. Earthwork is included in Section 02200.

B. Cast-in-Place Concrete is included in Section 03300.

1.3 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, MassHighway (SSHB) shall apply to materials and workmanship required for the work of this Section.

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

2.1 MATERIALS

A. Concrete shall be as specified in Section 03300, but in no case less than 3,500 psi at 28 days.

B. Expansion joint shall be bituminous type, ½-in thick meeting AASHTO Spec. M-213-65.

.

C. Materials for gravel base course shall be as specified in Section 02200.

PART 3-EXECUTION

3.1 SIDEWALK, WALKWAY AND DRIVEWAY APRON INSTALLATION

A. The full sidewalk, walkway or driveway apron panel(s) disturbed during construction shall be replaced. The Contractor shall saw cut the edges of the existing concrete at the edge of the existing undisturbed panels. The existing panels shall be saw cut at an existing tooled joint or removed to an existing expansion joint.

B. The subgrade for sidewalks, driveways and driveway aprons shall be shaped parallel to the proposed surface of the sidewalks, walkways and driveway aprons and thoroughly compacted. All depressions occurring shall be filled and again compacted until the surface is smooth and hard.

C. After the subgrade has been prepared, a gravel base course shall be placed. After being thoroughly compacted, the base course shall be at least 4-in in thickness and parallel to the proposed surface of the sidewalk, walkway or driveway apron. Reuse existing gravel base in areas not disturbed for trenching and provide new gravel base in areas disturbed for trenching.

D. Forms:

1. Side and transverse forms shall be smooth, free from wrap, of sufficient strength to resist springing out of shape, of a depth to conform to the thickness of the sidewalk, walkway or driveway apron.

2. All mortar or dirt shall be completely removed from forms that have been previously used. The forms shall be well staked and thoroughly braced and set to the established lines with their upper edge conforming to the grade of the finished sidewalk, walkway or driveway apron. Walkways shall have sufficient pitch to provide for surface drainage, but not to exceed ¼-in per foot. Driveway aprons shall have sufficient pitch to provide for surface drainage and shall be finished to meet existing grades of the driveway and street.

E. Placing and Finishing Concrete:

1. Concrete sidewalks, walkways and driveway aprons shall be placed in slabs to dimensions to meet existing walkways and driveway aprons, except as otherwise ordered. The joints between new and existing concrete shall be separated by transverse, preformed expansion joint filler.

2. Preformed expansion joint filler shall be placed adjacent to structures.

3. Concrete shall be placed in such quantity that,. after being thoroughly consolidated in place, it shall be 4-in in depth for sidewalks and walkways and 6-in in depth for driveway aprons. Finishing operations shall be delayed until all bled water and water sheen has left the surface and concrete has started to stiffen. After water sheen has disappeared, edging operations shall be completed. After edging and jointing operations, the surface shall be

floated with an aluminum or magnesium float. Immediately following floating, the surface shall be steel troweled. If necessary, tooled joints and edges shall be rerun before and after troweling to maintain uniformity. Finish with broom at right angles to alignment of walk, then round all edges with ¼-in radius after brooming.

4. When completed, the sidewalks, walkways and driveway aprons shall be kept moist and protected from traffic and weather for at least 3 days.

END OF SECTION 02515

SECTION 02576

PAVEMENT REPAIR AND RESURFACING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals removed or disturbed by the Contractor's operations and as specified and required for this project.

B. New pavement shall consist of initial temporary layer required to remain for a specified settlement time followed by the installation of final pavement layer.

C. 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.

1.2 RELATED WORK

A. Trimming edges of existing pavement for the purpose of excavating trenches shall be by either saw or wheel cutters.

B. Roadway line painting shall be restored to n1atch the conditions prior to construction.

1.3 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 1naterials and workmanship required for the work of this Section.

B. American Association of State Highways and Transportation Officials (AASHTO) AASHTO M144 - Standard Specification for Calcium Chloride.

C. Where reference is made to one of the above standards, the revision in effect at the tune of bid opening shall apply.

1.4 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTAL PROCEDURES.

1. Product Data: Submit complete data on materials to be used in construction, Including gradation tests for granular base.

2. Design Data: Submit design mix for bituminous base, binder and top course.

3. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

1.5 QUALITY ASSURANCE

A. Provide in accordance with Section 01400 and as specified.

B. Laboratory Testing Required:

l. The bituminous mixture shall be compacted to at least 95% of the density achieved on the laboratory testing of the design mix for the project. The density of the Bituminous Concrete Pavement will be determined by using either the following tests; Nuclear Density Gauge Method ASTM D2950 or the Bulk Specific Gravity Method AASHTO-T166.

C. Thickness: Test in-place asphalt concrete courses for compliance with requirements for thickness. Repair or remove and replace unacceptable paving as directed by Engineer. In-place compacted thickness will not be accepted if exceeding the following allowable variation from required thickness:

1. Binder Course 1-inch, plus no minus

2. Top (Wearing) Course: 1/2-inch, plus no minus

1.6 PROJECT SITE CONDITIONS

A. Environmental Requirements:

1. Do not place materials when underlying surface is muddy, frozen, or has frost, snow, or water thereon.

2. Do not place concrete when air temperature at time of placement, or anticipated temperature for following 24 hours, is lower than 40°F or higher than 90°F.

3. Apply prime and tack coats when ambient temperature is above 50°F and when temperature has not been below for 12 hours immediately prior to application.

4. Binder Course may be placed when air temperature is above 30°F and rising.

5. Grade Control: Establish and maintain required lines and elevations.

B. Existing Conditions:

1. Drawings show approximate locations of paving areas.

2. Drawings show approximate location of existing structures along pipeline route.

3. Location of subsurface borings and the logs are indicated on drawings.

1.7 GUARANTEE

A. All final pavement placed in City streets shall be warranted by the Contractor for a period of one year. During this period all areas which have settled or are unsatisfactory for traffic shall be removed and replaced at no cost to the City, including the cost of Traffic Police.

PART 2 PRODUCTS

2.1 MATERIALS

A. Calcium chloride shall conform to AASHTO M144, Type I or Type II.

B. Initial pavement (temporary paving) shall be Binder Course, conforming to the referenced specification, Section M3.11, Class I, Type I-1 bituminous concrete.

C. For locations not receiving a full width overlay, final trench pavement shall consist of Binder Course and Top Course, conforming to the referenced specification, Section M3.11, Class I, bituminous concrete.

PART 3 -EXECUTION

3.1 GENERAL

A. Paving shall consist of an initial layer of temporary paving followed by a second layer of permanent paving.

B. Within 4 days of backfilling in areas to be paved, the Contractor shall commence temporary paving, unless directed otherwise in writing by the Engineer. The Contractor shall not leave excavated areas over weekends unless through written approval of the Engineer.

After completion of the backfilling, final pavement shall not be placed over trenches until the temporary paving has been in place for at least 90 days, or a winter settlement period, unless otherwise directed in writing by the Engineer. Where it is used as backfill, final pavement may be installed once the CDF has cured.

D. Materials for pavement shall be mixed, delivered, placed and compacted in accordance with the referenced specification, Sections M3.11 and 460 and as specified herein.

E. Whenever the subbase becomes dry enough to cause dust problems, spread calcium chloride uniformly over the gravel surface in sufficient quantity to eliminate the dust.

F. 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.

G. Pavement Construction Period. No pavement shall be constructed during the period from December 20 to March 15, without approval in writing from the engineer.

3.2 PREPARATION

A. Protection of existing Roadways:

1. Saw cut existing pavement to required width and depth to avoid damage to adjacent pavement, curbs, gutters, or other structures and as indicated on the drawings.

B. Sub-Surface Preparation:

1. Pavement Subbase:

a. The subbase to be placed under pavement shall be a minimum of 12-inches thick after compaction. Subbase shall be evenly spread and thoroughly compacted in accordance with the Contract Documents.

b. The subbase shall be spread in layers not more than 8 - inches thick except the last layer of gravel shall be 4-inches thick, compacted measure. All layers shall be compacted to not less than 95 percent of the maximum dry density of the material as determined by ASTM D1557 Method C at optimum moisture content.

c. Complete subbase preparation, including dynamic compaction, for full width before placing surfacing materials.

2. Subgrade:

a. Prepare subgrade in accordance with Section 0221.

b. Complete subgrade preparation, including dynamic compaction, for full width before placing surface materials. .

c. Stabilize subgrades in accordance with Section 02221 so that loaded construction vehicles do not cause rutting or displacement when depositing materials.

3.3 DESCRIPTION

A. In general, the following pavement repairs shall be made:

1. Wherever existing paved areas are disturbed a 2-inch temporary pavement layer is to be placed. When, and if, this material is disturbed during additional excavation work required for utility installation it shall be replaced. After a 90-day minimum period, or a winter settlement period, a permanent pavement wearing course shall be installed.

2. In roads and streets that are not scheduled to have full width overlay placed, following a 90-day minimum period, or a winter settlement period, the temporary layer shall be removed, the pavement edges cutback 12-inches from existing, and a permanent pavement wearing course installed.

3. In roads and streets that are to receive a full width overlay, following a 90-day minimum period, or a winter settlement period, the full width 1-1/2 inch overlay of permanent pavement wearing course shall be placed over the existing pavement and the 2-inch temporary pavement layer.

4. Driveways shall be paved as described in 3.3A2, above.

5. Driveway aprons and waterways shall be paved as part of the work

6. Asphalt berms shall be replaced as part of the work.

7. The paving thicknesses specified above may be increased based on permit or field requirements. Payment for additional thickness shall be made at the unit price bid in the proposal

3.4 INSTALLATION

A. Initial pavement:

1. An initial layer of temporary pavement shall be placed wherever existing pavement has been removed or disturbed as soon as practical after backfilling is completed.

2. The pavement subbase shall be excavated, graded, and compacted to a depth of 2-inches below the existing pavement.

3. Hose clean with water all road surfaces adjacent to the area to be paved. No paving is to be placed until subsurface is dry.

4. The initial pavement layer shall be a hot mixed binder course placed and compacted to a thickness of 2-inches 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.

5. Initial pavement shall be maintained in a condition suitable for traffic until replaced or overlaid by final pavement. Defects shall be repaired within 24 hours of notification of such defects.

B. Final pavement: areas not receiving full width overlay

1. Remove initial pavement and subbase to 3-1/2-in. below existing pavement. Saw cut all edges back 12-inches from edge of original trench, keeping the final

pavement edge neat and straight. Shape and compact subbase to 95 percent of maximum dry density as determined by ASTM 01557, Method C.

2. Trim loose edges of existing pavement. Broom and tack coat all edges with emulsified or cutback asphalt.

3. Place Binder Course and compact to 2-in. thickness by steel-wheeled roller.

4. Place Top Course and compact to 1-1/2-in. thickness, finish smooth, dense and flush with surface of existing pavement.

5. Match roadway edges to and existing driveways or berms as required.

C. Final pavement: areas receiving full width overlay

1. The permanent pavement wearing course shall be a hot mixed top course and placed to a compacted thickness of 1-1/4 inches: Leveling course material shall be placed in vertical depression in the existing pavement which are greater than 0.5 inches from the surrounding existing pavement level.

2. Prior to the application of the overlay course, the entire surface shall be cleared of dirt and debris using power sweepers, and then tack coated with cut-back asphalt emulsion.

3. All thicknesses are measured after rolling. The permanent surface course shall be evenly spread and rolled with a power roller having a minimum weight of 5-tons.

4. The overlay course shall be keyed to the existing pavement at ends of pavement repair sections, including driveways. Keys shall be cut to full pavement depth and be at minimum width of 8-inches.

D. Pavement Markings:

1. The Contractor shall replace all reflectorized pavement markings removed or covered-over in carrying out the work, and as directed by the Engineer, no sooner than 48 hours after completion of overlay pavement. Markings shall conform to the latest standards of the municipality or agency having jurisdiction over the roadway. The markings shall be thermoplastic markings, 4-inches wide, white or yellow, single or double lines as required for road markings, and 12-inches wide, white for crosswalk markings.

2. Markings shall conform to MHD: M7.01.03 - White Thermoplastic Reflectorized Pavement Markings and M7.01.04 - Yellow Thermoplastic Reflectorized Pavement Markings.

3. The Contractor shall provide temporary markings on the temporary pavements where existing markings are removed at no additional cost to the Owner.

E. Curb and Gutter Replacement:

1. Replace curb and gutter with same material to pre-construction lines and curb sections. Reset granite curb to pre-construction line and grade.

2. Removal and replacement of curbing shall be done in accordance with Sections 501 and 580, as applicable of the MHD Specifications for Highways and Bridges.

3. Provide expansion joints at each intersection with existing curb sections.

4. Use expansion joints one inch wide. Fill with expansion joint material and cut to shape of curb section.

F. Sidewalk, Driveway, and Parking Area Replacement:

1. Gravel sidewalks:

a. Gravel sidewalks shall be restored to a condition at least equal to that existing immediately before the work was started.

2. Bituminous concrete sidewalks, driveways, and parking areas:

a. Construct in accordance with MHD Section 701, sidewalks, Wheelchair Ramps and Driveways.

b. The subgrade shall be shaped parallel to the proposed surface of the sidewalk or driveway and shall be thoroughly rolled and tamped. All depressions occurring shall be filled with suitable material and again rolled or tamped until the surface is smooth and hard in order for a gravel foundation to be placed upon it.

c. The sidewalk, driveway, or parking area shall be a minimum of 2-1/2 compacted inches thick, laid in two equal courses.

d. Sidewalk cross slopes cannot exceed 2 percent as required by the Americans with Disabilities Act (ADA). The Contractor shall merge new sidewalk slopes into existing sidewalk slopes as required by ADA.

3. Cement concrete sidewalks, and driveways

a. Construct in accordance with MHD Section 701, Sidewalks, Wheelchair Ramps and Driveways.

b. Use 6x6, W10xW10 welded wire reinforcement.

c. Concrete sidewalks shall be 4-inches thick and concrete driveways shall be 6-inches thick.

d. The subgrade for the walk or driveway shall be shaped to a true surface conforming to the proposed slope of the walk, thoroughly rolled at optimum moisture content, and tamped with a power roller weighing not less than one ton and not more than 5 tons. All depressions occurring shall be filled with suitable material and again rolled or tamped until the surface is smooth and hard.

e. After the subgrade has been prepared, a subbase of gravel at optimum moisture content shall be placed, thoroughly rolled by a power roller, and tamped. The gravel shall be a minimum of 8 inches in thickness.

f. The forms shall be smooth, free from warp, strong enough to resist springing out of shape, and deep enough to conform to the thickness of the proposed walk or driveway. All mortar or dirt shall be completely removed from forms that have been previously used. The forms shall be well staked thoroughly braced, and set to the established lines with their upper edge conforming to the grade of the finished walk or driveway.

g. The finished surface shall have sufficient pitch from the outside edge to provide for surface drainage. This pitch shall be ¼ of an inch per foot unless otherwise directed by the Engineer. Before the concrete is placed, he subbase for sidewalks shall be thoroughly dampened until it is moist throughout but without puddles of water.

4. Handicap ramps:

a. Handicap ramps will be installed where indicated on the drawings, in accordance with these contract documents.

b. Construct in accordance with MHD Section 701, Sidewalks, Wheelchair Ramps and Driveways.

c. The Contractor shall install curb cuts and accessible walkways in accordance with the requirements of the Americans with Disabilities Act and as required in 521 CMR (2/23/96 edition) Sections 21 and 22.

d. Handicap ramps are to be constructed of cen1ent concrete unless otherwise approved by the Engineer.

e. Existing granite curbing shall be removed, cut if required and reset to allow for the ramp construction. New curbing shall be installed to replace granite curbing damaged by the Contractor.

5. General:

a. Valve boxes, manhole frames, and all other castings shall be carefully set to the proposed finished grades.

G. Berms and Waterways

1. Bituminous curbing shall be replaced as required. Curbing shall be machine laid and conform to grade of roadway and adjacent curb areas.

2. Bituminous berms shall be replaced as required. Berms shall be machine laid and conform to the grade of the roadways. Berms shall be placed in accordance with MHD Specification 470.20.

3. Bituminous waterways which have been disturbed by construction operations shall be repaired or replaced. The waterways shall be repaired and constructed in accordance with the applicable requirements of Section 280 of the MHD Specifications. Waterways shall be placed in two 1-1/2-inch thick courses on a prepared gravel base. Material shall be compacted by tamping or rolling.

3.5 RAISING BOXES AND CASTINGS

A. Prior to placing permanent pavement, the Contractor shall raise all boxes, utility castings, as required, to proper grade.

B. Contractor shall coordinate with all utility companies to obtain their requirements on Castings.

C. Castings which need to be raised or adjusted to complete final top course full-width paving shall be done immediately prior to paving.

END OF SECTION 02576

SECTION 02577

PAVEMENT MARKING

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section specifies the removal of existing pavement markings and the furnishing and application of reflectorized pavement markings.

1.02 RELATED SECTIONS

1.03 APPLICABLE STANDARDS

A. Manual on Uniform Traffic Control Devices (MUTCD)-latest edition

B. Commonwealth of Massachusetts, Standard Specifications for Highways and Bridges (MHD). Latest standards.

1.04 SUBMITTALS

A. Submit certification that the reflectorized pavement markings meet the requirements of the MUTCD and MHD.

PART 2 PRODUCTS

2.01 MATERIALS FURNISHED BY CONTRACTOR

A. All pavement markings for the Grade Crossing shall be thermoplastic reflectorized pavement markings as follows

1. White Thermoplastic Reflectorized Pavement Markings (M7.01.03) as specified in Section 860 of the MHD.

2. Yellow Thermoplastic Reflectorized Pavement Markings (M7.01.04) as specified in Section 860 of the MHD.

B. All other incidental materials required for the execution of Pavement Marking.

PART 3 EXECUTION

3.01 General

A. Contractor shall notify the Authority and the Town of Braintree of work to be performed.

3.02 Remove the existing pavement markings within the limits shown on the Contract Drawings by an approved method such as; sand blasting using air or water, high pressure water, steam or superheated water, mechanical devices such as grinders, sanders, scrapers, scarifiers and wire brushes. Painting over a pavement marking will not be permitted. Material deposited on the pavement as a result of removing markings shall be removed as the work progresses. Any damage to the pavement caused by pavement marking removal shall be repaired by the Contractor at no additional cost to the Authority. Pavement marking removal shall be in accordance with the Construction Methods of the MHD, Section 850.69.

3.03 After existing pavement markings are removed, install reflectorized pavement markings as shown on Contract Drawings and as specified in MHD Section 860 and in the MUTCD.

END OF SECTION

SECTION 02609

REINFORCED CONCRETE DRAIN PIPE

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

A. This section includes the following:

1. Providing and testing reinforced concrete pipe as indicated and specified.

B. Related sections include the following:

1. Section 02221 - Trenching, Backfilling and Compaction

2. Section 02430- Manholes

3. Section 02431 - Catchbasins

4. Section 03300- Cast-in-Place Concrete

1.3 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:

1. Shop drawings showing pipe dimensions, reinforcement, joint and other details for each type and class pipe.

2. If less than 100 units of given size and class, submit three certified copies of pipe tests on identical pipe units made by the same manufacturer within past year.

3. If more than 100 units of given size and class, submit:

a. Reinforcing steel mill or sample test reports for each shipment of steel.

b. Cement mill test reports for each shipment of cement.

c. Aggregate test reports before manufacturer of pipe and monthly thereafter during production.

d. Records of average daily temperature and nun1ber of days pipe units cured, when average daily temperature below 60 deg.F.

e. Concrete cylinder compression test results within three days after test.

f. Absorption test results.

g. Pipe load-bearing test results.

1.4 QUALITY ASSURANCE

A. Provide in accordance with Section 01400 and as specified.

B Provide pipe made by manufacturer of established good reputation in the industry and manufactured in a plant adapted to meet the design requirements of the pipe.

C. Accept on basis of tests of materials, absorption tests, plant load-bearing tests, pressure tests, and inspection of completed product.

D. Testing Agencies:

1. Engage an acceptable independent testing laboratory to perform or witness tests, other than mill tests on reinforcing steel and cement, and certify the results.

E. Allow Owner to engage independent testing laboratory at Owner's expense to perform additional inspection or tests of any or all pipe units at manufacturer's plant or elsewhere. Accept such additional inspections or tests as test results of record.

F. Conduct all tests in accordance with applicable ASTM Specifications.

1. Materials

a. Reinforcing Steel: Mill test reports or reports on samples taken from each shipment to pipe manufacturer.

b. Cement: Mill test reports for each shipment to pipe manufacturer. Cement for this project kept segregated from other cement.

c. Aggregates: Tests to demonstrate compliance with specified requirements. Initial tests prior to commencement of pipe manufacturer and additional tests at least monthly during production of pipe.

2. Concrete: Compression tests on standard cylinders for first pipe unit, then for every 100 cu. yd. of concrete used in pipe fabrication, or for each additional 200 units of pipe, whichever is lesser amount of concrete. Make 4 cylinders for each test and break them at 7, 14 and 28 days. Set aside one cylinder in case of unsatisfactory break.

3. Conduct pipe tests on units selected at random by Engineer.

a. Absorption: Before load test, take 3 cores from each unit. Test by boiling. Average absorption: Maximum 8 percent of dry weight, no single test more than 9 percent.

b. Load-Bearing: Before delivery, conduct one test or one pipe unit of each size and class, and one additional test for each 200 units of each size and class, after taking cores for absorption test. Carry test to specified load to produce 0.01- in. crack; if no crack produced, pipe may be used. Plug cored holes with mortar as specified for repairs.

c. Pressure: Before delivery, test six units of each size and class. Join units in normal manner using joint to be furnished and bulkhead end units independently. Average internal hydrostatic pressure of 10 psi for 10 minutes minimum without visible leakage from joints or barrels. Perform test in presence of Engineer.

G. Inspection by Engineer:

1. At place of manufacture.

2. At site of work after delivery.

3. Reject pipe at any time if it fails to meet specified requirements, even If sample pipe accepted at plant.

4. Immediately remove rejected pipe from site.

1.5 DELIVERY, STORAGE AND HANDLING

A. Provide in accordance with Section 01610.

PART 2- PRODUCTS

2.1 PIPE FABRICATION

A. Interior: Smooth; no projections, indentations, offsets or irregularities.

B. Classes: As indicated.

C. Conform to ASTM C76, modified as follows:

1. Provide with proper concrete ends true to size; form on machined rings to ensure accurate joint.

2. Use Type II cement, no admixtures unless permitted by Engineer.

3. Cement content in concrete: At least 564 lbs. per cu. yd.

4. Aggregates: Fine and Coarse Aggregate per Sections 03300, 03346.

5. Reinforcement: Section 03200. Longitudinal reinforcement continuous. Minimum cover 3/4 in. allowed. Elliptical reinforcement not allowed.

6. Minimum laying length: 8-ft. except where otherwise indicated or permitted.

7. Curing: Saturated steam at temperature between 100 and 130 deg. F. for minimum 12 hours.

8. Shipping: Aged at least 450 day-degrees including steam curing period before shipping. Day-degrees defined as total nun1ber of days times the average daily air temperature at pipe surface. (Example: Five days at daily average temperature of 60 deg. F. equals 300 day- degrees.)

9. No lift holes.

10. Repairs

    a. Mortar: Minimum compressive strength 4,000 psi at 7 days, and 5,000 psi at 28 days, when tested in 3-in by 6-in. cylinders stored in standard manner.

    b. Only those allowed by ASTM C76.

11. Mark permanently on inside and outside of pipe:

    a. Date of manufacture

    b. Class

    c. Size

    d. Consecutive number

    e. Manufacturer's trade mark

2.2 FITTINGS AND SPECIALS

A. Reinforcement: As required for class of pipe to be used.

B. Details: As indicated and conforming to approved shop drawings.

C. Pipebells for chimneys or building connections:

l. Formed or built into pipe unit at plant.

2. Vitrified-clay bells with premolded gaskets: ASTM C700, extra strength, and ASTM C425.

2.3 JOINTS

A. Rubber Gasket Type: Gaskets in compression permitting longitudinal and angular movement.

B. Pipe 36 in. or less in diameter: 0-ring: ASTM C361 and as specified.

C. Pipe larger than 36 in. in diameter: 0-ring or ribbed-gasket: ASTM C443 and as specified.

D. Design:

l. No visible leakage, when tested average internal hydrostatic pressure of 10 psi.

2. Diameter of joint surfaces compressing the gasket: Not off more than 1/16 in. from true diameter, or as permitted by above ASTM Standard, whichever is less.

E. Composition and Texture of Gaskets:

1. Resistant to common ingredients of sewage, industrial wastes, and groundwater. Permanent under anticipated service conditions.

2. Fabricated by manufacturer regularly making rubber gaskets for pipe.

PART 3- EXECUTION

3.1 HANDLING

A. Handle into position in acceptable manner.

B. Furnish suitable devices for support when lifted.

3.2 INSTALLATION

A. Inspect before installation. Remove and replace defective units. Clear of debris and dirt.

B. Bedding:

1. Support on compacted screened gravel per Section 02223, or as indicated. Do not permanently support on saddles, blocking, or stones.

2. Provide bell holes for imparting bearing pressure to pipe barrel.

C. Alignment:

1. Install to line and grade indicated.

2. Maintain close joints with next adjoining unit. Match inverts. Do not drive down to grade by striking.

D. Jointing:

1. Clean and lubricate bell or groove before jointing per manufacturer's recommendation. Push into place. Force pipe units together by proper devices leaving minimum open recess inside and outside and achieving tightly sealed joints. Avoid force that could wedge apart or split bell or groove ends. Do not pull or cramp joints, except where permitted by Engineer.

2. Inspect proper position of joint gasket with feeler gage furnished by Contractor.

3. Remove and replace unfittable pipe units with suitable units and new gaskets.

4. Install gaskets and assemble joints in accordance with recommendations of manufacturers of joint material and pipe, subject to acceptance by Engineer. Provide watertight pipeline with flexible joints.

E. Backfill:

1. Compact gravel between pipe and sides of trenches to hold pipe in correct alignment Fill bell holes with screened gravel and compact as indicated.

2. Prevent floatation in trench.

F. Cleaning:

1. Use watertight plugs in open ends of pipe and branches when installation not in progress.

2. Do not use pipeline as conductor for trench drainage.

3. Prevent earth, water, and other material from entering pipeline.

4. Clean pipeline and manholes upon completion. Prevent soil, water, and debris from entering existing sewers.

3.3 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01700.

END OF SECTION 02609

SECTION 02622

POLYVINYL CHLORIDE GRAVITY PIPE

PART 1 -GENERAL

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the following:

1. Providing and testing of pipe, pipe fittings and specials, jointing materials, and accessories, of various sizes, classes, joints and types, and appurtenant work, at the locations and to the lines and grades as indicated and/or as directed, complete in place, in accordance with the drawings and specifications.

2. The pipe specified under this section shall include all gravity flow sanitary sewers.

B. Related sections include the following:

1. Section 02210 - Earth Excavation, Backfill, Fill and Grading

2. Section 02601- Manholes

1.3 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300- SUBMITTAL PROCEDURES:

1. Submit shop drawings or descriptive literature, or both showing pipe dimensions, joints, joint gaskets, and other details for each size of pipe to be furnished for the project. All pipe furnished shall be manufactured only in accordance with the specifications and the drawings.

1.4 QUALITY ASSURANCE

A. Provide in accordance with Section 01400 and as specified.

1.5 DELIVERY, STORAGE AND HANDLING

A. Provide in accordance with Section 01610. PART 2 - PRODUCTS

2.1 PIPE FITTINGS AND SPECIALS

A. The polyvinyl chloride pipe and fittings, including those required for stubs, shall conform to ASTM Standard Specifications for Type PSM PVC Sewer Pipe and Fittings, Designation ASTM D3034, latest revision, for sizes 4"-15" and ASTM F679, latest revision, for sizes 18"-27" The pipe shall have a maximum pipe diameter to wall thickness ratio (SDR) of 35. The pipe shall be tested by the flat plate deflection method at a minimum of 45 psi at 5 percent deflection in accordance with ASTM D 2412. Standard laying lengths shall be either 13 feet or 20 feet.

B. Specials, if required, shall conform to the Specifications for straight pipe insofar as applicable and to the details indicated on the Drawings or bound into the back of the Specifications.

C. Insulation shall be manufactured by Thermal Pipe Systems, Braintree, Massachusetts, Atlas Insulation, Ayer, Massachusetts or Insulated Piping Systems Inc., Canton, Massachusetts, or equal Insulation shall be factory formed-in-place polyurethane foam insulation having nominal thickness of 3", with an in-place density of 2.5 pcf, and a "K" factor of 0.14 BTU/in./hr/deg./F/sq.ft. Straight joints between insulated pipe lengths, and the end section of non-insulated pipe shall be 20-guage corrugated aluminum performed to be fastened with stainless steel screws and bands. Jackets shall have expansion joints at 25-foot intervals. Sections of jacket shall have 2-inch minimum at all seams.

2.2 JOINTS

A. Joints for the polyvinyl chloride pipe shall be push-on bell and spigot joints using elastomeric ring gaskets. The gaskets shall be securely fixed into place in the bells so that they cannot be dislodged during joint assembly. The gaskets shall be of a composition and texture which is resistant to con1mon ingredients of sewage and industrial wastes, as well as petroleum products (oil, gasoline, etc.) and groundwater, and which will endure permanently under the conditions of the proposed use. The joints shall conform to ASTM Standard Specifications for Joints for Drain and Sewer Plastic pipes using Flexible Elastomeric Seals, Designation D3212.

2.3 INSPECTION, TESTS AND ACCEPTANCE

A. All pipe delivered to the job site shall be accompanied by test reports certifying that the pipe and fittings conform to the above-mentioned ASTM Specifications. In addition, the pipe shall be subject to thorough inspection and tests, the right being reserved for the Engineer to apply such tests as he deems necessary.

B. All tests shall be made in accordance with the methods prescribed by the above mentioned ASTM Specifications, and the acceptance or rejection shall be based on the test results.

C. The Contractor shall furnish all labor to assist the Engineer in inspecting the pipe. Pipe will be inspected upon delivery, and such as does not conform to the requirements of this

contract shall be rejected and shall immediately be removed from the project site by the Contractor.

PART 3-EXECUTION

3.1 HANDLING PIPE

A. All pipe shall be stored at the site until installation in a manner which will keep the pipe at ambient outdoor temperatures. Temporary shading shall be provided as required to meet this requirement. Simply covering the pipe which allows temperature build-up when exposed to direct sunlight will not be permitted.

B. Care shall be taken to avoid damaging the pipe and fittings.

3.2 INSTALLATION

A; Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16-inch per foot of length. If a piece of pipe fails to meet this requirement for straightness, it shall be rejected and removed from the site. Any pipe unit or fitting discovered to be defective either before or after installation shall be removed and replaced with a sound unit.

B. No pipe or fitting shall be permanently supported on saddles, blocking, or stones. Crushed stone shall be as specified in Section 02435.

C. Suitable bell holes shall be provided, so that after placement, only the barrel of the pipe receives bearing pressure from the supporting material. Special care shall be taken to hold the trench width at the crown of the pipe to the maximum indicated on the Trench Detail included in the Details section of these specifications.

D. All pipe fittings shall be cleared of all debris, dirt, etc., before being Installed and shall be kept clean until accepted in the completed work.

E. Pipe and fittings shall be installed to the lines and grades indicated on the Drawings. Care shall be taken to ensure true alignments and gradients.

F. Before any joint is made, the previously installed unit shall be checked to assure that a close joint with the adjoining unit has been maintained that the inverts are matched and conform to the required grade. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber or other unyielding object.

G. All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer 's recommendation. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe units together so that they will fit with minimum open recess inside and outside and have tightly sealed joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends.

H. Joints shall not be "pulled" or "cramped" unless permitted by the Engineer.

I. Where any two pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units and new gaskets.

J. Details of gasket installation and joint assembly shall follow the directions of the manufacturers of the joint materials and of the pipe, all subject to review by the Engineer. The resulting joints shall be watertight and flexible.

K. All premolded gasket joint polyvinyl chloride pipe of a particular manufacturer may be rejected if there are more than five unsatisfactory joint assembly operations or "bell breaks" in 100 consecutive joints, even though the pipe and joint conform to the appropriate ASTM Specifications as hereinbefore specified. If the pipe is unsatisfactory, as determined above, the Contractor shall, if required, remove all pipe of that manufacturer of the same shipment from the work and shall furnish pipe from another manufacturer which will conform to all of the requirements of these specifications.

L. Open ends of pipe and branches shall be closed with polyvinyl chloride stoppers secured in place in an acceptable manner.

M. After each pipe has been properly bedded, enough crushed stone shall be placed between the pipe and the sides of the trench, and thoroughly compacted, to hold the pipe in correct alignment. Bell holes, provided for jointing, shall be filled with crushed stone and compacted, and then crushed stone shall be placed compacted to complete the pipe bedding.

N. The Contractor shall take all precautions to prevent flotation of the pipe in the trench.

O. At all times pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs, or by other acceptable means.

P. If water is in the trench when work is to be resumed, the plug shall not be removed until suitable provisions have been made to prevent water, earth, or other substances from entering the pipe.

Q. Pipelines shall not be used as conductors for trench drainage during construction.

3.3 ALLOWABLE PIPE DEFLECTION

A. Pipe provided under this Specification shall be so installed as to not exceed a maximum deflection of 5.0 percent. Such deflection shall be computed by multiplying the amount of deflection (nominal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.

B. Upon completion of a section of pipe, including placement and compaction of backfill, the Contractor shall measure the amount of deflection by pulling a specially designed gage assembly through the completed section. The gage assembly shall be in accordance

with the recommendations of the pipe manufacturer, and be reviewed by the Engineer. The section of pipe must be placed and backfilled for a minimum of 90 days before the deflection can be measured.

C. Should the installed pipe fail to meet this requirement, the Contractor shall do all work to correct the problem without additional compensation.

3.4 CLEANING

A. Care shall be taken to prevent earth, water and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out the pipeline and manholes being careful to prevent soil, water and debris from entering any existing pipe.

3.5 TESTING OF PIPE

A. If the visual inspection of the completed pipe or any part thereof shows any pipe, manhole or joint which allows infiltration of water in a noticeable stream or jet, the defective work or material shall be replaced or repaired as directed.

B. After completing installation and backfill of pipe, the Contractor shall, at his expense, conduct a line acceptance test using low pressure air.

C. Equipment used shall meet the following minimum requirements.

D. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.

E. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.

F. All air used shall pass through a single control panel.

G. Three individual hoses shall be used for the following connections.

1. From control panel to pneumatic plugs for inflation.

2. From control panel to sealed line for introducing the low pressure air.

3. From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

H. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

I. After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.

J. After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be te1med "Acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any groundwater that may be over the pipe) is not less than the time shown for the given diameter in the following table.

Pipe Diameter	Specification Time for Length Shown (min:sec)			
Inches	100ft.	200ft.	300ft.	400ft.
6	5:40	5:40	5:40	5:42
8	7:34	7:34	7:36	10:08
10	9:26	9:26	11:52	15:49
12	11:20	11:24	17:05	22:47
15	14:10	17:48	26:42	35:36
18	17:00	25:38	38:27	51:16
21	19:50	34:54	52:21	69:48
24	22:47	45:34	68:22	91:10

K. In areas where groundwater is known to exist, the Contractor shall install a 1/2-inch diameter capped pipe nipple, approximately 10-inches long, through the manhole wall adjacent to one of the sewer lines entering the manhole. This shall be done at the time the line is installed. immediately prior to the performance of the Line Acceptance Test, the groundwater shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is ll-112 feet, then the added pressure will be 5 psig. This increases the 3.5 psig to 8.5 psig, and the 2.5 psig to 7.5 psig. The allowable drop of one pound and the timing remain the same). In no case shall the starting pressure exceed 9.0 psig.

3.6 TEST FAILURE

A. If the section of pipe fails to pass the leakage and pressure test, or if there is any visible leakage, the Contractor shall locate, uncover and repair or replace the defective pipe fitting or joint and retest all at his own expense. Pipe will be considered passing only when the leakage does not exceed the above standard. Passing the test does not absolve the Contractor from his responsibility if leaks develop later within the period of warranty.

3.7 CONTRACT CLOSEOUT

Provide in accordance with Section 01700.

END OF SECTION 02622

SECTION 02721

STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all labor, materials, equipment and supervision necessary to complete the work specified in this Section or shown on the Contract Drawings, or both, but not limited to the following:

1. Storm drain piping, fittings, accessories and bedding.

2. Catch basins and catch basin frames and grates.

3. Drain manholes and drain manhole frames and covers.

1.2 RELATED SECTIONS

A. Drawings and general provisions of the Contract, and:

1. Section 02200 Earthwork

2. Section 02140 Dewatering and Drainage

1.3 SUBMITTALS

A. Submit shop drawings and manufacturer's specifications and installation instructions for all pipe materials including flared end sections, precast concrete catch basins and drain manholes, manhole frames and covers and catch basin frames and grates. Include component construction, features, configuration, and dimensions.

B. Each shipment of pipe, catch basins and metal castings shall be accompanied with the manufacturers notarized certificate that the materials meet the specification requirements.

1.4 REFERENCES

1. ASTM C32-05 Sewer and Manhole Brick.

2. ASTM C62-08 Building Brick.

3. ASTM C76-08a Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

4. ASTM C139-05 Concrete Masonry units for Construction of Catch Basins and Manholes.

5. ASTM C270-08a Mortar for Unit Masonry .

6. ASTM C443-05a Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

7. ASTM C478-08 Precast Reinforced Concrete Manhole Sections.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

A. Reinforce Concrete Pipe: ASTM C76, Class III (unless otherwise specified on the project drawings), modified bell and spigot compression gasket joints complying with ASTMC443.

B. General: Ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of same-type class of materials as piping unless otherwise indicated.

2.2 MANHOLES AND CATCH BASINS

A. The material to be used in the construction of storm drain manholes, catch basins, and drop inlets shall conform to MHD Standard Specifications, the Drawings, and these specifications. Design depths as indicated on the Contract Drawings.

B. Precast Concrete Manholes and Catch Basins: ASTM C478, eccentric cone, flat slab precast top; precast riser section and monolithic base section with integral floor.

C. Concrete Compressive Strength: 4000 psi minimum. Type II cement.

D. Reinforcing Steel: ASTM A185, 0.12 sq. in./linear ft. and 0.12 sq. in. (both ways) base bottom.

E. Joints sealed with rubber gaskets conforming to ASTM C443.

F. Steps: Forged 6061B, T6 aluminum or Copolymer Polypropylene Plastic with 1/2 inch Grade 50 steel reinforcement.

G. PVC Structures: ASTM DI784, ASTM D2122 and ASTM D2564.

H. Pipe Connectors: Provide a hydraulic cement, no shrink grout, which shall be made watertight with the RCP storm drainage pipe.

2.3 CAST IRON FRAME AND COVER

A. Frame and Cover: Cast iron construction, manufactured by LeBaron Foundry, Inc. (East Jordan Iron Works, Inc).

2.4 CAST IRON FRAME AND GRATE

A. Frame and Grate: Manufactured by E.L. LeBaron (East Jordan Iron Works, Inc.) model #LF-248-2 flange (single or double) or approved equal.

2.5 OIL AND FLOATING DEBRIS TRAP

A. Oil and Floating Debris Trap: Manufactured by Ground Water Rescue, Inc. model The Eliminator or approved equal.

2.6 MASONRY MATERIAL

A. Concrete Masonry Units: ASTM CI39.

B. Brick: ASTM C32Grade MS or ASTM C62) Grade SW.

C. Mortar: ASTM C270Type M.

2.7 PIPE BEDDING AND COVER MATERIALS

A. Bedding, Cover and Compaction Requirements: Fill Type as specified in Section 02200, and shown on the Details.

2.8 INFILTRATION BASIN

A. Infiltration basin shall be pre cast concrete type, a min of 6 feet in diameter and a min 6 ft. deep. Concrete strength shall be 4,000 psi @ 28 days. Cement shall be Portland Type II per ASTM Cl50-81. Steel reinforcement shall conform to ASTM A-615, Grade 60. Design loading per AASHO HS-10.

B. Infiltration basin shall comply with the standards of the City of Waltham.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that the trench cut and excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on Contract Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with processed

B. Remove large stones or other hard matter, which could damage piping, structures, or Impede consistent backfilling or compaction

3.3 BEDDING

A. Excavate for pipe trench or structure in accordance with Section 02200. Hand trim excavation for accurate placement of pipe and structures to elevations indicated on the Drawings.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 12 inches compacted depth.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION- PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321 and manufacturer's instructions. Seal joints watertight.

B. Place pipe on minimum 12 inch deep bed in accordance with Section 02200.

C. Lay pipe to slope gradients noted on drawings with maximum variation from true slope of 1/8 inch in 10 feet.

D. Install processed gravel at sides to the midpoint of the pipe. Install Ordinary Borrow from the midpoint of the pipe to the elevations indicated on the Contract Drawings, compacted to 95 percent maximum density at optimum moisture content.

E. Refer to Section 02200 for trenching and backfilling requirements. Do not displace or damage pipe when compacting.

3.5 INSTALLATION- CATCH BASINS AND DRAIN MANHOLES

A. Form bottom of excavation clean and smooth to correct elevation.

B. Install and level precast concrete manhole base and sections per the Details of the Drawings including 12" depth of crushed stone with filter fabric.

C. Establish elevations and pipe inverts for inlets and outlets as indicated on the Drawings. D. Mount frame and cover or frame and grate level in grout, secured to top cone or flat top section to elevations indicated on the Drawings.

3.6 FIELD QUALITY CONTROL

A. Request inspection prior to and immediately after placing aggregate cover over pipe.

B. Compaction will be performed in accordance with Section 02200.

3.7 PROTECTION

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 02721

SECTION 02901

MISCELLANEOUS WORK AND CLEANUP

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to do 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 the Contractor shall perform the work in accordance with other sections of this Specification. When no applicable specification exists the Contractor shall perform the work in accordance with the best modem practice and/or as directed by the Engineer.

C. The work of this Section includes, but is not limited to, the following:

1. Installing and maintaining construction warning signs.

2. Crossing and relocating existing utilities.

3. Restoring of driveways and sidewalks.

4. Cleaning up.

5. Incidental work.

6. Job photographs.

7. Protection and/or removal and reinstallation of existing signs, lampposts, fence posts, fencing and mailboxes.

8. Protection and bracing of utility poles.

9. Restoration and replacement of curbing.

10. Raking and re-seeding of grassed areas disturbed during construction and/or dewatering activities, including silt basin/dewatering activity areas.

PART2 PRODUCTS

2.1 MATERIALS

A. Materials required for this Section shall be the same quality of materials that are to be restored. Where possible, the Contractor may re-use existing materials that are removed.

PART 3- EXECUTION

3.1 INSTALLING AND MAINTAINING CONSTRUCTION WARNING SIGNS

A. Construction work zone traffic control shall be the contractor's responsibility. Generally, conformance with Part VI of the Manual of Uniform Traffic Control Devices (MUTCD), latest edition, "Standards and Guides for Traffic Controls for Street and Highway Construction, Maintenance, Utility, and Incident Management Operations", will be considered to meet this requirement.

3.2 CROSSING AND RELOCATING EXISTING UTILITIES

A. This Item includes 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 but is not limited to the following: bracing, hand excavation and backfill (except screened gravel) and any other work required for crossing the utility or obstruction not included for payment in other items of this specification. 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, the Contractor shall 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, the Contractor shall 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 F01m.

RESTORING OF 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 thickness existing prior to construction. Gravel drives shall be replaced and regraded.

B. Existing public and private sidewalks disturbed by the construction shall be replaced with sidewalks of equal quality and dimension. In general, sidewalks shall be 2-1/2

inches thick after rolling and compacting and the material shall be top course bituminous asphalt.

3.4 CLEANING UP

A. The Contractor shall remove all construction material, excess excavation, buildings, equipment and other debris remaining on the job as a result of construction operations and shall restore the site of the work to a neat and orderly condition. Any materials, and

sand or concrete materials shall be cleaned out of the manholes and catch basins. Haybales and siltfence as well as any silt and debris retained by same shall be removed.

3.5 INCIDENTAL WORK

A. Do all incidental work not otherwise specified, but obviously necessary to the proper completion of the Contract as specified and as shown on the Drawings.

3.6 PHOTOGRAPHS OF PROJECT

A. Prior to commencing work, Contractor may document existing conditions using construction photographs. Photographs for this purpose shall be at the Contractors' expense.

3.7 RESTORATION AND REPLACEMENT OF SIGNS, LAMPPOSTS, FENCE POSTS, FENCING, AND MAILBOXES

A. Existing signs, lamp posts, fence posts, fencing and mailboxes which may be damaged by the Contractor or removed by the Contractor during the course of installing the new pipelines 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.

3.8 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

3.9 PROTECTION AND BRACING OF UTILITY POLES

A. The Contractor shall be responsible for making all arrangements with the proper utility companies for the bracing and protection of all utility poles that may be damaged or endangered by the Contractors 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 RAKING AND RE-SEEDING

A. Grass and landscaped areas disturbed by the Contractor shall be raked and replenished with loam if required. Areas shall be re-seeded as required.

END OF SECTION 02901

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1-GENERAL

1.1 SUMMARY

In general, the Contractor shall supply all labor, equipment, temporary protection, tools and appliances necessary for the proper completion of the work as required in the specifications and in accordance with good construction practice. Refer to the Contract Drawings for locations of work included in the contract.

A. Work Included - The work under this section generally includes the following:

1. Concrete building foundations
2. Concrete slabs
3. Exterior concrete stairs
4. Concrete retaining walls

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section, and:

1. Section 02200 Earthwork

1.3 SUBMITTALS

A. In addition to Product Data, submit design mixes for each concrete mix.

1.4 QUALITY ASSURANCE

A. Quality Assurance: Comply with ACI 301, "Specification for Structural Concrete," and ACI117, "Specifications for Tolerances for Concrete Construction and Materials."

1. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in- service performance.

2. Manufacturer Qualifications: A firm experienced in manufacturing ready-Mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

PART 2-PRODUCTS

2.1 MATERIALS

A. Steel Reinforcement: As follows:

1. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
2. Plain-Steel Wire: ASTM A 82, as drawn.
3. Deformed-Steel Wire: ASTM A 496.
4. Plain-Steel Welded Wire Fabric: ASTM A 185, flat sheets.

B. Concrete Materials: As follows:

1. Portland Cement: ASTM C 150, Type I or II.
2. Aggregate: ASTM C 33, uniformly graded, from a single source.
3. Water: ASTM C 94.
4. Air-Entraining Admixture: ASTM C 260.
5. Water-Reducing Admixture: ASTM C 494, Type A.
6. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
7. Water-Reducing and Accelerating Admixture: ASTM C 494, Type
8. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

B. Related Materials: As follows:

1. Vapor Retarder: ASTM E 1745, Class C, not less than 7.8 mils polyethylene sheet.
2. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
3. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
4. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, of class and grade to suit requirements.

D. Curing Materials: As follows:

1. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
2. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
3. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
4. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
   a. 2 coats Sonneborn "Kure-N-Seal" or equal.

2.2 CONCRETE MIXES

A. Concrete Mixes, General; - Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, with the following properties:

B. Footings, Foundations, Retaining Walls

1. Con1pressive Strength (28 Days): 3000 psi.
2. Slump: 4 inches.
3. Air Content: 4.5 to 7.0 percent.

C. Slabs

1. Compressive Strength (28 Days): 4000 psi.
2. Slump: 3 inches.
3. Air Content: 4.5 to 7.0 percent

D. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.

PART 3 EXECUTION

3.1 FORMWORK

A. Design, construct, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

C. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved 28-day design compressive strength.

D. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

E. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTME 1643.

3.2 PLACING REINFORCEMENT

A. Steel Reinforcement: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.3 JOINTS

A. Locate and install construction, isolation, and contraction joints as indicated.

3.4 CONCRETE PLACEMENT

A. Deposit concrete continuously and avoid segregation. Deposit concrete in forms in horizontal layers no deeper than 24 inches, avoiding cold joints.

1. Consolidate concrete with mechanical vibrating equipment.
2. Screed and initial-float concrete floors and slabs using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
3. Comply with ACI 306.1 for cold-weather concrete placement.
4. Place concrete according to recommendations in ACI 305R when hot-weather conditions exist.

3.5 FINISHING

A. Finish formed surfaces as follows:

1. Apply rough-formed finish, defined in ACI 301, to concrete surfaces indicated or not exposed to public view.

B. Finishing Floors and Slabs: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces.

1. Float Finish: Apply float finish, defined in ACI 301, to surfaces indicated, to surfaces to receive trowel finish,

2. Trowel Finish: Apply a trowel finish to surfaces indicated and to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

   a. After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

   b. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding 10-foot long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following: 1/8 inch.

3. Trowel and Fine-Broon1 Finish: Apply a partial trowel finish, stopping second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

4. Broom Finish: Apply a broom finish to exterior concrete, bro01ning with fiber-bristle broom perpendicular to main traffic route, to platforms, steps, and ramps, and elsewhere as indicated.

3.6 CONCRETE PROTECTION AND CURING

A. Concrete Protection and Curing: Protect concrete from excessive cold or hot temperatures. Con1ply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

1. Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause excessive moisture loss.
2. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
3. Cure formed and unformed concrete for at least seven days by moisture curing, moisture-retaining-cover curing, or curing compound.
4. Cure and seal floors and slabs with a curing and sealing compound according to manufacturer's written instructions.

3.7 QUALITY CONTROL

A. Testing Agency: The Contractor will engage a qualified independent testing and inspecting agency subject to Owner approval to sample materials, perform tests, and submit test reports during concrete placement. Tests shall be performed according to ACI 301.

B. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

END OF SECTION 03300

SECTION 03600

GROUT

PART 1-GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment and incidentals required to install grout for modifications to existing foundations, walls and manholes as shown on the Drawings and as specified herein.

1.2 RELATEDWORK

A. Cast-in-Place Concrete is included in Section 03300.

1.3 SUBMITTALS

A. Submit, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installer for:

1. Commercially manufactured nonshrink cementitious grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to required ASTM standards and Material Safety Data Sheet.

B. Submit to Engineer, in accordance with Section 01300, proposed method of repairing penetrations of existing foundations (all types), including formwork arrangement and grout installation.

1.4 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts and Monolithic Surfacings and Polymer Concretes.

2. ASTM C579- Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts and Monolithic Surfacings and Polymer Concretes.

3. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens for Cementitious Mixtures.

4. ASTM C1107- Standard Specification for Packaged D1y, Hydraulic-Cement Grout

B. U.S. Army Corps of Engineers (CRD)

1. CRD C-621 - Corps of Engineers Specification for Nonshrink Grout.

C. Where reference is made to one of the above standards, the revision in effect at the time of the bid opening shall apply.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers and printed instructions.

B. Store materials in full compliance with the manufacturer's recommendations. Total storage time from date of manufacture to date of installation shall be limited to 6 months or the manufacturer's recommended storage time, whichever is less.

C. Material which becomes damp or otherwise unacceptable shall be immediately removed from the site and replaced with acceptable material at no additional expense to the Owner.

PART 2- PRODUCTS

2.1 GENERAL

A. The use of a manufacturer's name and product or catalog number is for the purpose of establishing the standard of quality desired.

B. Like materials shall be the product of one manufacturer or supplier in order to provide standardization of appearance.

2.2 MATERIALS

A. Nonshrink Cementitious Grout:

1. Nonshrink cementitious grouts shall meet or exceed the requirements of ASTM C1107, Grades B or C and CRD C-621. Grouts shall be Portland cement based, contain a pre-proportioned blend of select aggregates and shrinkage compensating agents and shall require only the addition of water. Nonshrink cementitious grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.

a. General purpose nonshrink cementitious grout shall conform to the standards stated above and shall be SikaGrout 212 by Sika Corp.; Set Grout by master Builders, Inc.; Gilco Construction Grout by Gifford Hill & Co.; Euco NS by The Euclid Chemical Co. NBEC Grout by U.S. Grout Corp. or equal.

b. Flowable (Precision) nonshrink cementitious grout shall conform to the standards stated above and shall be Masterflow 928 by Master Builders, Inc.; Hi-Flow Grout by the Euclid Chemical Co.; SikaGrout 212 by Sika Cotp.; Supreme Grout by Gifford Hill & Co.; Five Star Grout by U.S. Grout Corp. or equal.

B. Water:

1. Potable water, free from injurious amounts of oil, acid, alkali, organic matter or other deleterious substances.

PART 3 EXECUTION

3.1 PREPARATION

A. Surfaces to receive grout shall be clean and sound; free of ice, frost ice, dirt, grease, oil, curing compounds, laitance and paints and free of all loose material or foreign matter which may affect the bond or performance of the grout.

B. Roughen concrete surfaces by chipping, sandblasting, or other mechanical means to ensure bond of the grout to the concrete. Remove loose or broken concrete. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of lattice and firmly embedded into the parent concrete.

1. Air compressors used to clean surfaces in contact with the grout shall be the oilless type or equipped with an oil trap in the airline to prevent oil from being blown onto the surface.

C. Construct grout forms or other leakproof containment as required. Forms shall be lined or coated with release agents recommended by the manufacturer. Forms shall be of adequate strength, securely anchored in place and shored to resist the forces imposed by the grout and its placement.

3.2 INSTALLATION- GENERAL

A. Mix, apply and cure products In strict compliance with the manufacturer's recommendations and this section.

B. Have sufficient manpower and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and close at hand.

C. Maintain temperatures of the grout between 60 and 90 degrees F during grouting and until the grout compressive strength reaches 1000 psi or as recon1mended by the grout manufacturer, whichever is longer. Take precautions to minimize differential heating or cooling of existing surfaces and grout during the curing period.

D. Take special precautions for hot weather or cold weather grouting as recommended by the manufacturer when ambient temperatures and/or the temperature of the materials in contact with the grout are outside of the 60 and 90 degrees F range.

3.3 INSTALLATION- NONSHRINK CEMENTITIOUS GROUT

A. Mix in accordance with the manufacturer's recommendations. Do not add cement, sand, pea gravel or admixtures.

B. When mixing, add premeasured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the minimum additional water required to obtain the workability. Do not exceed the manufacturer's maximum recommended water content.

C. Placements greater than 3-inches in depth shall include the addition of clean, washed pea-gravel to the grout mix when approved by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.

D. Place grout into the designated• areas in a manner which will avoid segregation or entrapment of air. Do not vibrate grout to release air or to consolidate the material. Placement shall proceed in a manner which will ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.

E. Place grout rapidly and continuously to avoid cold joints. Do not place cement grouts in layers. Do not add additional water to mix (retemper) after initial stiffening.

F. Finish this surface with a wood float (brush) finish.

G. Begin curing immediately after form removal and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement or longer if recommended by the manufacturer. Saturate the grout surface by use of wet burlap, soaker hoses, ponding or other approved means. Provide sunshades as necessary. If drying winds inhibit the ability of a given curing method to keep grout moist, erect wind breaks until wind is no longer a problem or curing is finished.

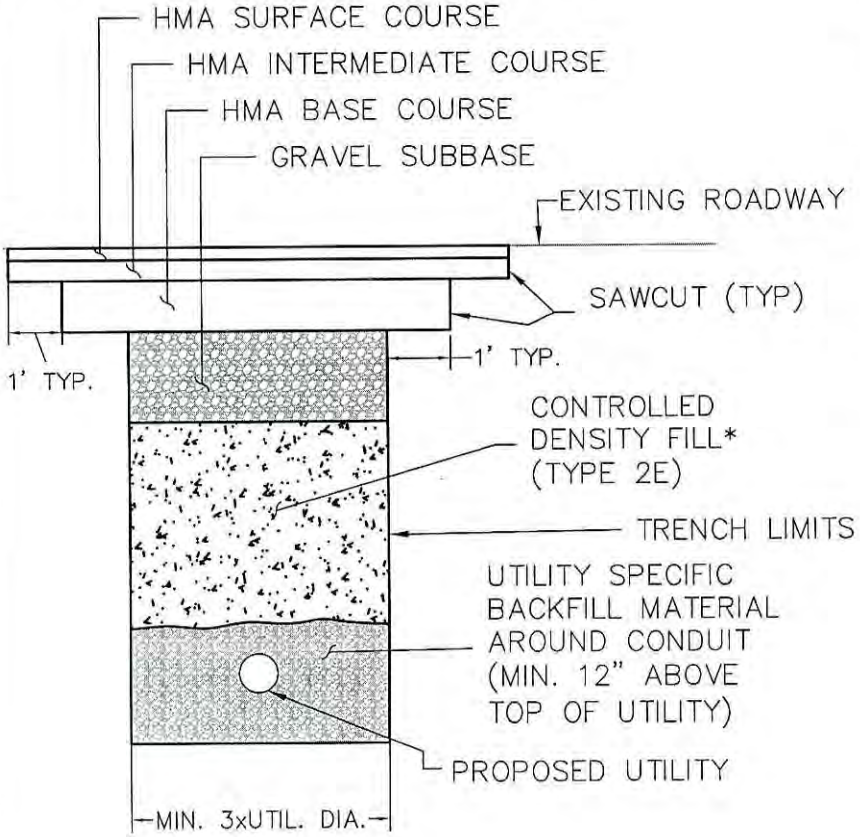
END OF SECTION 03600

APPENDIX C
Construction Details

TRENCH SECTION

N.T.S

(FOR TEMPORARY PAVING SEE NOTE 1)



PAVEMENT NOTES

PAVEMENT MIX DEPTH SHALL MATCH OR EXCEED THE EXISTING DEPTH OF HMA.

- 1.75" HMA SURFACE COURSE
  *MODIFIED TOP SHALL BE UTILIZED WHERE TRAFFIC EXCEEDS 10,000 VEH/DAY
- 1.75" HMA INTERMEDIATE COURSE
- 3.5"HMA BASE COURSE
  *HMA INTERMEDIATE COURSE MATERIAL SHALL BE USED
  *MAX. LIFT THICKNESS OF 2.5" COMPACTED
- MINIMUM 12" GRAVEL SUB-BASE:
  *MAXIMUM 3" AGGREGATE SIZE

*TRENCHES ON FREEWAYS SHALL REQUIRE A PAVEMENT DESIGN BE SUBMITTED FOR APPROVAL

NOTES:

1.) IF A TEMPORARY PATCH IS TO BE USED, THE CDF SHALL BE PLACED TO THE ELEVATION OF THE ADJOINING SUBGRADE, THEN GRAVEL SHALL BE PLACED AND COMPACTED TO WITHIN 3 1/2 INCHES OF THE FINISHED GRADE. THE LAST 3 1/2 INCHES SHALL BE BITUMINOUS CONCRETE PLACED IN TWO LAYERS: 1 1/2" TOP COURSE OVER 2" DENSE BINDER.

2.) MATERIAL WHICH MEETS THE SPECIFICATION FOR GRAVEL BORROW TYPE C (M1.03.0 TYPE C), PLACED AND COMPACTED IN LAYERS NO GREATER THAN 6", MAY BE USED IN PLACE OF THE CDF WITH APPROVAL FROM THE DISTRICT HIGHWAY DIRECTOR.

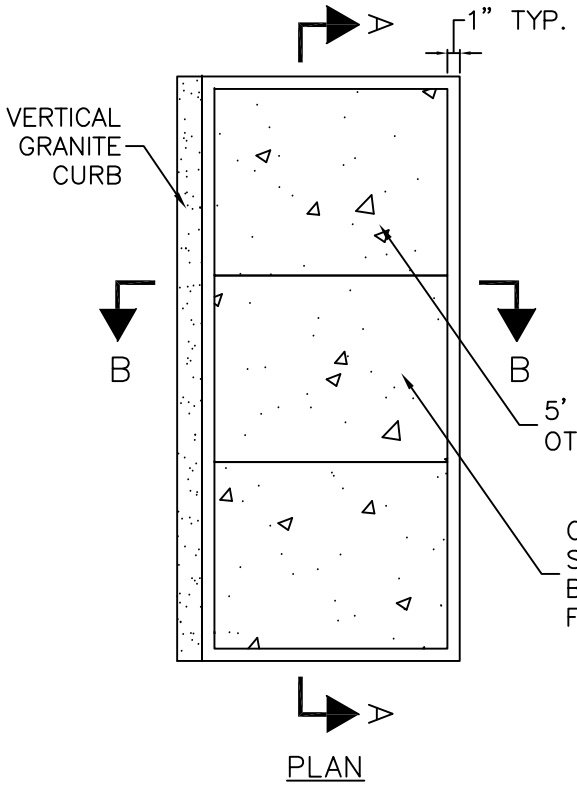
3.)THE EXPOSED EDGES OF ALL LONGITUDINAL AND TRANSVERSE SAW CUT JOINTS SHALL BE TREATED WITH HOT POURED RUBBERIZED ASPHALT JOINT SEALANT MEETING MASSDOT SPECIFICATIONS.

4.) YELLOW METAL FOIL MARKING TAPE SHALL BE PLACED 18" OVER THE CONDUIT (METAL MARKING TAPE/WIRE SHOULD BE USED FOR NON-METALLIC CONDUIT.)

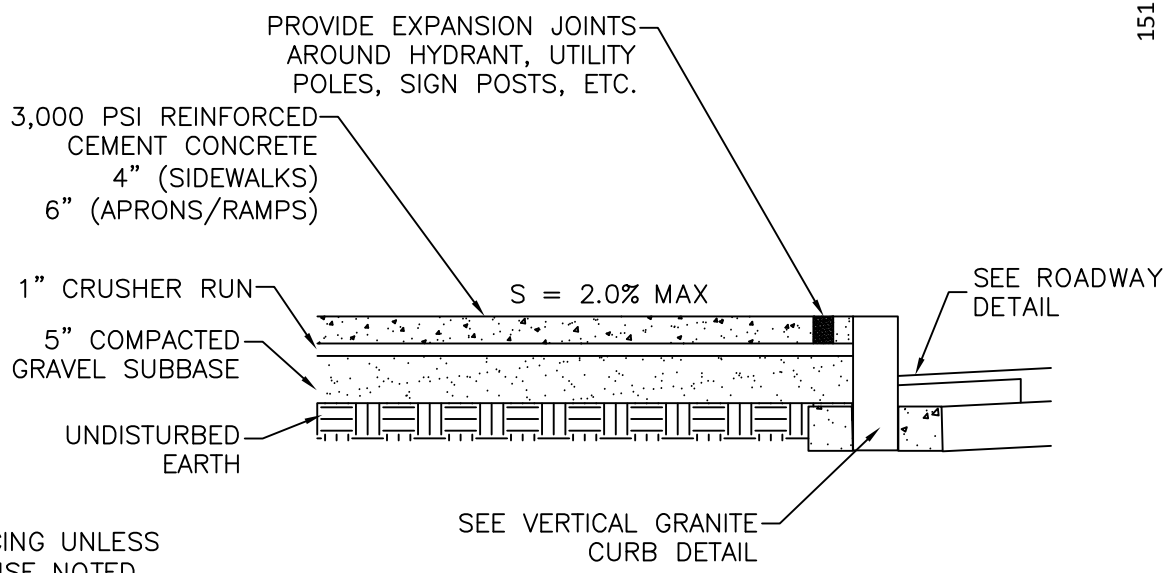
5.) FOR ROADS WITH AN EXISTING CEMENT CONCRETE BASE, A REINFORCED, HIGH EARLY STRENGTH AIR ENTRAINED, CLASS "F" CEMENT CONCRETE SLAB SHALL BE CAST IN PLACE TO MEET THE EXISTING PAVEMENT. SPECIFIC JOINT DETAILS WITH THE EXISTING PAVEMENT SHALL BE APPROVED DEPENDENT ON THE EXISTING SITE CONDITIONS.

6.) ALL TRENCH DIMENSIONS SHALL BE IN ACCORDANCE WITH SUB-SECTION 140.80 OF THE MASSDOT STANDARDS AND SPECIFICATIONS FOR HIGHWAYS AND BRIDGES.

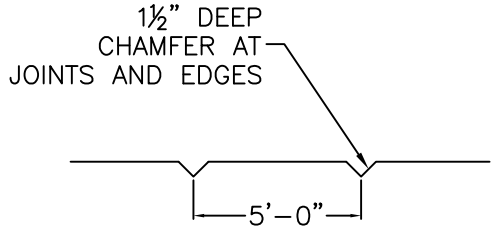
massDOT Massachusetts Department of Transportation Highway Division	UTILITY TRENCH PERMANENT PAVEMENT REPAIR	DATE: 8.25.10	NTS
		DRAWING NO.: XXXX	
		Drawn By: DHC	Checked By: JMM



PLAN



SECTION B–B

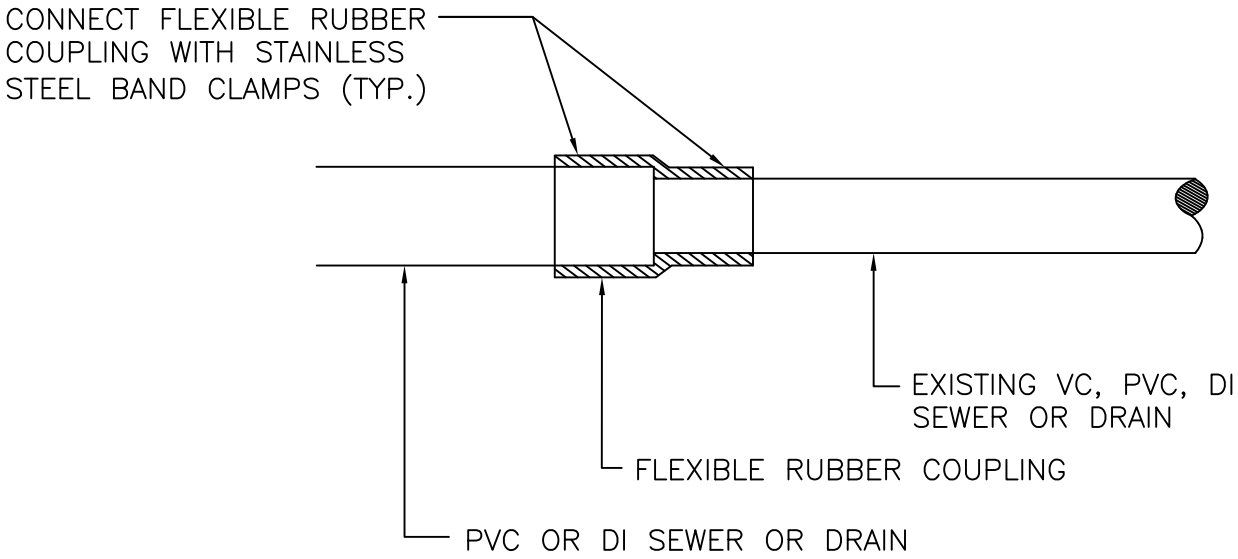


SECTION A–A

SIDEWALK NOTES:
1. NEW SIDEWALKS SHALL MATCH WIDTH OF EXISTING SIDEWALK UNLESS OTHERWISE NOTED.
2. SIDEWALK MATERIAL TO MATCH EXISTING SIDEWALK. FOR EXISTING ASPHALT SIDEWALK, SUBSTITUTE 4" CONCRETE.
3. SIDEWALKS TO BE BUILT ACCORDING TO ADA AND MA AAB REGULATIONS, 2.0% MAX (0% TOLERANCE) CROSS SLOPE.
4. SEE CONSTRUCTION PLANS AND GRADING PLANS FOR SIDEWALK WIDTHS AND GRADES.

CONCRETE SIDEWALK DETAIL

	FIGURE NAME: 701.000 – 4"&6" CEMENT CONCRETE SIDEWALK	SCALE: NOT TO SCALE
	CITY OF WALTHAM, MA. – ENGINEERING DEPARTMENT STANDARD DETAILS	REV. DATE: 3/30/2011



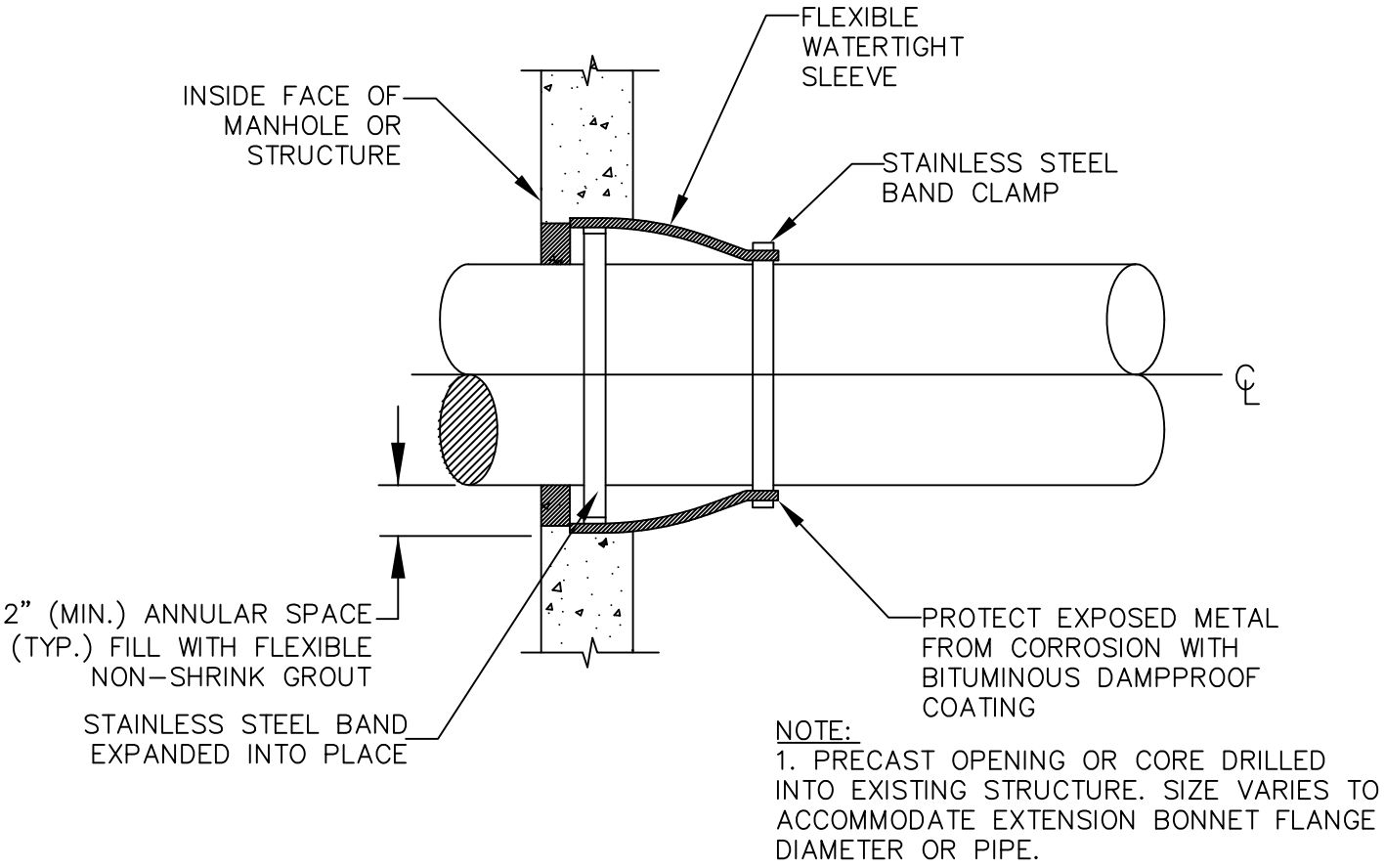
NOTES:

1. GRAVITY LATERAL PIPES (SEWERS OR DRAINS)
2. SEE SPECIFICATIONS FOR MATERIALS AND REQUIREMENTS.

PIPE FIELD CLOSURE (FLEXIBLE RUBBER COUPLING) DETAIL

FOR NON-PRESSURE PIPES OF DIFFERENT MATERIALS OR SIZES

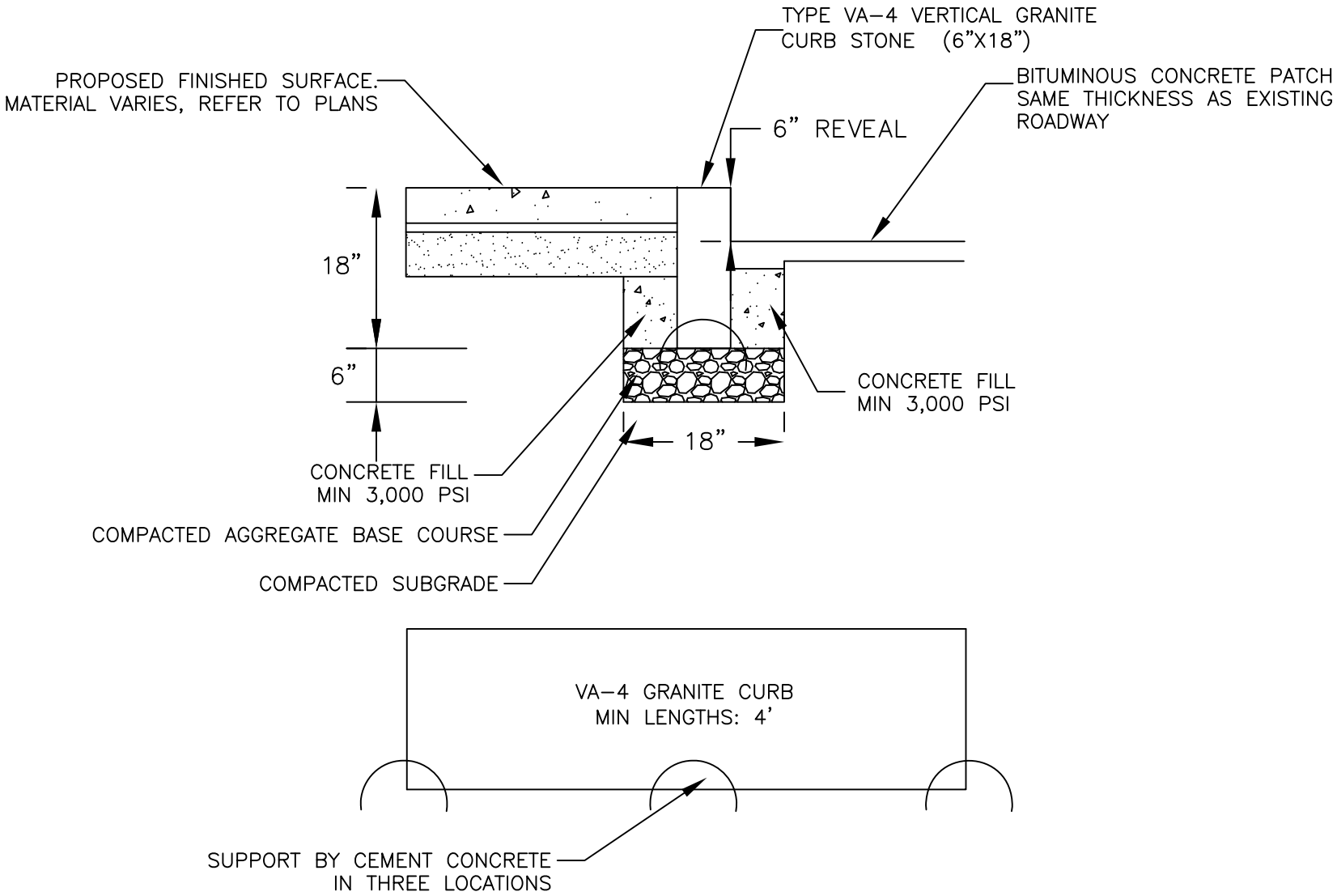
	FIGURE NAME: 999.100 – FERNCO CONNECTION DETAIL	SCALE: NOT TO SCALE
	CITY OF WALTHAM, MA. – ENGINEERING DEPARTMENT STANDARD DETAILS	REV. DATE: 12/8/2010



NOTE:
1. PRECAST OPENING OR CORE DRILLED INTO EXISTING STRUCTURE. SIZE VARIES TO ACCOMMODATE EXTENSION BONNET FLANGE DIAMETER OR PIPE.

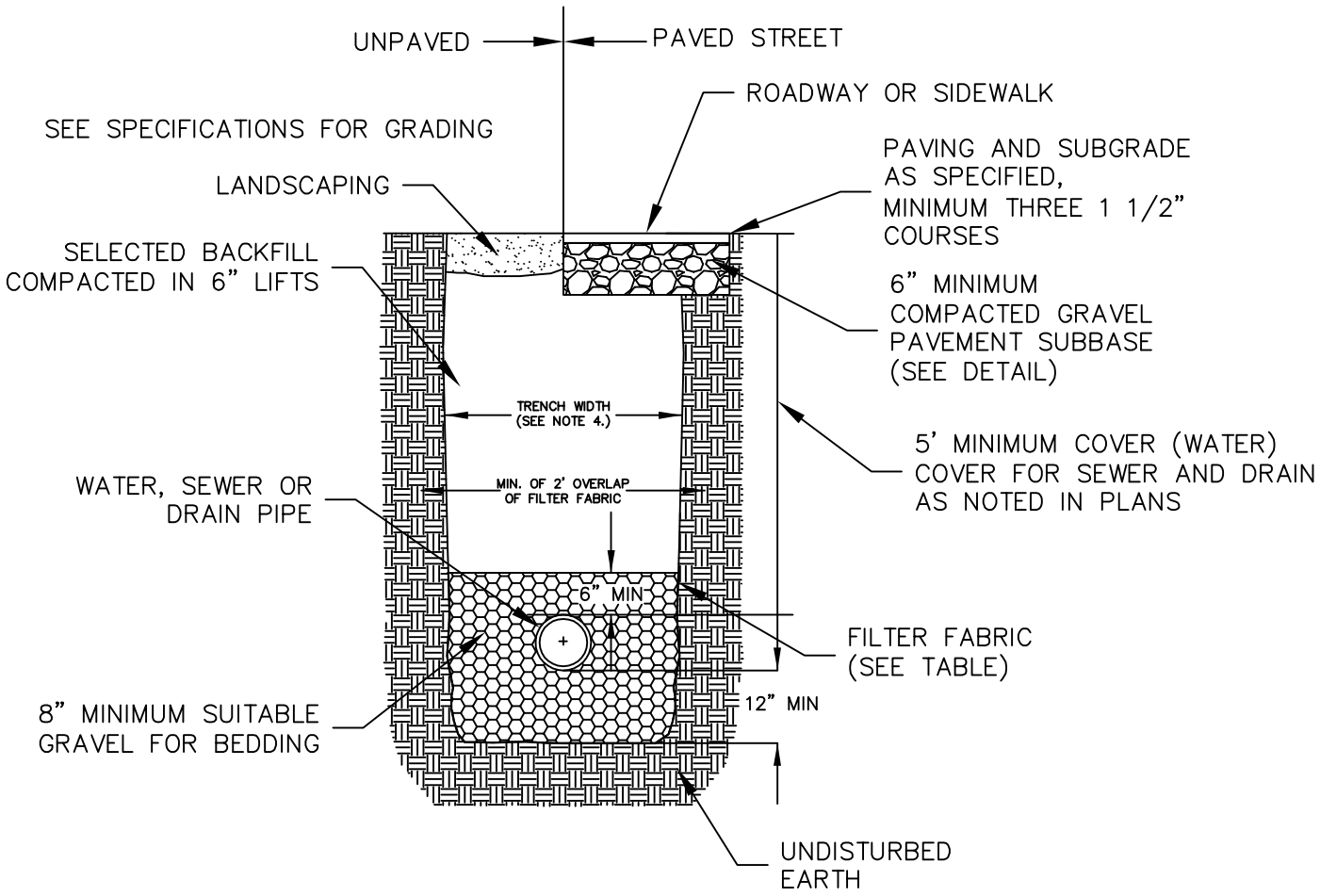
FLEXIBLE SLEEVE CONNECTION DETAIL

	FIGURE NAME: 202.000.A – FLEXIBLE SLEEVE CONNECTION DETAIL	SCALE: NOT TO SCALE
	CITY OF WALTHAM, MA. – ENGINEERING DEPARTMENT STANDARD DETAILS	REV. DATE: 12/8/2010 153



TYPICAL VERTICAL GRANITE CURB DETAIL

	FIGURE NAME: 504.000 – TYPICAL VERTICAL GRANITE CURB DETAIL	SCALE: NOT TO SCALE
	CITY OF WALTHAM, MA. – ENGINEERING DEPARTMENT STANDARD DETAILS	REV. DATE: 3/30/2011



NOTES:
1. ALL TRENCHES MUST BE JETTED OR PUDDLED AS REQUIRED BY THE ENGINEER.
2. PRIOR TO FINISHING PAVING, CUT SQUARE EDGES AT EXISTING PAVEMENT, AT LEAST 6 INCHES BEYOND OUTERMOST DISTURBED PAVEMENT.
3. NO LEDGE TO BE WITHIN 6" OF PIPE.
4. TRENCH WIDTH:

   LEDGE: OUTSIDE DIAMETER OF PIPE PLUS 2 FEET

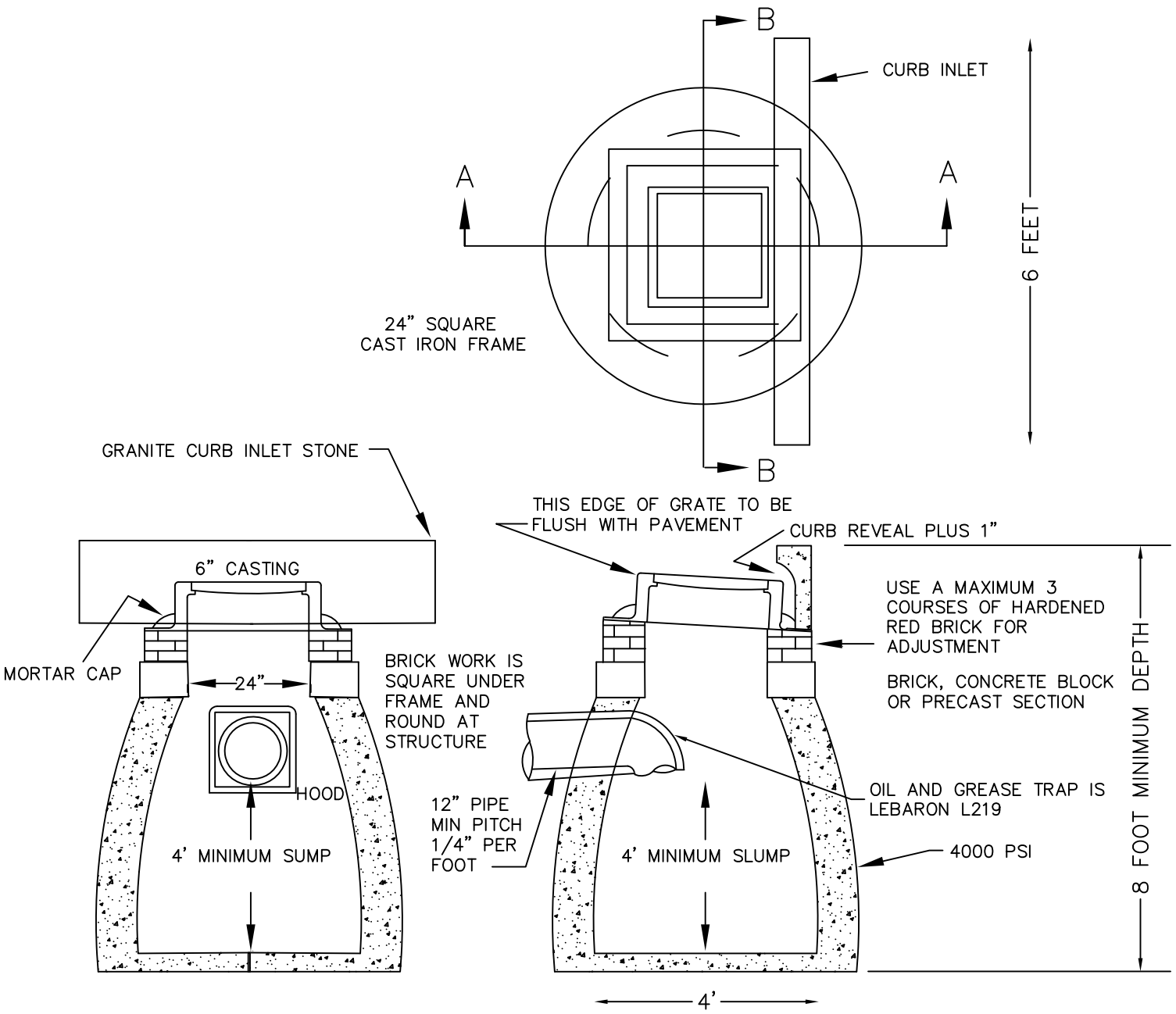
   EARTH: GREATER OF LEDGE VALUE OR 3 FEET (OR AS DETERMINED BY THE ENGINEER)

FILTER FABRIC USE

	SOIL TYPE	
	SILT OR CLAY	GRANULAR SOIL
ABOVE GROUND WATER	FILTER FABRIC NOT REQUIRED	FILTER FABRIC NOT REQUIRED
BELOW GROUND WATER	FILTER FABRIC REQUIRED	FILTER FABRIC NOT REQUIRED

WATER, SEWER, AND DRAIN TRENCH DETAIL

	FIGURE NAME: 141.000.A – TRENCH DETAIL	SCALE: NOT TO SCALE
	CITY OF WALTHAM, MA. – ENGINEERING DEPARTMENT STANDARD DETAILS	REV. DATE: 3/30/2011 155



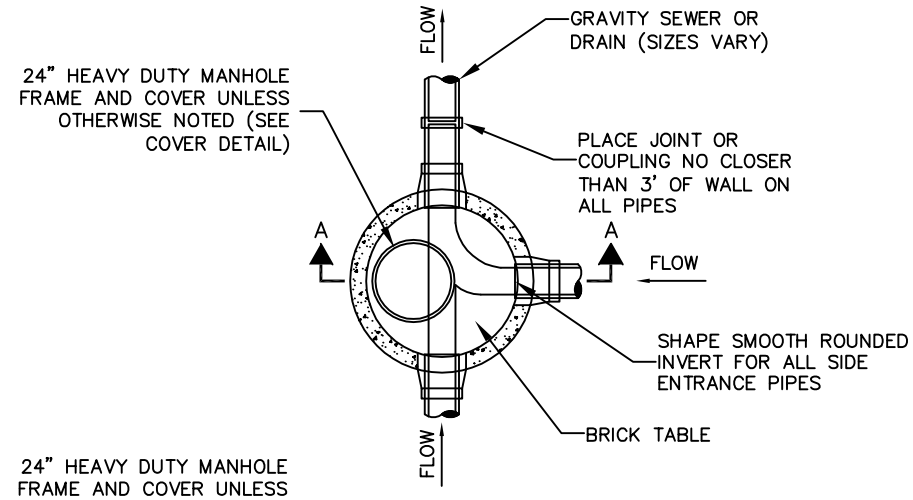
SECTION B–B

SECTION A–A

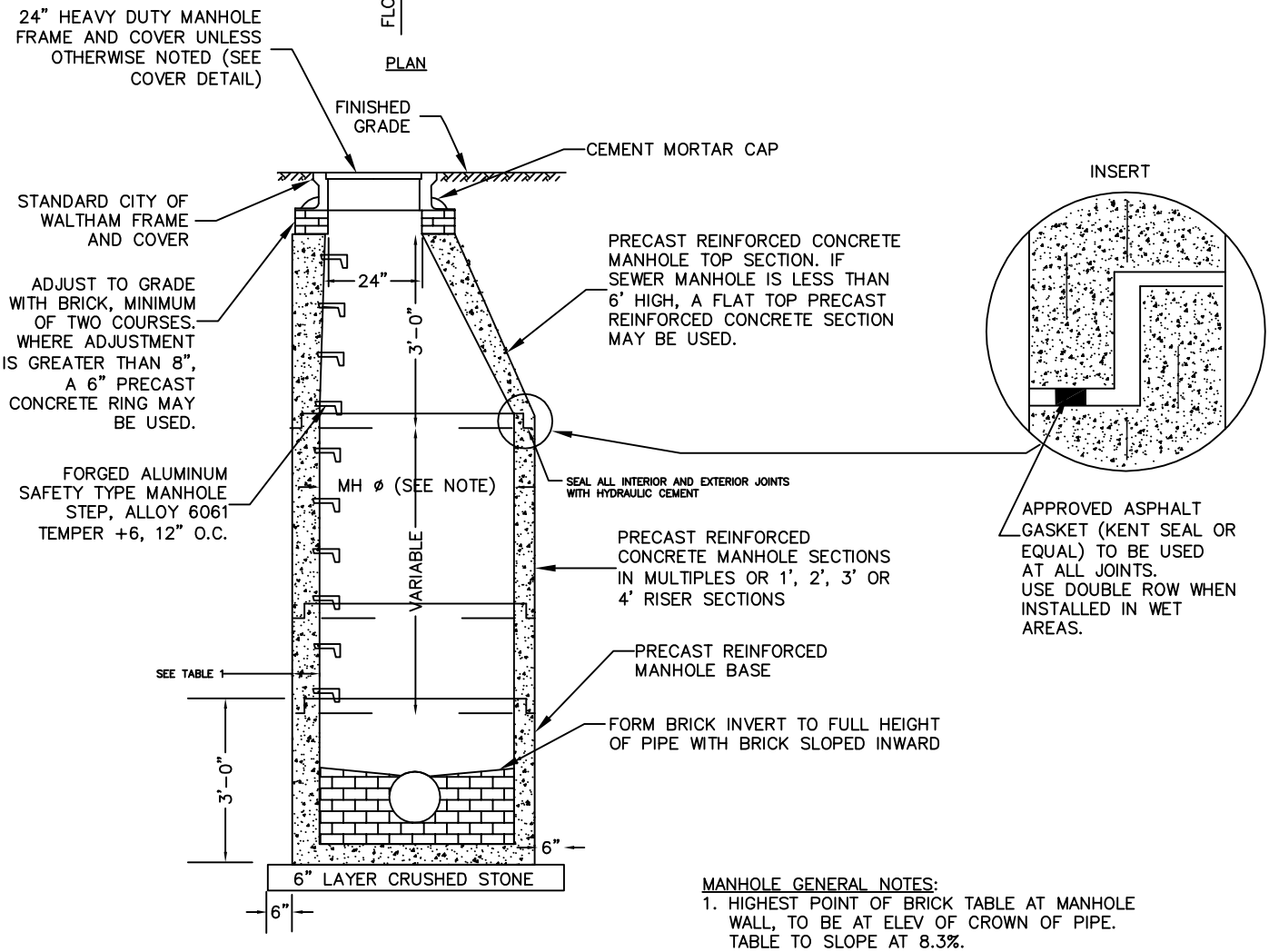
MAY BE CONSTRUCTED WITH 8" CONCRETE BLOCKS,
A COMPLETE 5" PRECAST STRUCTURE, OR A
COMBINATION OF 5" TO 8" PRECAST BASE SECTION
AND 8" CONCRETE BLOCKS LAID ABOVE.

STANDARD CATCH BASIN

	FIGURE NAME: 201.500.A – STANDARD CATCH BASIN DETAIL	SCALE: NOT TO SCALE
	CITY OF WALTHAM, MA. – ENGINEERING DEPARTMENT STANDARD DETAILS	REV. DATE: 12/8/2010 156



PLAN



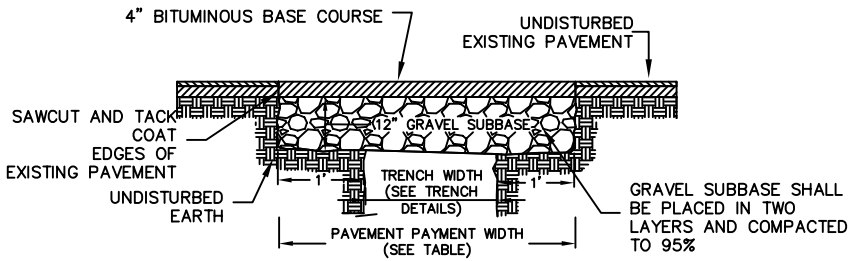
SECTION A–A

STANDARD MUNICIPAL MANHOLE

MANHOLE GENERAL NOTES:

1. HIGHEST POINT OF BRICK TABLE AT MANHOLE WALL, TO BE AT ELEV OF CROWN OF PIPE. TABLE TO SLOPE AT 8.3%.
2. SEWER OR DRAIN MANHOLE DIAMETER SHALL BE 4', 5', 6', 8' OR 10' AS SHOWN ON PLAN/PROFILE VIEWS.
3. DESIGN PRECAST SECTIONS WITH FRAME AND COVER FOR AASHTO H20 LOADINGS. UNLESS OTHERWISE NOTED
4. PRECAST MANHOLES SHALL BE PRE–ORDERED WITH PENETRATIONS AT ELEVATIONS INDICATED ON CONTRACT DRAWINGS.

	FIGURE NAME: 202.000.B – STANDARD MUNICIPAL MANHOLE DETAIL	SCALE: NOT TO SCALE
	CITY OF WALTHAM, MA. – ENGINEERING DEPARTMENT STANDARD DETAILS	REV. DATE: 12/8/2010 157



TRENCH PAY LIMIT TABLE FOR TEMPORARY PAVEMENT

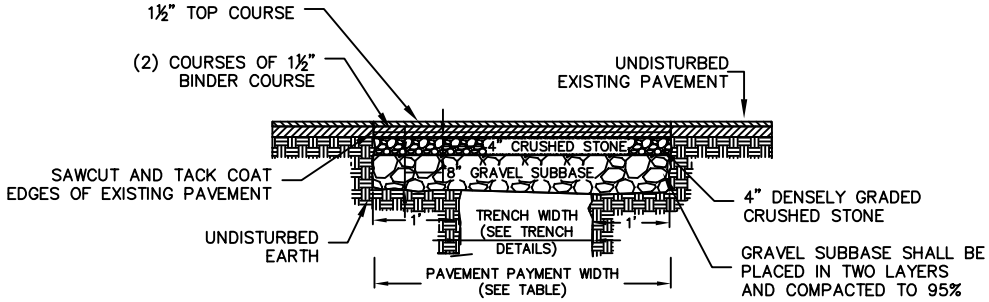
	DEPTH TO PIPE INVERT				
PIPE SIZE (I.D.)	0 – 8'	OVER 8' – 12'	OVER 12' – 16'	OVER 16' – 20'	
0" – 24"	6'–6"	9'–6"	12'–6"	15'–6"	PAY WIDTH
OVER 24"	O.D. + 4'–0"	O.D. + 7'–0"	O.D. + 10'–0"	O.D. + 13'–0"	

I.D. = INSIDE DIMENSION
O.D. = OUTSIDE DIMENSION

FOR EACH ADDITIONAL 4'–0" OF PIPE INVERT DEPTH OVER 20', ADD 3'–0" TO WIDTH LIMITS

TEMPORARY PAVEMENT DEPTH SHALL BE 3–IN.

TEMPORARY TRENCH PAVEMENT DETAIL



TRENCH PAY LIMIT TABLE FOR PERMANENT PAVEMENT

	DEPTH TO PIPE INVERT				
PIPE SIZE (I.D.)	0 – 8'	OVER 8' – 12'	OVER 12' – 16'	OVER 16' – 20'	
0" – 24"	8'–6"	11'–6"	14'–6"	17'–6"	PAY WIDTH
OVER 24"	O.D. + 6'–0"	O.D. + 9'–0"	O.D. + 12'–0"	O.D. + 15'–0"	

I.D. = INSIDE DIMENSION
O.D. = OUTSIDE DIMENSION

FOR EACH ADDITIONAL 4'–0" OF PIPE INVERT DEPTH OVER 20', ADD 3'–0" TO WIDTH LIMITS

PERMANENT TRENCH PAVEMENT DETAIL

TEMPORARY AND PERMANENT TRENCH PAVEMENT NOTES:
1. PERMANENT TRENCH PAVEMENT PAYMENT WIDTH SHALL BE THE TRENCH PAY LIMIT PLUS 2 FEET
2. TEMPORARY TRENCH PAVEMENT PAYMENT WIDTH SHALL BE EQUAL TO THE TRENCH PAYMENT LIMIT
3. REMOVE AND DISPOSE ALL TEMPORARY PAVEMENT AS REQUIRED. RESTORE AND COMPACT SUBBASE AS REQUIRED PRIOR TO PERMANENT TRENCH PAVEMENT.
4. DEPTH OF PERMANENT TRENCH PAVEMENT SHALL BE THE SAME THICKNESS AS THE EXISTING PAVEMENT.

	FIGURE NAME: 141.000.B – TRENCH PAVEMENT DETAILS	SCALE: NOT TO SCALE
	CITY OF WALTHAM, MA. – ENGINEERING DEPARTMENT STANDARD DETAILS	REV. DATE: 4/13/2011

APPENDIX D
Record Drawing Information

Cabot Street
Drain
Weston St – Bedford St

CABOT ST. DRAIN.

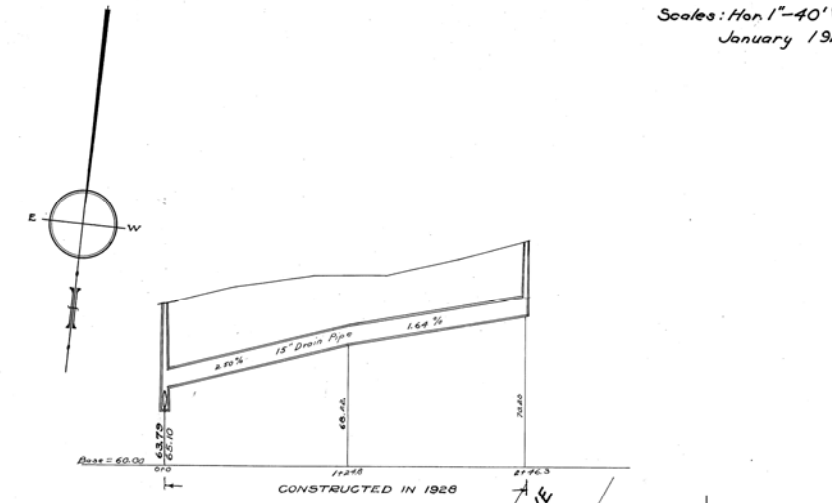
Scales: 40 Ft. Hor. & 4 Ft. Vert. Per Inch.

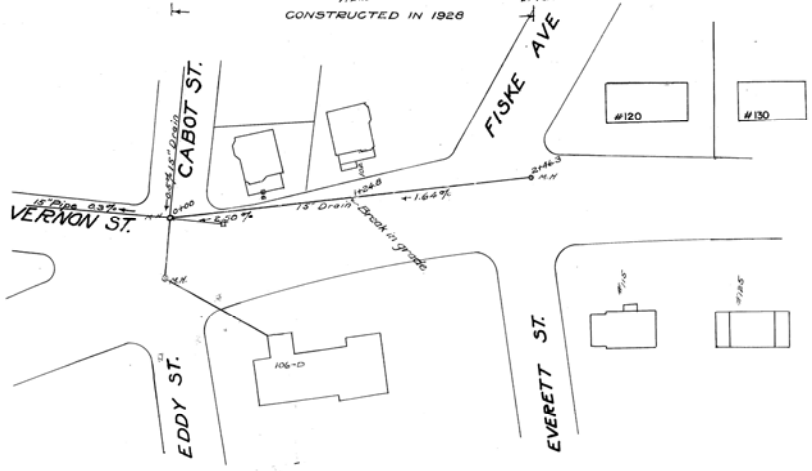
CABOT ST. A

Weston Street (B)
Drain
85 – # 120

WESTON STREET

Scales: Hor. 1"–40' Vert. 1"– 4'.
January 1928





WESTON ST. B

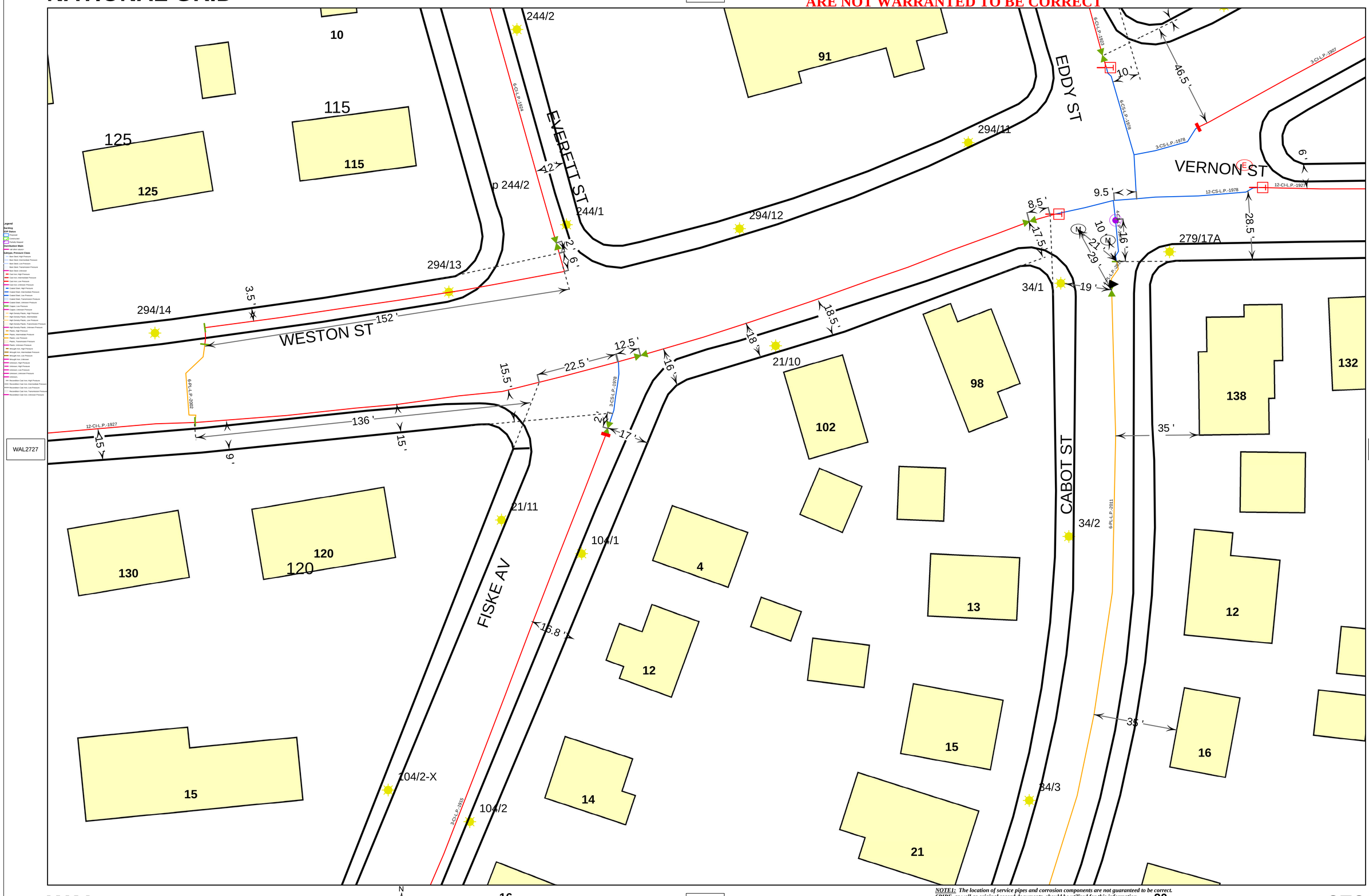
APPENDIX E
Utility Company Coordination
(For informational Purpose Only)

CALL BEFORE YOU DIG
1-888-DIG-SAFE
NOTE
THE LOCATION OF SURFACE AND UNDERGROUND OBJECTS SHOWN ARE NOT WARRANTED TO BE CORRECT

NATIONAL GRID

WAL2714

Generated by NIEMAW at 1/28/2014 11:09:04 AM on 1/28/2014



WAL **2728**

N W E S

NOTE1: *The location of service pipes and corrosion components are not guaranteed to be correct. SPIPE, as well as original record documents, should be utilized for this information.*

NOTE2: *The mains in NH without dimensions are not drawn to scale. These mains are intended to show the existence of gas main on the street and do not reflect the exact location of the main in the street.*