CITY OF SOMERVILLE MASSACHUSETTS
SOMERVILLE CITY HALL
93 HIGHLAND AVENUE
SOMERVILLE, MA 02143
BIDDING INSTRUCTIONS FOR
BEACON STREET UTILITY PROJECT
Bid No. 14-33

Enclosed you will find an invitation to bid for: The reconstruction of Beacon Street Sewer and Drains. Contract is from 11/1/2013 through 10/31/2014.

A Pre-Bid Conference will be held on Monday, October 21, 2013 at 10:00 AM, at the DPW, 2nd floor Conference Room, One Franey Road, Somerville MA.

When submitting bid, please identify the bid item and number clearly. All bids must be sealed and delivered to Purchasing Department, City of Somerville, 93 Highland Ave., Somerville, MA 02143. Please mark the outside of all bid envelopes with the Bid number above and write **"Beacon Street"** on the bid envelope.

BIDS SUBMITTED MUST BE AN ORIGINAL.

The completion of the following forms is necessary for consideration of a potential contract award. When submitting bid documents, please retain the order of documents as originally provided.

1) **"Notice to Bidders" signed by person submitting bid.**
2) **"Signature Form" complete when submitting your bid.**
3) **Tax Compliance/Non Collusion Form**
4) **Certificate of Signature Authority**
5) **Somerville Living Wage Form**
6) **Quality Requirements**
7) **Bid Pricing Page**
8) **Prevailing Wage Compliance Form**
9) **Responsible Employer Ordinance (REO)**

NOTE: **If Vendor is incorporated an updated "CERTIFICATE OF GOOD STANDING" from the Commonwealth of Massachusetts will be needed for the awarded vendor only.**

Please review and return with your sealed bids as sent. Also, insure that all forms are completed and your bid response is submitted as requested.

Your cooperation is greatly appreciated.

City of Somerville

Invitation for Bids for

Beacon Street Utility Project
Bid No. 14-33

I. General Information and Bid Submission Requirements

Bid Delivery

All bids must be delivered to City of Somerville, Purchasing Department, 93 Highland Avenue, Somerville, MA 02143.

A Pre-Bid Conference will be held on Monday, October 21, 2013, at 10:00 AM at the Somerville DPW, 2nd floor Conference Room, One Franey Road, Somerville, MA.

Bids must be delivered by: **11:00 A.M. on Wednesday, October 30, 2013**

1 copy of the bid should be submitted. Bids must be sealed and marked as follows:
"Bid for Beacon Street, Bid 14-33

All bids must include a non-collusion form, tax compliance certificate, bid pricing sheet, reference form as provided in this IFB, and 5% bid surety in the amount of **5% of the proposed bid amount.** A Bid bond, Certified Check, Treasurer's Check, or Cashier's Check made payable to the City must be submitted with each bid. Said bid guarantee will become the property of the City of Somerville if the proposal is accepted and the bidder either neglects or refuses to comply with the terms of the proposal. Bid guarantee will be returned within 30 days to all unsuccessful bidders.

Bid Signature

A bid must be signed as follows: 1) if the bidder is an individual, by her/him personally; 2) if the bidder is a partnership, by the name of the partnership, followed by the signature of each general partner; and 3) if the bidder is a corporation, by the authorized officer, whose signature must be attested to by the clerk/secretary of the corporation, and with the corporate seal affixed.

Time for Bid Acceptance

The contract will be awarded within 60 days after the bid opening. The time for award may be extended for up to 45 additional days by mutual agreement between the City of Somerville and the apparent lowest responsive and responsible bidder (or, for a contract requiring payment, the apparent highest responsive and responsible bidder.)

Bonding Requirements

A Performance Bond and a Labor and Materials Bond in the amount of 100% each is required upon contract award.

Prevailing Wage Requirements

Bidders will be required to comply with the Prevailing Wage Laws, M.G.L. c. 149. The applicable prevailing wage rates are attached.

Notwithstanding anything to the contrary in Articles of the General Conditions (included in the Contract) the City may, in its sole discretion withhold payment from the General Contractor with respect to a given application for payment unless the City has in its possession payroll records that are complete, accurate, and current as of the date of said application for payment. Payment by the City on one or more occasions in the absence of the General Contractor's compliance with this section shall not constitute a waiver of the City's right to withhold payment for noncompliance on other occasions.

The General Contractor shall submit payroll information on a weekly basis in a format approved by the City (form attached) numbered in numerical sequence and signed by the Contractor (including forms: for weeks when the Contractor is not on the site, in which case there shall be a notation to the effect "no work this payroll period" and a date anticipated for resuming work). The General Contractor shall submit these forms to: The Director of Engineering.

The City will take an active role in reviewing and monitoring these payrolls weekly. If the City suspects any violations, the City will report them to the Attorney General's Fair Labor and Practices Division. The Attorney General's Office, after conducting an investigation and a hearing can order the bidder to halt work, if it finds prevailing wage violations. Within fifteen days after completion of its portion of the work the bidder must submit a Statement of Compliance with the prevailing wage law. The City reserves the right to conduct hearings on bids that are significantly below the average bid price submitted on a project, to make findings of fact, and determinations. Weekly payrolls are public records and the bidder shall make them available upon request.

The Bidder is required to keep these records for a period of three years from the date of completion of this contract.

Changes and Addenda

If any changes are made to this IFB, an addendum will be issued. Addenda will be mailed or faxed to all bidders on record as having picked up the IFB. No changes may be made to the bid documents, by the Bidders; without written authorization and/or an addendum from the Purchasing Department.

Questions about the IFB

Questions concerning this invitation for bids must be submitted in writing to: Orazio DeLuca, City of Somerville, Purchasing Department, 93 Highland Avenue, Somerville, MA 02143 **before 4:30 P.M. on Friday, October 25, 2013.** Questions may be delivered, mailed, faxed to: 617-625-1344, or e-mailed to odeluca@somervillema.gov. Written responses will be mailed or faxed to all bidders on record as having picked up the IFB.

If any Bidders or proposers contact anyone outside of Purchasing, for information about this proposal, the bid/proposal will be disqualified from the bidding process.

Modification or Withdrawal of Bids, Mistakes, and Minor Informalities

A bidder may correct, modify, or withdraw a bid by written notice received by the City of Somerville prior to the time and date set for the bid opening. Bid modifications must be submitted in a sealed envelope clearly labeled "Modification No.__" to the address listed in part one of this section. Each modification must be numbered in sequence, and must reference the original IFB.

After the bid opening, a bidder may not change any provision of the bid in a manner prejudicial to the interests of the City or fair competition. Minor informalities will be waived or the bidder will be allowed to correct them. If a mistake and the intended bid are clearly evident on the face of the bid document, the mistake will be corrected to reflect the intended correct bid, and the bidder will be notified in writing; the bidder may not withdraw the bid. A bidder may withdraw a bid if a mistake is clearly evident on the face of the bid document, but the intended correct bid is not similarly evident.

Right to Cancel/Reject Bids

The City of Somerville may cancel this IFB, or reject in whole or in part any and all bids, if the City determines that cancellation or rejection serves the best interests of the City.

Unbalanced Bids

The City reserves the right to reject unbalanced, front loaded, and conditional bids.

Bid Prices to Remain Firm

All bid prices submitted in response to this IFB must remain firm for 60 days following the bid opening.

Unforeseen Office Closure

If, at the time of the scheduled bid opening, Purchasing Department is closed due to uncontrolled events such as fire, snow, ice, wind, or building evacuation, the bid opening will be postponed until 2:00 p.m. on the next normal business day. Bids will be accepted until that date and time.

II. Purchase Description/Scope of Services

Contract Term Length and Renewal Options

The contract will remain in effect from **November 1, 2013 to October 31, 2014.**

Price Submission

All prices must be stated in Unit Prices and Total Amounts as requested on the Bid price submission pages.

Estimated Quantities

The City of Somerville has estimated the quantities required for each of the items on the bid price submission pages, however, these estimates are estimates only and are not guaranteed.

Brand Name "Or Equal"
Any references to any brand name or proprietary product in the specifications shall require the acceptance of an equal or better brand. Samples may be requested before a final decision is made. The City has the right to make the final determination as to whether an alternate brand is equal to the brand specified.

Warranty

The bidder warrants that (1) the Supplies sold are merchantable, (2) that they are fit for the purpose for which they are being purchased, (3) that they are absent any latent defects and (4) that they are in conformity with any sample which may have been presented to the City.

The bidder guarantees that upon inspection, any defective or inferior Supplies shall be replaced without additional cost to the City. The Vendor will assume any additional cost accrued by the City due to the defective or inferior Supplies.

The bidder guarantees all Supplies for a period of one (1) year, or as otherwise specified herein.

Invoicing
Vendor will mail an invoice to the ordering department after completion and delivery of the order.

Cancellation

The City reserves the right to cancel this contract at any time on any grounds, including the vendor's failure to comply with the specifications provided herein.

Specifications/Scope of Work

General

The work to be performed under this contract consists of furnishing labor, materials, and equipment for the specified repairs at various municipally owned facilities.

Examination of Property

The contractor shall fully inform himself of the existing conditions where the work is to be done.

Protection of Property

The contractor shall take all precautions to protect the property of the City from injury and shall be held responsible for all employees or any person or persons, instrument or device directly or indirectly employed by him. Any corresponding damages shall be replaced, repaired and paid for by the contractor to the satisfaction of the City.

Quality of Workmanship

All work must be done in a thorough workmanlike manner.

Experience

The contractor shall have been established in the specified field for at least 5 years.

Response Time

The contractor must respond within forty-eight hours when issued notification by the City of Somerville.

Laws and Regulations

The contractor shall comply with all Federal, State and Local laws regulations and ordinances governing this type of work. The Contractor shall comply with all Mass Highway specifications as apply.

Replacement Components

The contractor shall carry sufficient stock of OEM quality parts and components.

Estimates and Surveys

The contractor shall, as required, furnish estimates and survey proposed work at no cost to the City.

The Beacon Street Utility Project will consist of rehabilitation and/or replacement of existing water mains, sanitary sewer mains and combined sewer mains within the Beacon Street corridor (Oxford Street to Dickinson Street).
Scope includes cleaning and lining of approximately 5,600 linear-feet of water main and the replacement of approximately 2,100 linear-feet of 8-inch diameter water main with new cement-lined ductile iron main.
Sewer improvements include the replacement of approximately 300 linear-feet of severely cracked and broken vitrified crap pipe and the cleaning and lining of approximately 14,500 linear-feet of vitrified clay and brick pipe. Work also includes lining of approximately 690 vertical feet of sewer manholes.

Project value estimated to be approximately $4,000,000.

SCOPE OF WORK AND SPECIFICATIONS BEACON STREET UTILITY PROJECT

SCOPE OF WORK

The work to be performed under this contract includes the Rehabilitation and/or replacement of existing water mains, sanitary sewer mains and combined sewer mains within the Beacon Street corridor (Oxford Street to Dickinson). Work also includes the cleaning and lining of approximately 5,600 LF of existing water main, and the replacement of approximately 2,100 LF of 8-inch diameter water main with new cement-lined ductile iron main. Sewer improvements include the replacement of approximately 300 LF of severely cracked and broken vitrified crap pipe and the cleaning and lining of approximately 14,500 LF of vitrified clay and brick pipe. Work also includes lining of approximately 690 Vertical Feet of sewer manholes. Please refer to technical specification for complete information.

PROVISION FOR TRAVEL AND PROSECUTION OF THE WORK

The street and adjacent side streets shall remain open to travel throughout the period required for the completion of the improvement except as permitted by the City of Somerville Traffic Commission. Reasonable facilities shall be provided by the contractor for the convenient and safe passage of pedestrians through the project and also to and from properties abutting the improvement. Particular care shall be taken at all times to establish and maintain such methods of procedure as will not create hazards of an unusual nature.

WORK SCHEDULE

Work on this project is mainly restricted to a ten hour day, five-day week with the Prime Contractor and all Sub Contractors working on the same shift. Peak hour work restrictions may apply as specified in the Street Permit or as directed by the Engineer.

DISPOSAL OF SURPLUS MATERIAL

Surplus material resulting from the various kinds of excavation and not required for use on the project shall be disposed of by the contractor, outside the project limits, at his own responsibility and without additional compensation thereof.

REMOVAL AND DISPOSAL OF STRUCTURES AND OBSTRUCTIONS

The Contractor shall accept and hold entire responsibility for the stacking and protection of materials that have been removed from the site and that are to be reused in the work. Any materials lost or damaged through lack of protection or carelessness by the Contractor shall be replaced at his expense.

PROTECTION AND RESTORATION OF PROPERTY

Special care shall be exercised by the Contractor during the prosecution of the work, to save from harm and injury any structure, public or private, water system situated above or below the surface, and adjacent properties lying within the scope of the project, not specifically designated to be removed or otherwise altered.

Any damage to private property due to the construction activities of the Contractor shall be repaired to the Homeowner's satisfaction within thirty (30) working days.

STREET TREES

Existing trees shall be retained and their roots protected at all times during construction.

BACKFILLING FOR STRUCTURES AND PIPES

All backfilling for structures and pipes shall conform to the Commonwealth of Massachusetts Department of Public Works Standard Specification for Highways and Bridges, 1988, Section 150.64.

RETAINAGE

A Retainage of 5% shall be held by the City. This sum shall be held by the City for a period of sixty (60) days after final estimate is made and the work is accepted by the City.

NOTE: Contractor's equipment is not to be parked or stored at the Public Works Yard at any time.

All unit prices quoted herein shall be firm for the duration of the Contract, regardless of any changes in the cost of materials or labor.

SPECIAL PROVISIONS

NOTICE TO OWNERS OR UTILITIES

Written notice shall be given by the Contractor to all public service corporations or officials owning or having charge of publicly or privately owned utilities of his intention to commence operations affecting such utilities at least one week in advance of the commencement of such operations, and the contractor shall, at the same time, file a copy of such notice with the Engineer.

Bidders are hereby notified that information is available regarding the existing utility structures which may be encountered within and adjacent to the limits of the work and the corporations owning controlling same. The completeness of this list is not guaranteed by the Department.

City of Somerville
Department of Public Works
Superintendent of Lights & Lines
Engineering Division
Water Division
Sewer Division
One Franey Road
Somerville, MA 02145
Tel. (617) 625-6600

Time Warner Cable
300 Commercial Avenue
Malden, MA 02148
Tel. (781) 397-2600

Massachusetts Water Resource Authority
(MWRA)
59 Amaranth Avenue
Medford, MA 02155

Tel. (781) 306-2130

NSTAR
NSTAR Way
Westwood, MA 02090
Tel. (781) 441-8000

Verizon New England
185 Franklin Street
Suite 1250
Boston, MA 02210
Tel. (617) 743-4524

Somerville Dept. of Traffic
and Parking
133 Holland Street
Somerville, MA 02144
Tel. (617) 625-6600 x7900

Algonquin Gas Trans Co.
8 Wilson Way
Westwood, MA

M.W.R.A. Water & Sewer Division
Charlestown Navy Yard
100 First Avenue
Boston, MA 02129
Tel. (617) 242-6000

Dept. of Conservation & Recreation
Division of Urban Parks & Recreation
153 Causeway Street
Boston, MA

RCN – CATV
115 West First Street
South Boston, MA 02127
Tel. (617) 670-2927

Bell Atlantic (BA)
285 Lucas Street
Woburn, MA 01801
Tel. (781) 939-3566

Comcast
116 Crosby Road
Unit 10
Dover, NH 03820
Tel. (603) 749-9194

Media One
790 Main Street
Wilmington, MA 01887
Tel, (978) 658-0400

The Contractor shall notify Massachusetts "DIG SAFE" 72 hours prior to start of construction.

"DIG SAFE" call center: 1-888-DIGSAFE or 1-888-344-7233.

BOND REQUIREMENTS

A Performance Bond and a Labor and Materials Bond in the amount of 100% each of the contract price will be required from the successful bidder.

PREVAILING WAGE REQUIREMENTS

Bidders will be required to comply with the Prevailing Wage Laws, M.G.L., C.149. Every bidder will be required to submit a certified payroll to the City every week. The City will take an active role in reviewing and monitoring these payroll weekly. If the City suspects any violations, the City will report them to the Attorney General's Fair Labor and Business Practices Division. The Attorney General's Office, after conducting an investigation and a hearing can order the bidder to halt work, if it finds prevailing wage violations. Within fifteen days after completion of its portion of the work the bidder must submit a Statement of Compliance with the prevailing wage law. The City reserves the right to conduct hearings on bids that are significantly below the average bid price submitted on a project, to make findings of fact and determinations. Weekly

payrolls are public records and the bidder shall make them available upon request. The Bidder is required to keep these records for a period of three years from the date of the completion of this contract.

CONTRACT PERIOD

The contract will be from **November 1, 2013 to October 31, 2014.**

INSURANCE REQUIREMENTS

(See attached)

INSURANCE REQUIREMENTS

The Vendor/Contractor shall maintain in full force and effect during the duration of this contract insurance issued by companies qualified to do business in the Commonwealth of Massachusetts, as follows:

a) COMMERCIAL GENERAL LIABILITY, in primary amounts not less than:

$ 2,000,000.00 per occurrence
$ 2,000,000.00 aggregate

b) AUTOMOBILE LIABILITY, including the use of all vehicles owned, leased, hired or borrowed, with limits not less than $ 2,000,000.00 combined single limit covering work performed under this contract.

c) WORKER'S COMPENSATION, statutory coverage as provided by General Laws, Chapter 152, as amended.

The Vendor/Contractor shall deposit with City certificates of insurance for such coverage in form and substance satisfactory to the City, **naming the City as an additional insured**, and shall deliver to the City new policies or certificates thereof for any insurance about to expire at least ten (10) days before such expiration. All such insurance policies shall contain an endorsement requiring **thirty (30) days written notice** to the City prior to cancellation or change in coverage, scope or amount of any such policy or policies. The Vendor/Contractor shall furnish the City with the name and telephone number of the insurance agent and with copies of the insurance policies and endorsements. The Vendor/Contractor shall submit all changes or alterations in the policies to the City for its approval.

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price	Amount
119.	1	RODENT CONTROL AT _____ LUMP SUM		
120.1	1,559	UNCLASSIFIED EXCAVATION AT _____ PER CUBIC YARD		
128.01	1	HEALTH AND SAFETY PLAN AT _____ LUMP SUM		
128.02	10	IMPLEMENTATION OF HEALTH AND SAFETY PLAN AT _____ PER HOUR		
128.03	10	PERSONNEL PROTECTION LEVEL C UPGRADE AT _____ PER HOUR		
128.04	10	MONITORING/ HANDLING AND STOCKPILING OF CONTAMINATED SOILS AT _____ PER CUBIC YARD		
128.05	20	DISPOSAL OF CONTAMINATED SOIL AT _____ PER TON		
128.06	200	TREATMENT OF CONTAMINATED GROUNDWATER AT _____ PER GALLON		
128.07	100	DISPOSAL OF GRANULAR ACTIVATED CARBON AT _____ PER POUND		
128.08	6	DISPOSAL OF TREATED WOOD PRODUCTS AT _____ PER TON		
129.	1,044	PAVEMENT MILLING AT _____ PER SQUARE YARD		
129.5	48	TRACK EXCAVATION AT _____ PER FOOT		

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price	Amount
129.7	18	TEMPORARY UTILITY POLE SUPPORT AT _____ PER EACH		
141.1	15	TEST PIT FOR EXPLORATION AT _____ PER CUBIC YARD		
142.	1,130	CLASS B TRENCH EXCAVATION AT _____ PER CUBIC YARD		
151.	331	GRAVEL BORROW AT _____ PER CUBIC YARD		
156.	374	CRUSHED STONE AT _____ PER TON		
170.	1,883	FINE GRADING AND COMPACTING AT _____ PER SQUARE YARD		
210.3	1	SANITARY SEWER MANHOLE (14 TO 18 FOOT DEPTH) AT _____ PER EACH		
220.10	753	SANITARY SEWER MANHOLE (BRICK) LINING AT _____ PER FOOT		
222.30	1	FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD AT _____ PER EACH		
250.08	125	8 INCH POLYVINYL CHLORIDE SANITARY SEWER PIPE AT _____ PER FOOT		
250.10	80	10 INCH POLYVINYL CHLORIDE SANITARY SEWER PIPE AT _____ PER FOOT		
250.15	72	15 INCH POLYVINYL CHLORIDE SANITARY SEWER PIPE AT _____ PER FOOT		

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price	Amount
251.	1	BY-PASS PUMPING SYSTEM AT _____ LUMP SUM		
251.08	5,010	8 INCH VC-PVC SEWER LINING (NON-MAN ENTRY) AT _____ PER FOOT		
251.10	1,673	10 INCH VC - PVC SEWER LINING (NON-MAN ENTRY) AT _____ PER FOOT		
251.12	1,024	12 INCH VC-PVC SEWER LINING (NON-MAN ENTRY) AT _____ PER FOOT		
251.15	1,826	15 INCH VC- PVC SEWER LINING (NON-MAN ENTRY) AT _____ PER FOOT		
251.18	1,924	18 INCH VC & BRICK - PVC SEWER LINING (NON-MAN ENTRY) AT _____ PER FOOT		
251.28	89	28 INCH BRICK(24X18 INCH EQUIVALENT) - PVC SEWER LINING (NON-MAN ENTRY) AT _____ PER FOOT		
251.36	25	36 INCH BRICK - PVC SEWER LINING (NON-MAN ENTRY) AT _____ PER FOOT		
251.48	4,017	48 INCH BRICK - PVC SEWER LINING (NON-MAN ENTRY) AT _____ PER FOOT		
256.	150	SERVICE LATERAL TOP HAT CONNECTION (NON-MAN ENTRY) AT _____ PER EACH		
302.06	75	6 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET) AT _____ PER FOOT		

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price	Amount
302.08	2,062	8 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET) AT_____ PER FOOT		
302.12	272	12 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET) AT_____ PER FOOT		
304.	5	OBSTRUCTIONS AT_____ PER EACH		
304.08	119	PUSH-ON RESTRAINED JOINT GASKET - 8" AT_____ PER EACH		
305.	5,641	CLEANING AND CEMENT LINING OF IRON WATER MAINS AT_____ PER FOOT		
306.	5,641	TELEVISION INSPECTION AT_____ PER FOOT		
309.	7,858	DUCTILE IRON FITTINGS FOR WATER PIPE AT_____ PER POUND		
311.	1	TEMPORARY WATER BY-PASS SYSTEM AT_____ LUMP SUM		
347.1	100	1 INCH COPPER TUBING TYPE K AT_____ PER FOOT		
350.06	4	6 INCH GATE AND GATE BOX AT_____ PER EACH		
350.08	15	8 INCH GATE AND GATE BOX AT_____ PER EACH		
350.12	24	12 INCH GATE AND GATE BOX AT_____ PER EACH		
358.	2	GATE BOX ADJUSTED AT_____ PER EACH		

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price	Amount
363.1	5	1 INCH CORPORATION COCK AT _____ PER EACH		
376.2	1	HYDRANT - REMOVE AND RESET AT _____ PER EACH		
431.1	214	HIGH EARLY STRENGTH CEMENT CONCRETE BASE COURSE AT _____ PER CUBIC YARD		
460.	422	HOT MIX ASPHALT AT _____ PER TON		
464.	132	BITUMEN FOR TACK COAT AT _____ PER GALLON		
472.	158	HOT MIX ASPHALT FOR MISCELLANEOUS WORK AT _____ PER TON		
482.3	3,688	SAWING ASPHALT PAVEMENT AT _____ PER FOOT		
580.	1,826	CURB REMOVED AND RESET AT _____ PER FOOT		
851.1	1	TRAFFIC CONES FOR TRAFFIC MANAGEMENT AT _____ PER DAY		
852.	200	SAFETY SIGNING FOR TRAFFIC MANAGEMENT AT _____ PER SQUARE FOOT		
853.1	5	PORTABLE BREAKAWAY BARRICADE TYPE III AT _____ PER EACH		
859.	1,800	REFLECTORIZED DRUM AT _____ PER DAY		

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price	Amount
860.04	100	4 INCH REFLECTORIZED WHITE LINE (PAINTED) AT _____ PER FOOT		
874.2	4	TRAFFIC SIGNS REMOVED AND RESET AT _____ PER EACH		
999.001	1,500	TRAFFIC POLICE AT FORTY DOLLARS AND NO CENTS PER MAN HOUR	$40.00	$60,000.00
			TOTAL	

Company Name: _____

Signature: _____

Signature Name & Title: _____

Telephone #: _____ Fax #: _____

Date: _____

ADDENDA #1_____ #2_____ #3_____ #4_____ACKNOWLEDGED
Failure to acknowledge receipt of addenda may result in your bid being rejected.

FORM FOR GENERAL BID
FOR CONSTRUCTION CONTRACT

To the Awarding Authority

A. The undersigned proposes to furnish all labor and materials required for:

_____
(project)

_____
(city or town)

in accordance with the accompanying plans and specifications prepared by

_____
(name of Architect)

specified below, subject to additions and deductions according to the terms of the specifications.

B. This bid includes addenda numbered _____
.

C. This proposed contract price is _____

_____
(total bid in words)

$_____.
(total bid in figures)

D. If there is attached a "Bid Form for Alternates", the Bidder shall fill in prices for each alternate. All blank spaces must be filled in. The omission of any item will result in the rejection of a bid. The price of each alternate shall include its pro rata share of overhead and profit;

E. The Undersigned Bidder agrees that, if it is selected as general contractor, it will within five days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the Awarding Authority, execute a contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials or payment bond, each of a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to the Awarding Authority and each in the sum of the contract price, the premiums for which are to be paid by the general contractor and are included in the contract price.

F. The Undersigned Bidder hereby certifies that it is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Project and that it will comply fully with all laws and regulations applicable to this Award, including

applicable provisions if MGL Chapter 149, ss.44A - J and MGL Chapter 30, ss. 39M et seq.

G. The Undersigned Bidder further certifies under the 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 subsection the work "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

H. The Undersigned Bidder agrees to comply with federal and state equal opportunity and labor requirements, including payment of prevailing wages.

I. The Undersigned Bidder certifies that it is a (Sole Proprietorship, General Partnership, Limited Partnership, Corporation, Trust, Joint Venture) _____, that the Federal Employer Identification Number (EIN) of the Bidder is # _____, and that it is in compliance with all federal, state, and local laws regarding taxation, and that:

1) if a Sole Proprietorship, it conducts business under the name _____ , and that a D/B/A Certificate has been filed with the Clerk of the City of Somerville, and that the residential address of the sole proprietor is _____ , and that the Bidder has been conducting business under that name for _____ years.

2) if a General Partnership, then name of the General Partnership is , the General partnership has been doing business under that name for _____years, and the names and residential addresses of the General Partners are _____

3) if a Limited Partnership, the name of the Limited partnership is , the Limited Partnership has been doing business under that name for _____ years, the names and residential addresses of the General Partners of the Limited Partnership are

_____

_____

and, a Certificate of Limited Partnership (obtainable from the Secretary of the Commonwealth) is submitted with this Form for Bid.

4) If a Corporation, the Bidder is incorporated in the State of _____, the name of the Corporation is _____
The Corporation has been doing business under that name for _____ years, the names and residential addresses of its officers are:

President: _____,

Treasurer: _____,

Clerk: _____,

and a current Certificate of Legal Existence, (obtainable from the Secretary of the Commonwealth for Massachusetts corporations and non-Massachusetts corporations

which are properly registered as foreign corporations doing business in the Commonwealth), is submitted with this Form for Bid.

5) if a Joint Venture, the name of the Joint Venture is

_____

,

the Joint Venture has been operating under that name for _____years, the names and business addresses of the Joint Venturers are:

_____

_____

_____

_____

_____

_____

the above-requested information regarding individual business entities is furnished for each joint venturer as follows

_____

and that a copy of the joint venture agreement is furnished with this Form for Bid.

J. The Undersigned Bidder certifies under penalties of perjury that the Bidder is not presently debarred from doing federal or state public construction work, that the Bidder has not had its low bid rejected by any municipality in the previous two years, except _____
, in which case the reasons for rejection were as follows:

_____

_____

_____

_____

K. The Undersigned Bidder certifies that the following three projects were completed during the previous six years and may be contacted by the Awarding Authority as references:

Name of Town & Project	$Amount	Name and Tel. No. of Contact
_____	_____	_____
_____	_____	_____
_____	_____	_____

L. The Undersigned Bidder understands that the contractor and subcontractors will be required to pay prevailing wages to laborers and mechanics, and that if the Undersigned's bid is significantly below the average bid, the Awarding Authority may require the Bidder to substantiate that the bid is based on payment of wages at prevailing rates.

M. An itemized Schedule of Values is attached with this Form for Bid.

Executed this _____ day of _____ 2013.

On behalf of _____
(Undersigned Bidder Name)

_____
(Business Address) and (Telephone)

By: _____
(Name and Address of Person Signing Bid)

_____
(Title of Person Signing bid)

III. Quality Requirements

Please respond to the following questions. A negative response to any of the following questions will automatically disqualify the vendor:

	Yes	No
Has the contractor been established, in the Sewer/ Drain Reconstruction field, for at least 5 years?		
Will vendor be able to respond within 48 hours after notification to proceed from the City?		
The Contractor is able to provide all labor, materials and equipment necessary to perform the required street resurfacing, according to the specifications?		
The Contractor is fully qualified to perform the Sewer/Drain Reconstruction project as specified; and is able to provide qualified personnel that will consist of a full crew?		
Can the Vendor certify that all employees to be provided, have successfully completed at least 10 hours of OSHA approved training in Construction Safety and Health?		
Optional: Vendor: Are you a State Office for Minority and Women Owned Business Assistance (SOMWBA) certified minority or woman owned business?		

IV. References

Please include on a separate sheet (see form enclosed) a minimum of three references for whom similar Street Resurfacing services have been provided. Include contact person and telephone number along with company name and address.

All prices must include travel time, fuel costs, delivery, and any other additional costs not provided for on the bid price sheet.

V. Rule for Award

One contract will be awarded to the lowest responsive and responsible bidder.

VI. Bid Pricing Sheet

Please quote on the listed items. Prices are to include equipment, delivery, the cost of fuel, the cost of labor and all other charges related to the products and services listed. Prices are to remain the same for the entire contract period.

IV. References

REFERENCE FORM

Bidder:_____

IFB Title: **Beacon Street Utility Project**
Bidder must provide references from three municipalities.

Reference:_____ Contact:_____

Address:_____ Phone:_____

_____ Fax:_____

Description and date(s) of supplies or services provided:_____

_____

_____

Reference:_____ Contact:_____

Address:_____ Phone:_____

_____ Fax:_____

Description and date(s) of supplies or services provided:_____

_____

_____

Reference:_____ Contact:_____

Address:_____ Phone:_____

_____ Fax:_____

Description and date(s) of supplies or services provided:_____

_____

_____

TECHNICAL SPECIFICATIONS

Technical Specifications

The following Technical Specifications are based on the most current MassDOT Standard Specifications. These specifications include The Commonwealth of Massachusetts, Massachusetts Highway Department, Standard Specifications for Highways and Bridges, dated 1988 as well as the Massachusetts Department of Transportation, Highway Division (MassDOT) Supplemental Specifications to the 1988 English Standard Specifications for Highways and Bridges, dated June 15, 2012, together known as the Standard Specifications.

The intent of these Technical Specifications is to be a standalone document, which the Contractor can use to bid and construct the project. To the best of our ability, we have included all relevant Sections of the Standard Specifications, with the exception of Division III, Materials Specifications of the Standard Specification. The Contractor shall refer to the current Division III, Materials Specification of the Standard Specification for all references to Sections M1 through M9.

For any Sections which are referenced in these Specifications but which have been inadvertently excluded, the Contactor shall refer to the Standard Specifications.

For ease of use, the entirety of each Section has been included in these Technical Specifications, even for those Sections where only portions of the Section are used.

Those portions of the Sections which are clearly not part of this Contract have been annotated with a strikethrough, which appear like this: ~~Sections Not Part of Contract~~.

Those portions of the Sections which are part of this Contract but are not included in the Standard Specifications have been annotated with italics, which appear like this: *New Sections*.

Those Payment Items which are clearly not part of this Contract have been annotated with a strikethrough, which appears like this: ~~Payment Item Not Part of Contact.~~

Those Payment Items which are part of this Contract but are not included in the Standard Specifications in addition to being bold, have been annotated with italics, which appear like this: ***New Payment Items***.

CITY OF SOMERVILLE
WATER & SEWER IMPROVEMENT PROJECT
BEACON STREET

IN THE CITY OF

SOMERVILLE

MIDDLESEX COUNTY

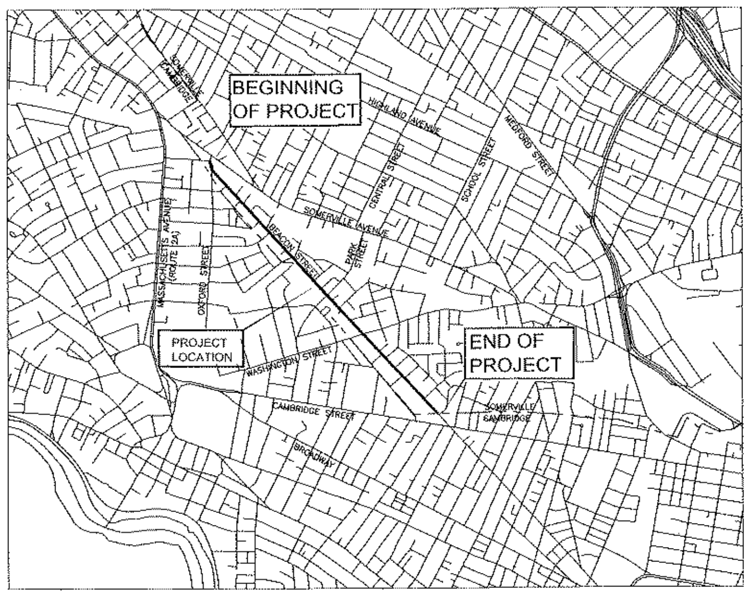
JULY 2013

MWRA I/I LOCAL FINANCIAL ASSISTANCE PROGRAM PROJECT NO. WRA-P8-30-3-816

MWRA LOCAL PIPELINE ASSISTANCE PROGRAM PROJECT NO. L WSAP13-043

INDEX

SHEET NO.	DESCRIPTION
C0.0	COVER SHEET
C1.0 – C1.10	EXISTING CONDITIONS PLANS
C2.0 – C2.10	SITE UTILITIES PLANS
C3.0	DETAILS
C4.0 – C4.2	TRAFFIC MANAGEMENT PLANS



MAYOR

JOSEPH A. CURTATONE

DEPARTMENT OF PUBLIC WORKS

STAN KOTY, *COMMISSIONER*

ROBERT KING, *DIRECTOR OF ENGINEERING*

OFFICE OF TRAFFIC & PARKING

TERENCE SMITH, *CITY TRAFFIC ENGINEER*

ENGINEER: Design Consultants, Inc.
Consulting Engineers and Surveyors
120 MIDDLESEX AVENUE
SUITE 20
SOMERVILLE, MA 02145
617-776-3350

NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP:

COVER SHEET

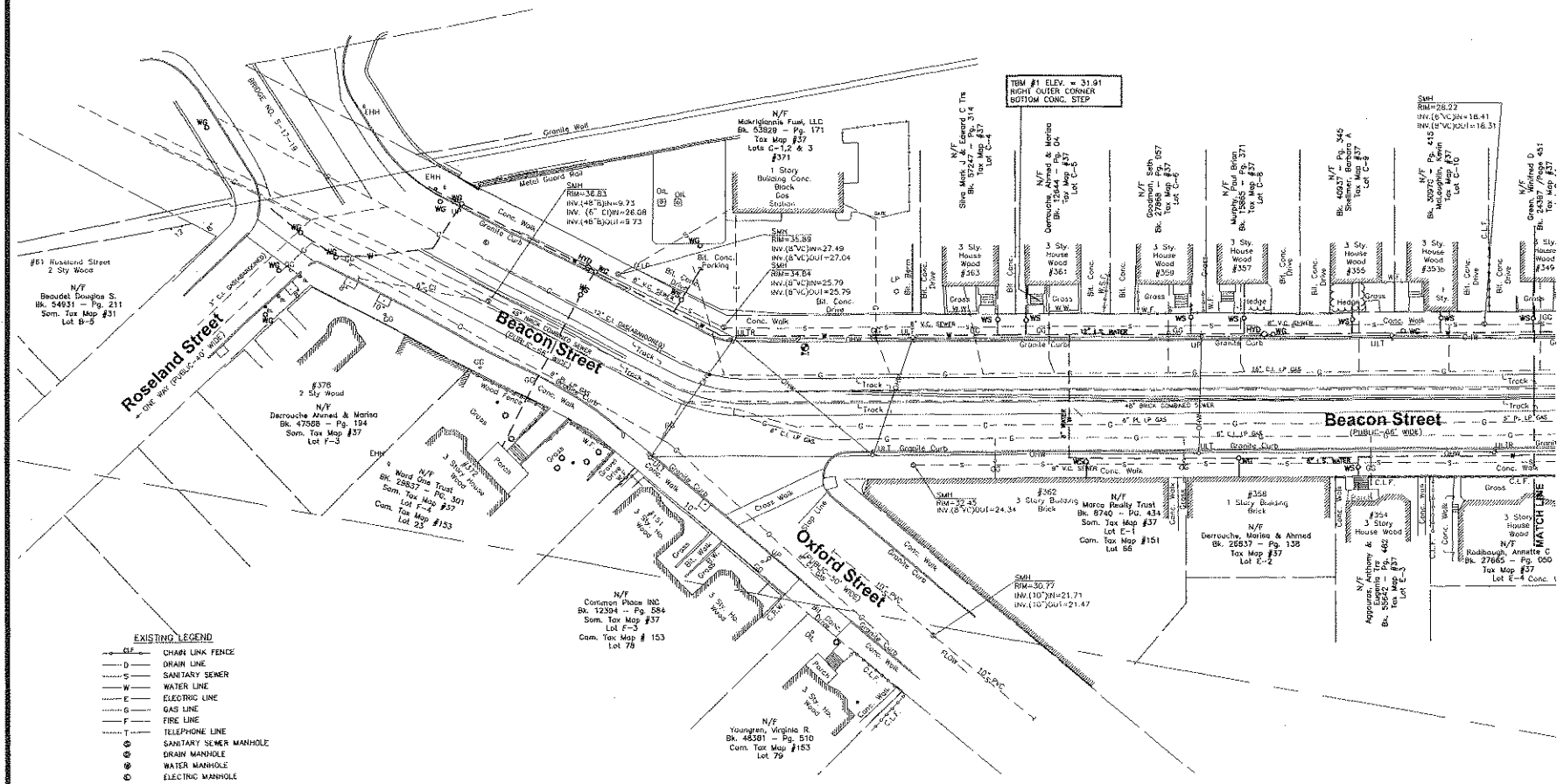
SHEET NAME:

C0.0

SHT NO:

DR BY: CAR
CHK BY: WAK
PROJ NO: 2012-027.10
DATE: 7.17.13
SCALE: N.T.S.

P:\2012 Projects\2012-027.10\Dwg_ENGINEERING\2012-027.10 Cover Sheet.dwg



EXISTING LEGEND

CLF	CHAIN LINK FENCE
D	DRAIN LINE
S	SANITARY SEWER
W	WATER LINE
E	ELECTRIC LINE
G	GAS LINE
F	FIRE LINE
T	TELEPHONE LINE
	SANITARY SEWER MANHOLE
	DRAIN MANHOLE
	WATER MANHOLE
	ELECTRIC MANHOLE
	TELEPHONE MANHOLE
	FIRE MANHOLE
	CATCH BASIN
	MONITORING WELL
HYD	FIRE HYDRANT
WG	WATER GATE
GAS	GAS GATE
UP	UTILITY POLE
MB	MAIL BOX
FA	FIRE ALARM BOX
x 23.67	SPOT ELEVATION
BB	BITUMINOUS BERM
EP	EDGE OF PAVEMENT
VGC	VERTICAL GRANITE CURB
CONC.	CONCRETE
BIT.	BITUMINOUS
	BORING
TP-3	TEST PIT

NOTES

1. ALL EXISTING GRANITE CURB SHALL BE RE-USED IN THE PROPOSED WORK. EXCEPT CURVED STONES OF A DIFFERENT RADIUS THAN PROPOSED CURB, OR GRANITE CURB DEEMED UNACCEPTABLE FOR USE BY THE ENGINEER. GRANITE CURB NOT RE-USED WILL BE DELIVERED TO A LOCATION WITHIN THE CITY SOMERVILLE AS DETERMINED BY THE DPW COMMISSIONER. GRANITE CURBING NOT WANTED BY THE CITY WILL BECOME THE PROPERTY OF THE CONTRACTOR.
2. ALL EXISTING CITY AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATIONS ARE NOT GUARANTEED.
3. ALL LIMITS OF PROPOSED SIDEWALK PATCHING SHALL BE TO THE NEAREST EXISTING CEMENT CONCRETE SIDEWALK JOINT OR AS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
5. THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL DRIVEWAYS AND ACCESS WAYS.
6. NO TRENCHES WILL BE ALLOWED TO REMAIN OPEN OVERNIGHT. ALL TRENCHES SHALL BE BACKFILLED AT THE END OF THE WORK DAY OR COVERED WITH STEEL PLATES PER 520 CMR 14.00 EXCAVATION AND TRENCH SAFETY. IF STEEL PLATES ARE USED, THE TOTAL LENGTH OF PLATES IN THE TRAVELED WAY WILL BE LIMITED TO 50'.

0 20 40 Feet

NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP

EXISTING CONDITIONS PLAN

SHEET NAME

C1.0

SHT NO:

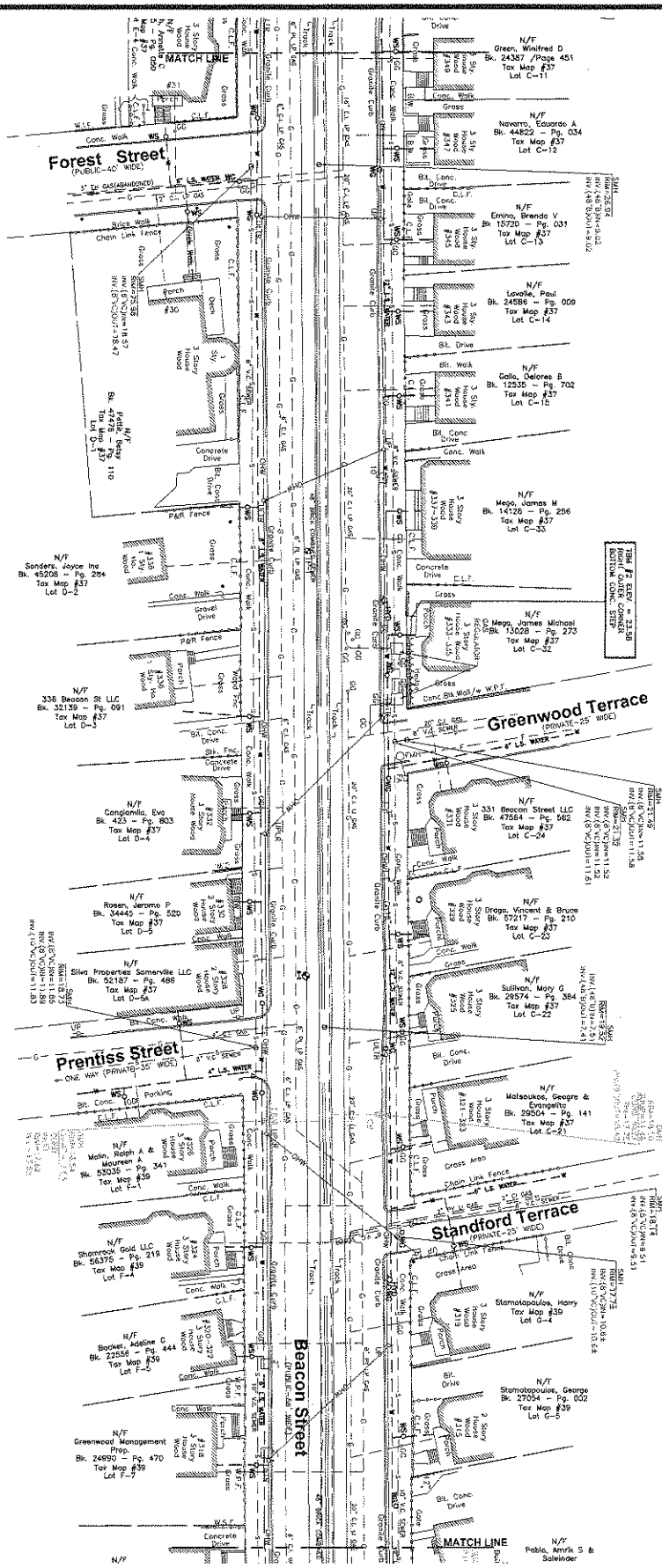
DR BY: WAK

CHK BY: WAK

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



SHT. NO.

DRAWN BY: WAK

CHK. BY: WAK

PROJ. NO. 2012-027.10

DATE: 1.17.13

SCALE: 1"=20'

C1.1

SHEET NAME:

EXISTING CONDITIONS PLAN

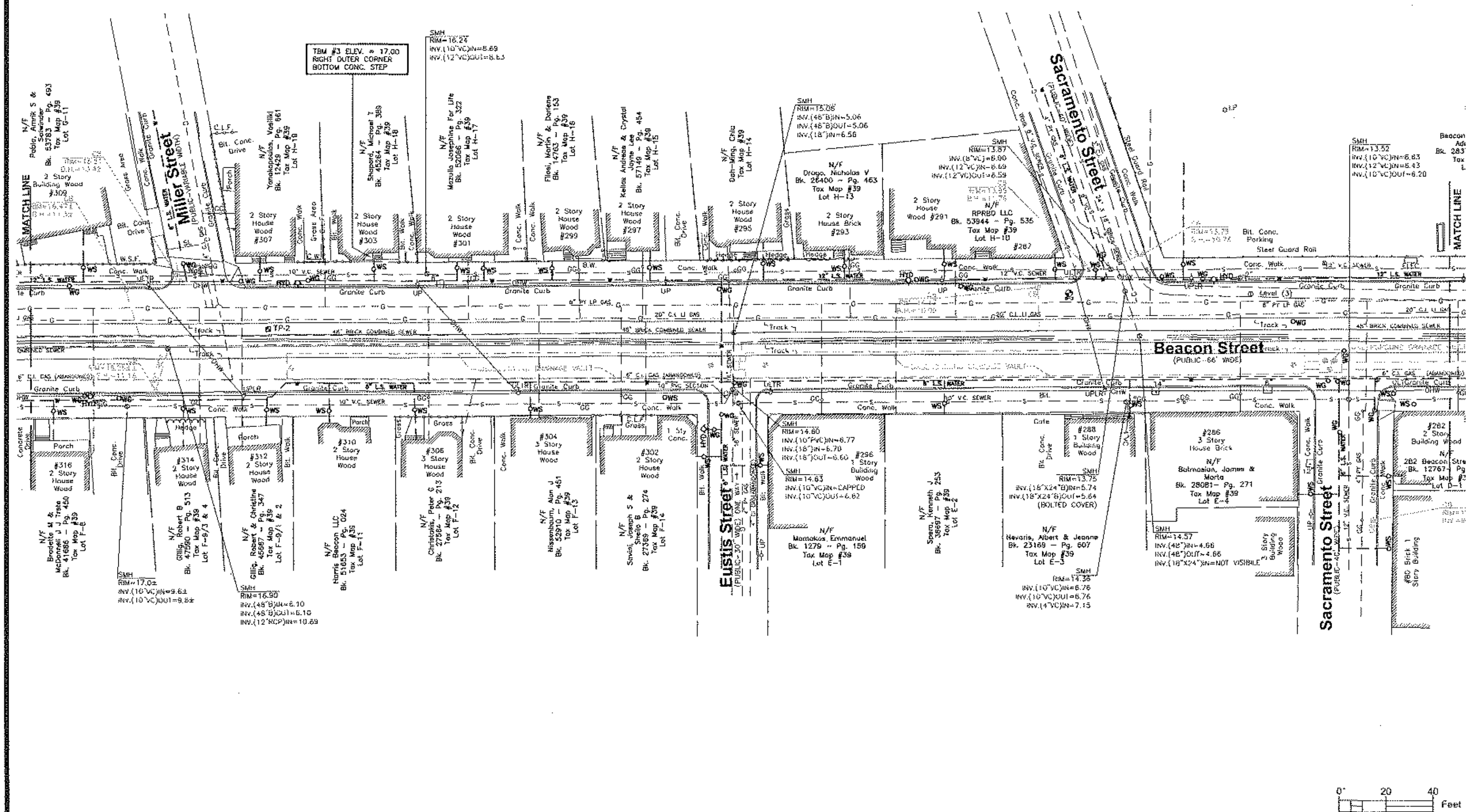
STAMP

NO.	DESCRIPTION	DATE

PROJECT INFO:

PROJECT TEAM:

NORTH



NORTH

PROJECT TEAM:

PROJECT INFO:

REV	DESCRIPTION	DATE

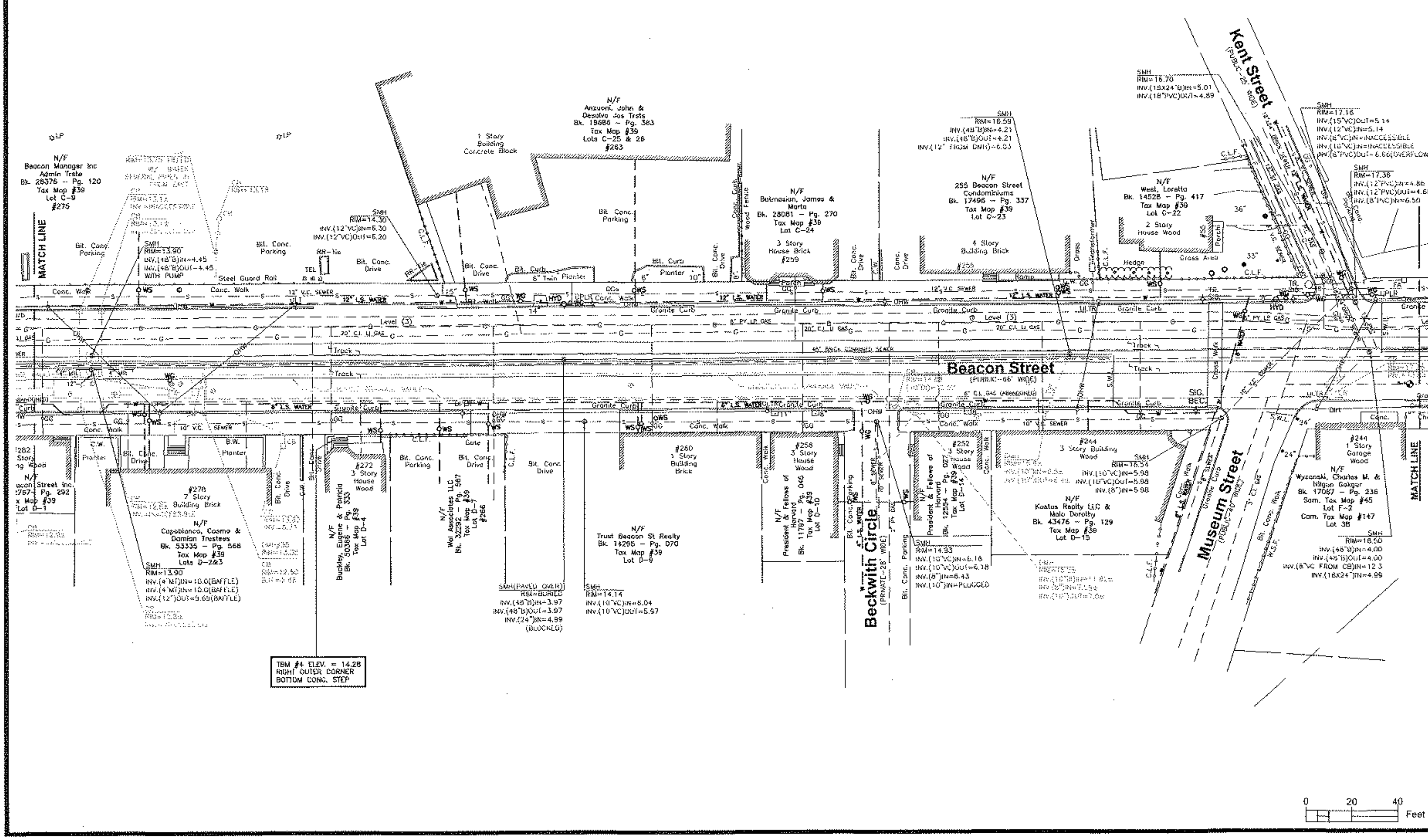
STAMP:

EXISTING CONDITIONS PLAN

SHEET NAME:

C1.2

SHT NO:
DR BY: WAK
CHK BY: WAK
PROJ NO: 2012-027.10
DATE: 7.17.13
SCALE: 1"=20'



NORTH

PROJECT TEAM:

PROJECT INFO:

REV.	DESCRIPTION	DATE

STAMP:

EXISTING CONDITIONS PLAN

SHEET NAME:

C1.3

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DR BY: WAK
CHK BY: WAK
PROJ NO: 2012-027.10
DATE: 7.17.13
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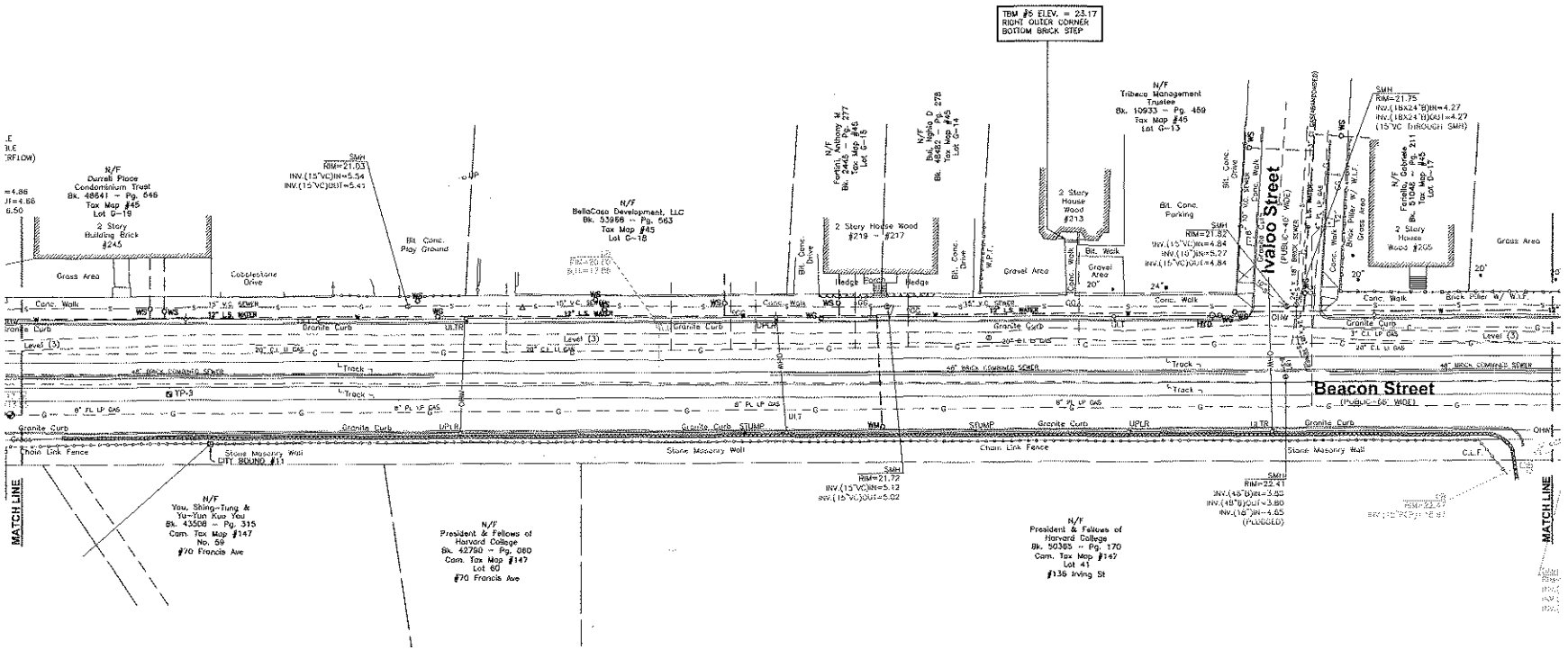


NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP:

EXISTING CONDITIONS PLAN

SHEET NAME:

C1.4

SHT NO:

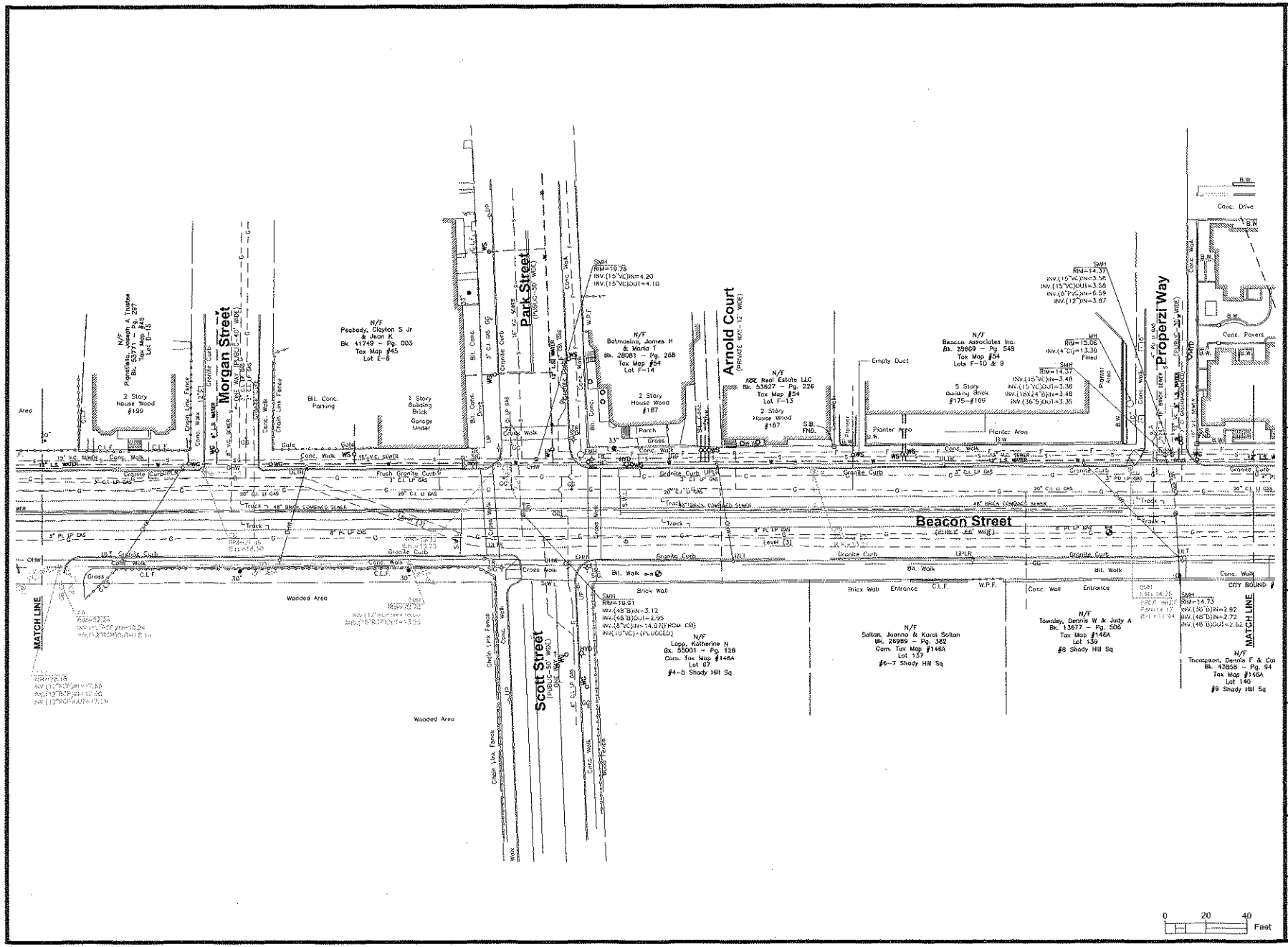
DR BY: WAK

CHK BY: WAK

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP:

EXISTING CONDITIONS PLAN

SHEET NAME:

C1.5

SHT NO:

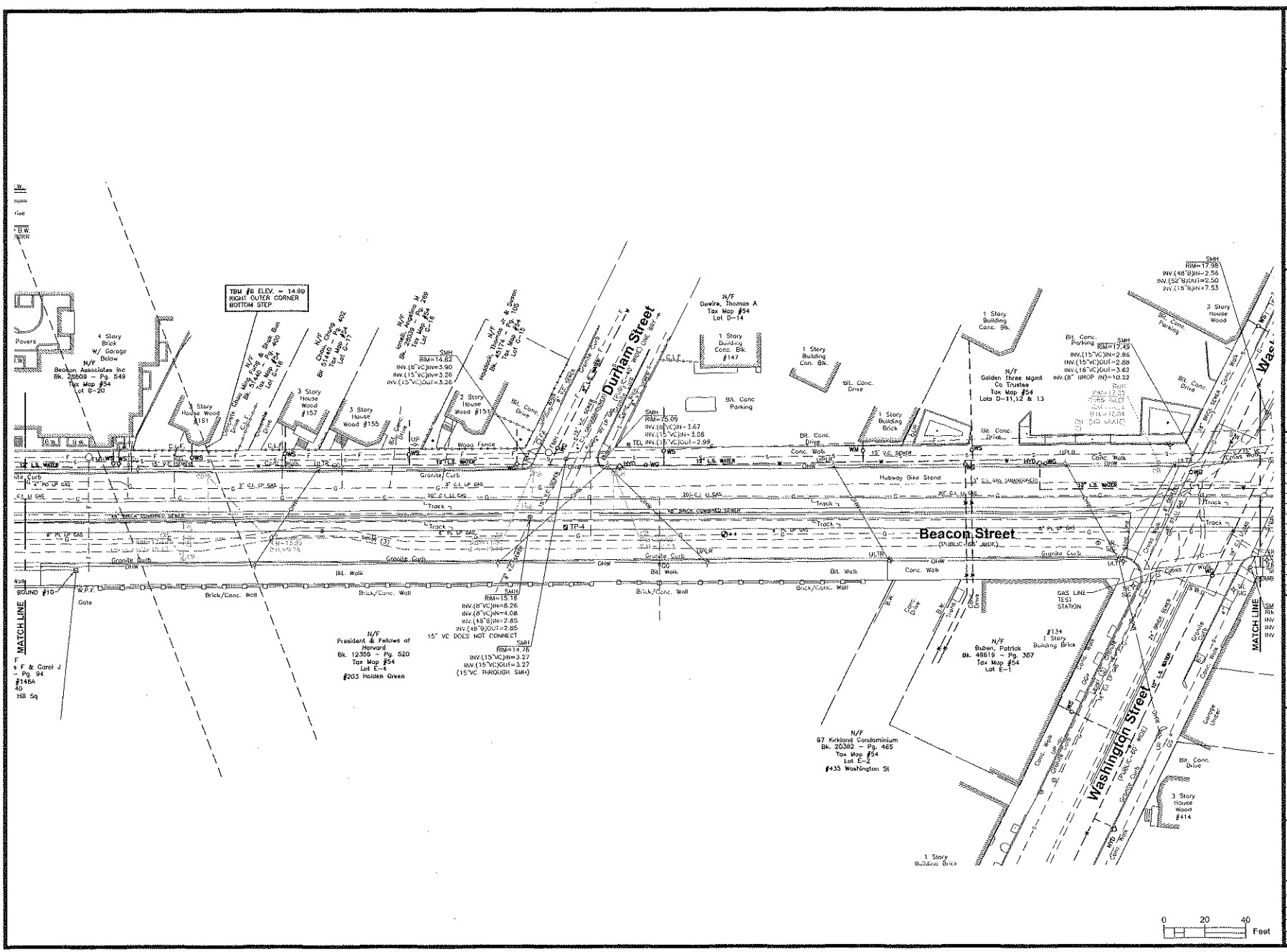
DR BY: WAK

CHK BY: WAK

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP:

EXISTING CONDITIONS PLAN

SHEET NAME:

C1.6

SHT NO:

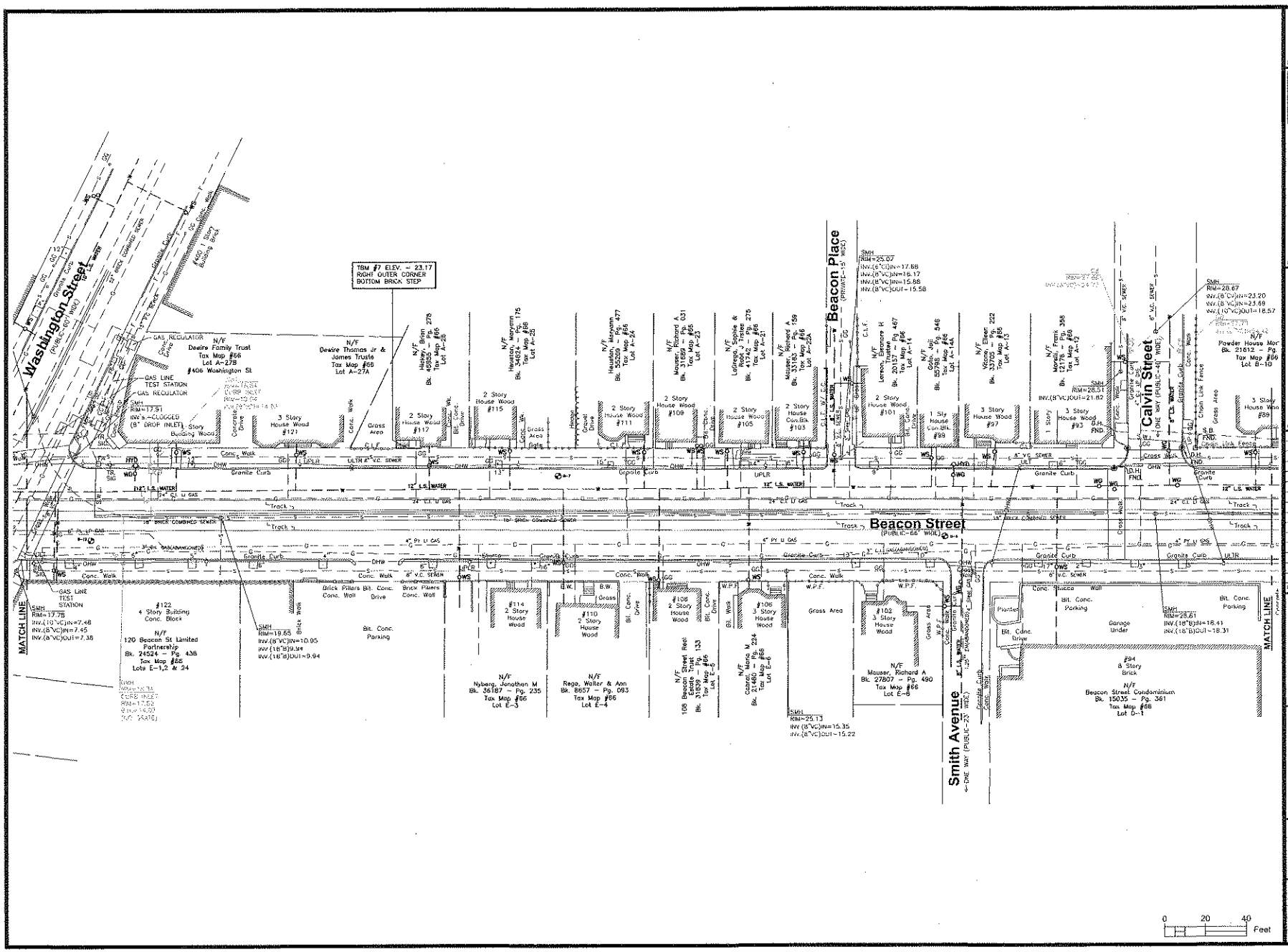
DR BY: WAK

CHK BY: WAK

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

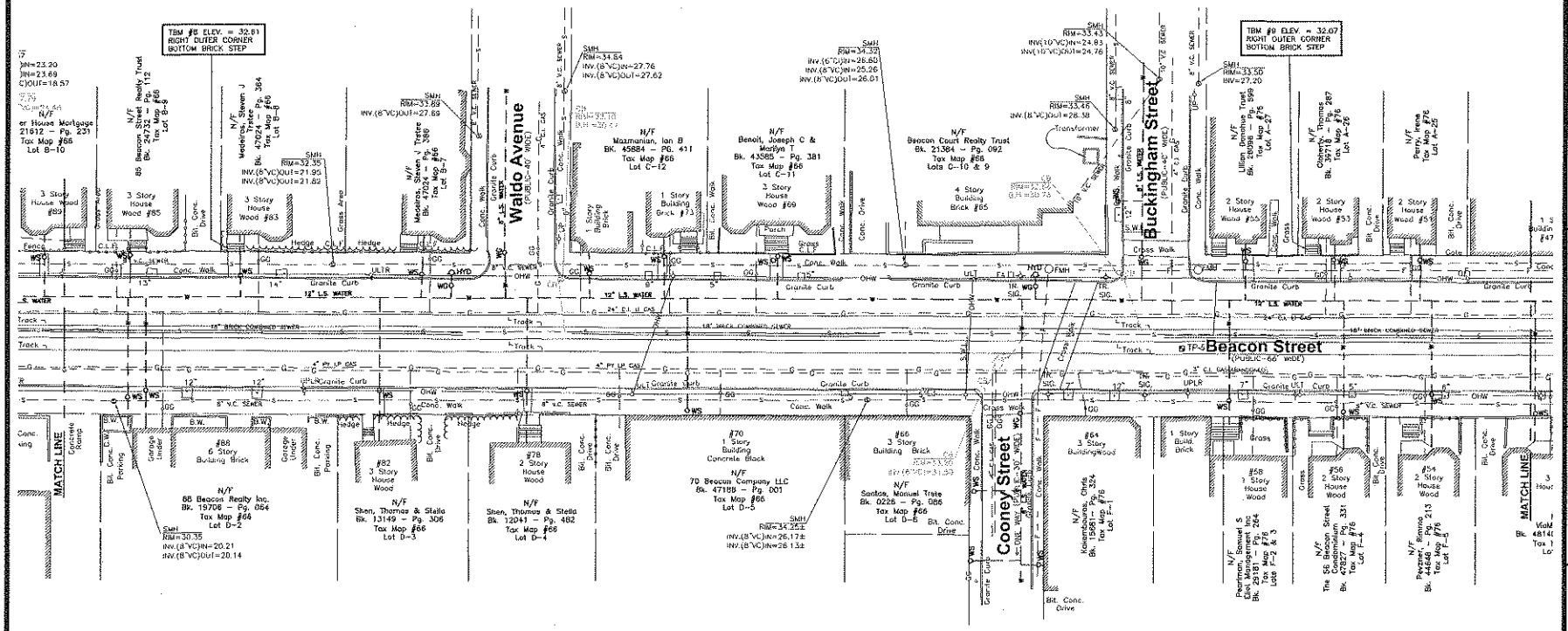
STAMP:

EXISTING CONDITIONS PLAN

SHEET NAME:

SHT NO: C1.7

DR BY: WAK
CHK BY: WAK
PROJ NO: 2012-027.10
DATE: 7.17.13
SCALE: 1"=20'



NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP:

EXISTING CONDITIONS PLAN

SHEET NAME:

C1.8

SHT NO:

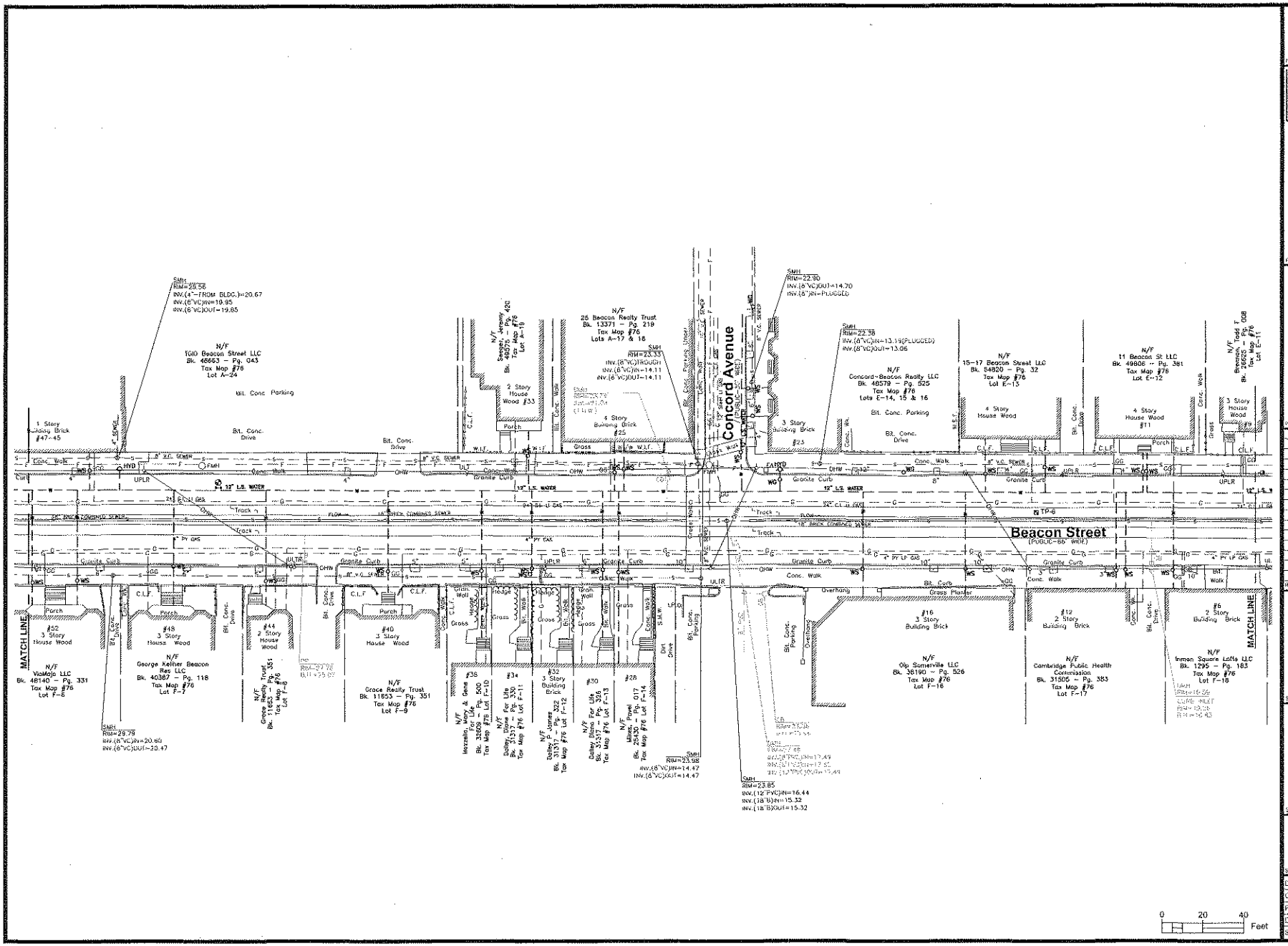
DR BY: WAK

CHK BY: WAK

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP

EXISTING CONDITIONS PLAN

SHEET NAME:

C1.9

SHT NO:

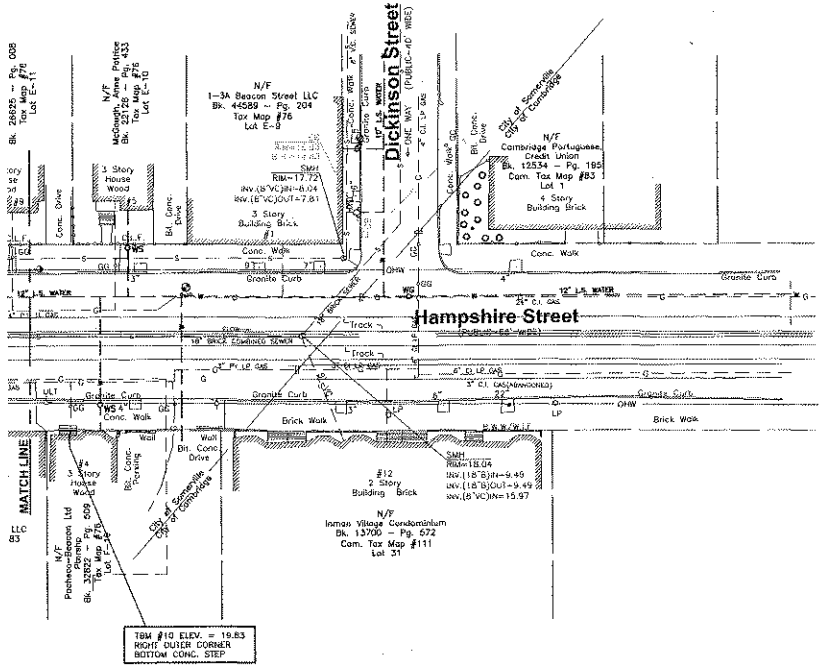
DR BY: WAK

CHK BY: WAK

PROJ NO: 2012-037.10

DATE: 7.17.13

SCALE: 1"=20'



0 20 40 Feet

NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP

EXISTING CONDITIONS PLAN

SHEET NAME

C1.10

SHT #OF

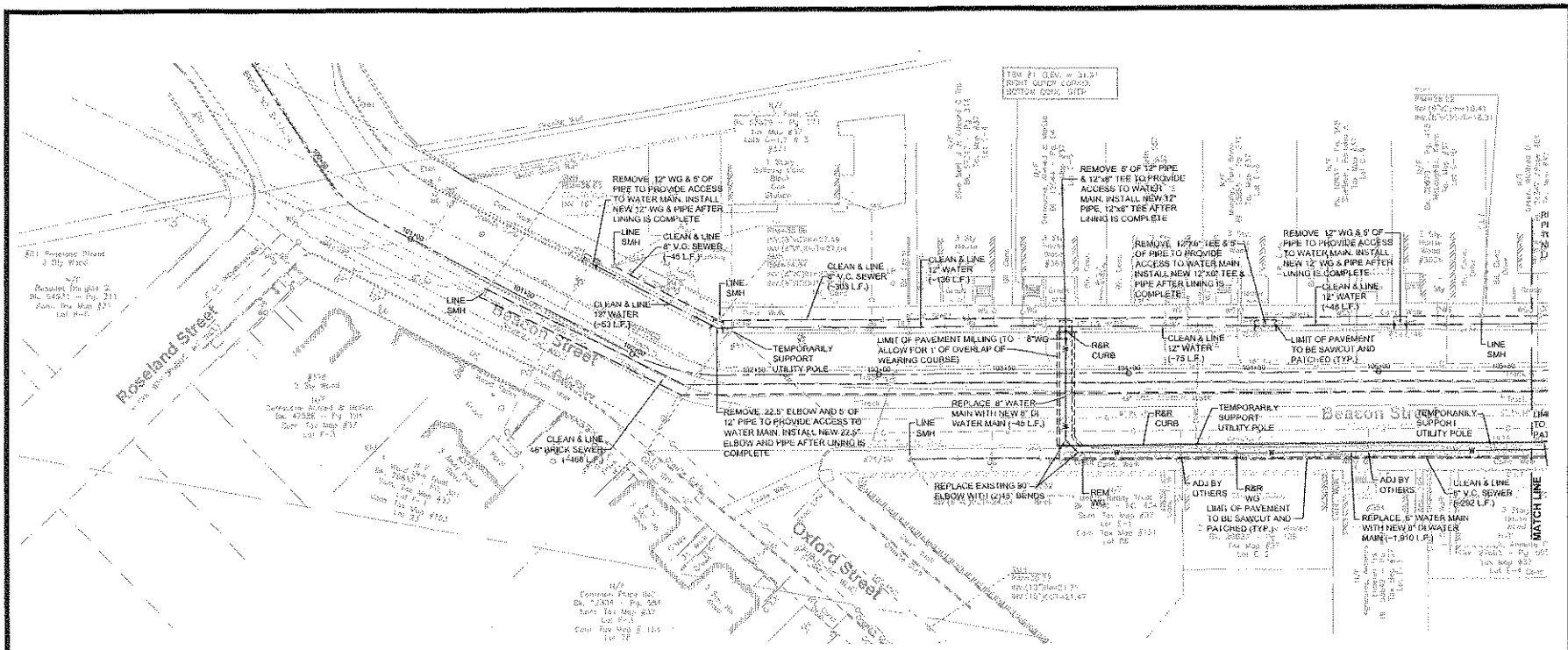
DR. BY: WAK

CHK. BY: WAK

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



NOTES

1. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
2. ALL MUNICIPAL OWNED CASTINGS WITHIN THE PROJECT AREA SHALL BE ADJUSTED TO NEW GRADE BY THE CONTRACTOR UNLESS OTHERWISE NOTED.
3. 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.
4. 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.
5. THE TERM "PROPOSED" (PROP) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET". (R&R)
6. TRENCH AREAS FOR THE CONSTRUCTION OF THE UNDERGROUND UTILITIES ARE TO BE REPATCHED WITH SAME MATERIAL AT THE SAME DEPTH AS THE EXISTING MATERIAL. THE AREAS OF TRENCHING SHALL BE NEATLY SAW-CUT AND THE NEW REPATCHING MATERIAL SHALL BE PROPERLY SEALED IN ACCORDANCE TO THE CITY OF SOMERVILLE MUNICIPAL STANDARDS.
7. THE CITY OF SOMERVILLE MUNICIPAL UTILITIES (WATER, SEWER & DRAIN) ARE PART OF DIG-SAFE. REQUEST FOR MARKINGS CAN BE MADE BY CALLING DIG-SAFE AT 1-888-344-7233 AT LEAST 72 HOURS PRIOR TO THE EXCAVATION. STREET OPENING PERMITS SHOULD ALSO BE FILED AT THAT TIME.
8. DURING EXCAVATION AND CONSTRUCTION OF PIPES AND STRUCTURES, TRENCHES MUST BE ADEQUATELY BRACED AND PROTECTED AGAINST CAVE-IN.
9. EXISTING TOPOGRAPHY & UTILITIES SHOWN ON THESE PLANS WERE PRODUCED FROM THE PLANS OF RECORD & THE EXISTING CONDITION PLAN PREPARED BY DESIGN CONSULTANTS, 120 MIDDLESEX AVENUE, SOMERVILLE, MA.
10. NO TRENCHES WILL BE ALLOWED TO REMAIN OPEN OVERNIGHT. ALL TRENCHES SHALL BE BACKFILLED AT THE END OF THE WORK DAY OR COVERED WITH STEEL PLATES PER 520 CMR 14.00 EXCAVATION AND TRENCH SAFETY. IF STEEL PLATES ARE USED, THE TOTAL LENGTH OF PLATES IN THE TRAVELED WAY WILL BE LIMITED TO 50'
11. ALL WORK PERFORMED AS PART OF THIS PROJECT SHALL CONFORM TO THE CITY OF SOMERVILLE DEPT. OF PUBLIC WORKS AND ANY OTHER AGENCY WITH AUTHORITY IN THIS AREA. IF THERE IS A QUESTION OF WHICH SPECIFICATION TO USE, MASSDOT, HIGHWAY DIVISION SPECIFICATIONS SHALL PREVAIL.
12. ALL SANITARY SEWER SERVICES AND STORM DRAINS THAT CONNECT TO PIPES THAT ARE BEING REPLACED SHALL BE CONNECTED TO THE NEW PIPE AS PART OF THIS CONTRACT. CONTRACTOR TO COORDINATE BY-PASS PUMPING FOR SANITARY SEWER AND WATER SO THERE IS NO INTERRUPTION IN SERVICE.

NOTES (CONT'D)

13. PRIOR TO CONSTRUCTION OF NEW SANITARY SEWER LINES AND MANHOLES, CONTRACTOR TO PERFORM TEST PITS AT LOCATIONS OF EXISTING LATERAL CONNECTIONS FOR SANITARY SEWER TO CONFIRM INVERTS OF LATERALS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
14. BORING WERE PERFORMED BETWEEN JUNE 6 AND JUNE 8, 2012 BY NORTHERN DRILLING.
15. WATER MAINS ARE ASSUMED TO BE 5 FEET BELOW THE EXISTING GROUND SURFACE. GAS LINES ARE ASSUMED TO BE 3 FEET BELOW THE EXISTING GROUND SURFACE. TELEPHONE LINES AND TRAFFIC SIGNAL CONTROLS ARE ASSUMED TO BE 2' BELOW THE EXISTING GROUND SURFACE.
16. THE CONTRACTOR SHALL PROVIDE THE CITY OF SOMERVILLE WITH A CONSTRUCTION SCHEDULE DELINEATING THE SEQUENCE OF WORK AND ESTIMATED TIME OF COMPLETION OF EACH SEGMENT OF WORK, PRIOR TO THE COMMENCEMENT OF WORK.
17. CONTRACTOR SHALL COORDINATE WITH THE SOMERVILLE DEPARTMENT OF PUBLIC WORKS FOR AN APPROPRIATE STAGING AREA.
18. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SITE RESTORATION AND CLEAN UP UPON COMPLETION OF THE PROJECT.
19. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES AND PROCEDURES, AND FOR SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH ALL WORK INCLUDED UNDER THIS CONTRACT. THE DRAWINGS DO NOT INCLUDE NECESSARY COMPONENTS FOR CONSTRUCTION SAFETY. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR PROVIDING AND MAINTAINING ALL SAFETY BARRIERS, WARNING FLASHERS, AS REQUIRED BY THE CONDUCT OF THE WORK FOR THE PROTECTION OF WORKERS AND NON-WORKERS ALIKE. THE CONTRACTORS ATTENTION IS DIRECTED TO OSHA REQUIREMENTS.
20. ALL CONSTRUCTION SIGNAGE SHALL CONFORM TO THE REQUIREMENTS OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).
21. DURING THE COURSE OF CONSTRUCTION ANY DAMAGE TO FENCES, RETAINING WALLS, GUARD RAILS, PATHS, STAIRS, VEGETATION, ETC. SHALL BE REPAIRED OR REPLACED TO ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
22. THE CONTRACTOR SHALL SUBMIT A TRAFFIC CONTROL PLAN FOR APPROVAL TO TRAFFIC AND PARKING, PRIOR TO COMMENCING CONSTRUCTION.
23. PIPE MATERIALS: (UNLESS OTHERWISE SPECIFIED)
    WATER: DUCTILE IRON PIPE
    SEWER: PVC POLYVINYL CHLORIDE PIPE
24. CONTRACTOR TO MAINTAIN WORK AREA IN A CLEAN CONDITION. NO CONSTRUCTION DEBRIS SHALL BE ALLOWED TO ACCUMULATE WITHIN THE WORKSITE AND NO DIRT, GRAVEL, ETC. SHALL BE ALLOWED TO ACCUMULATE ON THE PUBLIC RIGHT-OF-WAY.
25. PROPOSED SAW CUTS SHOWN ARE FOR NEW WATER MAIN INSTALLATION AND ACCESS TO THE EXISTING WATER MAIN FOR CLEANING AND CEMENT LINING. CONTRACTOR IS RESPONSIBLE FOR ACCESS TO THE EXISTING AND PROPOSED WATER MAINS FOR SERVICE CONNECTIONS (TEMPORARY AND PERMANENT).

LEGEND

- CHAIN LINK FENCE
- DRAIN LINE
- SANITARY SEWER
- WATER LINE
- ELECTRIC LINE
- GAS LINE
- FIRE LINE
- TELEPHONE LINE
- SANITARY SEWER MANHOLE
- DRAIN MANHOLE
- WATER MANHOLE
- ELECTRIC MANHOLE
- TELEPHONE MANHOLE
- FIRE MANHOLE
- CATCH BASIN
- MONITORING WELL
- FIRE HYDRANT
- WATER GATE
- GAS GATE
- UTILITY POLE
- MAIL BOX
- FIRE ALARM BOX
- HAND HOLE
- DECIDUOUS TREE
- SPOT ELEVATION
- BB BITUMINOUS BERM
- EP EDGE OF PAVEMENT
- VGC VERTICAL GRANITE CURB
- CONC. CONCRETE
- BIT. BITUMINOUS
- CPP CORRUGATED POLYETHYLENE PIPE
- PVC POLYVINYL CHLORIDE PIPE
- ADJ. ADJUST
- R&R REMOVE AND RESET
- EXISTING BORING
- PROPOSED SAW CUT LINE
- PROPOSED SEWER CLEAN AND LINE
- PROPOSED SEWER PIPE
- PROPOSED WATER CLEAN AND CEMENT LINE
- PROPOSED WATER PIPE
- BITUMINOUS CONCRETE PAVEMENT
- REMOVE AND RESET CURB

BORING NOTES:

1. BORINGS TAKEN FOR THE PURPOSE OF DESIGN AND SHOW CONDITIONS AT THE BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
2. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
3. FIGURES TO THE LEFT OF THE COLUMNS INDICATE THE DEPTH BELOW SURFACE AT BORING POINT
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS PRODUCED BY A 30" FALL OF 140 POUND MASS HAMMER REQUIRED TO DRIVE 2" I.D. SPOON 1 FOOT.
5. BORING SAMPLES TAKEN BETWEEN JUNE 6 AND JUNE 8, 2012.
6. BORING CONTRACTOR: NORTHERN DRILLING, 139 EAST MAIN STREET BUILDING A, NORTHBOROUGH, MA 01532.

BORING #B-1
STA 103+07 - 20 LT.
GROUND EL=33.8

0		9" OF ASPHALT & GRANITE
3	22	SILTY CLAY, LAMINATED BROWN/GRAY
5		
8	13	CLAY WITH SOME SILT, LAMINATED BROWN/GRAY
10		

BOTTOM OF HOLE - NO WATER LEVEL

0 20 40 Feet

NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP:

SITE UTILITIES PLAN

SHEET NAME:

C2.0

SHT NO:

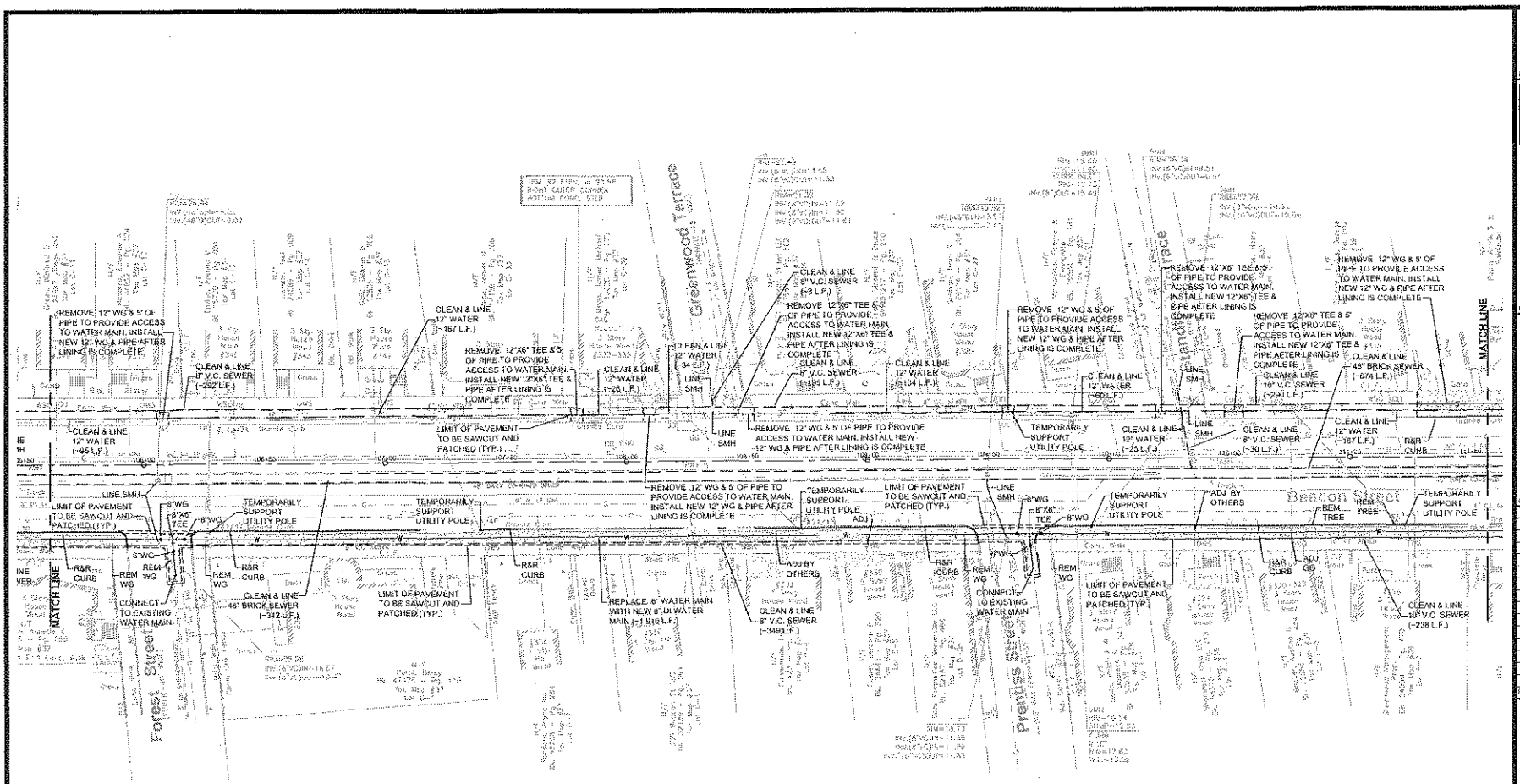
DR BY: CAR

CHK BY: WAK

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



BORING AB-2
STA 109+67 - 8' RT.
GROUND EL=19.6

0			10" OF ASPHALT & CONCRETE
3		36	MED COURSE SAND WITH TRACE GRAVEL LITTLE TO NO FINES, DARK BROWN
5			
8		17	MED TO FINE SAND, BROWN/ORANGE
10			

BOTTOM OF HOLE - NO WATER LEVEL

0 20 40 Feet

NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP:

SITE UTILTIES PLAN

SHEET NAME:

C2.1

SHT NO:

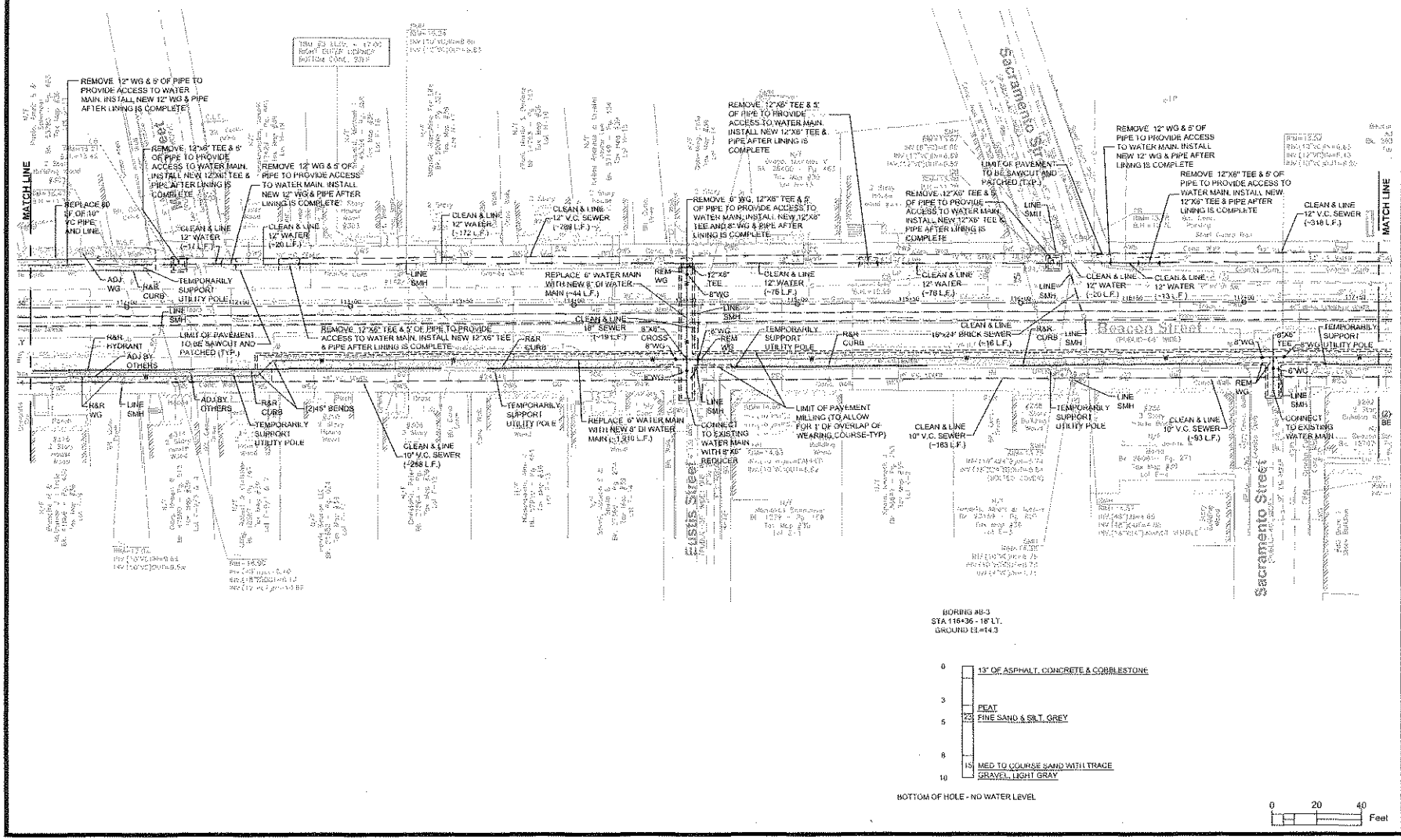
DR BY: CAR

CHK BY: WAN

PROJ NO: 2012-027.10

DATE: 7.12.13

SCALE: 1"=20'



NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP

SITE UTILITIES PLAN

SHEET NAME

C2.2

SHT NO:

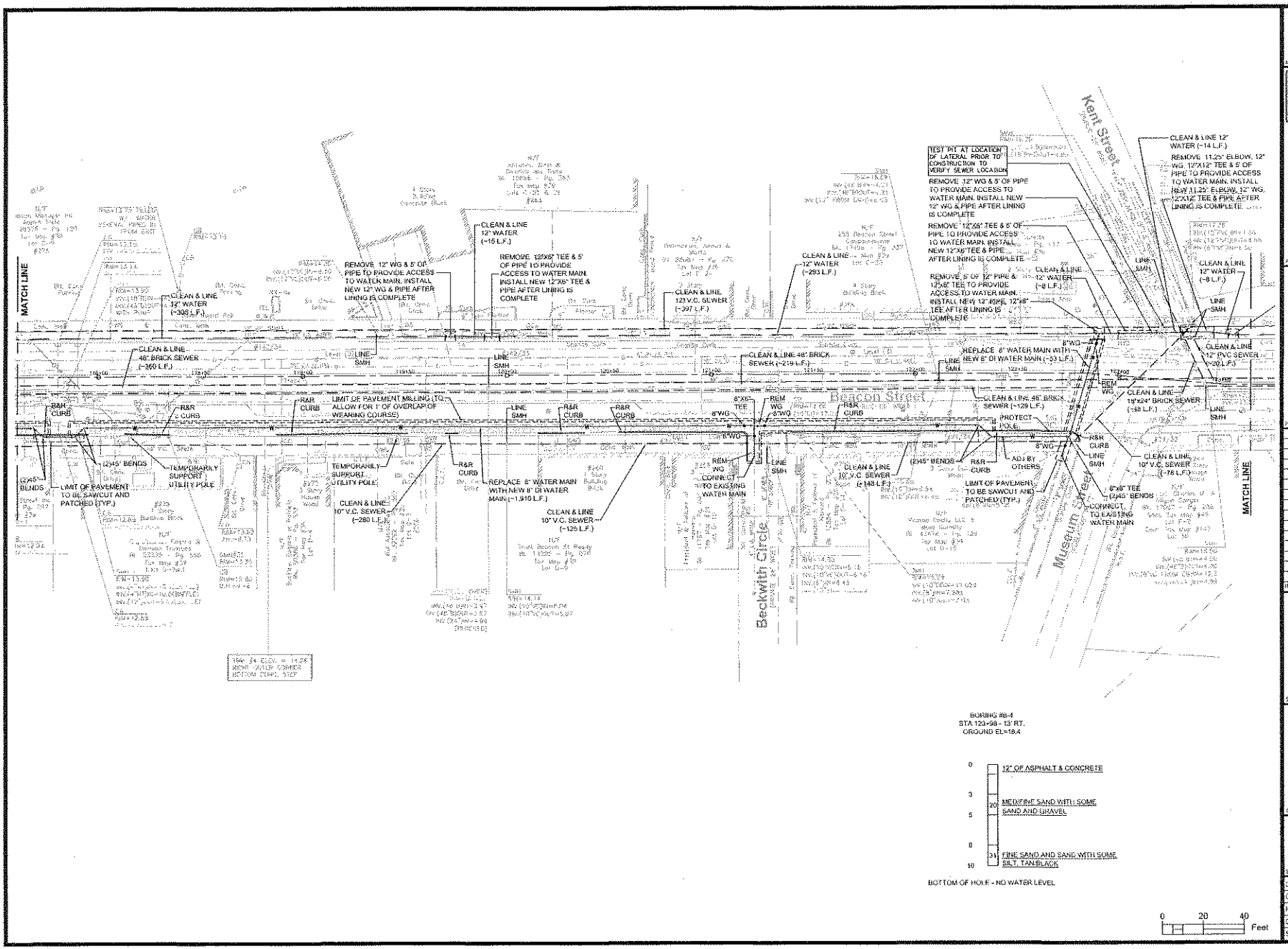
DR BY: CAR

CHK BY: WAK

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP

SITE UTILITIES PLAN

SHEET NAME

C2.3

SHT NO:

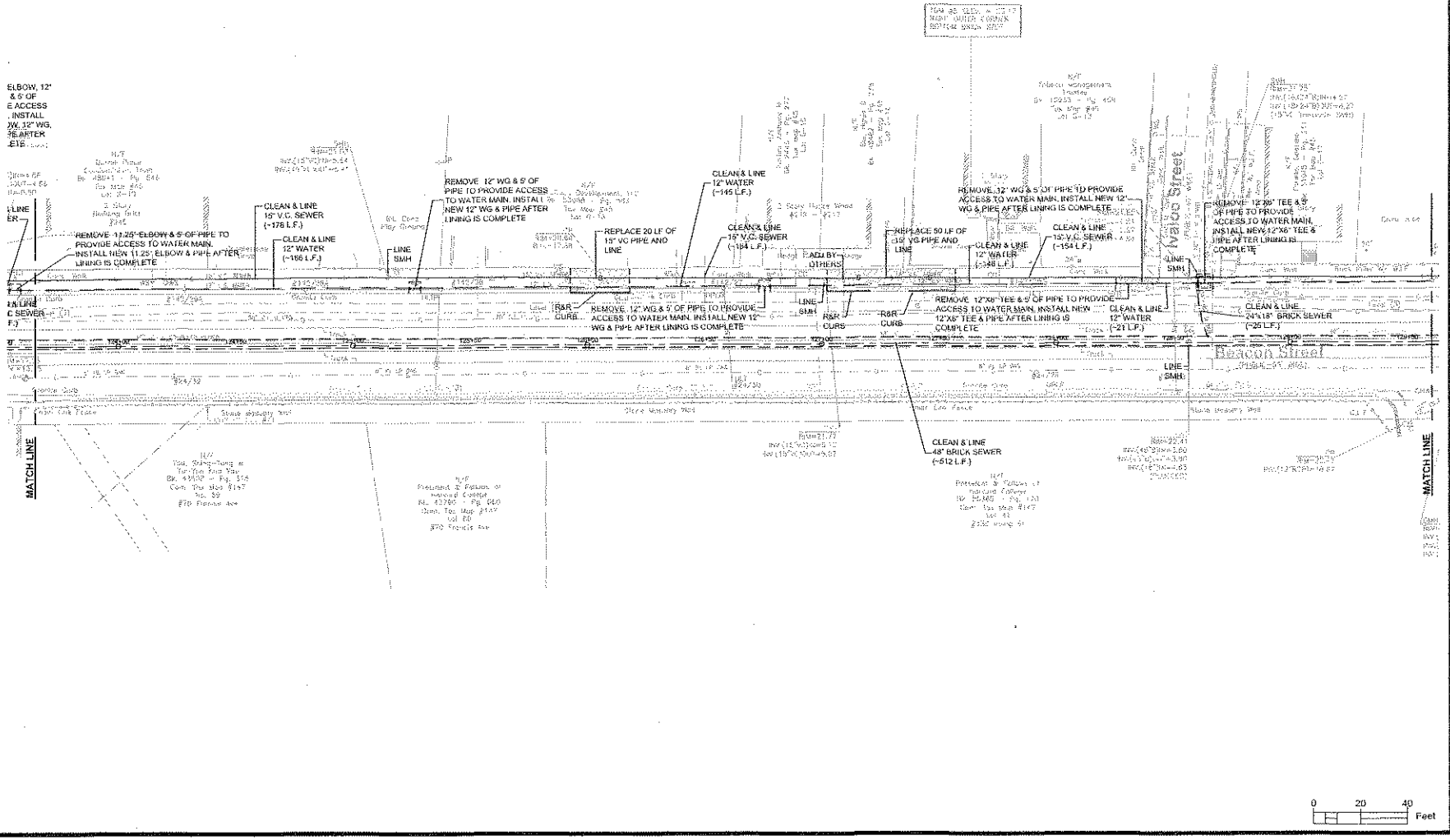
DR BY: CAK

CHK BY: WAK

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP

SITE
UTILITIES
PLAN

SHEET NAME:

C2.4

SHT NO:

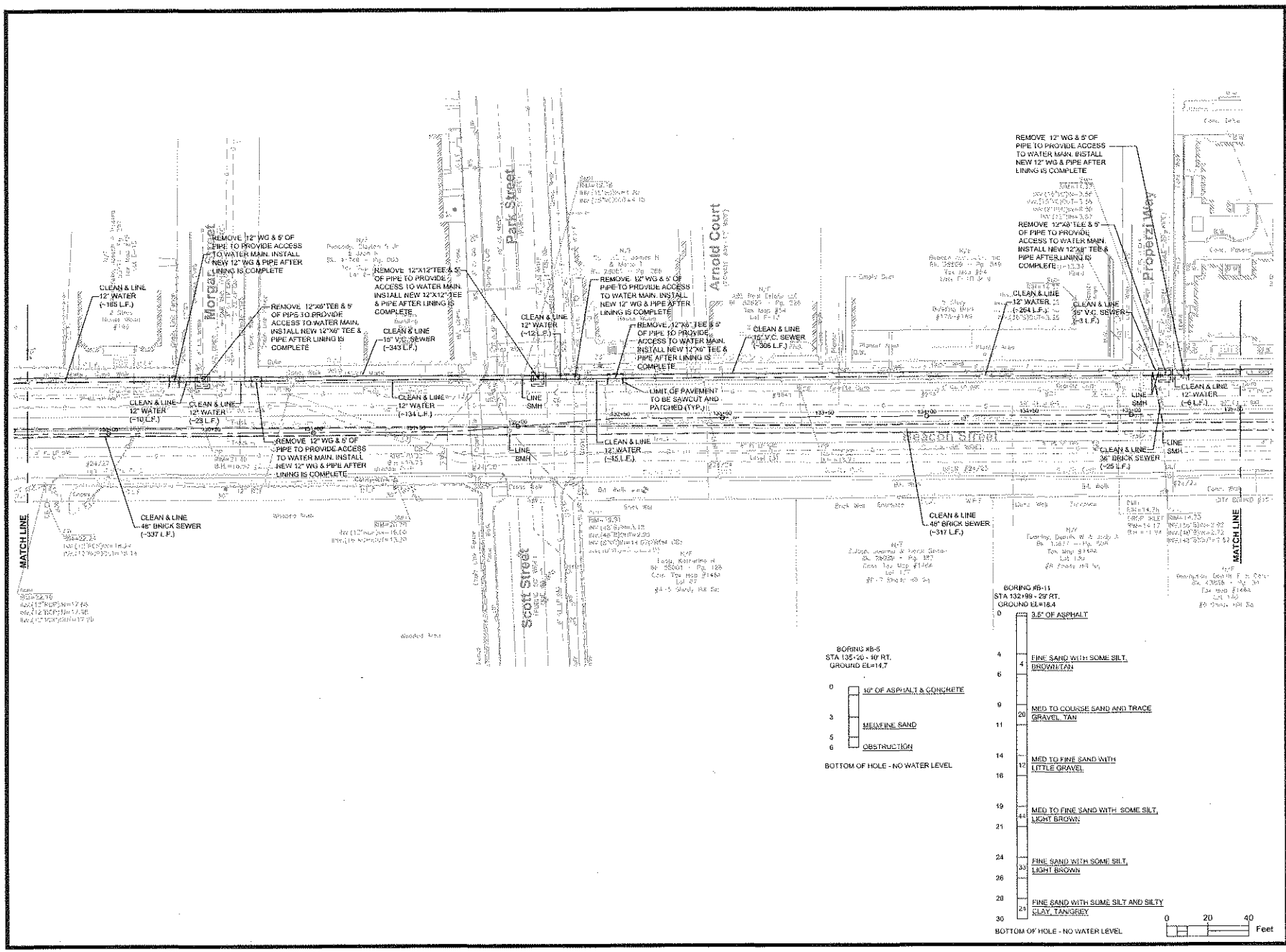
DR BY: CAR

CHK BY: WAK

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



NORTH

PROJECT TEAM

PROJECT INFO

NO	DESCRIPTION	DATE

STAMP

SITE UTILITIES PLAN

SHEET NAME

C2.5

SHEET#

DR BY: CAR
CHK BY: WAK
PROJ NO: 2012-027.10
DATE: 7.17.13
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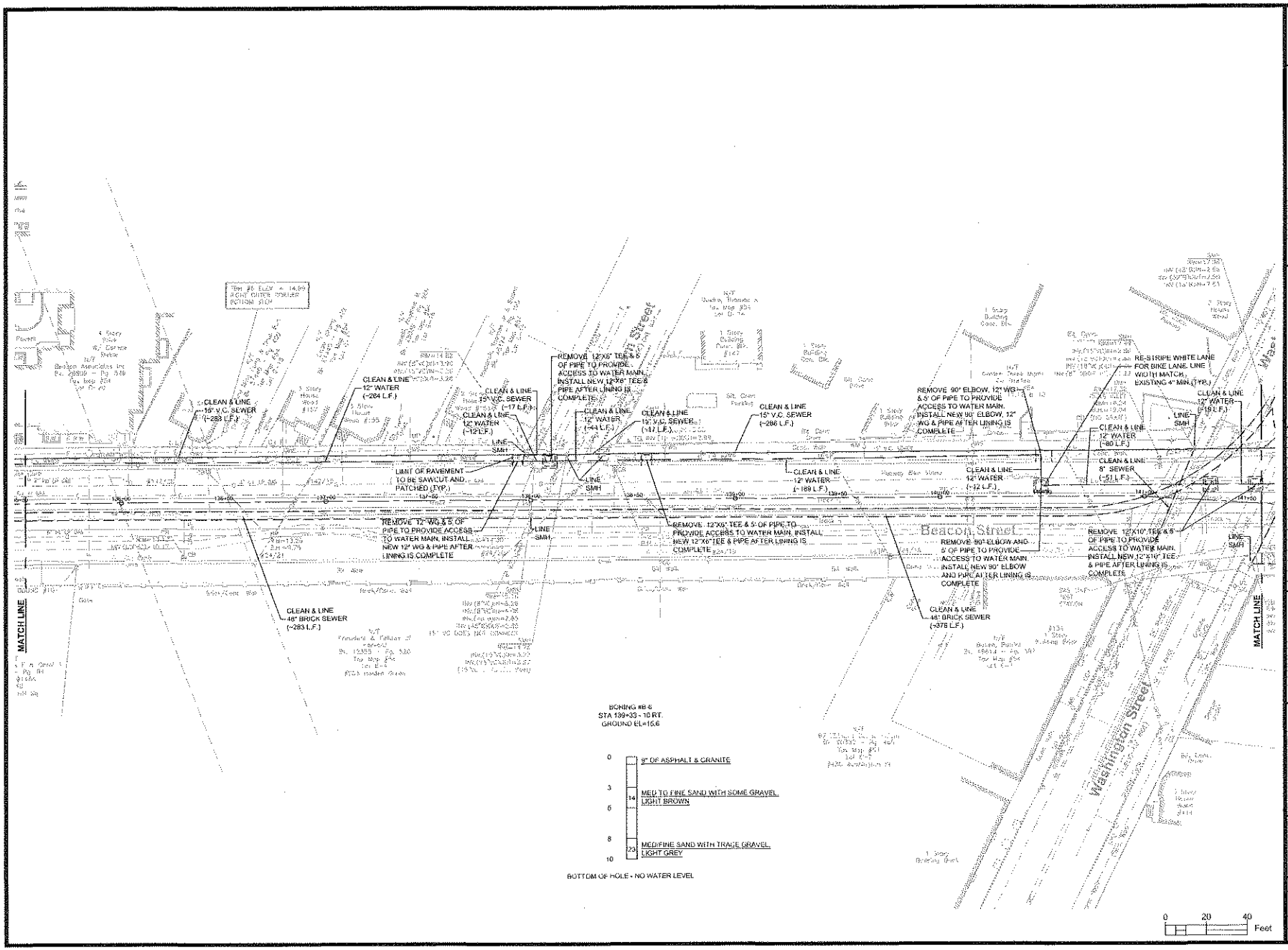


NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP:

SITE UTILITIES PLAN

SHEET NAME:

C2.6

SHT NO:

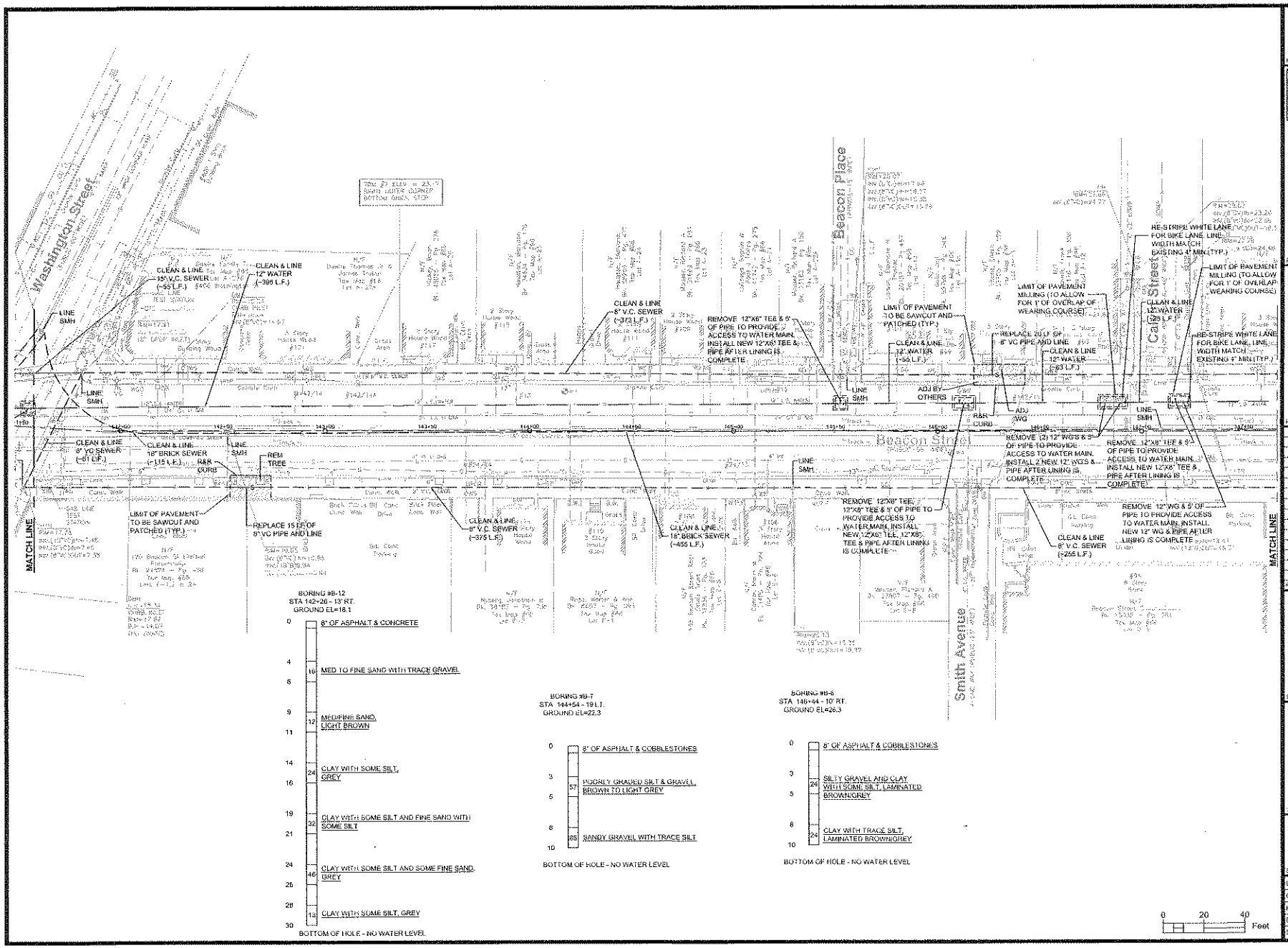
DR BY: CAR

CHK BY: WAK

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP

SITE UTILITIES PLAN

SHEET NAME:

C2.7

SHT NO:

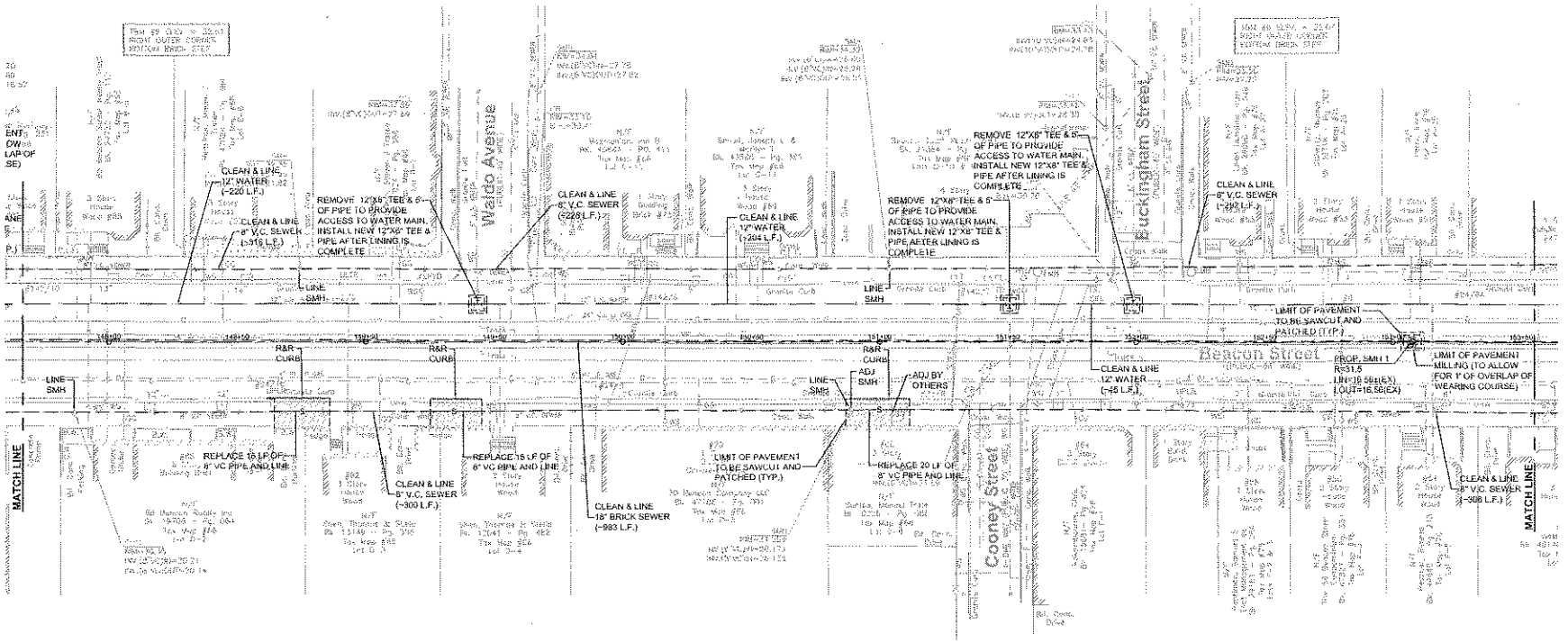
DR BY: CAR

CHK BY: WAK

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP

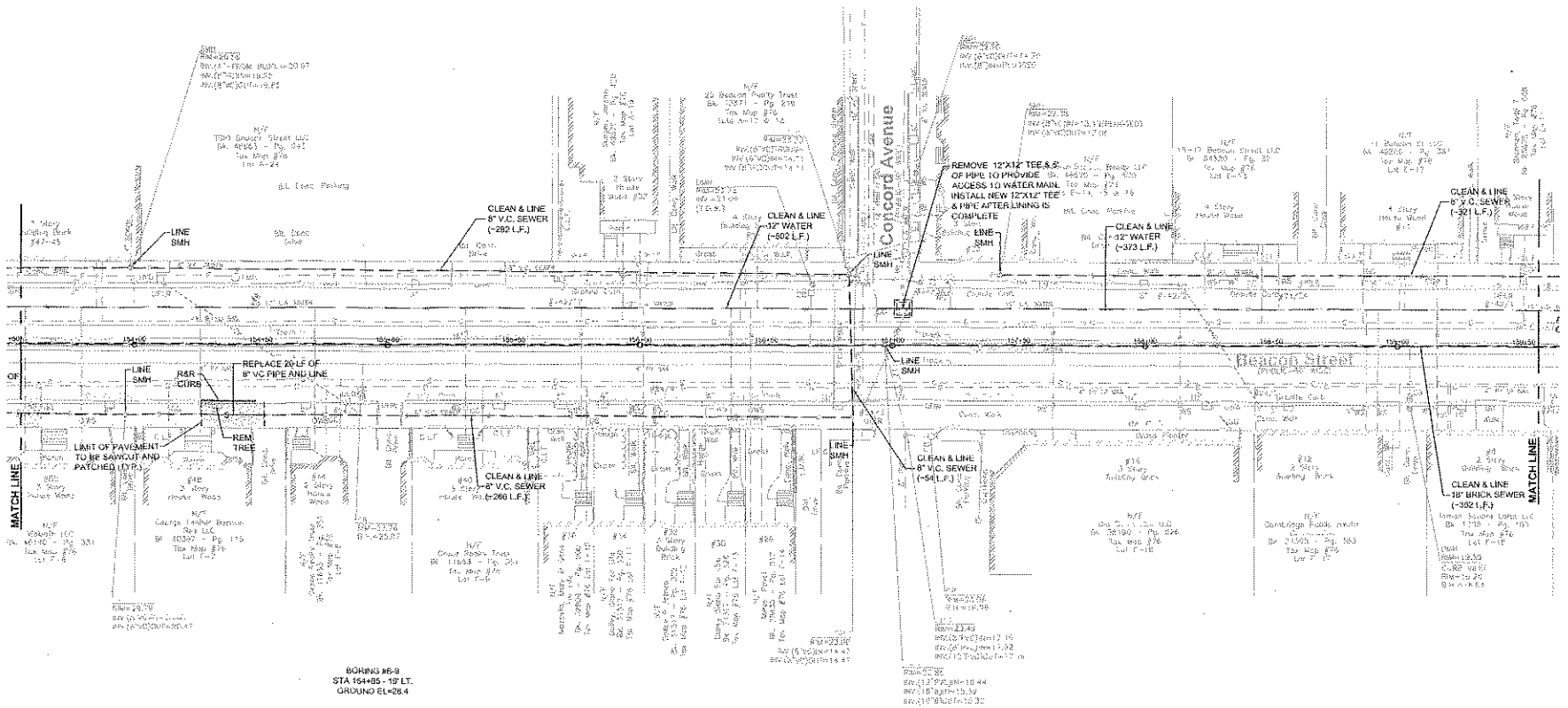
SITE UTILITIES PLAN

SHEET NAME

C2.8

SHT NO.

DR BY: CAR
CHK BY: WAK
PROJ NO: 2012-027.10
DATE: 7.17.13
SCALE: 1"=20'



NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP:

SITE UTILITIES PLAN

SHEET NAME:

C2.9

SHT NO:

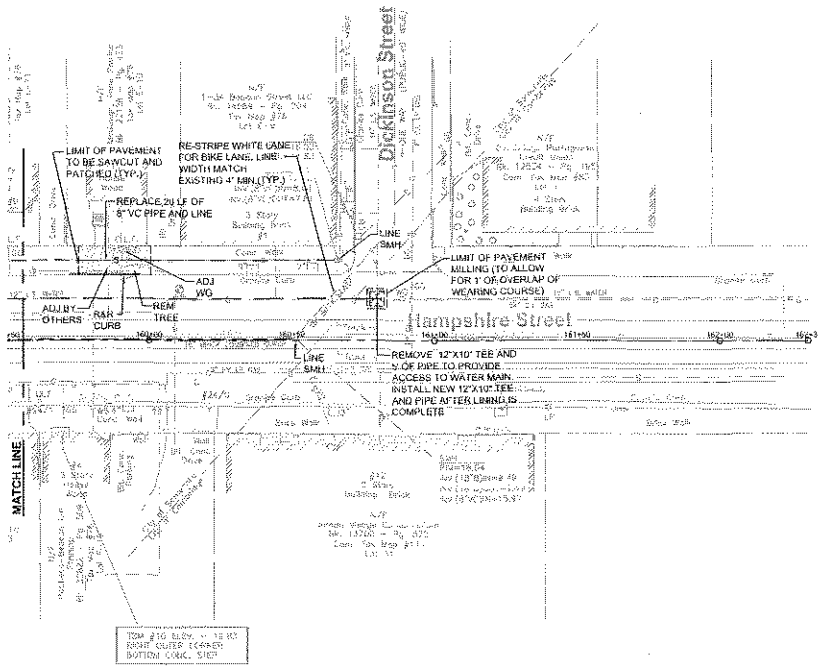
DR BY: CAR

CHK BY: WAK

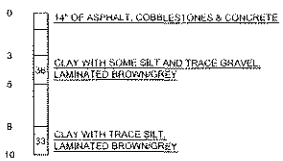
PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: 1"=20'



BORING #B-10
STA 160+48 - 17' LT.
GROUND EL=18.2



BOTTOM OF HOLE - NO WATER LEVEL

0 20 40 Feet

NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP

SITE UTILITIES PLAN

SHEET NAME:

C2.10

SHT NO:

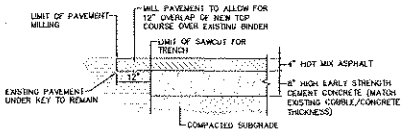
DR BY: CAR

CHK BY: WAK

PROJ NO: 2012-027.10

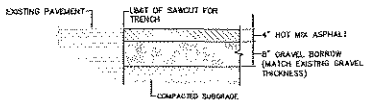
DATE: 7.17.13

SCALE: 1"=20'



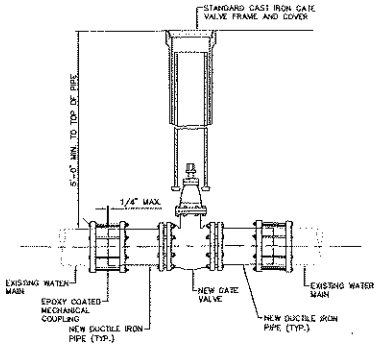
ROADWAY PATCH DETAIL

NOT TO SCALE



SIDEWALK/DRIVEWAY PATCH DETAIL

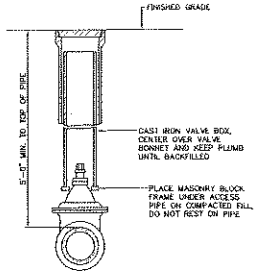
NOT TO SCALE



NOTES:
1. ALL EXCAVATION AND BACKFILLING AND PAVING SHALL BE IN ACCORDANCE WITH THE CITY OF SOMERVILLE REQUIREMENTS.

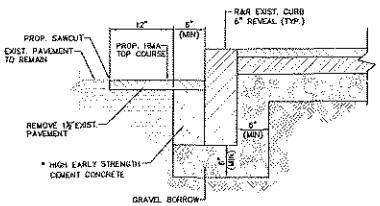
TYPICAL GATE VALVE INSTALLATION IN EXISTING WATER MAIN

NOT TO SCALE



GATE VALVE INSTALLATION IN TRENCH

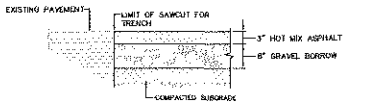
NOT TO SCALE



NOTES:
1. COMPACT BASE COURSE (GRAVEL) TO 95% MAXIMUM DRY DENSITY AS DETERMINED IN ACCORDANCE WITH ASTM D-1557.
2. * HIGH EARLY STRENGTH CONCRETE BASE COURSE SHALL BE INCLUDED IN THE LINEAR FOOT PRICE OF GRANITE CURB ITEMS.

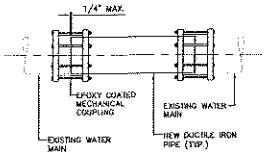
R&R EXISTING CURB IN EXISTING PAVEMENT

NOT TO SCALE



TEMPORARY PATCH DETAIL

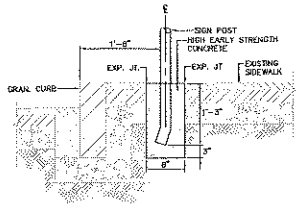
NOT TO SCALE



NOTES:
1. ALL EXCAVATION AND BACKFILLING AND PAVING SHALL BE IN ACCORDANCE WITH THE CITY OF SOMERVILLE REQUIREMENTS.

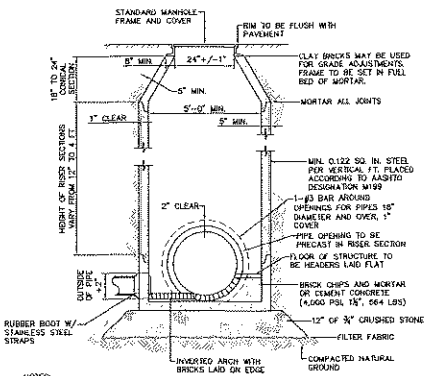
PIPE SECTION REPLACEMENT AT ACCESS POINT FOR LINING OPERATIONS

NOT TO SCALE



R&R EXIST SIGN

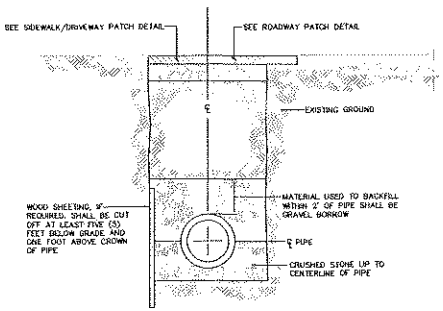
NOT TO SCALE



NOTES:
1. THROUGHLY COMPACT CRUSHED STONE BASE COURSE.
2. COMPACT SUBBASE TO 92% MAXIMUM DRY DENSITY AS DETERMINED IN ACCORDANCE WITH ASTM D-1557.

PRECAST CONCRETE MANHOLE

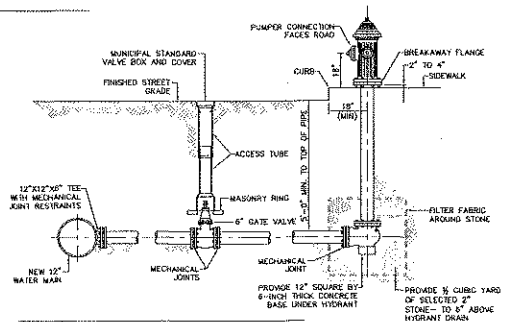
NOT TO SCALE



NOTES:
1. COMPACT BASE COURSE (GRAVEL) TO 95% MAXIMUM DRY DENSITY AS DETERMINED IN ACCORDANCE WITH ASTM D-1557.
2. COMPACT SUBBASE TO 92% MAXIMUM DRY DENSITY AS DETERMINED IN ACCORDANCE WITH ASTM D-1557.
3. COMPACT TRENCH BACKFILL TO 92% MAXIMUM DRY DENSITY AS DETERMINED IN ACCORDANCE WITH ASTM D-1557.
4. EXCAVATED MATERIAL MAY BE USED FOR FILL IN DRAINAGE STRUCTURES TO BE ABANDONED, AS DIRECTED BY ENGINEER.

TRENCH EXCAVATION

NOT TO SCALE



R&R EXISTING HYDRANT CONNECT TO NEW WATER MAIN

NOT TO SCALE

NORTH

PROJECT TEAM

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP

DETAILS

SHEET NAME:

C3.0

SHT NO:

DR BY: CAR

CHK BY: WAR

PROJ NO: 2012-027.10

DATE: 7.17.13

SCALE: N.T.S.

Description

101.20 General.

This work shall consist of clearing, grubbing, cutting, removal and disposal of all vegetation and debris from areas either within or outside of the Right-of-Way as shown on the plans or designated by the Engineer. The work shall also include the preservation from injury or defacement of all vegetation and objects designated by the Engineer to remain.

Construction Methods

101.60 General.

The burning of trees, brush, stumps, etc., will not be permitted. The Contractor shall provide other satisfactory methods of disposal without additional compensation.

The Contractor shall obtain written permission of the Engineer before storing debris within the Right-of-Way. Any clearing operations beyond the limits set by the Engineer shall be done with the approval of the Engineer and at the Contractor's expense. All such areas shall be restored to a condition acceptable to the Engineer including necessary mulching, seeding, and planting without additional compensation.

The Engineer shall be provided with notarized copies of agreements between the Contractor and owners of land used as disposal or storage areas.

~~When fencing is installed outside normal clearing areas, every reasonable effort shall be made to preserve trees or shrubs whose removal is not essential to the installation of the fencing.~~

~~Acceptable material obtained on the project may be used to produce wood chip mulch. The Contractor shall use an approved chipper and 1/4 inch knife setting as described under Subsection M6.04.3 Wood Chip Mulch. Material obtained from Elm trees shall not be accepted for use.~~

~~Wood chips produced on the project from clearing and grubbing shall be stockpiled within the location and used where and as directed.~~

~~Except for materials used for making wood chip mulch, the~~ *The* Contractor shall make all arrangements and negotiations necessary for the satisfactory disposal of trees, shrubs, stumps, roots, dead wood and other litter, in areas outside the Right-of-Way and in such manner that no condition or accumulation of material shall be permitted to disfigure or mar the finished landscape.

101.61 Clearing and Grubbing.

The stumps of all trees, brush and major roots shall be grubbed and removed in all excavation areas. ~~and under all embankments where the original ground level is within 3 ½ feet of the subgrade or slope of embankments.~~

~~All trees, stumps, and brush shall be cut off within 6 inches of the ground in embankment areas where the original ground level is more than 3 ½ feet below the subgrade or slope of embankments.~~

Trees and shrubs that are specifically designated by the Engineer not to be cut, removed, destroyed or trimmed shall be saved from harm and injury.

~~All damage done to trees by the Contractor's operations and all branches of trees extending within the roadway shall be trimmed and painted where cut as directed to provide a 20 foot minimum vertical clearance including selective trimming of trees as indicated.~~

~~101.62 Tree Trimming and Selective Clearing and Thinning.~~

~~A. General.~~

~~The work under this item shall consist of the removal of hazardous growth and dead, dying or diseased plant material; the removal of groups and individual plants which interfere with the growth of more desirable types of trees and the clearing away of lesser growth that may obscure outstanding trees, tree groups, or~~

~~scenic views. Any part of tree trunks or base of plant material located on the Location Lines shall be considered within the State Highway Limits.~~

~~Densely wooded areas shall be thinned to provide space for healthy growth by eliminating thinner, weaker trees and the reduction of number of varieties.~~

~~The Contractor's attention is called to the requirements for work under this item. The desired appearance to be attained in certain areas of heavy growth may require three or more operations. First, the obvious dead, dying and diseased trees and undergrowth shall be cut and cleared out of the area. This work includes removal of any previously fallen trees, branches, uprooted stumps and other debris as directed. Next, the area is to be thinned out, as directed, by removing the less desirable trees and brush which interfere with the growth of the better plant material. Finally, clear out lesser growth which may obscure outstanding trees, tree groups, or scenic views.~~

~~Tree up-branching and shaping under this item will be restricted to trees which have limbs and branches restricting sight distance, extending over roadways, shoulders, turn-outs, etc. Up-branching or trimming will be required to produce a 20 foot minimum vertical clearance over all locations described hereinbefore, and the removal of limbs and branches involved in this operation shall be accomplished as outlined hereafter.~~

~~B. Prosecution of Work.~~

~~(Supplementing Subsection 8.03). Quality of work must conform with accepted tree trimming practices.~~

~~All trimming and pruning shall conform to recognized tree surgery practices, and particular note should be made that painting with an approved tree dressing or paint, will be required on all cuts 2 inches or over in diameter.~~

~~The dressing or paint shall be applied no later than two days after the cuts are made.~~

~~Recognized tree surgery practices include among many others, the fact that all limbs and branches which require removal and all stubs regardless of age must be cut flush either to a union with the next larger sound limb or branch or flush to the trunk of the tree.~~

~~The cutting shall be performed by experienced woodsmen. Trained tree climbers are required for pruning of tall growth. Care shall be exercised by the Contractor to prevent injury to trees and shrubs designed to be preserved. Any injury to limbs, bark or roots of such plants shall be repaired by the Contractor, as directed, or the plants replaced without additional compensation for such repair or replacement.~~

~~C. Cutting and Treatment of Stumps and Stubble.~~

~~Standing trees, undesirable brush and existing stumps to be removed shall be cut flush with the ground and a 2" tolerance permitted and the resulting stumps or stubble then brushed or sprayed with a chemical spray material conforming to the requirements of M9.02.0 of Division III, Materials.~~

~~Application shall be by brush or spray so as to give complete coverage and wetting to the point or runoff.~~

~~This application shall be completed within two days after the cutting.~~

~~As the specified chemical herbicide is harmful to desirable roadside growth, the Contactor shall apply the chemical in such a manner that damage will not occur either from the direct spray or from drift of the chemical to any desirable growth.~~

~~The Contractor shall use all necessary precautions to prevent injury to crops or damage to other desirable growth on private abutting property, as well as to those within the Right of Way, and shall assume full responsibility for any damage.~~

~~D. Disposal of Cuttings.~~

~~The Contractor may dispose of cut material by processing into a wood chip mulch as described in Subsection M6.04.3 and spreading uniformly throughout the cleared and thinned areas as directed by the Engineer.~~

101.63 Disposal of Trees.

All trees to be cleared shall become the property of the Contractor and be disposed of outside the Right-of-Way subject to the regulations and requirements of the state and local authorities governing the disposal of such materials, at no additional compensation.

The trees, including cuttings and slash shall be disposed after cutting as soon as practicable and in such a manner as not to detract from the appearance of the roadside.

If the existing ground in the area is disturbed by any of the work or equipment, the Contractor shall rough-grade and loam and seed if necessary the disturbed areas, if so directed, without additional compensation.

101.64 Disposal of Stumps and Brush.

After removal, all stumps including the major root system shall be disposed by the Contractor at his own responsibility outside the layout where the material will not cause obstructions to streams and will not detract from the appearance of the roadside.

101.65 Disposal of Dutch Elm Diseased Wood.

Dutch Elm diseased wood shall be disposed of in accordance with the provisions of General Law, Chapter 87, Section 5 and Chapter 132, Sections 8 and 11, as amended; and in accordance with any additional local regulations.

Where the work included the removal of elm trees or the limbs of elm trees, such trees or limbs thereof shall be disposed of immediately after cutting or removal and in such a manner as to prevent the spread of Dutch Elm disease. This shall be accomplished by covering them with earth to a depth of at least 6 inches in areas outside the highway location where the Contractor has arranged for disposal.

Where the work includes the removal and disposal of stumps of elm trees, such stumps shall be completely disposed of immediately after cutting in the manner specified above.

Compensation

101.80 Method of Measurement.

~~Clearing and grubbing shall be measured by the horizontal plane area and will be the number of acres within the limiting stations of the project and/or as designated by the Engineer and the outside limits of measurement shall extend to a point 5 feet beyond the top or bottom of slopes, excluding existing roadway and shoulder surfaces, streams or bodies of water.~~

~~Areas outside of the limits specified above, when cleared and grubbed in connection with the construction of fences and noise barriers shall be computed on the basis of a 10 foot width multiplied by the total length installed, and when done in connection with excavating ditches or trenches the width shall be limited to 5 feet beyond the outer edge of the excavation.~~

~~Measurement of selective clearing and thinning will be based on the actual number of acres which receive the required attention. Approximate locations will be shown on the plans or detail sheets and as designated in the field by the Engineer.~~

~~Trees and stumps, regardless of the size, that fall within an area to be cleared and grubbed or selectively cleared and thinned shall not be measured separately for payment.~~

Only such trees as have a shortest diameter of at least 9 inches and less than 24 inches shall be included in Item 103. Trees removed (Diameter Under 24 Inches). Only such trees as have a shortest diameter of 24 inches or more shall be included in Item 104. Trees Removed (Diameter 24 Inches and Over).

~~Tree trimming shall be measured along the length of tree trimming operation. Sections along the length of the tree trimming operation where no trees are required to be trimmed for a length of 30 feet or more shall be subtracted from the total length of the tree trimming operation.~~

The item of Stumps Removed shall include the removal and satisfactory disposal of all tree stumps which remain in their original position and measure 9 inches or more in shortest diameter at the cutoff point, where

the trees have been previously removed by others. A stump shall not be construed as a tree under these specifications unless the trunk extends over 6 feet above the average ground.

Trees or stumps to be removed which have the shortest diameter specified for payment will be measured in place by the following procedure:

Where the tree consists of a single trunk extending more than a 3 foot vertical height above the average natural ground line, the shortest diameter shall be measured at the 3 foot level above the average elevation of the original ground.

Any tree whose main truck separates into multiple trunks or which has limbs or branches growing out from the main truck below the 3 foot level defined hereinbefore shall have its shortest diameter measured at the lowest point on the main trunk where multiple growth or branching out begins.

The shortest diameter of a stump shall be measured at the cutoff except that where multiple growth begins below cutoff, the shortest diameter shall be measured at the main trunk where multiple growth begins.

Measurement for payment under the respective items shall be such that any individual growth to be classed as a tree stump shall be measured in a manner to limit payment to one single tree or stump at each particular location of the individual growth. When multiple trunks with a common root system are separated at ground level each separate trunk shall be considered as an individual growth under these specifications.

The quantity of trees or stumps to be paid for will be the number actually removed by the Contractor in the completed and accepted work as determined by count.

~~Wood chip mulch produced from Cleaning and Grubbing will be measured by the cubic yard (truck load measure) at time of spreading.~~

101.81 Basis of Payment.

~~Clearing and Grubbing and Selective Clearing and Thinning will be paid at the contract unit price per acre and shall include the removal of all brush, trees, stumps and roots within the designated area. No separate payment will be made for any individual tree or stumps removed within the area of either item.~~

~~When clearing and grubbing work is not included in the proposal as a payment item, payment for any such work will be included in the excavation or borrow items.~~

Individual trees to be removed will be paid for at the contract unit price each and shall include the stump and major root systems. Only trees to be removed will be paid for at the contract unit price each and shall include the stump and major root systems. Only trees having a shortest diameter of 9 inches and over as defined in Subsection 101.80 shall be measured for payment.

~~Tree Trimming shall be paid for at the contract unit price per foot.~~

Stumps to be removed, as defined in Subsection 101.80, will be paid at the contract unit price each and shall include the major root system.

The contract unit price shall include the cost of all arrangements and methods required to protect from harm all existing overhead or underground installations. The contract unit price shall include the cost and application of all paints, dressings or spray materials.

~~No payment shall be allowed for preparation and spreading of wood chip mulch used from areas included under Selective Clearing and Thinning. Wood chip mulch directed to be produced from Clearing and Grubbing shall be paid for complete in place at the contract unit price.~~

101.82 Payment Items.

~~101.~~	~~Clearing and Grubbing~~	~~Area~~
~~102.~~	~~Selective Clearing and Thinning~~	~~Acre~~
~~102.1~~	~~Tree Trimming~~	~~Foot~~
~~103.~~	~~Tree Removal (Diameter Under 24 Inches)~~	~~Each~~
~~104.~~	~~Tree Removal (Diameter 24 Inches and Over)~~	~~Each~~
~~105.~~	~~Stump Removal~~	~~Each~~
~~767.4~~	~~Wood Chip Mulch~~	~~Cubic Yard~~

Description

119.20 General.

The work to be done consists of the control (extermination) of rodents, prior to the *start of construction as* ~~demolition of buildings, in dump areas, land fills or other areas so~~ designated by the Engineer.

119.60 Control (Extermination)

This work shall consist of two (2) phases as follows:

1. Initial Treatment.

This phase shall start immediately after execution of the Contract and shall be applied in ~~all buildings to be razed and to all other buildings and~~ areas within the limits of construction where, in the Engineer's judgement, rodents have gathered or may gather during the construction period. A toxic material consisting of zinc phosphide pre-packaged acute toxicants or another acute anti-coagulant which has been approved by the Massachusetts Department of Food and Agriculture-Pesticide Board, with a suitable bait shall be used. The treated bait shall be placed in all *manhole* structures *impacted by construction* ~~to be demolished~~ so as to attract the greatest possible number of rodents; and in accordance with best practice.

2. Maintenance

One week (more or less, as directed) after the "Initial Treatment", the Contractor shall start a program of maintenance to rid the *manhole* structures and adjacent areas within the limits of this Contract of any remaining rodents, their carcasses, and to prevent their migration to other adjacent areas. The toxicant should be an acute anti-coagulant pre-mixed bait and used in accordance with the labeled and regulatory laws.

All visible carcasses of rodents shall be removed and disposed satisfactorily.

The toxic bait shall be renewed semi-monthly or as directed, throughout said maintenance period until *the work has been completed* ~~structures have been demolished and the cellar holes have been filled to the extent required~~.

All extermination operations shall be in accordance with the rules and regulations of the Municipality and State Health Departments.

Compensation

119.81 Basis of Payment.

The work will be paid for at the contract lump sum price

119.82 Payment Items.

119. Rodent Control **Lump Sum**

Description

120.20 General.

This work shall consist of excavation, disposal or compaction of all materials not being removed under some other item which is encountered within the limits of the Contact in accordance with the specifications and in close conformity with the lines, grades, thicknesses and cross sections shown on the plans or established by the Engineer. All excavation will be classified as ~~"Earth Excavation", "Class A Rock Excavation", "Muck Excavation", "Topsoil Excavated and Stacked", "Bituminous Concrete Excavation by Cold Planer", and~~ "Unclassified Excavation"~~, as hereinafter described~~.

Materials from all classes of excavation which are unsuitable, and any surplus of suitable materials remaining after completing the formations of embankments, shoulders, approaches, widening of roadway or embankment slopes as directed or backfilling, will be known as waste and shall be disposed of by the Contractor outside the Right-of-Way at his responsibility and expense, unless otherwise directed. Waste material shall not be disposed of in the flood channel of any stream.

Existing concrete foundations, if not interfering with the proposed construction, may be abandoned in place with approval of the Engineer. Foundations under the roadway surface shall be removed to a depth of 3 feet below finished grade. Foundations outside the roadway surface shall be removed to a depth of 1 foot below the proposed finished grade.

~~**120.21 Earth Excavation.**~~

~~Earth Excavation shall consist of all excavations not included as Class A Rock Excavation or excavation which is otherwise classified and paid for.~~

~~Unless otherwise provided for in the Contract, Earth Excavation shall also include as incidental to the general work of the removal and disposal of abandoned junk cars, trash, signs, fences, guardrail, guide posts, bituminous concrete berms and debris of every nature.~~

~~**120.22 Class A Rock Excavation.**~~

~~When encountered within the limits of roadway or channel excavation unless otherwise provided for the Proposal.~~

~~Class A Rock Excavation shall consist of:~~

~~1. Igneous, metamorphic and sedimentary rock which cannot be excavated without blasting or the use of rippers.~~

~~2. All rock, stone, parts of stone, brick or cement concrete pavement, parts of cemented stone walls or masonry stone structures measuring one (1) cubic yard or more that require blasting for removal.~~

~~**120.23 Muck Excavation.**~~

~~Muck excavation shall consist of the removal and disposal of saturated or unsaturated mixtures of soils of organic matter not suitable for foundation material regardless of moisture content.~~

~~**120.24 Topsoil Excavated and Stacked.**~~

~~The work to be done under this item consists of excavating topsoil from certain locations listed on the details sheets and where directed, to the depths shown on the cross sections or as directed, and stacking the topsoil in accordance with the provisions of Subsection 120.65.~~

120.25 Hot Mix Asphalt Pavement Milling.

This work shall consist of milling and removal of existing Hot Mix Asphalt (HMA) pavement courses from the project by the Contractor. Milling shall be performed in conformity with the limits, line, grade, and typical cross-section shown on the plans. The milled material shall become the property of the Contractor.

120.26 Unclassified Excavation.

This work shall consist of all earth excavation ~~as specified in Subsection 120.21, rock excavation as specified in Subsection 120.22 and all other excavation not provided elsewhere in contract~~.

120.27 Track Excavation.

This work shall consist of excavation and satisfactory disposal for the removal of existing buried railroad tracks where shown on the plans or encountered during excavation activities.

120.28 Sawing Asphalt Pavement.

This work shall include the sawcutting of existing pavements at limits of pavement patching, reset curbing, and as directed by the Engineer.

120.29 Health and Safety Plan.

It is the Contractor's ultimate responsibility to ensure the health and safety of all the Contractor's employees and subcontracting personnel, the Engineer and his representatives, and the public from the physical and chemical hazards resulting from the work.

A Health and Safety Plan (HASP) shall be prepared by a Certified Industrial Hygienist or other experienced individual with the appropriate OSHA required training to prepare such a plan. It shall include the components required by OSHA 29 CFR 1910.120 (B). The preparer's name and work experience shall be included as part of the Health and Safety Plan submittal. The plan shall be designed to identify, evaluate, and control health and safety hazards and provide for emergency response if needed. The Health and Safety Plan shall be a dynamic document with provisions for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations that may affect site workers and the public. Health and safety procedures provided by the Contractor shall comply with all the appropriate regulations that address employee working conditions (e.g. OSHA, RCRA, CERCLA). In addition, guidelines of NIOSH, OSHA, USCG, EPA, etc., shall be followed. Equipment used for the purpose of health and safety shall be approved and meet pertinent standards and specifications of the appropriate regulatory agencies.

The Health and Safety Plan shall be submitted to the Engineer for approval at least two weeks prior to commencement of work. The review and acceptance of the plan by the Engineer does not relieve the Contractor of the responsibility for attaining the required degree of protection and training or for compliance with all laws, rules, regulations, standards or guidelines in effect during the execution of the Contract.

A copy of the Health and Safety Plan shall be maintained on-site at all times by the Contractor. The on-site copy shall contain the signature of the Engineer. The employee's signature on the Health and Safety Plan shall be deemed prima facie evidence that the employee has read and understands the plan. A copy of the plan with signatures shall be submitted to the Engineer at the conclusion of the Contract or at the Engineer's request. Signature sheets shall be submitted monthly, or at the request of the Engineer.

120.30 Implementation of Health and Safety Plan.

For all construction activities that require handling or exposure to potentially hazardous materials or physical harm, the Health and Safety Plan shall specify an on-site Safety Officer. The site Health and Safety Officer's duties shall include but are not limited to implementation of the Site Health and Safety Plan, training, evaluating risks, safety oversight, determining levels of personnel protection required, and performing any required monitoring at the site. A Daily Log shall be kept by the on-site Safety Officer and provided weekly to the Engineer. This log shall be used to record a description of the weather conditions, levels of personnel protection being employed, monitoring data, and any other information relevant to on-site safety conditions. The Site Health and Safety Officer shall sign and date the Daily Log.

In the event that subsurface contamination is discovered during construction, the Site Safety Officer shall be present to oversee all handling, storage, sampling, and transport of such contaminated materials.

The level of protection relative to respiratory and dermal hazards required to ensure the health and safety of on-site personnel will be stipulated in the Health and Safety Plan and will be subject to modification by the On-Site Safety Officer based on changing site and weather conditions and the following factors: type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, physical state of

the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, necessary personnel and equipment, and type of equipment to be utilized.

The Contractor shall be required to provide appropriate personnel protective equipment for anyone who is working in an area either containing or suspected of containing hazardous materials. This work will include both individuals physically working in these areas and those directing the work of same. Contingencies for upgrading the level of protection for on-site workers will be identified in the Health and Safety Plan, and the Contractor shall have the necessary materials/equipment on hand to implement the level of protection upgrade in a timely manner. Payment for this level of upgraded protection shall be paid for under Item 128.03.

120.31 Personnel Protection Level C Upgrade.

The Contractor shall provide to all workers disposable protective clothing appropriate to the hazard level of the work. The protective equipment and its use shall be in strict compliance with the Health and Safety Plan (Item 128.01) and all appropriate regulations that address employee-working conditions.

120.32 Monitoring/Handling and Stockpiling of Contaminated Soils.

The On-Site Safety Officer or Environmental Consultant shall be responsible for evaluating soil with non-natural discoloration, petroleum or chemical odor, the presence of petroleum liquid, sheering on the groundwater surface, or any abnormal gas or materials in the ground which are known or suspected to be contaminated with oil or hazardous materials. Soil suspected of gasoline contamination shall be field tested using the jar headspace procedures according to DEP Bureau of Waste Site Cleanup Interim Policy #WSC-94-400 "Reuse and Disposal of Contaminated Soils At Landfills" and the Bureau of Waste Prevention Interim Policy #BWP-94-037. The Engineer shall be contacted immediately when any results indicate contamination requiring soil removal, or when contamination not detectable by on-site instrumentation is suspected.

The Contractor shall be required to supply all personnel and materials necessary to comply with this section and to support the anticipated levels of protection and monitoring described above. In cases where hazardous materials have been identified, the Contractor shall procure the services of a Licensed Site Professional (LSP) to assist in the management of the materials in accordance with the Massachusetts Contingency Plan (MCP), 310 CMR 40.000.

Soil test borings were performed along Beacon Street in June, 2012 and screened with a photoionization detector using the DEP's Jar Headspace method. All readings were at background concentrations (~<1 ppm). However, due to the urban condition of the project area, it is possible that excavated soils may be contaminated. Where possible, all soils originally in contact with groundwater will be replaced in the same trench up to the existing groundwater level. All soils determined to be contaminated by metals or petroleum products through the monitoring/evaluation program will be stockpiled for disposal in accordance with all DEP statutes, policies, and regulations.

The Environmental Consultant/Contractor shall be responsible for identifying a disposal/recycling facility and obtaining all permits, approvals, Bills of Lading, etc. prior to the removal of the contaminated soil from the site. Any soils contaminated with hazardous materials that are not of petroleum origin shall be handled on a case-by-case basis. The Contractor shall obtain at least three (3) bids for the handling and disposal of any contaminated material. All manifests, Bills of Lading, etc. will be the responsibility of the Contractor with copies provided to the Engineer. The Contractor is also responsible for hiring LSP services as needed for oversight and management of Bills of Lading, etc.

120.33 Disposal of Contaminated Soil.

The Contractor and their LSP shall be responsible for the proper disposal or recycling of contaminated soils. The classification of the soil types and the proper methods of disposal and recycling of these soils shall comply with the methods described under subsection 120.34 and in accordance with all DEP and EPA statutes, policies, and regulations.

120.34 Treatment of Contaminated Groundwater.

Soil test borings were performed along Beacon Street in June, 2012 and screened with a photoionization detector using the DEP's Jar Headspace method. All readings were at background concentrations (~<1

ppm). However, due to the urban condition of the project area, it is possible that contaminated groundwater may be encountered during trench excavations. It is possible that treatment of the contaminated groundwater will be required to complete the work under this contract. The methods described under subsection 120.34 provide for the identification, testing, management and treatment or disposal of contaminated groundwater and shall be implemented, at a minimum and as necessary by the Contractor via methods under subsection 120.34.

It is not the intent herein for these specifications to design for or specify to the Contractor which particular treatment is to be used if necessary. Rather, it is the intent to provide guidance to the Contractor and their LSP for informational and bidding purposes only. It is, therefore, the Contractor and their LSP's responsibility to use a treatment method that allows him/her to meet any and all laws, regulations, policies, guidelines, and permit requirements.

The overall handling and management of contaminated groundwater is regulated by DEP under the provisions of 310 CMR 40.000. The un-permitted discharge of contaminated dewatering effluent into the environment (storm drain, surface water body, onto the ground) is a violation of several federal, state and local laws and regulations.

Should dewatering of contaminated groundwater be necessary, approvals must be sought from the appropriate regulatory jurisdiction.

The Contractor shall consider the following four options:

1. *Pumping to a tight tank or "vacuum truck" with subsequent treatment/disposal at an off-site approved facility.*
2. *Discharging to a sanitary sewer with appropriate permit from local and regional sewerage authorities and DEP.*
3. *Discharging to a storm drain or surface water body with permit or approval from DEP and/or the EPA or*
4. *Discharging to the ground with the approval from DEP.*

Generally, the utilization of options (2) through (4) involves treating the contaminated groundwater prior to discharge. Treatment of contaminated groundwater for dewatering operations is generally performed using a mobile treatment trailer equipped with one or more granular-activated carbon (GAC) canisters, although other techniques are also used.

For short-term operations, treatment and discharge to surface water body/storm drain may be the most cost-effective and expedient alternative. In such cases, a short-term exemption from the permitting provisions of the National Pollutant Discharge Elimination System (NPDES) may be approved by the EPA, via the Regional Office in Boston, Massachusetts.

The EPA will not specify a treatment system or method but normally requires that the treated discharge water meet Massachusetts Drinking Water Standards. The Contractor shall be responsible for determining compliance with the requirements of the obtained Permit and also for any sampling, testing, and disposal required in connection with said Permit. The Contractor is also advised that additional requirements may be administered by the local sewer authority. The City reserves the right to collect additional samples of dewatered groundwater to determine the Contractor's compliance with the Permit's requirements.

Long term discharges to surface waters or storm drains and any discharge to the ground requires approval and/or issuance of a permit from the Division of Water Pollution Control, (DEP), under the provisions of 314 CMR 3.00 and 5.00, respectively. In such cases, contact DEP, Division of Water Pollution Control, One Winter Street, Boston, MA 02108.

For the purpose of these specifications and to establish a basis for the bid, it is anticipated that granular-activated carbon will be the treatment medium for dewatered contaminated groundwater. The bidder shall factor into the payment item all costs associated with the testing and analyses that may be required by the permitting agency. In addition, any laboratory testing of groundwater is to be performed by a DEP certified laboratory for the parameters being tested. Copies of all field and laboratory testing results will be supplied to the Engineer. Bid price shall also include full compensation for labor, materials, maintenance, mobilization, rental, and other related costs. Item 128.07 will be used for disposal of used granular-activated carbon canisters.

120.35 Disposal of Granular Activated Carbon.

Work under Item 128.07 is based upon the use of granular-activated carbon as the treatment medium for contaminated groundwater (Item 128.06) that is found during excavations in which contaminated groundwater is encountered.

120.36 Disposal of Treated Wood Products.

Work under this item shall consist of the removal and disposal of treated wood products, including railroad ties that may be located within the work area. The Limit of Work is in an area that has historically been used as a passage for mass transit, and unknown abandoned track locations should be expected. The removal of known and unknown ties shall be completed by their total removal and backfilling of the excavation with compacted fill. The removal and backfilling of tracks shall be included in the specific task for Track Excavation (Item 129.5).

120.37 Temporary Utility Pole Support.

It is anticipated that installation of utilities will require temporary support of the existing utility poles along Beacon Street. The Contractor shall coordinate with the appropriate utility company for the temporary utility pole support as required. The Contractor shall take full responsibility for coordination and implementation of the temporary utility pole support necessary to complete the work.

Construction Methods

120.60 General

A. Sequence of operations.

When required, the Contactor shall so prosecute his work that traffic will be maintained over and through the work with a maximum of safety and convenience in accordance with the provisions of Subsection 7.09, "Public Safety and Convenience".

The sequence of all excavation operations, earth or rock, shall be such as to insure the most efficient utilization of excavated materials into embankments (as specified in Section 150) and the use of a minimum amount of borrow. When the plans require excavation in areas in close proximity to existing roads, structures and utilities it shall be the responsibility of the Contactor at his expense to construct suitable drainage ditches or use other satisfactory means and methods to protect and maintain the stability of such roads, and structures located immediately adjacent to but outside the limits of excavation.

The Contactor's attention is directed to the requirements of the Prevention of Water Pollution and Erosion. The Contactor shall prosecute the work as to prevent the ponding of water. Each lift of excavation shall be visibly crowned to allow drainage of surface and rain water.

B. Disposal of Excavated Materials.

All suitable materials obtained from the excavation or from the removal of present structures shall be used either in the formation of embankment, shoulders, slopes, loam or clay hardening, etc., or for backfill under, over or around structures, pipe culverts or drains and at such other places as directed and the material shall be placed and compacted in a manner conforming to the specifications for the particular type of work required without additional compensation. It shall be the Contactor's responsibility to obtain from the Engineer approval for the use and placing of various materials encountered in excavation.

It shall be the Contractor's responsibility to dispose of material designated as unsuitable and any excavated material which is not required, except as noted in Paragraph C of this subsection, outside of the Right-of-Way in such a manner as not to obstruct streams or otherwise impair the drainage, appearance, safety or efficiency of any structure or any other part of the road.

No materials from the excavation, nor from construction, shall be deposited in flood plains nor within 100 feet of any body of water without compliance under provisions of Chapter 131, Section 40 of the Massachusetts Wetlands Protection Act. Notifications to the Engineer, in writing, will be required wherein such filling has been authorized by the local Conservation Commission.

No excavated material shall be placed outside of and adjacent to the Right-of-Way without the written approval of the Engineer. The Contractor shall certify he has proper releases from property owners within 500 feet of Right-of-Way which is used as disposal areas for unsuitable material.

The Contractor shall construct sod or other adequate retaining banks around perimeters of the disposal areas outside the project to protect existing roads, or contaminated by, the excavated material. Stream channels and ditches within and adjacent to the project shall be maintained as at the present or as specifically altered by the design of the project.

All waste areas shall be thoroughly stabilized by means of drains, proper grading, mulching, loaming and seeding as required to promote vegetation and to insure the areas will not be subject to erosion.

C. Grading Outside of the Location.

Where directed, earth, loam, or borrow of the kind required shall be used for grading outside the Right-of-Way and the surface shall be raked, smoothed and rolled. Excavation shall be made as directed on slopes or surfaces outside of and adjoining the location.

When temporary or existing roads are abandoned within the limits of highway work and beyond the limits of the main roadway slopes, their surfaces shall be removed and graded and loamed for a neat and natural appearance for proper drainage of surface water, as directed.

~~**120.61 Earth Excavation.**~~

~~This work shall be performed in the manner specified in Subsection 120.60 and Subsection 170.60.~~

~~**120.62 Class A Rock Excavation.**~~

~~Class A Rock Excavation shall be performed in accordance with the requirements specified in Subsection 120.60, with the following additional requirements:~~

~~The Contactor shall prosecute his work so that all rock available for disposal in embankments shall be removed previous to the final embankment formation. Rock shall be partially or completely stripped of overburden, as directed, before removal operations are begun. Loose or shattered fragments of rock which may be a hazard to traffic shall be removed from the slopes.~~

~~**120.63 Presplitting Rock.**~~

~~Presplitting shall be required in rock cuts 10 feet or more in vertical height where designed slope is 1 horizontal to 4 vertical or steeper. Rock cuts more than 25 feet in vertical height may be presplit in stages (lifts) at the option of the Contractor, provided that no stage shall be less than 10 feet and further provided that no payment will be made for additional excavated quantities caused by offsetting presplitting holes beyond the specified face in the top on successive stages. Presplitting holes in successive stages shall be offset not more than 2 feet inside of the previously split face.~~

~~Prior to blasting of any rock for removal, the Contactor shall presplit the rock along the designated cut face by the method hereinafter described to produce a uniform plane of rupture, so that the resulting face will not be affected by subsequent fragmentation blasting and excavation operations.~~

~~The Contactor shall adjust his blasting operations according to the characteristics and structure of the rock formation to obtain the required slope without fracturing the rock beyond the split face.~~

~~The sequence of operations shall be as follows, unless otherwise directed:~~

1. ~~Remove all overburden soil within the areas of proposed fragmentation blasting to expose the rock surface.~~
2. ~~Drill 2 ½" or 3" normal diameter holes not more than 3 feet on centers along the top of the proposed slope line and at the required inclination, to the full depth of the cut or to a predetermined stage (lift) elevation. Presplit holes shall deviate not more than ½ foot at any point from the plane of specified slope, nor more than 1 foot at any point from a vertical plane through the top of the hole and normal to the plane of slope.~~

3. Fragmentation blast holes shall be positioned so that no portion of any blast hole shall be within 4 feet of the designated presplit face, unless otherwise permitted by the Engineer.

   The plane of presplitting slope as originally drilled shall not be penetrated by subsequent fragmentation blast holes.

4. The Contractor shall inspect and test each hole to determine the possible presence of any obstruction before placing the charge. No loading shall be permitted until the hole is clear of all obstructions. Precautions shall be used in placing the charges to prevent caving in of material from the wall of the hole.

5. Cartridge explosives prepared and packaged by explosive manufacturing firms and approved by the Engineer shall be used in presplitting holes except, with prior permission of the Engineer, either of the following charges may be used as an alternative provided the results are satisfactory:

   a. Continuous column commercial explosives manufactured especially for presplitting.

   b. Multiple strands of high strength (175-200 grains of explosive per foot) detonating fuse (Primacord) taped together at 4' or 6' intervals.

6. The spacing of the dynamite charge in each hole shall be accomplished by securely taping (or attaching by other approved means) each piece of dynamite to the detonating fuse at the selected intervals or by deckloading. If the latter method I used, the dynamite must be in intimate contact with the detonating fuse to assure detonation of all charges.

7. All space in each hole not occupied with the explosive charge shall be filled with 3/8" crushed stone meeting the requirements of Materials Subsection M2.01.6. No other material or type of stemming will be permitted.

8. The detonation of presplit charges shall precede the detonation of adjacent fragmentation charges within the section by a minimum of 25 milliseconds.

120.64 Muck Excavation.

The work of muck excavation shall be performed in accordance with the requirements of Subsection 120.60 with the following additional requirements:

Muck shall be excavated to the estimated widths and depths shown on the plans and/or so as to completely remove the muck. Where a proposed bridge or other structure comes within the limits of muck excavation, that portion of the excavation within the limits of the proposed structure will be paid for as Muck Excavation.

120.65 Topsoil Excavated and Stacked.

This work shall consist of removing topsoil and stacking it where and as directed in accordance with the relevant requirements of Sections 120 and 751.

Such of the topsoil as it will be selected, after testing by Department of material obtained by test pits, shall be stacked neatly outside the limits of the proposed slopes within the Right of Way or such material may be temporarily stacked by the Contractor outside the Right-of-Way for his own convenience, with the approval of the Engineer, in which case the Contractor shall be responsible for all arrangements and negotiations. If the material stacked outside the Right of Way is not available when needed for use on the project, the Contractor will furnish at his expense an equal volume of equal material.

If the temporary storage areas outside the Right of Way require clearing and grubbing, the Contractor shall do such work without additional compensation.

Storage areas shall be cleared, grubbed and rough graded so that the maximum amount of stacked material will be available for reuse.

The Contractor shall take reasonable care to avoid leaving and unsightly condition and to avoid any unnecessary damage or injury to natural surrounding and roadside growth. The landscape shall be left in a satisfactory, neat and trim condition upon completion of the work.

120.66 Hot Mix Asphalt Pavement Milling.

This work consists of removing bituminous concrete by Cold Planer in designated areas. The Cold Planer must be equipped with an elevating device capable of loading planed material directly into dump trucks while operative. It shall have all necessary safety devices such as reflectors, headlights, taillights, flashing lights, and back up signals so as to operate safely in traffic both day and/or night.

~~For night time planning operations the temporary illumination of the paving area shall be in accordance with the requirements of Section 850, and shall require an approved lighting plan before any planing work begins.~~

The Cold Planer shall be designed and built for planing flexible pavements and possess the ability to plane cement concrete patches when encountered in bituminous pavement. It shall be self-propelled and have the means for planing without tearing or gouging the underlying surface. Variable lacing patterns shall be provided to permit a rough grooved or smooth surface as directed.

A three inch cut to predetermine grade or any specified lesser depth may be required in one pass. The minimum width of pavement planed in each pass shall be six feet, except in areas to be trimmed and edged. The machine shall be adjustable as to crown and depth and meet the standards set by the Air Quality Act for noise and air pollution.

The milled or planed surface shall conform generally to the grade and cross slope required. The surface shall not be torn, gouged, shoved, broken or excessively grooved. It shall be free of imperfections in workmanship that prevent resurfacing after this operation. Surface texture shall be as specified by the Engineer and excess material shall be removed so that the surface is acceptable to traffic as required.

120.67 Unclassified Excavation.

This work shall consist of the excavation, removal and satisfactory disposal, in accordance with the relevant provisions of Section 120.60 of all materials listed under Section 120 necessary for the construction of the proposed work as shown on the Plans or as directed, except those materials for which payment is specified under other items of the Contract.

120.68 Track Excavation.

Track Excavation shall consist of the excavation and satisfactory disposal for the removal of existing buried railroad tracks where shown on the plans or encountered during the excavation activities that will be an obstruction to the proposed work. Railroad ties, if encountered, shall be disposed of in accordance with local and state laws and shall be paid for under Item 128.08 Disposal of Treated Wood Products. Railroad beds shall be backfilled with approved material, to the original grade.

120.69 Sawing Asphalt Pavement.

Sawcut equipment shall be approved by the Engineer prior to commencing work.

All edges of excavations made in sawcutting pavements and sidewalks shall be squared by sawcutting with power-driven tools to provide a neat, clean edge for joining new pavement and sidewalks as shown on the Plans. Ragged, uneven edges will not be accepted. Areas that have been broken or undermined shall be edged neatly with a minimum disturbance to remaining pavements or sidewalks.

Sawcut surfaces shall be sprayed or painted with a uniform thin coat of RS-1 asphalt emulsion immediately before placement of bituminous concrete material against surface.

Compensation

120.80 Method of Measurement.

All classes of excavation ~~except topsoil~~ will be measured in their original position by the cross section method except where such measurement is impracticable the volume shall be measured by such other methods as the Engineer may determine.

In any case, payments will be made only for the excavation to lines and grades as indicated on the plans or as directed.

~~Pay limits for rock excavation actually removed will be as follows:~~

~~1. For side slopes.~~

~~a. In excavation for side slopes up to a limit of 24 inches beyond and parallel to slope lines either shown on the plans or ordered in writing by the Engineer.~~

~~b. No allowance will be made for rock excavation beyond these specified lines in side slopes except that if ordinary borrow is required for the work and excess rock excavation is used in embankments such rock will be paid for as ordinary borrow.~~

~~2. Rock excavation in curb and edging trenches not already paid for in previous rock excavation will be paid up to a width of 18 inches, providing rock extends to that width.~~

~~3. For areas between side slopes.~~

~~a. In excavation to subgrade an allowance of a depth of 6 inches below subgrade lines.~~

~~b. In any other rock excavation an allowance of a depth of 6 inches below lines of proposed excavation.~~

~~Boulders which are to be included in the item for rock excavation will be measured at the point of removal.~~

~~Presplitting of rock will be measured by the square yard of exposed rock face, measured from the top of exposed rock to the bottom of the Class A Rock Excavation at the presplit face, as directed.~~

~~Topsoil excavation will be measured in its original position by measuring the surface area of topsoil to be removed and measuring the depth to be removed by test pits prior to removal, or by the cross section method as determined by the Engineer.~~

Pavement Milling will be measured by the square yard to the limits shown on the plans or as directed.

Track Excavation shall be measured by the foot.

Disposal of Treated Wood Products shall be measured per ton.

Sawing bituminous concrete will be measured for payment by the linear foot on the pavement surface.

Monitoring/handling and Stockpiling of Contaminated Soils will be measured by the volume, in cubic yards, of documented contaminated material monitored, handled and/or stockpiled as described under Item 128.04.

Disposal of Contaminated Soil shall be measured by the weight of contaminated material removed from the site and delivered to an approved landfill, disposal facility, or recycling facility and includes any costs for approvals, permits, testing, transportation, and disposal.

Treatment of Contaminated Groundwater shall be measured as the number of gallons disposed or contaminated groundwater pumped through the granular-activated carbon (Item 128.06) as the medium for the treatment of contaminated groundwater that is found in pipe trenches, manhole excavations, catch basin excavations that need to be dewatered.

Temporary utility pole support shall be paid for at the contract unit price per pole.

120.81 Basis of Payment.

All classes of excavation will be paid for at the contract unit price per yard of the particular type of excavation as defined hereinafter.

In Contracts where ordinary borrow is required, excavated material taken by the Contactor with the prior written permission of the Engineer, and used on the project for purposes other than for forming embankments will be paid for at the contract price for the purpose of which it is used, in addition to the payment to be made for excavation, provided that any additional filling material made necessary by such use shall be replaced except Bituminous Concrete excavated by Cold Planer.

The amount of borrow to be replaced shall be as follows:

~~1. If Class A Rock Excavation is used in revetment, the revetment shall be measured in its final position, and this computed quantity shall be divided by 1.20 and the resulting quantity shall be the amount of borrow to be replaced.~~

2. If Earth Excavation is used for gravel borrow, special borrow, etc., the amount of gravel borrow, special borrow, etc., as computed (including any percentage added to in place measurement) shall be the amount of borrow to be replaced.

   Payment shall be made only for the purpose the borrow was used until such time as replacement borrow is supplied, at which time an equal volume of excavation will be paid for.

In Contracts where excavated materials are used as described in the paragraph above and no additional filling material is required, the following will govern:

1. Material such as gravel, sand, special borrow, or impervious soil borrow obtained in excavation and used as gravel, sand borrow, special borrow or impervious soil borrow will be paid for only at the contract price for the proposed use.
2. Topsoil obtained in excavation and stacked for future use on the project will be paid for at the contract unit price for the item of Topsoil Excavated and Stacked (which price will include excavating for test pits required) but if such future use necessitates rehandling and spreading, payment will also be made at the contract unit price for Topsoil Rehandled and Spread.

~~3. No deduction from the item of Class A Rock Excavation will be made on account of the use of boulders or rock fragments in masonry or in revetment.~~

~~Presplitting of rock will be paid for at the contract unit price per square yard of exposed presplit rock face.~~

Pavement Milling will be paid for at the contract unit price per square yard and shall include temporary illumination.

Track Excavation will be paid for at the contract unit price per foot of track (2 rails) removed.

Disposal of Treated Wood Products will be paid at the Contractor bid price per ton, which payment shall be considered as full compensation for all labor, tools, equipment, permits, shipping papers and materials required to do the work as described above and in accordance with local and State rules and regulations.

Sawing bituminous concrete will be paid for at the Contract unit price per linear foot, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

No separate payment will be made for sawcutting required for installing granite curbing, but all costs in connection therewith shall be included in the unit price bid under their respective Items.

The work to be done under the item Health and Safety Plan shall be paid at the contract lump sum price under Item 128.01 for the development and preparation of the HASP by a qualified individual.

Implementation of the Health and Safety Plan will be paid at the hourly contract bid price and shall include the cost of enforcement by an on-site Safety Officer. Personnel protective clothing and equipment below Level "C" shall be considered incidental to the project and shall be a cost borne by the Contractor.

The work to be performed under item Personnel Protection Level C Upgrade shall be paid at the contract unit price per man hour required in assumed Level 'C' personnel protection, including all additional labor, materials, and equipment.

Monitoring/handling and Stockpiling of Contaminated Soils shall be paid for at the contract unit price, per cubic yard, which payment shall be considered compensation for all labor including monitoring, LSP, tools, equipment, and materials needed to do the work as described above.

Disposal of Contaminated Soils shall be paid at the contract unit price per ton, which payment shall be considered as full compensation for all labor, tools, equipment, permits, shipping papers, and materials required to do the work as described above.

Treatment of Contaminated Groundwater shall be paid for at the contract unit price per gallon of groundwater pumped, which price shall be full compensation for all necessary labor and materials,

mobilization, maintenance, demobilization of the appropriate unit(s), freight, and rental costs, field and laboratory testing costs and permits. Costs associated with the disposal of granular-activated carbon shall be covered under Item 128.07.

Disposal of Granular Activated Carbon shall be paid for at the contract unit price per pound of carbon used. All other costs associated with treatment of contaminated groundwater will be covered under Item 128.06 Treatment of Contaminated Groundwater.

Disposal of Treated Wood Products shall be paid for at the contract unit price per ton, which payment shall be considered as full compensation for all labor, tools, equipment, permits, shipping papers and materials required to do the work as described above and in accordance with local and State rules and regulations.

Temporary utility pole support shall be paid for at the contract unit price per pole and shall include the cost of coordination, approvals, permits and charges by the utility company for the temporary utility pole support. No extra claims for payment due to utility back charges from the utility company to the Contractor shall be allowed.

120.82 Payment Items.

~~**120. Earth Excavation**~~	~~**Cubic Yard**~~
120.1 Unclassified Excavation	**Cubic Yard**
~~**121. Class A Rock Excavation**~~	~~**Cubic Yard**~~
~~**122. Presplitting Rock**~~	~~**Square Yard**~~
~~**123. Muck Excavation**~~	~~**Cubic Yard**~~
~~**125. Topsoil Excavated and Stacked**~~	~~**Cubic Yard**~~
128.01 Health and Safety Plan	***Lump Sum***
128.02 Implementation of Health and Safety Plan	***Hour***
128.03 Personal Protection Level C Upgrade	***Hour***
128.04 Monitoring/Handling and Stockpiling of Contaminated Soils	***Cubic Yard***
128.05 Disposal of Contaminated Soil	***Ton***
128.06 Treatment of Contaminated Groundwater	***Gallon***
128.07 Disposal of Granular Activated Carbon	***Pound***
128.08 Disposal of Treated Wood Products	***Ton***
129. Pavement Milling	**Square Yard**
129.5 Track Excavation	***Foot***
129.7 Temporary Utility Pole Support	***Per Pole***
482.3 Sawing Asphalt Pavement	***Foot***

Description

140.20 General.

Excavation for ~~foundations of bridges, culverts, pipe drains, masonry walls, other~~ structures, *sewers* and test pit excavation to determine the location of underground utilities shall be made to the depth and lines indicated on the plans or established by the Engineer.

~~140.21 Bridge Excavation.~~

~~Bridge excavation shall include excavation required for construction of bridges, culverts having a clear square span of 8 feet or more, end walls and wingwalls that are part of these structures and major wall structures as designated in the Contract Documents.~~

~~The excavation shall include the removal and satisfactory disposal of materials including piles, sheeting and timbers encountered in these constructions.~~

~~In areas where unsuitable material is removed and backfilled under Item 123, Muck excavation, the excavation of the backfill shall be included under bridge excavation.~~

~~All other material encountered in the above noted construction, except that classified as Class B Rock Excavation and Muck Excavation as defined in these specifications, will be classified as Earth Excavation.~~

~~140.22 Class A Trench Excavation.~~

~~Unless otherwise shown on the plans, Class A Trench Excavation shall include the removal and satisfactory disposal of all materials, except Class B Rock Excavation that are encountered in the construction or demolition of masonry culverts and other structures having a clear square span of less than 8 feet, masonry inlets, culvert ends, masonry walls, revetment, test pits, paved waterways, construction of drains for slope or subgrade stabilization and in the construction, widening, straightening or deepening of drainage ditches and water courses in connection with pipes or structures having a clear span of less than 8 feet.~~

~~Test pits to locate underground services shall be excavated where directed and will be classed as Class A Trench Excavation. The Contractor shall take special care during this excavation to avoid damage to any underground structures or utilities. When necessary the Contractor shall cooperate with representatives of public service companies in order to avoid damage to their structures by permitting them to erect suitable supports, props, shoring or other means of protection.~~

140.23 Class B Trench Excavation.

Class B Trench Excavation shall include the removal and satisfactory disposal of all materials, except Class B Rock Excavation, encountered in the construction of ~~drainage~~, *sewer* and water pipes greater than 5 foot maximum depth specified in Section 200.

Trench excavation for pipe laying in roadway cuts shall include only that portion of the trench which is below the roadway excavation except where the Engineer orders in writing, that the trench excavation and its backfill shall be completed before the roadway excavation is begun.

~~140.24 Channel Excavation.~~

~~Channel excavation shall include the removal and satisfactory disposal of all materials other than those classified as Bridge Excavation, Trench Excavation, Muck Excavation or Rock Excavation when encountered in the excavation for streams or rivers or excavation on new locations for same in connection with drainage structures having a clear span of 8 feet or more.~~

~~140.25 Class B Rock Excavation.~~

~~This item shall include the removal and satisfactory disposal when encountered in the excavation for drainage structures, fences, highway guard, posts, bounds, pipes, ducts, walls, open trenches and bridge structures of:~~

a. Boulders measuring 1 cubic yard or more and all solid rock that requires blasting or breaking by hand power tools (such as jackhammers, etc.) prior to removal.

b. Masonry removed from the walls, covers and other portions of existing drainage structures, also plain and reinforced concrete pavements, and masonry removed from bridge structures.

Removal operations shall be so prosecuted that no damage will be caused to adjacent structures or property.

140.26 Drainage Structures abandoned or Removed.

The work shall consist of the removal and stacking of iron castings. The plugging of inlets and outlets and the filling of all drainage structures designated to be abandoned and the removal of all masonry and filling the cavity of the drainage structures designated to be removed.

140.27 Test Pits for Exploration.

Test pits shall be excavated where and as directed by the Engineer. The Contractor shall take special care during the excavation to avoid damage to any existing structure or conduit. Hand excavation may be required to ensure no damage to surrounding utilities.

Construction Methods

140.60 General

A. Sequence of operations.

The Contractor shall prosecute his work so as to conform to the requirements of Subsection 120.60A.

B. Disposal of Excavated Materials.

The Contactor shall prosecute his work so as to conform to the requirements of Subsection 120.60B.

C. Cofferdams.

Cofferdams for foundation construction shall be carried to adequate depths and heights, shall be safely designed and as watertight as necessary for the proper performance of the work which must be one inside them. Sheeting shall be driven to a sufficient depth below the proposed foundation grade to permit reasonable change in depth of the proposed foundation to a maximum of 2 feet except where solid rock is encountered. The interior dimensions shall be sufficient for the unobstructed and satisfactory completion of such construction work as pile driving, form building, inspection and pumping. Cofferdams which become tilted or are displaced during the process of building the substructure shall be righted, reset or enlarged as may be necessary to provide the necessary clearances and this shall be at the sole expense of the Contactor. Cofferdams shall be unwatered and the proposed masonry footings placed in the dry.

Cofferdams shall be constructed so as to protect masonry against damage from a sudden rising of water and to prevent damage to the foundation by erosion. No part of the cofferdam shall be left in such a way as to extend into the substructure masonry, without written permission from the Engineer.

Upon request, the Contactor shall submit plans to the Engineer for his information showing his proposed method of cofferdam construction prior to the start of such construction. The furnishing of such plans and methods shall not serve to relieve the Contractor of any of his responsibility for the safety of the work or the responsibility for the successful completion of the project.

Where the plans indicate construction of a tremie concrete seal below the footing or if in the Engineer's opinion a tremie seal is necessary, he may require the placing of underwater concrete of such dimensions as necessary to safely dewater the foundations and place the footing in the dry.

All tremie concrete seals shall be placed as shown on the plans or as directed by the Engineer.

Before placing the underwater concrete, the inside walls of the cofferdam shall be thoroughly cleaned and the walls made sufficiently tight to reduce the flow or current of water to less than 10 ft. per minute. The elevation of the water inside the cofferdam shall be controlled during the placing and curing of the concrete. Concrete shall not be placed in water having a temperature below 35°F. No pumping of water shall be permitted while concrete is being placed nor until the concrete has cured a minimum of 24 hours. Once

~~concreting has started the tremie shall not be moved laterally through the deposited concrete. When necessary to move the tremie it shall be lifted out of the concrete and moved to the new position. Unless otherwise directed by the Engineer, spacing of the tremies shall be at the Contractor's option.~~

~~After each excavation is completed, the Contractor shall notify the Engineer and no constructions shall be started until the Engineer has approved the depth of the excavation and the character of the foundation wall.~~

~~Unless otherwise provided, all parts of the cofferdams shall be removed after the completion of the substructure, care being taken not to disturb or otherwise injure the finished masonry.~~

~~Sheet piling used in the construction of the cofferdams may be left in place at the option of the Contractor, provided it is cut off at an elevation as may be directed by the Engineer, and the cutoff portions are removed from the site.~~

~~D. Excavation for Stepped Footings.~~

~~Where the footings for bridges are shown stepped, the Contactor shall sheet and shore the existing ground so that adjacent sections of the footings will rest on undisturbed ground according to the pattern shown on the plans. The sheeting shall be strong enough to support the earth along the designated lines, tight wnough to restrain the fines in the concrete, and shall be left in place to the extent required to hold the concrete that is to be placed against it. Before the concrete is placed, the sheeting shall be cut so that none of the sheeting will extend into the concrete. Shoring and bracing shall be removed. If rock is encountered, it shall be stepped to the pattern shown and sheeting will not be required.~~

~~E. Water Control in Foundation Areas.~~

~~When concrete for the foundations of a structure is to be placed in the dry, the Contactor shall use such equipment and perform his operations in such a manner that boiling or other disturbances of the ground in the foundation area will be prevented and shall be keep the area being excavated dry by such means that will prevent the entering of water through or from the adjacent ground, if such entering water could affect the stability of the foundation material or the adjacent ground or foundations.~~

~~No surface pumping will be allowed. Water shall be controlled by means of properly screened sumps or well points. If sumps are used, they shall be installed at strategic locations but not closer than 5 feet from the nearest edge of the footing.~~

~~The Contactor shall provide temporary diversion channels, excavations, embankments, sheeting, drains, flumes, well point unwatering systems, pumps, or other effective procedures or structures together with all labor, materials and equipment necessary for unwatering the foundation areas. Such work shall be subject to the approval of the Engineer, but such approval will not relieve Contractor of responsibility for the adequacy of construction, maintenance, operation and safety of the water control system. Upon completion of the work all temporary embankments and structures shall be removed from the site. All temporary excavations shall be backfilled in accordance with the applicable provisions of Section 150 for forming embankments or as directed.~~

F. Shoring and Bracing of Trenches.

Sheeting and bracing of trenches and other excavations shall be in accordance with all OSHA requirements.

G. Excavation.

Trenches for pipes~~, structural pipes, arches, and pipe arches~~ shall be excavated to the required line and grade and of sufficient width to permit thorough tamping of backfill material under the haunches. Soft or unsuitable material existing below the required bedding grade shall be removed as directed and replaced with sand, gravel, crushed stone or other suitable material and thoroughly compacted. ~~Rock or boulders shall be removed below the bedding grade as specified in Subsection 140.25.~~

All materials excavated from pipe trenches ~~and subdrain trenches~~ and not used in the backfill of the trench will be used as part of the embankment, when deemed suitable for this purpose by the Engineer, and no deduction will be made from the in-place measurement of embankment.

If cross pipes, conduits, drains or other unforeseen obstacles are encountered during the excavation, the proposed line and grade of the pipe may be altered, but only as directed by the Engineer.

When pipes, ~~structural pipes, arches and pipe arches~~ are to be installed in new embankments, the Contactor shall first construct and compact the embankment to an elevation at least 2 feet above the proposed flow line.

When culverts, storm drains or sewer pipes are to be installed in roadway areas on traveled ways, the edges of the trench through the pavement shall be cut to a neat line, using an approved pavement breaker or power saw.

~~140.61 Channel Excavation.~~

~~The excavation shall be made and the bank sloped as shown on the plans or as directed.~~

~~Unless otherwise directed, the banks outside of the limits of a bridge structure shall be cut to a 2 to 1 slope. Within the limits of the bridge structure, the banks shall be cut to the slope required for revetment.~~

~~No waste or surplus excavation shall be left within 5 feet from the edge of the ditch or channel. Any such surplus or waste material shall be spread in a thin, uniform layer. All ditches and channels constructed on the project shall be maintained to the required cross section and shall be kept free from debris until final acceptance.~~

~~140.62 Class B Rock Excavation.~~

~~If a rock is encountered in a location such that it may be used as part of a base, footing, wing, or abutment of any structure, it shall not be removed. The surface of all rock or other hard material upon which masonry is to be placed shall be freed from all loose fragments, cleaned and cut to a firm surface. The surface shall be level, stepped or serrated, as directed by the Engineer.~~

~~All structures shall be founded on uniform bedding materials. If rock is encountered at portions of the bottom of the foundation for bridges, box culverts, structural plate pipe, structural plate pipe arches and end walls and wingwalls that are part of these structures, the rock shall be removed to a minimum depth of 1 foot below the bottom of foundation for a depth of fill on the structure up to 25 feet. For fills over 25 feet the depth of excavation shall be increased 1 inch for every additional 2 feet of fill. The excavation shall be backfilled with gravel borrow and compacted. Payment for such excavation will be made under the item for Class B Rock Excavation. Where wingwalls are not integral with the bridge or culvert the overdepth excavation will not be required.~~

140.63 ~~Drainage Structures Abandoned or Removed.~~

~~The present castings shall be carefully removed. They shall be satisfactorily stored and protected until they are required for use or until they are removed from the project by the owners.~~

~~Inlets and outlets of structures to be abandoned shall be plugged with brick masonry not less than 8 inches in thickness, conforming to Section 201. Upper portions of the masonry shall be removed to a depth of 3 feet below the finished grade at the location designated by the Engineer, and the structures shall be completely filled with selected excavated material placed in 6 inch layers and thoroughly compacted.~~

~~The existing masonry of structures to be removed shall be completely removed.~~

~~The cavity shall be completely filed with selected excavated materials placed in 6 inch layers and thoroughly compacted.~~

Compensation

140.80 Method of Measurement

All classes of excavation for structures will be measured in their original position by the cross section method except that where such measurement is impracticable the volume shall be measured by such other methods as the Engineer may determine. In calculating excavation for structures the sides of the excavation will be considered vertical.

~~Bridge Excavation shall be measured as follows:~~

~~Unless otherwise shown on the plan the quantity of excavation shall be computed within the following limits:~~

~~Horizontally~~

~~To vertical planes 12 inches outside of and parallel to the neat lines of masonry bases or footings.~~

~~To vertical planes 18 inches outside of and parallel to the inside walls of structural plate pipes and arches (spans 8 feet or more and without masonry footings) at their widest dimensions.~~

~~To vertical limits of crushed stone or gravel borrow for bridge foundations as shown on the plans.~~

~~Vertically~~

~~From the bottom of the earth excavation limits of proposed roadway and/or design slopes carried through the structure location or existing ground surface, whichever is lower, to the bottom of the required excavation as determined by the Engineer.~~

~~In areas where unsuitable material is removed and backfilled under Item 123, Muck Excavation, excavation of the backfill will be measured horizontally and vertically as above except the upper limit of excavation shall be two feet above the swamp or two feet above any water that is present, whichever is higher.~~

~~Where masonry is ordered removed from existing substructures, only the actual quantity ordered removed shall be measured for payment.~~

~~Excavation made outside the lines prescribed for payment will be considered as made for the Contractor's convenience and will not be included for payment under any item of excavation, nor will the refilling of any such area be included under any item of filling material.~~

~~Class A Trench Excavation shall be measured as follows:~~

~~For masonry culverts (having a clear square span of less than 8 feet), inlets and walls, a width of 1 foot outside the base of the masonry section shown on the plans and to the depth required. Trench excavation for walls in cuts shall include only that portion below the elevation of the subgrade adjacent to the wall. For walls where an embankment is proposed, trench excavation shall be only that portion between the existing ground and the bottom of the foundation. All other Class A Trench Excavation will be measured according to the amount of materials removed to the lines and grades shown on the plans or as directed.~~

Class B Trench Excavation shall be measured as follows:

For ~~pipe culverts, drains~~, *sewer* and water pipes the depth of excavation shall be measured from the bottom of the pipe barrel to the bottom of the roadway excavation or existing ground, whichever is lower, as determined above the center line of the pipe, less five (5) feet. The width of excavation shall be three (3) feet greater than the rated inside diameter of the pipe up to a point five (5) feet above the bottom of the pipe barrel and a width above that point equivalent to the base width plus and allowance for 1 to 1 slopes on the sides of the trench for the measured depth described above. The allowance for 1 to 1 slopes will be included regardless of the actual slope excavated or whether sheeting or shoring is used that is not included for payment under Section 950. ~~The sides of the trench excavation will be considered vertical when sheeting is used and paid for separately under Section 950 and the width shall be three (3) feet greater than the inside diameter of the pipe.~~ If necessary to obtain a satisfactory foundation for ~~pipe culverts, drains,~~ *sewer* and water mains, trenches shall be excavated deeper than normally required for bedding the pipe and such excavation below the barrel of the pipe will be measured for payment under this item. The width of the trench shall be three (3) feet greater than the rated inside diameter of the pipe and the depth shall be the actual depth as directed by the Engineer.

~~Class B Rock Excavation shall be measured as follows:~~

~~Pay limit for rock excavation actually removed in all masonry culverts, walls and bridges, will be up to a limit of 1 foot outside of the foundation. This rock excavation in cuts shall include only that portion below the limits of payment of Roadway Earth Excavation or Class A Rock Excavation and in embankment only that portion below the surface of the existing ground.~~

~~Pay limit for rock actually excavated in pipe trenches will be made to a width of 2 feet greater than the rated inside diameter of the pipe barrel, providing rock extends to that width. The maximum depth of rock to be paid shall be equal to the difference in depth between the top of the original rock in the trench and a line 12 inches below the bottom and outside of the pipe barrel. No part of any rock remaining in the trench shall come within 6 inches of any portion of the pipe. Rock actually excavated in the construction of catch basins, manholes, and leaching basins will be calculated on a basis of 1 foot outside of the outer walls and 6 inches below the bottom of the structure. Rock excavation in subdrain trenches will be measured as specified above for pipe trenches.~~

~~Rock excavation in post and bound holes not already paid for in previous rock excavation shall be based on an area 2 feet square multiplied by the depth of rock encountered in the post or bound hole required plus 6 inches.~~

~~Rock excavation in channel excavation will be measured as specified in Subsection 120.22.~~

~~The unit of measurement for drainage structure abandoned or removed will be each structure abandoned or for each structure removed, complete.~~

Test Pit for Exploration will be measured as the actual volume removed to the limits established by the Engineer.

140.81 Basis of Payment.

Excavation for structures will be paid for at the contract unit price per cubic yard under the item for the particular type of excavation encountered.

The unit price per cubic yard shall include all backfilling when the materials are obtained from excavation, all clearing and grubbing (except as may be otherwise provided on the plans or in the Specifications), all excavations for the structure formation of embankments, disposal of surplus material, and the furnishing of all equipment, tools, labor and work incidental thereto.

~~If cofferdams, sheeting, shoring, bracing, unwatering system or other method of control for excavation are not specific items in the Contract, no allowance in addition to the prices bid for any items in the Contract will be made for such controls, or for labor, equipment or materials required. If any change in depth for foundation greater than 2 feet or in other dimensions of the foundation is directed by the Engineer after the controls have been provided, and if such change is greater than can be accommodated by the controls as constructed by the Contractor with the approval of the Engineer, then any changes made as directed by the Engineer will be paid in accordance with the Contract provisions for Extra Work. Excavation, borrow, concrete or other items of work done within the controlled area will be paid for only at the contract prices for these items unless the operations require different or additional equipment or labor in addition to or different from that required to perform the operation for the pay unit of an item the additional costs will be paid for under Extra Work. Where salvage of material is involved in the additional work, the value of the salvage shall be deducted from the additional payment.~~

Backfilling when not obtained from excavation will be paid for at the contract unit price for the kind of material used.

~~Bridge Excavation will be paid for at the contract unit price per cubic yard under Item 140., Bridge Excavation. Bridge excavation within a cofferdam and included in the Proposal as a separate pay item will be paid under Item 140.1, Bridge Excavation within Cofferdam. All other excavation encountered in the construction of bridges, culverts (spans 8 feet or more) and major wall structures, not otherwise defined in these specifications will be classified and paid for as Earth Excavation.~~

~~Class A Trench Excavation will be paid for at the contract unit price per cubic yard of Class A Trench Excavation except that where the depth is greater than 8 feet, that excavation below the 8 foot depth will be paid for at a price per cubic yard equal to 1 ½ times the price bid per cubic yard for Class A Trench Excavation with the exception that no addition to unit bid price will be allowed for excavation of open ditches that may exceed 8 feet in depth for excavation required for the construction of revetment regardless of the~~

~~depth. Test Pit fro Exploration shall be paid for at the contact unit price per cubic yard which price shall include excavation (including hand excavation) backfilling and compaction.~~

Class B Trench Excavation will be paid for at the contract unit price per cubic yard for Class B Trench Excavation.

~~Channel excavation (except rock) will be paid for at the contract unit price per cubic yard of Channel Excavation which price shall include full compensation for all handling, stacking or rehandling of excavated material.~~

~~Where channel excavation is made adjacent to a bridge or other structure the limits of pavement for channel excavation begin at the outer limits of payment for excavation for bridge or other structure.~~

~~Excavation for placing of riprap in channel excavation areas where required will be included under the item of Channel Excavation.~~

~~Rock excavation (except in channel excavation) will be paid for at the contract unit price per cubic yard of Class B Rock Excavation. Class B Rock excavated within a cofferdam (constructed of lumber, wood or steel sheeting) will be paid for at 3 times the contract unit price per cubic yard of Class B Rock Excavation.~~

~~Rock excavation in channel excavation will be paid for at the contract unit price per cubic yard of Class A Rock Excavation.~~

~~Drainage structures abandoned will be paid for at the contract unit price each under the item for Drainage Structures Abandoned.~~

~~Drainage structures removed will be paid for at the contract unit price each under the item for Drainage Structures Removed~~.

140.82 Payment Items

~~**140.**~~	~~**Bridge Excavation**~~	~~**Cubic Yard**~~
~~**140.1**~~	~~**Bridge Excavation within Cofferdam**~~	~~**Cubic Yard**~~
~~**141.**~~	~~**Class A Trench Excavation**~~	~~**Cubic Yard**~~
141.1	**Test Pit for Exploration**	**Cubic Yard**
142.	**Class B Trench Excavation**	**Cubic Yard**
~~**143.**~~	~~**Channel Excavation**~~	~~**Cubic Yard**~~
~~**144.**~~	~~**Class B Rock Excavation**~~	~~**Cubic Yard**~~
~~**145.**~~	~~**Drainage Structure Abandoned**~~	~~**Each**~~
~~**146.**~~	~~**Drainage Structure Removed**~~	~~**Each**~~

Description

150.20 General.

Construction of all embankment fill shall be done in accordance with the relevant provisions of Sections 120, 150 and 170 in accordance with the procedures described herein.

This work comprises the formation of embankments with suitable material obtained from excavation and borrow, thoroughly compacted to produce a stabilized embankment. The work shall be performed in accordance with the lines and grades shown on the plans as directed.

Material available from widened cuts outside the slopes indicated on the plans or as ordered by the Engineer may be used in embankments or elsewhere upon written request by the Contractor and subsequent written approval by the Engineer. The Engineer shall determine the suitability of any excavation material for incorporation into the embankment.

If the Contractor desires to waste excavated material and provide borrow to replace it for his own convenience, he may do so only after obtaining the written approval of the Engineer and after satisfactory arrangements have been made for the measurements and disposal of the material.

When it is determined by the Engineer that there is not sufficient material available either from excavation within the Right-of-Way or the slope lines of the section under Contract for the formation of embankments, roadbeds in cut sections, foundations, shoulders, or backfill the Contractor shall obtain such additional material as may be necessary from outside the location, and this material will be borrow material.

~~**150.21 Borrow Pit Restrictions.**~~

~~With the exception of commercial borrow pits, the location, material removal operation and final shaping and finishing of borrow pits, regardless of locations, must conform to all local and State regulations, and for the purpose of preventing water pollution shall be subject to approval by the Engineer prior to use, during the material removal operation and upon completion. Borrow pits shall be so graded and finished after material removal is completed that there can be no reasonable possibility of a safety hazard nor ponding of water nor water pollution caused by later erosion of the pit.~~

~~Borrow pits located adjacent to the Right of Way shall be finished by extending the slope of the cross section to a berm to be constructed or left within the Right of Way at the side line. The berm shall be a minimum of 5 feet high and 2 feet wide across the top with natural slopes in both directions, or as otherwise directed. The floor of the pit shall slope away from the location line at a minimum rate of ½ inch per foot for at least 50 feet.~~

~~Portion of borrow pits (within 500 feet of the project or any other highway location line) which may be noticeable from a traveled way, residence or place of business, shall be neatly trimmed and left in a condition satisfactory to the Engineer. Particular attention shall be given to make the slopes harmonize with the general appearance of the adjacent landscape, provided however, that no slope shall be steep enough to constitute a public menace. No unsightly accumulation of material shall be permitted which may in any manner deface the finished landscape.~~

~~The cost for the final shaping and finishing of borrow pits shall be included in the contract unit price of the type of borrow furnished with no additional compensation.~~

Materials

150.40 General.

All embankment materials, whether coming from excavation or borrow shall consist of solid, sound material aggregate. It shall be free from deleterious, organic, elastic or foreign matter and shall be adequately graded for satisfactory compaction into a stabilized soil structure.

These materials will be classified into particular groups according to AASHTO Designation M 15, "The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes".

All borrow material to be furnished shall meet the requirements specified in the following Subsections of Division III, Materials:

Ordinary Borrow	M1.01.0
Gravel Borrow	M1.03.0
Sand Borrow	M1.04.0 Type b
~~Gravel Borrow for Bridge Foundation~~	~~M1.03.0 Type b~~
Special Borrow	M1.02.0
~~Impervious Soil Borrow~~	~~M1.08.0~~
Crushed Stone	M2.01.0
~~Crushed Stone for Bridge Foundation~~	~~M2.01.0~~

Reclaimed Pavement Borrow Material meeting subsection M1.09.0 may be substituted for either Ordinary Borrow or Gravel Borrow under pavement areas and sidewalks.

Construction Methods

150.60 General

Prior to starting work, the Contractor shall obtain approval for the compaction equipment to be used. Unless otherwise required in the Special Provisions, each layer of embankment material shall be thoroughly compacted with power rollers or tamping rollers. Other equipment or equivalent compactive capacity may be used subject to trial on the project and approval by the Engineer. Compacting equipment will not be used for any other purpose during compaction operations.

The use of tractors, trucks, scrapers or other equipment designed primarily for purposes other than compaction and being used for purposes other than solely compaction will not be considered as compaction equipment, but traffic of such vehicles shall be distributed over this fill in such a manner as to take advantage of the additional compaction afforded thereby.

Sufficient leveling and compacting equipment shall be provided to do the work or spreading and compacting the material promptly after it has been deposited. When, in the Engineer's judgment, such equipment is inadequate to spread and compact the material properly, the Contractor shall reduce the rate of excavation and placing of the fill to a rate not to exceed the capacity of the leveling and compacting equipment or employ additional equipment.

The Contractor shall plan his grading operation to use all rock possible from all excavation either as backfill in excavated muck areas or in areas of greatest depth.

~~Before placing of any fill, the areas under embankments shall be cleared, grubbed, and stripped as specified in Section 101 and 120.~~

Frozen material shall not be placed on embankments nor shall embankment be placed on material frozen to a depth of over 3 inches. If during the construction of an embankment, the top layer becomes frozen to a depth of over 3 inches, the frozen material shall be removed before a succeeding layer is placed on the embankment. This work shall be performed at no additional expense to the ~~Department~~ *City*.

Frozen excavated material which will be suitable when dry shall be allowed to thaw and dry and then be placed in the embankment. No compensation will be allowed for the storing and rehandling of these materials.

Embankments shall be formed by placing successive layers of material uniformly distributed and compacted over the full width of the cross section unless otherwise directed. Stumps, rubbish, sod, frozen or other unsuitable materials shall not be incorporated in the embankment.

The Contractor shall prosecute his work so that no damage will occur to drainage pipe lines, *sewers* or masonry or brick structures (See Subsection 150.64).

150.61 Preparation of Foundation Areas.

The foundation areas shall be cleared, grubbed and stripped as required, and all soft, spongy or other material not suitable for embankment foundation shall be removed. When, in the Engineer's judgment, there is reasonable doubt as to the suitability of the existing material for embankment foundation, no further work shall be performed in the area in question until the material is tested and approved for use or remedial methods are ordered by the Engineer.

~~Embankment areas 3 feet or less in height from the subgrade to the existing ground shall be rough graded and compacted to not less than 95 percent of the maximum dry density of the material as determined by the AASHTO Standard Method of Test T99, Method C at optimum moisture content, as determined by the Engineer, without additional compensation before placing any fill. If the material retaining on the #4 sieves is 50% or more of the total sample this test shall not apply and the material shall be compacted to the satisfaction of the Engineer.~~

~~For embankments greater in height than 3 feet below the proposed subgrade to existing ground no additional embankment foundation area preparation will be required, provided the material within the area is suitable for the purpose.~~

~~Regardless of the height of fill, where embankment is to be placed against existing earth slopes, steeper than 3 to 1, the slope shall be broken up into steps of random width as the fill is places in order to provide a suitable bond between the existing ground and the new embankment. Both the material cut out and the bottom of the area cut into shall be compacted along with and to the same degree as the material being placed in the embankment without additional compensation for excavation, benching or compacting.~~

~~Where foundations for bridges, culverts (span 8 ft or more) and major wall structures are to be founded on the embankment, the embankment to the extent shown on the plans shall be constructed of Gravel Borrow for Bridge Foundations and/or Crushed Stone for Bridge Foundations.~~

~~At the sites of footings for abutments, piers or other structures having pile foundations, the material shall be placed in embankment prior to driving piles and shall be of a quality and grading that will not obstruct driving of the piles.~~

~~Where foundations for structures are to be supported on newly formed embankments and where flying wingwalls are to be constructed, the embankment shall be placed to an elevation of at least 2 feet above the bottom of the proposed foundation or flying wingwalls and thoroughly and satisfactorily compacted.~~

~~After the above work is completed the material within the area of the proposed foundation or flying wingwalls will be excavated to the grade of the bottom of the concrete. Excavation of this compacted fill will be paid for under the item of Bridge Excavation as stipulated in Subsection 140.21.~~

~~150.62 Embankment Construction With Materials Other Than Rock.~~

~~Embankment construction with materials other than rock shall not be placed from December 1 to April 1, except with written permission of an under such special conditions and restrictions as may be imposed by the Engineer.~~

~~Embankment 10 feet or more in height from the elevation of the subgrade to the original ground elevation shall be constructed to the elevation of the proposed subgrade and then allowed to settle for 60 days (or such other period as the Engineer shall direct in writing) before the pavement structure is constructed thereon. If the condition of the subgrade is suitable, not frozen or muddy and is shaped, compacted and fine graded within the tolerance provided in the Specification, the Contractor may apply and the Engineer may approve the placing but not the fine grading of the subbase prior to the termination of the 60 day waiting period.~~

~~Earth embankment shall be placed and compacted in uniform layers not exceeding 12 inches in depth, loose measurement; each layer of material shall be spread on the entire width of the embankment and leveled off by approved equipment.~~

~~The embankment materials shall be compacted to not less than 95 percent of the maximum dry density of the embankment material as determined by AASHTO Standard Method of Test T 99, Method C, corrected in accordance with AASHTO T 224. If the material retained on the ¾ inch sieve is 30 percent or more of the~~

~~total sample, this test shall not apply and the material shall be compacted to the target density. The target density shall be established by determining the number of passes of a roller required to produce a constant and uniform density, after conducting a series of tests using either AASHTO T 30, In Place Density and Moisture Content of Soil and Soil Aggregate by Nuclear Methods (Shallow Depth), or AASHTO T 191, Density of Soil In Place by the Sand Cone Method. The Contractor shall, without additional compensation, employ whatever measures may be necessary to adjust the natural water content of the suitable embankment material to permit the placement and compaction as hereinafter specified.~~

~~Each lift of compacted materials shall be visibly crowned to allow drainage of surface and rain waters off the surface of the embankment. No stones larger than 3 inches shall be used to fill where piles are to be driven. Embankment constructed in basement areas of demolished buildings and other areas restricting the use of power rollers, etc., shall be compacted by mechanical tamping with approved power tools.~~

~~If the natural in place moisture of the excavated material makes it impractical to compact the soil, the Contractor shall dry the soil by disking, harrowing, blading, rotary mixing or by other approved means, or compaction of the layer of wet material may be deferred until the layer has dried so that it can be properly compacted. If these above methods do not produce the desired results, or when in the judgment of the Engineer, excessive moisture resulting from climatic conditions beyond the control of the Contractor is considered to have affected adversely the stability of the previously placed and satisfactorily compacted embankment materials, the Engineer may direct the placement of single layers of "Special Borrow" to act as stabilizing drainage layers. When so ordered by the Engineer, the Contractor shall place a layer of "Special Borrow" having a depth of not more than 12 inches in thickness, loose measure. Such materials shall be placed completely over the entire width between the limits designated by the Engineer, and shall be placed completely over the entire width between the limits designated by the Engineer, and shall be compacted as hereinafter specified before the succeeding layer of suitable embankment materials from the roadway excavation is placed.~~

~~150.63 Rock in Embankment.~~

~~Where rock is used in embankments the materials shall be carefully spread so that all large stones shall be well distributed and the interstices of each layer shall be practically filled with smaller stones and suitable material from excavation and borrow to form a solid and dense layer of embankment. No rock in excess of 6 inches in its largest dimension shall be incorporated in the top 2 foot layer of embankment immediately below the subgrade. The maximum size of boulders or ledge fragments used in embankments shall be such that they can be incorporated into layers not exceeding 3 feet in depth. Any stones or fragmented material too large to be placed in 3 foot layers shall be broken down by blasting or other means to appropriate size.~~

~~Rock in fills shall not be placed adjacent to masonry or brick structures or to any pipe lines. At bridge abutments rock fill shall not be placed within 20 feet of the parapet.~~

150.64 Backfilling for Structures and Pipes.

A. General.

All backfilling shall consist of suitable materials uniformly distributed and thoroughly compacted. When suitable backfilling materials cannot be obtained from excavation, the material shall consist of satisfactory borrow.

When directed, mechanical tampers shall be used in compacting backfill for trenches, and in hard to reach areas around masonry.

No backfill whatsoever shall be placed on or against structures, pipes, or other masonry, until permitted by the Engineer. It shall be formed of successive layers not more than 6 inches in depth, uniformly distributed and each layer thoroughly compacted.

B. Structures.

~~The backfill in back of abutments and wingwalls of bridges shall consist of gravel. The gravel shall meet the specifications of Subsection M1.03.0, Type b. Measurement of "Gravel Borrow" under this work will not include any filling made beyond a vertical plane 1 foot outside the footings except as directed.~~

Whenever backfill is placed in back of, *around* or over *structures,* arches, culverts or rigid frames, the fill shall be first placed midway between the ends of the structure. The remainder of the fill shall then be placed to equal depths on both sides of the structure, working equally both ways from the center of the structure toward the ends. This procedure shall continue up to the bottom of the subbase of the roadway.

C. Pipes.

No load greater than 8 tons shall be moved over any pipe until a fully compacted backfill of at least 2 feet has been placed over the top of the pipe. This minimum will be increased to 3 ½ feet for a 40,000 pound single wheel load and to 4 feet for a 60,000 pound single wheel load. The required fully compacted backfill cover shall be placed a minimum of 50 feet on both sides of the pipe crossing. However, compliance with this requirement is not to be construed as relieving the Contractor of any responsibility concerning damage to the pipe.

Material used for backfilling to a point 2 feet over the pipe shall contain no stones larger than 3 inches in greatest dimension, except material used to backfill corrugated plastic pipe shall consist of gravel borrow meeting the requirements of M1.03, Gravel Borrow type d to a depth of 2 feet over the top of the pipe.

Backfill below the haunches shall be placed in 6 inch layers and compacted simultaneously on both sides of the pipe with railroad tampers or approved mechanical rammers which shall not come in contact with the pipe. Backfill above the haunches shall be placed in 6 inch layers and compacted as directed. Backfill material shall be moist prior to and during compaction.

~~Backfilling for structural plate pipe, pipe arches and arches shall be placed evenly on both sides of the structure in layers not exceeding 6 inches in depth. Backfilling shall be placed uniformly on both sides of pipe. The fill material shall be thoroughly tamped around the pipe or pipe arch, between the pipe or pipe arch and the side of the trench, or for a minimum distance each side of the pipe or pipe arch equal to the diameter or span of the structure~~.

In all cases the filling material shall be thoroughly tamped. Puddling or jetting the backfill will not be permitted, except with written approval of the Engineer.

~~**150.65 Backfilling Muck Excavation Areas.**~~

~~Backfilling after muck is removed shall consist of rock fragments, builders up to 2 cubic yards in size, if available, or selected clean granular material not more than 15% of which will pass through a #200 sieve as determined by AASHTO Test T-11. The backfill shall be obtained from suitable excavation on the project, or from Special Borrow under Item 150.1. When rock is used as backfill, granular material meeting the specifications described above shall also be provided and used with the rock backfill. The volume of the granular material shall be sufficient to fill all voids and interstices of the rock backfill.~~

~~Where directed, backfilling shall be placed immediately after the muck has been excavated in order that any remaining soft material may be pushed ahead of the backfill and readily removed.~~

~~The backfill shall be placed at least 2 feet above the top of the swamp area or at least 2 feet above the level of any water that is present whichever will give the highest elevation of the backfill.~~

~~The surface of the embankment shall be kept free of unsuitable material. No muck or unsuitable material shall be entrapped by any successive deposits of fill.~~

~~**150.66 Gravel Borrow for Bridge Foundations.**~~

~~The gravel shall be placed on firm material free from standing water and thoroughly compacted in layers not exceeding 12 inches in depth, loose measurement, in accordance with the provisions of Subsection 150.62 to a minimum total depth of 2 feet, except the compacted gravel as tested in the field shall be not less than 95% of the laboratory maximum density as determined by AASHTO T 180 Method D, corrected in accordance with AASHTO T 224.~~

~~In areas where it is not practicable to compact the gravel for bridge foundations by rollers or other rolling moving equipment the compaction shall be accomplished by means of mechanical or pneumatic tampers.~~

~~Compaction of the gravel and any adjoining embankment material shall be done simultaneously so that the respective materials will be confined substantially to the indicated lines.~~

~~150.67 Crushed Stone for Bridge Foundation.~~

~~Crushed stone shall be furnished and placed where shown on the plans and where directed by the Engineer.~~

~~In no case shall crushed stone be placed on other than firm material.~~

~~The crushed stone shall be placed to an elevation one foot above ground water level or lowered water level.~~

~~The entire mass of crushed stone shall be compacted into place by overlapping coverage by pneumatic tired earth rollers having 4 wheels abreast and loaded, vibratory plate compactors, vibratory rollers or by other means that shall achieve equivalent compaction and are approved by the Engineer.~~

~~The compaction operation shall be continued until there is no moving stone directly ahead of the wheels of the moving machine.~~

150.68 Crushed Stone.

Crushed stone shall meet the Division III Materials specification for the intended application as follows:

Noise Barrier	M2.01.2
Pipe Bedding	M2.01.4
Revetment Foundations	M2.01.2

The minimum total depth of crushed stone to be placed under this item of work shall be 6 inches. No compaction will be required for depth up to 1 foot. For any depth over 1 foot, the crushed stone shall be placed and compacted in layers not to exceed 6 inches. Compaction will be accomplished by means of mechanical or pneumatic tampers. Compaction effects shall continue until the stones are firmly interlocked and the surface is unyielding.

Compensation

150.80 Method of Measurement.

All borrow with the exception of sand borrow and crushed stone will be measured in place. When this method of measurement is impracticable and the Engineer, prior to the start of construction, so directs and the Contractor agrees in writing, borrow, with the exception of sand borrow and crushed stone, will be measured in its original position in the pit after stripping by the cross-section method.

When ordinary borrow is paid for as measured in place, it shall be measured from existing or compacted old ground surface to the lines and grades applicable to embankment as shown on the plans or as directed.

The volume of ordinary and special borrow when in place measure is necessary, shall be determined as follows:

1. Measure the total volume of embankment in place;
2. Add 12.5 percent to this quantity (for compaction);
3. Deduct the total volume of all suitable materials available for embankments, including rock excavation; except that excavated under Section 140.60;
4. Deduct an additional 25 percent of the volume of rock excavation.

When not measured in its original position in the pit by the cross section method, gravel borrow used in subbase, gravel for base course, gravel for surfacing, ~~gravel for bridge foundations~~ and gravel for backfilling around structures and pipes, will be paid for as measured in place plus 15%.

When not measured in its original position in the pit by cross section method gravel borrow used in slope stabilization and other miscellaneous uses will be paid as measured in place plus 12.5%.

If material that is measured in place is taken from a cross sectioned pit, the amount of material to be deducted from the cross-section pit quantity shall be equal to the material measured in place plus any allowable percent added to the in place measurement.

~~Sand borrow will be measured by the cubic yard by load measurement. The quantity shall be the volume of the load, as measured, divided by 1.15.~~

~~If stone screenings are used the volume shall be obtained from its weight using 2700 pounds as the weight of a cubic yard of stone screenings.~~

Crushed stone complete in place will be measured by the ton.

The weight slips shall be countersigned on delivery by the Engineer, and no weight slip not so countersigned shall be included for any payment under the Contact.

No overhaul allowance will be made for any kind of borrow.

150.81 Basis of Payment.

Payment for the formation of embankments as specified will be included in the items of excavation or borrow. Excavated material used with the permission of the Engineer for other than the formation of embankment will be paid for as specified in Subsection 120.81 and such payment shall include full compensation for the formation of the required embankments. The contract unit prices for the aforesaid items shall constitute full compensation for the satisfactory performance and completion of the entire work.

Borrow will be paid for at the contract unit price per cubic yard, complete in place, which shall include such test pits and borings necessary to procure samples to establish the suitability of the materials and all required stripping operations.

Crushed stone will be paid for at the contract unit price per ton, complete in place.

150.82 Payment Items.

~~**150. Ordinary Borrow**~~	~~**Cubic Yard**~~
~~**150.1 Special Borrow**~~	~~**Cubic Yard**~~
151. Gravel Borrow	**Cubic Yard**
~~**151.01 Gravel Borrow – Type c**~~	~~**Cubic Yard**~~
~~**151.1 Gravel Borrow for Bridge Foundation**~~	~~**Cubic Yard**~~
~~**151.2 Gravel Borrow for Backfilling Structures and Pipes**~~	~~**Cubic Yard**~~
~~**154. Sand Borrow**~~	~~**Cubic Yard**~~
156. Crushed Stone	**Ton**
~~**156.1 Crushed Stone for Bridge Foundations**~~	~~**Ton**~~

Description

170.20 General.

The shaping, trimming, compacting and finishing of the surface of the subgrade or existing gravel base, the grading ~~and finishing of all unpaved shoulder and slopes~~ and the preparation of all areas for topsoil *and* loam ~~riprap or slopes paving as shown on the plans~~ or as directed, shall be constructed in accordance with these specifications and in close conformance with the lines, grades and typical cross sections on the plans or established by the Engineer.

Construction Methods

170.60 General

All soft or spongy material below the subgrade shall be removed to a depth to be determined by the Engineer and backfilled with satisfactory material.

~~All material within a depth of 2 feet below the subgrade in embankment areas shall conform to the requirements of Subsection M1.02.0 for Special Borrow Material except that it shall contain no stone larger than 6 inches in its greatest dimension and shall be placed and compacted in layers not exceeding 8 inches in depth, compacted measurement.~~

~~In cut sections (excluding rock excavation) where existing topsoil within a depth of 2 feet below the subgrade, after testing, is found to comply with the requirements of Subsection M1.02.0 for Special Borrow Material, shall not be excavated.~~

~~In cut sections (excluding rock excavation) where the existing soil within a depth of 2 feet below the subgrade, after testing or gradation requirements, is found to have greater than 14% material passing the #200 mesh, the material shall be excavated~~.

The replacing material shall conform to the requirements of Subsection M1.02.0 for Special Borrow Material, except that it shall contain no stone larger than 6 inches in its greatest dimensions and shall be placed in layers not exceeding 8 inches in depth, compacted measurement.

~~In the areas described above where Special Borrow is to be used, the plane of the base upon which the material is to be placed shall be compacted and graded until the surface is smooth, without additional compensation. A tolerance of 1 inch above or below the proposed grade will be allowed, provided that this 1 inch above or below grade is not maintained for a distance longer than 50 feet and that the required crown is maintained.~~

In areas where the contract specifies the use of Gravel Borrow and the existing soil, after testing, is found to comply with the requirements of Subsection M1.03.0, the material may remain in place if so directed by the Engineer. If replacement material is required to supplement the existing gravel it too shall conform to the requirements of Subsection M1.03.0.

170.61 Fine Grading and Compaction.

Before surfacing or sub-base is spread, the subgrade shall be shaped to a true surface conforming to the proposed cross section of the *roadway* ~~highway~~ and compacted in accordance with the provisions of Subsections 150.60 ~~and 150.62~~. All depressions and high spots shall be filled with suitable material or removed and such areas again compacted until the surface is smooth and satisfactorily compacted. A tolerance of ½ inch above or below the finished subgrade will be allowed provided that this ½ inch above or below grade is not maintained for a distance longer than 50 feet and that the required crown is maintained in the subgrade. Any portion of the subgrade which is not accessible to a roller shall be thoroughly compacted with mechanical tampers or by other adequate methods approved as satisfactory by the Engineer.

Compensation

170.80 Method of Measurement.

The grading and compaction of the subgrade will be measured by the horizontal square yard at the plane at the bottom of subgrade in all areas where a subgrade was placed. The grading and compacting of the existing gravel material to remain in place shall be measured by the horizontal square yard.

Grading and finishing for the entire project will include all grading work not included under the item of Fine Grading and Compacting (in subgrade area).

170.81 Basis of Payment.

Payment for the shaping and compacting of the subgrade or existing gravel material as specified herein shall be included in the item for Fine Grading and Compacting. The removal and disposal of material below subgrade will be paid for at the contract unit price per cubic yard for the appropriate excavation items in Section 120.

Grading and finishing other than subgrade areas or existing gravel areas to remain in place will be included in the price of the other respective items of work involved.

~~In areas where Special Borrow is required as stipulated in Subsection 170.60, the material shall be paid for as Special Borrow. The provisions of Subsection 120.81 shall apply when the Special Borrow is obtained from excavation.~~

In areas where Gravel Borrow material is required as stipulated in Subsection 170.60, the material shall be paid for as Gravel Borrow.

170.82 Payment Items.

~~**150.1**~~	~~**Special Borrow**~~	~~**Cubic Yard**~~
151.	**Gravel Borrow**	**Cubic Yard**
170.	**Fine Grading and Compacting**	**Square Yard**

Description

201.20 General.

This work shall consist of the construction of manholes, ~~inlets and basins~~ *and rehabilitation of the walls and bases of existing manholes* in accordance with the specifications, and in close conformity with the lines and grades shown on the plans or established by the Engineer.

Existing brick manholes shall be rehabilitated using system of a cementitious mortar base with an epoxy sealant finish.

The Contractor shall furnish all labor, materials, equipment and incidentals required to rehabilitate the walls and base of existing manholes for all locations as shown on the plans or specified herein or as directed by the Engineer.

The Contractor shall follow the instructions of the material manufacturers and shall take all necessary precautions to prevent hazardous conditions during the storage, handling, opening, mixing, application, removal and cleaning of the materials required for the manhole wall and base rehabilitation.

All methods of rehabilitation specified under this section shall require the submittal of shop drawings, installation methods, list of materials to be used and precautions against hazardous conditions to be submitted for review and approval.

The work called for under this section shall also include plugging and patching existing leaks within the manhole to be rehabilitated with cementitious mortar grout prior to performing the rehabilitation of the manhole walls and base.

Sanitary Sewer Manholes shall conform to City of Somerville Construction Standard as shown on the Plans.

Materials

201.40 General.

Concrete for these structures shall meet the requirements of Section 901 Cement Concrete Masonry *of the Standard Specifications*. Other material shall meet the requirements specified in the following Subsections of Division III, Materials.

Clay Brick	M4.05.2
Cement Concrete Blocks	M4.05.1
Precast Drainage Structures	M4.02.16
Cement Mortar	M4.02.15
Reinforcing Bars	M8.01.1
Iron Castings	M8.03.0
Steel Castings	M8.03.2
Dry Stone Masonry	M9.04.9

Sanitary Sewer Manhole Lining:

1. *Plugs*

   Acceptable plugging materials include:

   a. *A premixed Portland cement-based and fiber reinforced hydraulic cement consisting of Portland cement, graded silica aggregates, special plasticizing and accelerating agents. It shall not contain chlorides, gypsums, plasters, iron particles or gas forming agents or promote the corrosion of steel it may come in contact with. It shall have a set time of approximately 50 seconds. It shall also have a ten-minute compressive strength of approximately 500-psi. And can be applied both wet and dry. It shall also be corrosion and acid resistant, and possess 0% shrinkage at 90% relative humidity.*

b. A siliconate-based liquid accelerator field mixed with neat Portland cement. It shall have a set time of approximately 50 seconds.

2. *Patch*

   Patching material shall consist of a premixed Portland cement-based and fiber reinforced hydraulic cement consisting of portland cement, graded silica aggregates, special plasticizing and accelerating agents. It shall not contain chlorides, gypsums, plasters, iron particles or gas forming agents or promote the corrosion of steel it may come in contact with. It shall have a set time range of 3 to 15 minutes to suit application. It shall also have a one-hour compressive strength of approximately 600-psi. and can be applied both wet and dry. It shall also be corrosion and acid resistant and possess 0% shrinkage at 90% relative humidity.

3. *Cementitious Coating*

   The cementitious mortar coating shall consist of a two-coat system based on cementitious compounds. The coating shall provide a chemical and mechanical bond to itself and the application surface. The coating shall be waterproof and shall be able to withstand the hydrostatic application pressure of the sealant after setting. Set time shall take no more than 1.5 hours for each coat.

4. *Sealant Coating*

   The sealant shall consist of acrylanide, liquid acrylic or epoxy coating system. It shall consist of a moisture insensitive, solventless epoxy coating capable of being applied, curing and bonding to wet or dry surfaces. The color shall be white to aid in maintenance operations and improved visibility. The sealant shall be fast curing, resistant to abrasion, hydrocarbons, dilute acids, sulfuric acids, dilute alkalis and shall exhibit strong bonding characteristics to concrete and/or cementitious surfaces. The sealant shall not contain any toxic compounds and shall be safe in their uncured or cured states and shall be non-flammable and non-toxic. Test results shall be provided on materials used indicating that a high quality corrosion barrier shall be provided and that materials used will not deteriorate within a design service life of twenty (20) years in wastewater collection system environments.

5. *Water*

   Water used to mix product shall be clean and potable.

6. *Equipment*

   Only manufacturer approved equipment shall be used as specified by the material supplier for the application of cementitious and/or epoxy coating systems.

201.42 Submittals.

A. Sanitary Sewer Manhole Lining.

THE FOLLOWING MUST BE SUBMITTED AND APPROVED PRIOR TO CONSTRUCTION:

A statement containing the contractor's name, address, years of experience in installing the type of rehabilitation system proposed, and at least three references relating to the rehabilitation of the same type being proposed here.

A statement identifying the rehabilitation process/product by trade name as well as by the industry known generic name. This statement shall include a brief description of the materials proposed to be used for brick manholes, as well as the process used to install and cure said materials.

The contractor must provide an affidavit proving that the product has a minimum 5-year history of being used for reconstruction of sanitary system manholes. Manufacturer must provide a list of at least 5 manhole projects completed during the last 5 years.

Where applicable, a certification that the Contractor is an approved installer/applicator of the proposed rehabilitation processes. The Contractor shall also provide certification that he is an approved equipment operator for the use of any specialized equipment, which may be necessary for the proposed rehabilitation processes.

Descriptions of grouts and their applicability of use in sealing active leaks in brick and concrete manholes including documented service of satisfactory performance in similar applications.

A letter of certification from the rehabilitation method manufacturer in which all physical and chemical properties of the material to be used shall be certified. These properties shall at least include the following:

1. *Cementitious Coating*
   a. *Compressive Strength*
   b. *Bond*
   c. *Cement Expansion*
   d. *Applied Density*
   e. *Shrinkage*
   f. *Freeze/Thaw*
   g. *Pull out strength*
   h. *Placement time*
   i. *Sulfate Resistance*
2. *Sealant Coating*
   a. *Compressive Strength*
   b. *Tensile Strength*
   c. *Flexural Strength*
   d. *Shrinkage*
   e. *Bond*
   f. *Applied Density*

Construction Methods

201.60 General.

~~Basins,~~ Manholes ~~and inlets~~ shall be built to the lines, grades, dimensions and design shown on the plans and as directed with the necessary frames~~, gratings,~~ covers, ~~hoods,~~ etc., and in accordance with these specifications. ~~Basin and inlet grates other than Cascade type may be Type A-1 or A-3, but only one type may be used throughout the project.~~

Sanitary Sewer Manholes shall be constructed according to the specifications of the Municipality as designated in the Contract. Castings shall be obtained as directed without cost to the Contractor at the site of the improvements from existing structures; ~~from the Party of the First Part at the Town or City Yard; from the Massachusetts Correctional Institute of Walpole; furnished under Section 220,~~ or furnished as a contract item. ~~It will be the Contractor's responsibility to determine, prior to submitting his bid, from which of the above mentioned sources he will obtain the castings.~~ Transportation, delivery, and installation of all castings will be included in the contract unit bid price for the kind of structure involved.

201.61 Excavation.

Excavation shall conform to the applicable portions of Section 140.

201.62 Laying Bricks and Block.

Brick and concrete blocks shall be soaked in water before laying. All joints in brick structures shall be thoroughly flushed full of mortar and no joint on the inside face shall be greater than 1/8 inch. After the bricks are laid, the joints shall be pointed on the outside. As brick walls are laid up, the outside of the structure shall be plastered with 1/2 inch thick mortar coat. As circular concrete block walls are laid-up the horizontal joints and keyways shall be flushed full with mortar. As rectangular blocks are laid up all horizontal and vertical joints shall be flushed full with mortar. ~~Plastering of the outside block structures will not be required. The joints in precast units shall be wetted and completely mortared immediately prior to~~

~~setting a section. No structure shall be backfilled until all mortar has completely set. When the floors of structures are made of concrete, or left open, as directed.~~

201.63 Placing Castings.

Frame castings for ~~basins,~~ manholes ~~and inlets~~ shall be set in full mortar beds true to the line and grades as directed.

~~Where directed the castings shall be temporarily set at such grades as to provide drainage during the construction.~~

The castings of structures located within the pavement area shall not be completely set to the established grade until the bottom course of pavement has been laid.

The final setting of all other castings shall be performed at the proper stage of construction as directed.

Cement concrete collars shall be placed around the castings after the final setting as shown on the plans and as directed.

~~Hoods shall be installed in catch basins only when required by the Special Provisions.~~

~~**201.64 Weep Holes.**~~

~~Unless otherwise directed or specified in the Special Provisions, 2 weep holes shall be built into the walls of a new basins, precast units and in Types C, CF, D and DF drop inlets as shown on the plans. Each weep holes shall consist of a section of 4 inch pipe or equivalent opening to carry water through the wall of the structure.~~

~~The ends of the pipe, if used, shall be saw cut and left flush with the walls of the structure.~~

~~The outside end of the pipe or opening shall be covered with a 1/4 inch mesh galvanized wire screen 23 with 2 cubic feet of crushed stone conforming to Material Section M2. The stone shall be placed against and over the end of the pipe or opening to prevent the entrance of the finer filling material. Only one type of weep hole shall be used throughout the project.~~

201.65 Backfilling.

Backfilling requirements shall conform to the Provisions of the Subsections 120.60B, 150.60 and 150.64.

201.66 Sanitary Sewer Manhole Lining.

General.

The Contractor shall coordinate construction of the manhole rehabilitation to avoid if possible the need to by-pass flow around the manhole. When pumping and bypassing is required the Contractor shall supply the pumps, conduits and other equipment to divert the flow of sewage around the manhole in which work is to be performed. All equipment, labor and administration of the by-passing operations shall be considered an incidental part of this item, no matter how many times the Contractor is required to by-pass flow. After the work has been completed, flow shall be restored to normal.

Prior to the start of any rehabilitation work, the Contractor shall ensure that all materials and rehabilitation systems shall not leach toxic substances into the environment or the sanitary sewer collection system.

Surface Preparation.

The existing brick manholes to be rehabilitated shall be cleaned using high-pressure water. Acid or degreaser washing will only be allowed where foreign material could not be removed with water. Grease deposits may be removed by use of a water-based industrial cleaner and a scrub brush.

Loose and protruding brick, mortar and concrete shall be removed using a mason's hammer and chisel or scraper.

Existing manhole steps, which are intact and in good condition as determined by the Engineer may be left in place. Steps that have signs of corrosion, are broken, or deemed unacceptable by the Engineer must be removed from the manhole wall in their entirety and the holes plugged as specified below. If the method of rehabilitation requires that the steps be removed then the steps shall be replaced at the contractor's expense.

The Contractor shall not allow removed material, cleaning agents, bricks, mortar or other extraneous material into the sanitary sewer collection system.

The contractor shall stop all water from leaking into the manhole in order to provide dry conditions for the application of the liner.

Installing Plugs or Grout.

The Contractor shall plug holes and stop active hydrostatic infiltration into the manhole from cracks in the walls and base and from gaps between pipes and walls or inverts with the appropriate plugging material. This work shall be performed to the satisfaction of the Engineer. The manhole walls and invert shall be dry prior to the installation of lining materials.

Patching.

After the active hydrostatic infiltration is stopped and the plugging material has set, clean and patch non-infiltration holes, cracks and breaks in the manhole walls, pipe, connections and base in accordance with the instructions of the material manufacturer. This work shall be performed to the satisfaction of the Engineer.

Materials Preparation.

Mixing of the materials shall be in accordance with the instructions of the material manufacturer and to the satisfaction of the Engineer. The Contractor shall ensure that the materials are handled and mixed so that no materials enter the sanitary sewer collection system or the environment.

Cementitious Coating Application.

The manhole surfaces to be coated with a cementitious mortar coating shall be free of all foreign material and shall be damp without noticeable free water droplets or running water, but saturated, just prior to application.

Materials shall be wet spray applied from the base to the top of the manhole, using as many passes as necessary but each application shall not exceed ½ inch.

The finished thickness for the cementitious mortar coating shall not exceed 1 inch.

Each coat shall completely cover the base, walls, inverts, corbel and chimney up to the manhole frame and cover and shall be fully adhered and free of voids or holidays. Any material, which is found to sag or slump, shall be removed and replaced with new material as directed by the Engineer. All excess material and overspray shall be removed immediately. Any damage to the coating shall be repaired in accordance with the instructions of the material manufacturer and to the satisfaction of the Engineer.

Curing shall commence immediately after application. Curing of the cementitious mortar coating shall be in accordance with the instructions of the material manufacturer. The Contractor shall also ensure that the proper curing methods are followed in accordance with good concrete curing practice as outlined in ACI 308.

Sealant Coating Application.

The manhole surfaces to be coated with a sealant coating shall be free of all foreign material and shall be applied only to a fully cured cementitious mortar coating or existing pre-cast concrete surface.

Materials shall be spray applied from the base to the top of the manhole, at a minimum of 50 mils wet film thickness and using as many passes as necessary to achieve 150 mils but each application shall not exceed 100 mils.

Each coat shall completely cover the base, walls, inverts, corbel and chimney up to the manhole frame and cover and shall be fully adhered and free of voids or holidays. Any material, which is found to sag or slump, shall be removed and replaced with new material as directed by the Engineer.

Clean Up.

After the rehabilitation work has been completed, the Contractor shall clean up the entire project area and return any disturbed areas to as good a condition as existed prior to the work being performed. The Contractor shall dispose of all excess material and debris not incorporated in the permanent installation.

Warranty.

All work shall be guaranteed against defected workmanship and materials for a period of one (1) year after completion and acceptance of the work.

201.67 Manhole Vacuum Testing.

The Contractor shall furnish the vacuum equipment, test plugs, water and appurtenances necessary for testing all manholes. Manholes shall be tested by the negative air pressure (vacuum) method in accordance with ASTM Specification C1244. If the leakage or infiltration rate in any manhole fails the vacuum test the Contractor shall locate the leaks and repair them at his own expense.

Compensation

201.80 Method of Measurement

Measurement for ~~catch basins, leaching basins,~~ manholes ~~and drop inlets (Types C and C),~~ will be based on a standard unit having a depth of 6 1/2 feet; ~~for drop inlets (Types A and B) having a depth of 4 feet 10 inches,~~ as measured vertically at the center of the structure from the top of the ~~grating or~~ cover to the ~~top of the floor in the case of basins and inlets and the~~ invert in the case of manholes. When the measured depth exceeds the standard unit, the number of units paid for will be in the proportion of the measured depth to the standard depth down to 9 feet. ~~Basins,~~ Manholes~~, or drop inlets~~ having a depth less than this standard unit will be counted as one unit. ~~Each gutter inlet shall be counted as one unit.~~ Measurement for manholes more than 9 feet down to a depth of 14 feet will be based on a standard unit depth of 9 feet as measured vertically at the center of the structure from the top of the cover to the invert. Measurement for manholes more than 14 feet down to a depth of 18 feet will be based on a standard unit depth of 14 feet as measured vertically at the center of the structure from the top of the cover to the invert.

When items for Manholes (9' to 14' Depth) or Manholes (14' to 18' Depth) do not appear in the Proposal, the standard unit of depth for all structures shall be 6 1/2 feet.

~~Special manholes will be measured as complete units regardless of depth.~~

Transportation, delivery and installation of all castings will be included in the contract unit bid price for the kind of structure involved.

The quantity of manholes to be paid for under the Sanitary Manhole Lining item shall be the vertical foot of manholes rehabilitated and shall include furnishing, installing and operating and removing temporary by-pass flow (as necessary); removing and reinstalling existing protruding manhole steps (as necessary), cleaning and preparing the manhole interior with materials including water and equipment furnished by the Contractor.

201.81 Basis of Payment

The accepted quantities of manholes~~, inlets and basins~~ will be paid for at the contract unit price each, complete in place, which shall not include the cost of castings.

Payment for the concrete collars shall be included in the contract unit price of the structure involved.

~~Extra depth excavation below the proposed bottom of structure to obtain a stable foundation will be paid for as Class B Trench Excavation.~~

~~When directed, the castings of drainage structures on the roadways opened to traffic will be set to a temporary grade, and the unit will be considered complete in place and paid for at the contract unit price for the type of structure involved. At such time as the casting or structure and casting is adjusted to final grade the work shall be done and payment made under the provisions of Section 220. Crushed stone for weep holes will be included in the price of the structure.~~

If the material for back fill is obtained from borrow it will be paid for at the contract unit price per cubic yard or ton for the kind of borrow required.

Furnishing new castings will be paid for at the contract unit price each under the items ~~for Frame and Grate or~~ Frame and Cover ~~or __ inch Hood~~.

The unit price paid under the Sanitary Sewer Lining item shall include furnishing and installing plugs, patches and grout around pipe openings and at all holes to stop active hydrostatic infiltration into the manhole. The unit price paid for under this item shall also include furnishing, preparing, mixing, applying and curing the materials; furnishing testing equipment, making samples and performing tests on materials as requested by the Engineer. The unit price paid for under this item shall also include all labor, tools, equipment, materials and all other incidentals necessary to rehabilitate existing manhole walls and base. Removal and disposal of drainage structure sediments is considered incidental to this work..

201.82 Payment Items

~~**201.**~~	~~**Catch Basin**~~	~~**Each**~~
~~**202.**~~	~~**Manhole**~~	~~**Each**~~
~~**202.2**~~	~~**Manhole (9 to 14 foot depth)**~~	~~**Each**~~
~~**202.3**~~	~~**Manhole (14 to 18 foot depth)**~~	~~**Each**~~
~~**203.**~~	~~**Special Manhole**~~	~~**Each**~~
~~**204.**~~	~~**Gutter Inlet**~~	~~**Each**~~
~~**205.**~~	~~**Leaching Basin**~~	~~**Each**~~
~~**206.**~~	~~**Drop Inlet, Type A**~~	~~**Each**~~
~~**206.1**~~	~~**Drop Inlet, Type AF**~~	~~**Each**~~
~~**207.**~~	~~**Drop Inlet, Type B**~~	~~**Each**~~
~~**207.1**~~	~~**Drop Inlet, Type BF**~~	~~**Each**~~
~~**208.**~~	~~**Drop Inlet, Type C**~~	~~**Each**~~
~~**208.1**~~	~~**Drop Inlet, Type CF**~~	~~**Each**~~
~~**209.**~~	~~**Drop Inlet, Type D**~~	~~**Each**~~
~~**209.1**~~	~~**Drop Inlet, Type DF**~~	~~**Each**~~
210.3	***Sanitary Sewer Manhole (14 to 18 foot depth)***	***Each***
~~**220.**~~	~~**Drainage Structure Adjusted**~~	~~**Each**~~
220.10	***Sanitary Sewer Manhole (Brick) Lining***	***Foot***
~~**221.**~~	~~**Frame and Cover**~~	~~**Each**~~
~~**222.**~~	~~**Frame and Grate**~~	~~**Each**~~
~~**222.1**~~	~~**Frame and Grate, MHD Cascade Type**~~	~~**Each**~~
222.30	***Frame and Grate (or Cover) Municipal Standard***	***Each***
~~***224**~~	~~**__ inch Hood**~~	~~**Each**~~
~~**142.**~~	~~**Class B Trench Excavation**~~	~~**Cubic Yard**~~
~~**144.**~~	~~**Class B Rock Excavation**~~	~~**Cubic Yard**~~
151.	**Gravel Borrow**	**Cubic Yard**
~~**156.**~~	~~**Crushed Stone for Drainage, Revetment and Water Work Foundation**~~	~~**Ton**~~

*Pipe or appurtenance size will be included as part of the item number in order to differentiate between the sizes.

Description

230.20 General.

This work shall consist of ~~the construction of~~ *furnishing, installing (including excavation up to 5 feet and backfilling) and testing* ~~culvert storm drains~~, sewer pipes, hereinafter referred to as "Pipe", *PVC sewer pipes and fittings of the size, type and class specified* ~~and flared end sections for Reinforced Concrete or Metal Pipe~~, in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer.

Materials

230.40 General.

Materials shall meet the requirements specified in the following subsections of Division III, Materials:

~~Corrugated Metal Pipe~~	~~M5.03.0~~
~~Asphalt Coated Corrugated Metal Pipe Arch~~	~~M5.04.0~~
~~Asphalt coated Smooth Steel Liner Helically Corrugated Shell Metal Pipe~~	~~M5.04.3~~
~~Reinforced Concrete Pipe~~	~~M5.02.1~~
~~Ductile Iron Pipe~~	~~M5.05.3~~
~~Structural Plate for Pipe and Pipe Arch~~	~~M5.04.2~~
~~Jointing Materials for Pipe~~	~~M9.10.0~~
~~Mortar for Pipe Joints~~	~~M4.02.15~~
~~Reinforced Concrete Pipe, Flared Ends~~	~~M5.02.2~~
~~Metal End Sections~~	~~M5.03.6~~
~~Polymeric Precoated Corrugated Metal Pipe~~	~~M5.03.8~~
Corrugated Plastic (Polyethylene) Pipe	M5.03.10
~~Corrugated Plastic Flared Ends~~	~~M5.03.10~~

Polyvinyl chloride (PVC):

Solid wall PVC pipe, sizes 4 inch to 20 inch and fittings shall conform to ASTM Standard Specification for type PSM sewer pipe and fittings, designation 3034. Co-extruded PVC pipe and fittings using recycled materials and conforming to ASTM Standard Specification, designation F1760, may also be used. All pipes shall have a minimum pipe diameter to wall thickness ratio (SDR) of 35 and a minimum pipe stiffness of 46 psi. Solid wall polyvinyl chloride pipe sizes 18 inch and greater, and fittings, shall conform to ASTM Standard Specification for large diameter PVC pipe, designation F-679.

The pipe fittings shall have an SDR of 35 and a pipe stiffness of 46 psi. Wye branches shall conform to the specifications referenced above for pipe material. Saddle wye branches are prohibited. Pipe and fittings shall have bell and spigot (push-on) joints using elastomeric ring gaskets. Gaskets shall be made of a composition and texture, which is resistant to common ingredients of sewage and industrial wastes, including oils and ground water and which will endure permanently under the conditions of its proposed use. Joints shall conform to ASTM Standard Specifications of Joints for Drain and Sewer Plastic Pipe using Flexible Elastomeric Seals, Designation D3212-76.

By-Pass Pumping System:

The Contractor is required to furnish all materials, labor, equipment, power, maintenance, etc. to implement a temporary pumping system for the purpose of diverting the existing sewer flow around the work area for the duration of the project. The work area under this section will include all those areas where new pipes replace a portion of or the entire existing pipe. This item does not include the by-pass systems included in Items 220.10 SANITARY SEWER MANHOLE (BRICK) LINING, 251.08 8 INCH CLAY SEWER LINING (NON-MAN ENTRY), 251.10 10 INCH VC – PVC SEWER LINING (NON-MAN ENTRY), 251.12 12 INCH

VC – PVC SEWER LINING (NON-MAN ENTRY), 251.15 15 INCH VC-PVC SEWER LINING (NON-MAN ENTRY), 251.18 18 INCH BRICK SEWER LINING (NON-MAN ENTRY), AND 251.48 48 INCH BRICK SEWER LINING (NON-MAN ENTRY). No claims shall be allowed for interference to other work resulting from an inadequate bypass system.

The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The Contractor shall employ the services of a vendor who can demonstrate to the Engineer that he specializes in the design and operation of temporary bypass pumping systems. The vendor shall provide at least five (5) references of projects of a similar size and complexity as this project performed by his firm within the past three years. A minimum of 15 years experience in design and implementation of successful sewer bypass must be demonstrated by the by-pass vendor.

Construction Methods

230.60 General.

Excavation and backfill shall conform to the applicable portions of Sections 140 and 150.

Existing pavement need not be precut along trench lines, but care shall be taken to avoid unnecessarily disturbing the existing pavement areas beyond the limits shown. All sewer pipe 8 inch diameter and greater shall be laid using a laser system approved by the Engineer. PVC pipe shall not be stored in direct sunlight.

230.61 Bedding Pipes.

The bedding for the pipe shall be shaped to conform reasonably close to the lower 10% of the pipe and recesses excavated for bells of bell and spigot pipes.

All pipes shall be laid to the specified line and grade, with a firm bearing throughout each length and with bell ends uphill.

All piping shall be adequately supported in accordance with the contract plans and as specified herein. The Contractor shall furnish all labor necessary to assist the Engineer in inspecting the pipe and fittings. The pipe and fittings shall be inspected upon delivery and any which do not conform to the above specifications shall be rejected and immediately removed from the site by the Contractor. Installation shall be in accordance with ASTM D2321.

Where the bottom of the trench is, in the opinion of the Engineer, found to be unstable, the Contractor shall excavate the unsuitable material to the width and depth ordered by the Engineer, and shall replace all unsuitable materials, as directed, with a well compacted foundation consisting of crushed stone conforming to Standard Specification M2.01.4. Crushed Stone Foundations will be paid for under Item 156, only where shown on the drawings or ordered by the Engineer. Where rock is encountered it shall be removed to a depth of 12 inches below and from all sides of the pipe.

230.62 Pipe Joints.

~~The joints of clay, cement concrete and reinforced concrete pipe, shall be formed by caulking into the ball a gasket of jute or oakum and then filling the remainder of the joint with cement mortar. The invert shall be kept smooth and free of any obstructions. In the case of concrete pipe the surfaces to be joined shall thoroughly cleaned and wetted with water before the joint is made. Corrugated metal pipe and corrugated plastic (polyethylene) pipe shall be firmly joined with an approved coupling.~~

When rubber type ring gaskets are used, the pipe ends shall be designed so that the gasket will be confined on all sides and will not support the weight of the pipe. Regardless of the type of joint used the interior surfaces of abutting pipes shall form a smooth grade when pipe laying is completed.

~~Where water tight joints are required, reinforced cement concrete pipe shall be joined using flexible water tight rubber gaskets conforming to ASTM C443. Any alternative joint design must be pre-approved by the Department's Research and Materials Engineer.~~

~~In designated areas, as directed, certain joints may be left open to allow for entrance of underground water into the pipe line.~~

230.63 Placing Castings.

A. Excavation. (See Subsection 140.60)

B. Bedding.

The pipe or pipe-arch structure shall be placed on prepared foundation carefully shaped to fit the lower plate or plates of the structure so that the flow line will conform to the required grade.

The arch structure shall be placed on a foundation as shown on the plans. Each side of the arch shall rest on a galvanized channel, as detailed on plans, securely embedded in the substructure.

C. Erections.

The plates for the structure shall be assembled according to the manufacturer's assembly instructions. Pipe or pipe arch structures may be assembled in their final location or adjacent to it, and then placed on the prepared foundation as a complete unit. Arches shall be erected in place upon the prepared substructure. When completed, all bolts shall be effectively tightened.

D. Elongation of Pipe.

All pipe shall be fabricated elliptically so as to increase the vertical diameter 5 percent and decrease the horizontal diameter 5 percent. These dimensions shall be subject to manufacturing tolerances.

E. Coating.

The entire outside surface and the inside bottom half of the pipes and the entire outside and inside of the bottom and corner plates of pipe arches shall be covered with a coat of bituminous material conforming to Subsection M7.04.01 of Division III, Materials.

When the structure is erected in the final location, the bottom of all plates that are to be in contact with the ground shall be coated and allowed to dry before they are placed in the structure.

For arches, the entire outside surface shall be covered with one coat of bituminous material as specified above. The metal bearing channel shall be filled with an approved asphalt filler to the level of the concrete after erection of the arch and before backfilling is started.

F. Backfilling.

Backfilling requirements shall conform to the provisions of Subsections 120.60B, 150.60 and 150.64.

G. Flared End Sections.

The unit shall be accurately aligned on a prepare bed on the existing ground, or if so directed by the Engineer, on compacted gravel fill.

230.64 Field Testing of Corrugated Plastic Pipe.

Installed pipe shall be tested to ensure the maximum vertical deflection of the thermoplastic pipe does not exceed five percent of its base inside diameter. The base inside diameter is defined as the specified nominal diameter minus the AASHTO allowable inside diameter tolerance of 1.5% but not more than 1/2 inch.

A minimum of 20% of the total length of each size of Corrugated Plastic Pipe installed on the project shall be tested. Only mandrel testing shall be used for pipe sizes of 24 inches or less. For pipe sizes greater than 24 inches, the Contractor shall have the option to video inspect, and (1) use a mandrel test if a deflection is noted or (2) hand measure, for pipes with a diameter greater than 36 inches, to the requirements listed below. Runs of pipe to be tested shall be selected by the Engineer. The failure of any tested pipe shall subject all corrugated Plastic Pipe of every size to 100% testing, at the discretion of the Engineer.

Deflection tests shall be performed by the Contractor under the direction of the Engineer not sooner than 30 days after completion of installation and compaction of backfill. The pipe shall be cleaned and inspected for offsets and obstructions prior to testing.

Mandrel Test:

- Shall be used for all pipes up to 24 inches (600 mm) nominal inside diameter

- The mandrel shall be pulled through the pipe by hand to ensure that maximum allowable deflections have not been exceeded
- The mandrel diameter shall be verified and approved by the Engineer prior to use
- Use of an unapproved mandrel will invalidate the test
- If the mandrel fails to pass through the pipe, the pipe will be deemed to be over deflected
- The mandrel shall be a rigid device, with odd numbered legs (9 legs minimum) having an effective length not less than its nominal diameter
- The mandrel shall be fabricated of steel with pulling rings at each end
- The mandrel shall be stamped or engraved on some segment other than a runner indicating the nominal size, and mandrel OD

Video Inspection:

- May be used to determine if a deflection is evident in pipes with a nominal inside diameter greater than 24 inches
- Verification of the actual deflection limits must be accomplished using the mandrel test method or the hand measurement method
- Provide and use a mobile color video camera and light source to inspect pipes
- The video camera must be able to be moved inside the pipe barrel and be controlled remotely by the inspector
- The video camera must have a remote monitor and a recording apparatus to view and record the condition of the installed pipes
- A copy of the pipe inspection video recording, in an approved format, shall be provided to the Engineer

Hand Measurement:

- Measure manually any deflections of pipe larger than 36 inches nominal inside diameter up to 48 inches nominal inside diameter
- Must be done in the presence of the Engineer

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

Nominal Size (inches / mm)	Allowable Deflected Diamete (inches / mm)
12 300	11.2 285
15 375	14.0 356
18 450	16.8 428
24 600	22.4 570
30 750	28.0 713
36 900	33.7 856
42 1 050	39.4 1 001
48 1 200	45.1 1 142

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

230.65 PVC Pipe.

A. PVC Couplings.

Sewer Couplings shall be pressure rated at least equal to that of the pipe.

The coupling sleeve shall be 0.25 inch minimum thickness elastomeric polyvinyl chloride with a minimum tensile strength of 1.93 ksi.

The sleeve shall fit snugly onto the pipe to be joined and be resistant to common chemicals present in sewerage. Adjustable pipe clamps shall consist of a slotted band that mates with the worm gear screw and a screw housing all manufactured of stainless steel, and suitable for underground service.

B. Storage and Handling.

Each pipe unit shall be handled into its position in the trench only in such manner, and by such means as acceptable to the Engineer. Care shall be taken to avoid damaging the pipe and fittings. Sewer pipe shall be laid at the lines and grades as shown on the plans and specified herein. Whenever encountered within the trench, existing sewer/drain lines shall be removed unless otherwise noted. All existing sewer/drain lines, which are to be abandoned in place, shall be plugged at all open ends. Each pipe and/or fitting to be installed shall be subjected to a careful inspection just prior to installation. Each straight length of pipe shall be generally straight. Centerline deviation of more than .05 inch per 12 inch of length shall be deemed unacceptable and such pipe shall immediately be removed from the site.

PVC and Closed Profile PVC Pipe shall be supported by compacted-screened gravel. No pipe or fitting units shall be supported on saddles, blocking or stones.

Suitable bell holes shall be provided so that after installation only the barrel of the pipe receives bearing pressure from the supporting material.

All pipes and fittings shall be cleaned of all debris, dirt or other foreign substances prior to being installed and shall be kept clean until accepted. Before any joint is made, the previously installed unit shall be checked to insure that a closed joint with the adjoining unit has been maintained and that the inverts are matched and conform to the required grade. Pipe shall not be driven down to the required grade by striking with an unyielding object. Immediately before joining the pipe all joint surfaces shall be cleaned and the bell or groove shall be lubricated in accordance with the manufacturer's recommendations. Each pipe unit shall be pushed into place without damage to the pipe or gasket.

All open ends of pipe and branches shall be closed with stoppers secured in place in an acceptable manner. After each pipe has been properly bedded, enough screened gravel or 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 shall be filled with screened gravel and compacted, and then screened gravel shall be placed and compacted to complete the pipe bedding as indicated on the drawings. The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench.

At all times pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs, or by other acceptable means. If water is in the trench when work is to be resumed, the plug shall not be removed until suitable provisions have been made to prevent water, earth, or other substances from entering the pipe. Pipelines shall not be used as conductors for trench drainage during construction.

All manhole connections shall be as shown on the drawings except that concrete and mortared connections shall be equipped within integral O-ring or other sealant such that a positive watertight seal is established.

Allowable PVC Pipe Deflection provided under this specification shall be so installed as to not exceed a maximum deflection of 4.0 percent. Such deflection shall be computed by multiplying the amount of deflection (nominal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.

Upon completion of a section of sewer, 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 acceptable to the Engineer. Should the installed pipe fail to meet this requirement, the Contractor shall do all work to correct the problem as the Engineer may require without additional compensation.

C. Pipe Joint Testing.

General:

The Contractor is required to furnish all materials, labor, equipment and power required for testing sewer pipe joints by applying a positive air pressure to the joints, monitoring, recording the pressure of the void and grouting the joints as necessary using the packer injection method so that each joint passes the pressure test.

Equipment:

The basic equipment used for mainline pipe joints shall consist of a remotely operated color television camera capable of pan and tilt, joint testing device (packer) and test monitoring and recording equipment. The equipment shall be constructed in such a way as to provide means for introducing air under pressure into the void area created by the expanded ends of the packer against the host pipe and a means for continuously measuring, viewing and recording the actual static pressure of the test medium and grout within the void area only. The packer shall be of a size less than the diameter of the host pipe, with cables at either end used to pull it through the line and may be constructed in such a manner as to allow a restricted amount of sewage to flow at all times. The packer shall be expanded by air pressure. The packer shall be of low void space construction with void volume given by the packer manufacturer.

Void pressure data shall be transmitted from the void area to the monitoring equipment or video picture of a pressure gauge mounted on the packer and connected to the void area. All test monitoring shall be above ground and in a location to allow for simultaneous and continuous observation of the televising monitor and test monitoring equipment.

Grouting equipment shall consist of the packer, appropriate pumping and hosing systems capable of supplying an uninterrupted flow of sealing materials to completely fill the voids. The grout pumping system shall be sized to deliver a mixed volume of grout at a minimum of 3 gpm and 30 gallons of uninterrupted flow within 10 minutes.

The volume of mixed grout pumped must be capable of being measured and recorded for each grouted joint. Generally, the equipment shall be capable of performing the specified operations in sewers where flows do not exceed 25 percent of pipe diameter unless permitted by the Engineer.

Grouts – General:

A. *All grout materials must have the following characteristics:*
    a. *While being injected, the grout must be able to react/perform in the presence of water.*
    b. *The ability to increase grout mix viscosity, density and gel strength by increased concentration of constituents or the use of approved additives.*
    c. *The cured grout must withstand submergence in water without degradation.*
    d. *The resultant grout formation must be homogeneous and prevent the passage of water through the pipe joint.*
    e. *The grout must not be biodegradable.*
    f. *The cured grout should be chemically stable and resistant to organics found in sewage.*
    g. *Residual grout shall be easily removable from the sewer line to prevent blockage of the sewage flow.*

B. *Handle, mix and store grout in accordance with the manufacture's recommendations. The materials shall be delivered to the site in unopened original manufacture's containers.*

Chemical Grouts:

A. *Water based chemical grouts shall have the following characteristics:*

a. *A minimum of 10% acrylamide base material by weight in the total grout mix. A higher concentration of acrylamide base material is recommended to increase strength or offset dilution during injection.*

b. *The ability to tolerate some dilution and react in moving water during injection.*

c. *A viscosity of approximately 2 centipoise, which can be increased with approved additives.*

d. *A controllable reaction time from 10 seconds to 1 hour.*

e. *A reaction (curing) that produces a homogeneous, chemically stable, non-biodegradable, firm, flexible gel.*

Control Tests:

The Contractor shall perform such controls tests as is necessary to ensure that the testing equipment is properly functioning. Any testing performed with equipment not functioning properly will be redone by the Contractor with no cost to the Owner.

Pipe Preparation:

Prior to the application of the chemical grouting materials, the Contractor shall thoroughly clean the sewer designated to receive the chemical grouting. Cleaning shall constitute removal of all loose debris and solids which inhibit proper seating of the packer.

Grout Preparation:

A. *Follow the manufacturer's recommendations for mixing and safety procedures.*

B. *Adjust gel time as necessary to compensate for changes in temperature in grout component tanks or hoses. The addition of dilution water to extend gel times is not acceptable unless the resulting base grout tank only material exceeds 20% by weight for solution grouts.*

C. *During the grouting process, the grouting technician shall monitor the grout component tanks to make sure that proper ratios are being pumped.*

Joint Testing Procedure:

A. *Joint testing pressure shall be equal to 0.5 psi per vertical foot of pipe plus 2 psi; however, the test pressure shall not exceed 10 psi without approval of the Engineer.*

B. *Individually test each sewer pipe joint at the above-specified pressure (and retest after sealing) in accordance with the following procedure:*

a. *Air Test Procedure*

i. *The packer shall be positioned within the pipe in such a manner as to straddle the joint to be tested.*

ii. *The packer ends shall be expanded so as to isolate the joint from the remainder of the pipe to create a void area between the packer and the pipe joint. The ends of the testing device shall be expanded against the pipe as per the manufacturer's recommendations. If all attempts to isolate the joint fail, pump grout in an attempt to seal the leak around the packer end elements.*

iii. *After the void pressure is observed to be equal to or greater than the required test pressure, the air flow shall be stopped. If the void pressure decays more than 1.0 psi within 15 seconds, the joint will have failed the test and shall be sealed and retested until the joint passes.*

C. *Upon completing the testing of each individual joint, the packer shall be deflated with the void pressure meter continuing to display the void pressure. Should the void pressure meter fail to drop to 0.0+/- 0.5 psi, clean the test equipment or residual grout or make the necessary equipment repairs to provide for an accurate void pressure reading.*

Grouting – general:

Grout all joint connections that failed the pressure test by the injection method. This shall be accomplished by forcing grout through a system of pumps and hoses into and through the joints of the sewer from the packer within the sewer pipe.

Remove excess grout from pipe and laterals. Excess grout shall be defined as a thickness of grout that given its location, size and geometry, could cause a blockage. Flush or push forward to the next downstream manhole, remove from the sewer system and properly dispose of excess grout.

Pipe Joint Sealing By packer Injection Grouting

A. *Place the mainline packer over the joint to be sealed by means of CCTV camera in the line.*

B. *Pneumatically expand the packer sleeves such that they seal against the inside periphery of the pipe to form a void area at the joint now completely isolated from the remainder of the pipe line.*

C. *Pump grout materials, in stages if needed, into this isolated area to seal the pipe joint.*

D. *Retest the joint. Repeat the grouting and retesting as necessary until the joint passes the pressure test. Record the amount of grout pumped on the testing log.*

D. Television Inspection.

Seven days after the completion of the backfilling of each section of new pipe, as defined as a length of pipe between two manholes, the Contractor will provide a televised inspection of the pipe to be presented to the Engineer. The Inspector or Engineer shall be present during the taping. The tape will be DVD format and will show a clear picture of the inside of the new pipe. If the Engineer determines that the tape is unacceptable for review the contractor shall re-televise the line until an acceptable tape has been submitted. No payment for the pipe will be made until the Engineer has reviewed the tape and accepted the pipe. In the event that the pipe is not acceptable for any reason relating to the proper construction of the pipe according to these specifications and the Contractor will be responsible to re-excavate and repair the defects to the satisfaction of the Engineer at no additional cost. The payment for the televised inspection will be incidental to the laying of the pipe.

E. Clay Cutoff.

If crushed stone bedding is used, 12 inch wide impermeable clay cutoff barrier shall be installed across the trench bottom every 100 feet or as directed by the Engineer, to prevent groundwater from flowing unimpeded along the pipe trench, through the crushed stone. No additional payment will be made for this barrier.

F. Service and Lateral Connections.

Service connections shall be installed at a minimum slope of 2 percent at the locations determined by the Engineer in the field. It should be anticipated that each building along the sewer being installed will have one sewer lateral service connection.

Also, connection stubs for future construction may be required as directed by the Engineer or City. Each branch installed for future use shall be fitted with a watertight masonry plug and shall extend to the limits of work where shown in order to minimize the impact of future connections.

Chimneys shall be installed when directed by the Engineer. Such chimneys shall be constructed in accordance with City standard details.

G. Sewer Coupling Installation.

Sewer couplings which are factory manufactured shall be installed at all connections from existing pipe to proposed pipe unless the existing pipe is the same material as the proposed pipe and the bell and spigot end of the pipes to be connected are compatible and free from defects. All sewer couplings shall be installed in accordance with the manufacturer's recommendations for the types of pipe to be connected.

H. Inspection and Acceptance.

Acceptance will be on the basis of material and/or pressure tests and inspection by the Engineer. Inspection may be made at the place of manufacture, or on the work after delivery, or both, and the pipe shall be subject to rejection at any time due to failure to meet any of the specification requirements, even though

sample pipe units may have been accepted as satisfactory at the place of manufacture. The Contractor shall immediately remove all rejected pipe from the project site. Tests and certified copies in triplicate of test results will be required for the materials as described herein. If less than 100 units of a given size and class of pipe are required, the Contractor may submit certified copies of tests made on identical pipe units made by the same manufacturer within the past year. If more than 100 units of a given size and class of pipe are required, the Contractor shall, at his own expense, engage the services of an acceptable independent testing laboratory to perform or witness all tests and certify the results. In addition, the Engineer reserves the right to have any or all pipe units inspected or tested, or both, by an independent testing laboratory at either the manufacturer's plant or elsewhere. Such additional inspection and/or tests shall be the test results of record. Should the test results be satisfactory, the cost for the tests shall be at the Engineer's expense. Should the test results not be satisfactory, the cost for the tests shall be at the Contractor's expense. All tests shall be made in accordance with the above-mentioned applicable ASTM specifications, and acceptance or rejection shall be based on the test results.

I. Other.

Residuals in the existing pipe to be removed shall be disposed of by the Contractor in conformance with all federal, state and local requirements.

Additional requirements for backfill and compaction of the sewer trench shall be as specified under drain pipe Items.

230.66 Dewatering.

Geotechnical borings were performed between June 6-8, 2012 along Beacon Street to evaluate soil and groundwater conditions. Soil boring information is shown on the Drawings. Groundwater was not observed in the boring. It is anticipated that the installation of the new PVC pipe and connections to the existing building services will not be below the groundwater table and will not require dewatering. The Contractor shall be fully responsible for the design, operation and maintenance of the dewatering system used with no additional compensation if required. The design of the system shall be submitted to the Engineer for approval prior to installation and implementation of the dewatering system. Approval of the dewatering system does not relieve the Contractor of responsibility for the dewatering system. Clean discharge from the dewatering system may be directed to the existing municipal storm drain after approval of the dewatering system by the Engineer. The Contractor shall be solely responsible for ensuring the discharge from the dewatering system to the municipal storm drain is clean. Any discharge which is not clean shall be treated by the Contractor until the turbidity levels are acceptable to the Engineer, with no additional compensation. The dewatering operations required for the installation of the new PVC and connections to the existing building services shall be considered incidental to the installation of the new PVC and connections to the existing building services and will be paid for under those items.

230.67 By-Pass Pumping System.

Submittals:

The Contractor shall prepare with the vendor a specific, detailed description of the proposed pumping system and submit it for approval.

The Contractor shall submit to the Engineer detailed plans and descriptions outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing wastewater flows. All pumps, pipe and system shall be by a single specified vendor. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials and all other incidental items necessary and/or required to insure proper protection of the facilities, including protection of the access and bypass pumping locations from damage due to the discharge flows, and compliance with the requirements and permit conditions specified in these Contract Documents. No construction shall begin until all provisions have been provided and the Engineer has reviewed the submittals.

The plan shall include but not be limited to details of the following:

1. *Construction sequencing.*

2. *Staging areas for pipe, pumps and appurtenances.*
3. *Sewer plugging method and types of plugs.*
4. *Number, size, material, location and method of installation of suction piping.*
5. *Number, size, material, method of installation and location of the installation of discharge piping.*
6. *Bypass pump sizes, capacity, number of each size to be on site and power requirements.*
7. *Calculations of static lift, friction losses, and flow velocity (pump curves showing pumps operating range shall be submitted including a calculated system curve at peak capacity).*
8. *Standby power generator size, location, if required.*
9. *Downstream discharge plan.*
10. *Method of protecting discharge manholes or structures from erosion and damage.*
11. *Thrust and restraint block sizes and locations.*
12. *Sections showing suction and discharge pipe depth, embedment, select fill and special backfill.*
13. *Method of noise control for each pump and/or generator.*
14. *Any Temporary pipe supports and anchoring required.*
15. *Design plans and computation of access to bypass pumping locations as described herein.*
16. *Calculations for selection of bypass pumping pipe size including friction loss and velocity. A system curve will be required, plotting the performance of the pumps at the required suction lift.*
17. *Schedule for installation of and maintenance of bypass pumping lines.*
18. *Plan indicating location of bypass pumping lines.*
19. *Pumps will not be benched down to make the suction lift without the approval of the Engineer.*
20. *The Contractor's submittal will be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.*

Materials:

All pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system. Vacuum pump and diaphragm type devices shall not be accepted. The pumps may be electric or diesel powered. All pumps used must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows. The pump manufacturer shall be ISO 9002 certified.

The Contractor shall provide the necessary stop/start controls for each pump.

The Contractor shall include one stand-by pump of each size to be maintained on site.

Back-up pumps shall be on-line, isolated from the primary system by a valve.

Discharge Piping:

In order to prevent the accidental spillage of flows all discharge systems shall be constructed of rigid pipe with positive, restrained joints. Under no circumstances shall aluminum "irrigation" type piping or glued PVC pipe be allowed. Discharge hose will only be allowed in short sections and by specific permission from the Engineer.

Allowable piping materials will be special thickness Class 50 ductile iron 100% restrained joint pipe, welded steel pipe or fused, high-density polyethylene pipe. Connection to force main shall be 1.0 MPA rated hosepipe valve and fitting.

Pumps connected by a common suction manifold will not be permitted. Each pump will have an individual suction line.

Design Flow Requirements:

Bypass pumping systems shall have sufficient capacity to pump the full capacity of the pipeline to be bypassed. The Contractor shall provide all pipeline plugs, pumps of adequate size to handle peak flow, and temporary discharge piping to ensure that the total flow of the main can be safely diverted around the section to be installed or replaced. The Contractor shall operate the bypass pumping system 24 hours per day or as required.

The Contractor shall have adequate standby equipment available and ready for immediate operation and use in the event of an emergency or breakdown. One standby pump for each size pump utilized shall be available at the mainline flow bypassing locations, ready for use in the event of primary pump failure.

Bypass pumping system shall be capable of bypassing the flow around the work area and of releasing any amount of flow up to full available flow into the work area as necessary for satisfactory performances of work.

The Contractor shall make all arrangements for bypass pumping during the time when the main is shut down for any reason. System must overcome any existing force main pressure on discharge.

The bypass system shall be designed to meet the noise management requirements at all times. All diesel driven primary and standby pumps shall be sound attenuated. The use of critical silenced canopy pump or pumps or acoustical whisper pack enclosures for sound attenuation is required.

Construction Methods:

Performance Requirements:

It is essential to the operation of the existing sewerage system that there be no interruption in the flow of sewage throughout the duration of the project. To this end, the Contractor shall provide, maintain and operate all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required), conduits, all necessary power, and all other labor and equipment necessary to intercept the sewage flow before it reaches the point where it would interfere with this work, carry it past his work and return it to the sanitary sewer downstream of his work.

The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

The Contractor shall provide all necessary means to safely convey the sewage past the work area. The Contractor will not be permitted to stop or impede the main flows under any circumstance.

The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharging of sewers; damage to sewer and that will protect public and private property from damage and flooding.

The Contractor shall protect water resources, wetlands and other natural resources.

Field Test:

The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to actual operation. The Engineer will be given 24 hours notice prior to testing.

Field Inspection:

Contractor shall inspect bypass-pumping system every two hours to ensure that the system is working correctly.

Maintenance Service:

The Contractor shall insure that the temporary pumping system is properly maintained and a responsible operator shall be on hand at all times when pumps are operating.

Extra Materials:

Spare parts for pumps and piping shall be kept on site as required.

Precautions:

Contractor is responsible for locating any existing utilities in the area the Contractor selects to locate the bypass pipelines. The Contractor shall locate his bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from the Engineer. The Contractors shall pay all costs associated with obtaining all approvals.

During all bypass-pumping operations, the Contractor shall protect the local sewer lines from damage inflicted by any equipment.

The Contractor shall be responsible for all physical damage to all local sewer lines caused by human or mechanical failure.

Installation and Removal:

The Contractor shall remove manhole sections or make connections to the existing sewer and construct temporary bypass pumping structures only at the access locations described herein and as may be required to provide adequate suction conduit.

Plugging for blocking of sewage flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance or work, it is to be removed in a manner that permits the sewage flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.

When working inside manhole or force main, the Contractor shall exercise caution and comply with OSHA requirements when working in the presence of sewer gases, combustible or oxygen deficient atmospheres, and confined spaces.

The installation of the bypass pipelines is prohibited in all salt marsh/wetland areas. The pipeline must be located along the curb lines of the streets. When the bypass pipeline crosses private driveways, the Contractor must place the bypass pipelines in trenches and cover with temporary pavement or use approved road ramp devices. Upon completion of the bypass pumping operations, and after the receipt of written permission from the Engineer, the Contractor shall remove all the piping, restore all property to pre-construction condition and restore all pavement. The Contractor is responsible for obtaining any approvals for placement of the temporary pipeline within public ways.

Compensation

230.80 Method of Measurement

A. Pipes shall be measured in place and the quantity to be paid for shall be the length actually constructed as directed within the limits specified below.

For measurement purposes the end of pipe in closed structures shall be considered at the inside face of the wall and at masonry headwalls it shall be considered to be at the face of the headwall.

Pipe bends for ~~corrugated plastic~~ *and PVC* pipe shall be in accordance with the standard drawings and the length of pipe sections containing bends shall be measured along the centerline and shall be paid for as straight sections of pipe.

~~Reinforced Concrete Pipe Flared Ends and Metal End Sections will be measured in place by the unit each, complete and approved.~~

Trench excavation in excess of 5 feet and rock excavation shall be measured as specified in Subsection 140.80 for Class B Trench Excavation ~~and Class B Rock Excavation respectively~~.

B. ~~Structural plate pipe or pipe arches shall be measured in place and the quantity to be paid for shall be the length actually constructed as directed and o the following limits:~~

~~For structural plate pipe the length shall be the average of the top and bottom center line length; for pipe arches, the bottom center line length; and for arches, the average of the springing line lengths.~~

~~Trench Excavation in excess of 5 feet and Rock Excavation for structural plate pipe, arches and pipe arches shall be measured in accordance with the relevant provisions of Subsection 140.80 for Class B Trench Excavation and Class B Rock Excavation.~~

~~Corrugated plastic~~ *PVC* pipe includes testing and all other incidentals necessary to complete the work. All costs incurred by the contractor attributable to retesting and corrective action, including any delays, shall be borne by the contractor at no cost to the ~~Department~~ *City*.

The By-pass pumping system shall be paid for on a lump sum basis. The lump sum price shall constitute full compensation for all labor, tools, and equipment necessary for the by-pass pumping of existing flows in the manner specified. The lump sum price shall include all locations where temporary closure of the existing sewer is necessary.

230.81 Basis of Payment

Pipe ~~culverts, pipe drains and pipe~~ sewers will be paid for at the contract unit price per lineal foot of the kind of pipe required, installed and complete in place. ~~Corrugated plastic pipe shall include gravel borrow Type D backfill material.~~

~~Reinforced Concrete Pipe Flared Ends and Metal End Sections will be paid for at the contract unit price each for the size and kind of pipe end specified.~~

Trench excavation for ~~pipe culverts, pipe drains,~~ pipe sewers ~~, structural plate pipe arches and pipe arches~~ greater than a depth of 5 feet and rock excavation will be paid for as specified in Subsection 140.81 for Class B Trench Excavation ~~and Class B Rock Excavation~~. No payment for trench excavation for pipes will be made within the limits of one foot outside the base section of ~~catch basins,~~ manholes or ~~leaching basins~~.

Trench Excavation and backfill for trenches 5 feet or less in depth for pipe ~~arches, pipe culverts, pipe drains, and structural plate pipe arches~~ shall be included in the various items of pipe. Backfill for that part of a trench which is more than 5 feet depth shall be included in the item for Class B Trench Excavation. If the material for backfill is obtained from borrow it will be paid for at the contract unit price per cubic yard or ton of kind of borrow required.

Masonry ends and foundations will be paid for at the contract unit price per cubic yard of the kind of masonry required.

Gravel Borrow will be paid in accordance with Subsection 150.

Dewatering shall be considered incidental to the payment items in this section and no additional compensation shall be paid to the Contactor for such dewatering systems.

Payment for the by-pass pumping system will be measured on percent completion of the total lump sum contract amount after each bypass-pumping segment has been completed and dismantled to the satisfaction of the Engineer.

230.82 Payment Items

~~*230 --Inch Corrugated Metal Pipe--Gage~~	~~Foot~~
~~*230.7 --Inch Corrugated Metal Pipe Ends Sections...Gage~~	~~Each~~
~~*232 --x--Inch ACCM Pipe-Arch...Gage~~	~~Foot~~
~~*234 --Inch Drainage Pipe-Option~~	~~Foot~~
~~*252 --Inch Corrugated Plastic (Polyethylene) Pipe~~	~~Foot~~
~~*251.1 --Inch Corrugated Plastic Pipe Flared End~~	~~Each~~
~~*238. Ductile Iron Pipe~~	~~Linear Foot~~
~~*239. Structural Plate Pipe~~	~~Linear Foot~~
~~*240. Structural Plate Pipe-Arch...Gage~~	~~Linear Foot~~
~~*241. --Inch Reinforced Concrete Pipe. Flared End~~	~~Each~~
~~to *245.1-~~	
250.08 8 Inch Polyvinyl Chloride Sanitary Sewer Pipe	*Foot*
250.10 10 Inch Polyvinyl Chloride Sanitary Sewer Pipe	*Foot*
250.15 15 Inch Polyvinyl Chloride Sanitary Sewer Pipe	*Foot*
251. By-Pass Pumping System	*Lump Sum*
~~*255. Polymeric Precoated Corrugated Metal Pipe~~	~~Linear Foot~~
142. Class B Trench Excavation	Cubic Yard
~~144. Class B Rock Excavation~~	~~Cubic Yard~~
151. Gravel Borrow	Cubic Yard
156. Crushed Stone ~~for Drainage Foundation~~	Ton
~~903. 3000 psi, 1 ½", 470-Cement Concrete Masonry~~	~~Cubic Yard~~
~~685. Field Stone Masonry in Cement Mortar~~	~~Cubic Yard~~

*Pipe or appurtenance size will be included as part of the item number in order to differentiate between the sizes.

Description

250.20 General.

This section describes requirements for furnishing all labor, materials, transportation, and equipment necessary for the rehabilitation of existing deteriorated sewers as listed in contract documents by means of the installation of cured-in-place and "fold and form" pipe lining; thus rendering each unit free of infiltration/inflow and structural defects. Liners including all thermosetting liners must take the shape of the existing pipe after installation and shall not leave a gap or annular space between the liner and the pipe. The pipe rehabilitation method shall not require excavation for installation of the liner or to re-open existing service connections. At the pre-construction meeting, the Contractor shall submit detailed design calculations of the liner including liner material, sizes of material, specification of materials, shop drawings including any special methods or procedures or any other information deemed necessary by the Engineer. For purposes of designing the liner, the existing sewer shall not be considered in conjunction with the liner to produce a composite pipe capable of withstanding all earth, hydrostatic and live loads.

250.40 Materials.

All materials used in the liner installation shall be industry-accepted materials for sewer pipe rehabilitation and to the satisfaction of the Engineer. The lining will be chemically resistant to withstand internal exposure to sewage containing gases at normal levels for domestic sewage of hydrogen sulfide, carbon monoxide, carbon dioxide, methane, dilute sulfuric acid, external exposure to soil bacteria and any other chemical attack which may be due to materials in the surrounding ground.

The new lining shall be continuous over the entire length between adjacent manholes and free as commercially practicable from visual defects such as foreign inclusions, dry spots, air bubbles, pinholes, pimples, wrinkles and delamination. The new lining shall be impervious and free of any leakage from the surrounding ground or from the ground to the inside of the rehabilitated pipe. Any defects, which will affect, in the foreseeable future as determined by the Engineer, the integrity or strength of the new lining, shall be repaired or the new lining replaced at the Contractor's expense and to the satisfaction of the Engineer.

250.42 Submittals.

The following must be submitted and approved prior to construction are:

1. *A statement containing the lining contractor's name, address, years of experience in installing the type being proposed here. The lining contractor shall have the minimum experience of having performed lining on a minimum of 5 similar projects and must have a minimum of 10 years experience.*
2. *A statement identifying the rehabilitation process/products by trade name as well as by the industry known generic name. This statement shall include a brief description of the material composition, physical properties, manufacturer's recommendation for handling, storing and repair of pipe and fittings, as well as the process used to install the liner.*
3. *A certification that the Contractor is an approved licensed installer of the rehabilitation method.*
4. *A letter of certification from the liner manufacturer in which all physical and chemical properties of the material to be used shall be certified. These properties shall at least include the following:*

   Instantaneous Tensile Strength (yield) psi
   Long Term(1) Tensile Strength (yield) psi
   Instantaneous Tensile Strength (break) psi
   Long Term(1) Tensile Strength (break) psi
   Instantaneous Flexural Modulus psi
   Long Term(1) Flexural Modulus(2) psi
   (1) Long Term is defined as 50-yr. Loadings

(2) Long Term Flexural Modulus is defined as smaller of creep modulus or continuous loading modulus of elasticity (50 year)

The following must be submitted at the Pre-Construction meeting:

5. *Detailed design calculations, including assumptions upon the calculations are based. The calculations shall consider traffic loading; earth loads, hydrostatic loads, and shall be based on a long-term basis and shall include applicable technical data sheets. It shall be assumed that the existing conduit will contribute no appreciable strength to the completed lining. These calculations must be stamped by a Professional Engineer registered in Massachusetts.*
6. *The selected "liner pipe" shall be designed based upon the following criteria:*
   a. *The dead load for the actual depth of cover.*
   b. *Saturated soil conditions using a soil weight of 120 pounds per cubic foot and coefficient of friction Ku1=0.130.*
   c. *Groundwater levels above the top of the pipe equal to actual conditions or stated conditions as indicated in the contract documents. Otherwise, it shall be a height of ½ of the height distance from the crown of the pipe to the street or surface grade.*
   d. *Loss of hydraulic capacity shall not exceed 10%.*
7. *For Fold and Form type liners: the type of seal to be used at the manhole entry point.*

For informational purposes the following materials shall be considered acceptable for use on this project, subject to review of the required submittals:

1. *Cured-in Place Liners*

The following criteria are set forth. All CIPP liners shall be manufactured and installed in accordance with ASTM F1216, latest versions.

FIBERGLASS & RESIN	*CRITERIA*	*Polyester*	*Epoxy*
FIBERGLASS & MORTAR RESIN	*Tensile Strength*	*3,000*	*4,000*
FIBERGLASS & EPOXY RESIN and POLYESTER & EPOXY RESIN	*Flexural Strength psi (ASTM D790)*	*4,500*	*5,000*
POLYESTER & POLYESTER RESIN	*Modulus of Elasticity psi (ASTM D790)*	*250,000*	*3000,000*

2. *Fold & Form Liners*

MATERIALS	*CRITERIA*	*STANDARD*
POLYVINYLCHLORIDE (PVC)	*Tensile Strength ASTM D-1784*	*3,500 psi (ASTM D638)*
HIGH DENSITY POLYETHYLENE (HDPE)	*Flexure Strength ASTM D-1248*	*4,100 psi (ASTM D790)*
	Modulus of Elasticity	*135,000 psi (ASTM D790)*

Construction Methods

250.60 General.

The new liner shall be fabricated to a size that when installed will neatly fit the internal circumference of the conduit to be rehabilitated as specified by the Engineer. The Contractor shall make allowance for any longitudinal or circumferential stretching of the liner during installation. The length of the liner shall be that deemed necessary by the Contractor to efficiently carry out the lining process at the inlet and outlet of the respective manholes. The Contractor is responsible for verifying all lengths, exact pipe dimensions and sizes in the field before installation. Individual liner runs can be made over manhole-to-manhole sections as determined in the field by the Contractor and approved by the Engineer. The pipe sizes indicated on the Contract documents are normal pipe sizes. The Contractor shall be solely responsible for determining all sizes; shapes, lengths and all other information needed to fabricate the liner. No additional payment shall be made if the Engineer deems removal of the liner necessary or the liner is unable to be installed due to incorrect sizing by the Contractor.

250.61 Preinstallation.

The following procedures prior to lining shall be adhered to according to the lining method submitted or as deemed necessary by the Engineer:

a. *Cleaning of Sewer Line: Prior to lining, it shall be the responsibility of the Contractor to clean debris out of the sewer line in accordance with City standards or as directed by Engineer.*

b. *Inspection of Pipelines: Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections by closed circuit television. The interior of the pipeline shall be carefully inspected to determine the location of any conditions, which may prevent proper installation, and it shall be noted so that these conditions can be corrected.*

c. *Television Inspection: The Contractor shall inspect by closed circuit TV the section to be rehabilitated, record the locations of all obstructions and determine which service taps are active or non-active by dye testing.*

d. *Sewage Flow Control: The Contractor shall bypass the sewage around the sections of line that need bypassing as deemed necessary by the Engineer. A sewer line plug shall be inserted into the line upstream of the section being worked for bypassing. The plug shall be so designed that all or any portion of the sewage can be released. After the work has been completed, flow shall be restored to normal. The by-pass shall be made by plugging an existing upstream manhole if necessary and pumping the sewage into a downstream manhole or adjacent system. When pumping and bypassing is required, the Contractor shall supply the pumps, conduits, and other equipment to divert the flow of sewage around the manhole section in which work is to be performed. The by-pass system shall be of sufficient capacity to handle existing flow plus additional flow that may occur.*

   The Contractor will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and by-pass system. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum. All bypassing systems shall be approved by the Engineer. Approval of the bypassing system by the Engineer shall in no way be construed as relieving the Contractor of any responsibility under this Contract as related to protection of the interest of the City of Somerville DPW and the general public.

   At the end of each working day, temporary tie-ins shall be made between the rehabilitated section and the existing system and the by-pass plug removed.

   When flow in a sewer line is plugged, blocked, or by-passed, sufficient precautions must be taken to protect the sewer lines from damage that might result from sewer surcharging. Further, precautions must be taken to insure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.

   Under no circumstances will the dumping of raw sewage on private property or in city streets be allowed.

This work will be incidental to the pipe lining.

e. *Line Obstructions: It shall be the responsibility of the Contractor to clean the line of any obstructions, solids protruding services, or collapsed pipe that will prevent the complete sealing of the liner to the satisfaction of the Engineer. If pre-construction inspection reveals an obstruction, such as a badly misaligned joint, then the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavations shall be approved in writing by the Engineer prior to the commencement of the work and shall be considered as a separate pay item under the appropriate pay item.*

   Protruding laterals shall be ground down to the face of the pipe to allow for a tight fitting liner. Payment for removal of protruding laterals will be included in sewer lining items.

f. *The Contractor shall provide whatever measures are required to prevent the movement or discharge of gases, liquids or solids associated with the liner material and process into adjacent properties upstream or downstream of the sewer being rehabilitated. The Contractor shall be responsible and liable for any damages or violations associated with such actions. The Contractor shall also be responsible for monitoring and protecting as required the discharge of any by-products caused by the installation of the liner or the lining process.*

g. *For Fold and Form type liners: After installation of the liner a mechanical type sealing device capable of providing a watertight seal shall be installed at the manhole to seal the liner to the manhole wall. Grouting alone is not acceptable. The type of seal must be submitted as a shop drawing and approved by the Engineer.*

250.62 Service Connections.

After the new pipe liner has been completely installed all existing active services shall be reconnected. All existing inactive services shall not be reconnected. The decision not to reconnect an existing service shall be approved by the City in writing through its Engineer only after the Engineer oversees and approves TV and dye testing logs.

250.63 Testing.

The water tightness of the pipe shall be gauged during the installation under a positive head. After the work is completed, the Contractor will provide the City with Videotape showing the completed work including the restored conditions.

250.64 Video Taping.

After work is completed, the Contractor shall supply the City with DVD's showing the rehabilitated section before and after rehabilitation including service connections.

250.65 Certification of Materials.

The Contractor shall supply the Engineer with a certified statement from each material supplier that the material supplied meets or exceeds the requirements of these specifications. The certification shall identify by name the project and specification.

The Contractor shall furnish, install and test all materials specifically all liner joints or fittings if necessary in accordance with these specifications.

250.66 Guarantee.

The Contractor and manufacturer shall guarantee all liners installed for a period of three years from the date of acceptance. During this period all serious defects discovered in the liner as determined by the Engineer, shall be removed and replaced in a satisfactory manner at no cost to the City. The City intends to conduct an independent television inspection of each lining prior to the completion of the three-year guarantee period.

250.67 Clean-Up.

After the installation work has been completed, the Contractor shall clean up the entire project area and return any disturbed areas to as good a condition as existed prior to the work being performed. The

Contractor shall dispose of all excess material and debris not incorporated in the permanent installation. Other restoration not part of an eligible Point Repair shall be considered incidental to the rehabilitation of pipe for the appropriate size and MH section.

250.68 Removal of Protruding Taps.

General.

The work under this Section shall include all equipment, materials and labor necessary to locate and internally remove taps that protrude sufficiently to interfere or prevent television inspection.

Equipment.

Protruding taps shall be removed using an internal, remote-controlled intruding pipe remover. Excavation and replacement of protruding taps will not be allowed except as authorized in writing by the Engineer.

The equipment shall consist of a main body containing a rotating head assembly equipped with carbide cutting edges. The rotating cutting head shall be driven by air or by electricity and shall be capable of cutting concrete, vitrified clay pipe or other materials commonly used for pipe construction with the exception of case iron or steel. The equipment shall be pulled through the pipe using winches and a cable set up between adjacent manholes. TV camera shall be furnished as necessary to accurately position the cutting equipment.

Construction Method.

Protruding taps that do not inhibit completion of the television inspection, but were removed for the convenience of the Contractor (such as removal of a tap to eliminate a reverse set-up), shall not be considered for payment. Nothing in these Specifications shall prevent the Contractor from removing protruding taps for Contractor's own convenience provided they are removed according to these Specifications at the Contractor's expense and at no cost to the City.

The Contractor shall maintain a complete record of all taps that were removed, and furnish two (2) copies of this record at the Completion of this project. The list shall show the date, sub-area, street, pipe reach, station and location (left, right or top) of each tap as well as the reason why removal was unsuccessful.

The Contractor shall protect existing pipelines and service connections from damage caused by improper use of the equipment. Damage to a pipe or service connection caused by removal of a tap shall be repaired immediately; as directed by the Engineer at the Contractor's own expense. The Contractor shall remove all dirt and debris from the pipe following completion of tap removal in that reach.

Compensation

250.80 Method of Measurement.

The length of sewers to be paid for under the appropriate subdivisions will be measured by the linear foot along the centerline of pipe, the length of manhole inverts (as measured between inside walls of the manholes) being deducted and will be paid for at the contract unit price per linear foot lined.

250.81 Basis of Payment.

The unit price shall constitute full compensation for all labor, tools and equipment necessary for the adequate by-pass pumping of existing flows, cleaning of the pipe prior to installation, installation of the liners, reconnection of service connections and laterals, cleaning up the site and furnishing an acceptable DVD of the completed work.

The Contractor shall identify all connections to be reopened during his initial cleaning and televising of the existing sewers. A log will be prepared and submitted to the Engineer verifying the address, station, quadrant location and time of closure and reopening of each connection. Each connection reopened or left closed will be documented in the log form and indicated in the screen of the final DVD.

250.82 Payment Items.

251.08 8 Inch VC – PVC Sewer Lining (non-man entry)	*Foot*
251.10 10 Inch VC – PVC Sewer Lining (non-man entry)	*Foot*
251.12 12 Inch VC – PVC Sewer Lining (non-man entry)	*Foot*
251.15 15 Inch VC – PVC Sewer Lining (non-man entry)	*Foot*
251.18 18 Inch VC & Brick – PVC Sewer Lining (non-man entry)	*Foot*
251.28 28 Inch Brick (24"x18" Equivalent) – PVC Sewer Lining (non-man entry)	*Foot*
251.36 36 Inch Brick – PVC Sewer Lining (non-man entry)	*Foot*
251.48 48 Inch Brick – PVC Sewer Lining (non-man entry)	*Foot*

Description

252.20 General.

Under this item the Contractor is required to furnish all materials, labor, equipment, power, maintenance, etc. to implement a temporary pumping system for the purpose of diverting the existing sewer flow around the work area for the duration of the project. The work area under this section will include all those areas where new pipes replace a portion of or the entire existing pipe. This item does not include the by-pass systems included in Item 220.10 SANITARY SEWER MANHOLE LINING or Items 251.08 8 INCH VC – PVC SEWER LINING (NON-MAN ENTRY) through 251.48 48 INCH BRICK SEWER LINING (NON-MAN ENTRY). No claims shall be allowed for interference to other work resulting from an inadequate bypass system.

The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The Contractor shall employ the services of a vendor who can demonstrate to the Engineer that he specializes in the design and operation of temporary bypass pumping systems. The vendor shall provide at least five (5) references of projects of a similar size and complexity as this project performed by his firm within the past three years. A minimum of 15 years experience in design and implementation of successful sewer bypass must be demonstrated by the by-pass vendor.

252.40 Materials.

All pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system. Vacuum pump and diaphragm type devices shall not be accepted. The pumps may be electric or diesel powered. All pumps used must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows. The pump manufacturer shall be ISO 9002 certified.

The Contractor shall provide the necessary stop/start controls for each pump.

The Contractor shall include one stand-by pump of each size to be maintained on site.

Back-up pumps shall be on-line, isolated from the primary system by a valve.

252.42 Submittals.

The Contractor shall prepare with the vendor a specific, detailed description of the proposed pumping system and submit it and the vendor's references with his bid proposal.

The Contractor shall submit to the Engineer detailed plans and descriptions outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing wastewater flows. All pumps, pipe and system shall be by a single specified vendor. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials and all other incidental items necessary and/or required to insure proper protection of the facilities, including protection of the access and bypass pumping locations from damage due to the discharge flows, and compliance with the requirements and permit conditions specified in these Contract Documents. No construction shall begin until all provisions have been provided and the Engineer has reviewed the submittals.

The plan shall include but not be limited to details of the following:

1. *Construction sequencing.*
2. *Staging areas for pipe, pumps and appurtenances.*
3. *Sewer plugging method and types of plugs.*
4. *Number, size, material, location and method of installation of suction piping.*
5. *Number, size, material, method of installation and location of the installation of discharge piping.*
6. *Bypass pump sizes, capacity, number of each size to be on site and power requirements.*
7. *Calculations of static lift, friction losses, and flow velocity (pump curves showing pumps operating range shall be submitted including a calculated system curve at peak capacity).*

8. *Standby power generator size, location, if required.*
9. *Downstream discharge plan.*
10. *Method of protecting discharge manholes or structures from erosion and damage.*
11. *Thrust and restraint block sizes and locations.*
12. *Sections showing suction and discharge pipe depth, embedment, select fill and special backfill.*
13. *Method of noise control for each pump and/or generator.*
14. *Any Temporary pipe supports and anchoring required.*
15. *Design plans and computation of access to bypass pumping locations as described herein.*
16. *Calculations for selection of bypass pumping pipe size including friction loss and velocity. A system curve will be required, plotting the performance of the pumps at the required suction lift.*
17. *Schedule for installation of and maintenance of bypass pumping lines.*
18. *Plan indicating location of bypass pumping lines.*
19. *Pumps will not be benched down to make the suction lift without the approval of the Engineer.*
20. *The Contractor's submittal will be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts*

252.43 Discharge Piping.

In order to prevent the accidental spillage of flows all discharge systems shall be constructed of rigid pipe with positive, restrained joints. Under no circumstances shall aluminum "irrigation" type piping or glued PVC pipe be allowed. Discharge hose will only be allowed in short sections and by specific permission from the Engineer.

Allowable piping materials will be special thickness Class 50 ductile iron 100% restrained joint pipe, welded steel pipe or fused, high-density polyethylene pipe. Connection to force main shall be 1.0 MPA rated hosepipe valve and fitting.

Pumps connected by a common suction manifold will not be permitted. Each pump will have an individual suction line.

252.44 Design Flow Requirements.

Bypass pumping systems shall have sufficient capacity to pump the full capacity of the pipeline to be bypassed. The Contractor shall provide all pipeline plugs, pumps of adequate size to handle peak flow, and temporary discharge piping to ensure that the total flow of the main can be safely diverted around the section to be installed or replaced. The Contractor shall operate the bypass pumping system 24 hours per day.

The Contractor shall have adequate standby equipment available and ready for immediate operation and use in the event of an emergency or breakdown. One standby pump for each size pump utilized shall be installed at the mainline flow bypassing locations, ready for use in the event of primary pump failure.

Bypass pumping system shall be capable of bypassing the flow around the work area and of releasing any amount of flow up to full available flow into the work area as necessary for satisfactory performances of work.

The Contractor shall make all arrangements for bypass pumping during the time when the main is shut down for any reason. System must overcome any existing force main pressure on discharge.

The bypass system shall be designed to meet the noise management requirements at all times. All diesel driven primary and standby pumps shall be sound attenuated. The use of critical silenced canopy pump or pumps or acoustical whisper pack enclosures for sound attenuation is required.

Construction Methods

252.60 Performance Requirements.

It is essential to the operation of the existing sewerage system that there be no interruption in the flow of sewage throughout the duration of the project. To this end, the Contractor shall provide, maintain and operate all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required), conduits, all necessary power, and all other labor and equipment necessary to intercept the sewage flow before it reaches the point where it would interfere with this work, carry it past his work and return it to the sanitary sewer downstream of his work.

The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

The Contractor shall provide all necessary means to safely convey the sewage past the work area. The Contractor will not be permitted to stop or impede the main flows under any circumstance.

The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharging of sewers; damage to sewer and that will protect public and private property from damage and flooding.

The Contractor shall protect water resources, wetlands and other natural resources.

252.61 Field Test.

The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to actual operation. The Engineer will be given 24 hours notice prior to testing.

252.62 Field Inspection.

Contractor shall inspect bypass-pumping system every two hours to ensure that the system is working correctly.

252.63 Maintenance Service.

The Contractor shall insure that the temporary pumping system is properly maintained and a responsible operator shall be on hand at all times when pumps are operating.

252.64 Extra Materials.

Spare parts for pumps and piping shall be kept on site as required.

252.65 Precautions.

Contractor is responsible for locating any existing utilities in the area the Contractor selects to locate the bypass pipelines. The Contractor shall locate his bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from the Engineer. The Contractors shall pay all costs associated with relocating utilities and obtaining all approvals.

During all bypass-pumping operations, the Contractor shall protect the local sewer lines from damage inflicted by any equipment.

The Contractor shall be responsible for all physical damage to the local sewer lines caused by human or mechanical failure.

252.66 Installation and Removal.

The Contractor shall remove manhole sections or make connections to the existing sewer and construct temporary bypass pumping structures only at the access locations described herein and as may be required to provide adequate suction conduit.

Plugging for blocking of sewage flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance or work, it is to be removed in a manner that permits the sewage flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.

When working inside manhole or force main, the Contractor shall exercise caution and comply with OSHA requirements when working in the presence of sewer gases, combustible or oxygen deficient atmospheres, and confined spaces.

The installation of the bypass pipelines is prohibited in all salt marsh/wetland areas. The pipeline must be located along the curb lines of the streets. When the bypass pipeline crosses local streets and private driveways, the Contractor must place the bypass pipelines in trenches and cover with temporary pavement or use approved road ramp devices. Upon completion of the bypass pumping operations, and after the receipt of written permission from the Engineer, the Contractor shall remove all the piping, restore all property to pre-construction condition and restore all pavement. The Contractor is responsible for obtaining any approvals for placement of the temporary pipeline within public ways.

Compensation

252.81 Basis of Payment.

The lump sum price shall constitute full compensation for all labor, tools, and equipment necessary for the bypass pumping of existing flows in the manner specified. The lump sum price shall include all locations where temporary closure of the existing sewer is necessary.

252.82 Payment Items.

251.	***By-Pass Pumping System***	***Lump Sum***

Description

256.20 General.

This section describes requirements for furnishing all labor, materials, transportation, and equipment necessary for the rehabilitation and reconnection of service lateral top hat connections to rehabilitated sewer lines, without excavation, by installation and ultraviolet light curing of a resin-impregnated, flexible fiberglass insert with sealing epoxy element in the form of a tube or top hat that will be installed into the existing service lateral utilizing a pressure apparatus and ultraviolet light curing device positioned in the mainline pipe. Service lateral connections may be a combination of tee's, wye's or break-in taps of varying sizes and angles from 30 to 90 degrees and may include over-cut lateral openings, pilot holes or defects in relined sewer pipe. The resin shall be rapidly cured to transform the flexible insert into a hard, impermeable top hat seal around and in the lateral connection. The service lateral top hat connection product shall extend from the mainline into the lateral connection in a continuous tight fitting, watertight pipe-within-a-pipe to eliminate any visible ground water leakage and future root growth at the lateral to mainline connection. The service lateral top hat connection product system shall be compatible with the mainline and lateral pipe or liner. If, within the warranty period, the service lateral top hat connection product installed in the sewer system is not acceptable due to leakage or any other defects, although originally accepted, the Contractor shall repair or replace the affected portion at no cost to the City.

256.40 Materials.

All materials used in the service lateral top hat connection installation shall be industry-accepted materials for service lateral connection rehabilitation and to the satisfaction of the Engineer. The finished service lateral top hat connection product shall be an ECR (E-glass corrosion resistant) fiberglass laminate impregnated with an ultraviolet light reactive polyester resign which when cured will be chemically resistant to withstand internal exposure to sewage containing gases at normal levels for domestic sewage of hydrogen sulfide, carbon monoxide, carbon dioxide, methane, dilute sulfuric acid, external exposure to soil bacteria and any other chemical attack which may be due to materials in the surrounding ground.

The new service lateral top hat connection product shall be compatible with the lining system utilized for the mainline and lateral sewer lines. Any defects, which will affect, in the foreseeable future as determined by the Engineer, the integrity or strength of the new service lateral top hat connection, shall be repaired or the new service lateral top hat connection replaced at the Contractor's expense and to the satisfaction of the Engineer.

256.42 Submittals.

The following must be submitted and approved prior to construction are:

1. *A statement containing the service lateral top hat connection contractor's name, address, years of experience in installing the type being proposed here. The service lateral top hat connection contractor shall have the minimum experience of having performed similar operations on a minimum of 5 similar projects and must have a minimum of 10 years experience.*
2. *A statement identifying the rehabilitation process/products by trade name as well as by the industry known generic name. This statement shall include a brief description of the material composition, physical properties, manufacturer's recommendation for handling, storing and repair of pipe and fittings, as well as the process used to install the liner.*
3. *A certification that the Contractor is an approved licensed installer of the rehabilitation method.*
4. *A letter of certification from the manufacturer in which all physical and chemical properties of the material to be used shall be certified. These properties shall at least include the following:*

   Instantaneous Tensile Strength (yield) psi
   Long Term(1) Tensile Strength (yield) psi

Instantaneous Tensile Strength (break) psi
Long Term(1) Tensile Strength (break) psi
Instantaneous Flexural Modulus psi
Long Term(1) Flexural Modulus(2) psi
(1) Long Term is defined as 50-yr. Loadings
(2) Long Term Flexural Modulus is defined as smaller of creep modulus or continuous loading modulus of elasticity (50 year)

The following must be submitted at the Pre-Construction meeting:

5. *Detailed design calculations, including assumptions upon the calculations are based. The calculations shall consider traffic loading; earth loads, hydrostatic loads, and shall be based on a long-term basis and shall include applicable technical data sheets. It shall be assumed that the existing conduit will contribute no appreciable strength to the completed service lateral top hat connection. These calculations must be stamped by a Professional Engineer registered in Massachusetts.*
6. *The selected top hat shall be designed based upon the following criteria:*
   a. *The dead load for the actual depth of cover.*
   b. *Saturated soil conditions using a soil weight of 120 pounds per cubic foot and coefficient of friction Ku1=0.130.*
   c. *Groundwater levels above the top of the pipe equal to actual conditions or stated conditions as indicated in the contract documents. Otherwise, it shall be a height of ½ of the height distance from the crown of the pipe to the street or surface grade.*
   d. *Loss of hydraulic capacity shall not exceed 10%.*

For informational purposes the following materials shall be considered acceptable for use on this project, subject to review of the required submittals:

1. *Cured-in Place*

The following criteria are set forth. All service lateral top hat connections shall be manufactured and installed in accordance with ASTM F1216, latest versions.

CRITERIA	*REQUIREMENT*
Modulus of Elasticity psi (ASTM D790)	*800,000 psi*

Construction Methods

256.60 General.

The flexible fiberglass top hat tube insert shall be fabricated to a size that when installed will key into the internal surface irregularities of the lateral joint and neatly fit to the internal circumference of the lateral. The top hat tube shall be a laminate made of non-woven fiberglass materials that allow for circumferential stretching and angular alignment with the lateral pipe connection geometry during insertion.

The insert laminate shall seal to the inside wall of the sewer main 3 inches around the lateral opening and to the lateral wall 12 inches up into the lateral pipe from the main.

A secondary epoxy-sealing component shall be used to form a sealing bond between the service lateral top hat connection product and the host lateral and main pipe walls.

256.61 Line Preparation.

The following procedures prior to service lateral top hat connection installation shall be adhered to according to the method submitted or as deemed necessary by the Engineer:

a. *Prior to installing the service lateral top hat connection product the area around the lateral sealing surface in both the main and lateral shall be inspected. Waste product build-up, hard scale, roots,*

lateral cutting debris or resin slugs must be removed using high pressure water jetting or in-line cutters.

b. *Break-in connection and/or lateral protruding into the mains shall be ground back to no more than a 1/8-inch protrusion into the mainline.*

c. *Built-up deposits on the main and lateral pipe walls shall be removed. The removal shall reach at least one foot beyond the service lateral top hat connection product to allow the bladder to inflate tightly against the pipe walls ensuring a smooth transition from the service lateral top hat connection product to the existing pipe wall.*

d. *In relined pipes the lateral must be opened 95 percent or more and edges finished without "teeth". Over-cuts shall not exceed one inch beyond the internal diameter of the lateral.*

e. *The Contractor shall be responsible for bypassing of sewage during the installation of the service lateral top hat product. In cases where the temporary backup of sewage is accepted as a replacement for bypassing, the Contractor shall be responsible for all damage caused by the backup. Bypassing of sewage during the installation of the service lateral top hat connection shall be considered incidental to the service lateral top hat connection Item and shall be included in the Item's cost.*

256.62 Installation.

a. *The resin impregnated service lateral top hat connection product shall be loaded on the applicator apparatus, attached to a robotic manipulator device and positioned in the mainline pipe at the service connection that is to be rehabilitated. The robotic device together with a television camera shall be used to align the service lateral top hat connection repair product with the service connection opening. Air pressure, supplied to the applicator through an air hose, shall be used to insert the resin impregnated connection repair product into the lateral pipe. The inserted product will then be inspected using a TV camera to confirm the service lateral top hat connection product is correctly positioned and/or centered in the lateral opening prior to curing. This TV inspection step is necessary to minimize the reworking or excavation/repair of incorrectly deployed service lateral top hat connection product. The insertion pressure shall be adjusted to fully deploy the service lateral top hat connection product into the lateral connection and hold the service lateral top hat connection product tight to the main and lateral pipe walls without causing damage to either. The Contractor will be responsible for repairing any damage caused to the main or lateral pipe due to excessive pressure, to the satisfaction of the Engineer.*

b. *The pressure apparatus shall include a bladder of sufficient length in both the main and lateral lines such that the inflated bladder extends beyond the ends of both the lateral tube and main brim segments of the service lateral top hat connection product pressing the end edges flat against the internal pipe wall thus forming a smooth transition from the service lateral top hat connection product to pipe diameters without a step, ridge or gap between the service lateral top hat connection product and the inner diameters of the lateral and mainline pipes.*

c. *After installation is completed, the recommended pressure must be maintained on the impregnated service lateral top hat connection product for the duration of the ultraviolet light curing process.*

d. *The packer is then deflated, removed from the connection and returned to the manhole to repeat the cycle.*

e. *A epoxy-sealing component shall then be used to form a sealing bond between the service lateral top hat connection product and the host lateral and main pipe walls.*

256.63 Testing.

The finished service lateral top hat connection shall be free of dry spots, lifts and delamination.

The installed service lateral top hat connection should not inhibit the post installation video inspection.

256.64 Video Taping.

After work is completed, the Contractor shall supply the City with DVD's showing the rehabilitated service lateral connection before and after rehabilitation.

256.65 Certification of Materials.

The Contractor shall supply the Engineer with a certified statement from each material supplier that the material supplied meets or exceeds the requirements of these specifications. The certification shall identify by name the project and specification.

256.66 Guarantee.

The Contractor and manufacturer shall guarantee all service lateral top hat connections installed for a period of three years from the date of acceptance. During this period all serious defects discovered in the service lateral top hat connections as determined by the Engineer, shall be removed and replaced in a satisfactory manner at no cost to the City. The City intends to conduct an independent television inspection of each service lateral top hat connection prior to the completion of the three-year guarantee period.

256.67 Clean-Up.

After the installation work has been completed, the Contractor shall clean up the entire project area and return any disturbed areas to as good a condition as existed prior to the work being performed. The Contractor shall dispose of all excess material and debris not incorporated in the permanent installation.

Compensation

256.80 Method of Measurement.

Service lateral top hat connections will be measured complete in place per each.

256.81 Basis of Payment.

The unit price shall constitute full compensation for all labor, tools and equipment necessary for the adequate by-pass pumping of existing flows, cleaning of the pipes prior to installation, installation of the service lateral top hat connection, cleaning up the site and furnishing an acceptable DVD of the completed work.

The Contractor shall identify all connections to be repaired during his initial cleaning and televising of the existing sewers. A log will be prepared and submitted to the Engineer verifying the address, station, quadrant location and time of closure and reopening of each connection. Each connection reopened or left closed will be documented in the log form and indicated in the screen of the final DVD.

256.82 Payment Items.

256. Service Lateral Top Hat Connection (non-man entry) Each

Description

301.20 General.

Work under this section shall consist of making alterations in existing municipal water main systems or constructing new sections of existing systems affected by highway ~~and bridge~~ construction. The work includes furnishing and installing new water pipe and appurtenances and removing and resetting existing materials in the same or new locations in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer.

301.21 Workmen.

All personnel employed by the Contractor on this work shall be experienced and skilled in water main installation.

301.22 Protection of Underground Structures.

All conduits, pipes or structures uncovered during excavation, whether or not they are shown on the plans, shall be protected, and if damaged by the Contractor shall be repaired by him or the utility company at the expense of the Contractor.

The Contractor shall not abandon existing conduits, pipes or structures without the prior approval of the Engineer.

301.23 Notices.

Prior written notice of at least 48 hours shall be given by the Contractor to affected Municipal Water and Fire Departments, with a copy of such notice submitted to the Engineer, before any water main is shut off and in no case shall a gate or hydrant be opened or shut without proper authorization.

Materials

301.40 General.

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

Thrust Blocks	
Cement Concrete	M4.02.00
Water Pipe and Fittings	
Copper Tubing	M5.06.0
Ductile Iron Pipe and Fittings	M5.05.3
Insulation and Waterproof Jackets	M9.11.0
Cellular Glass	M9.11.1
Fiber Glass	M9.11.2
Expanded Polystyrene	M9.11.3
Urethane	M9.11.4
Jointing Materials for Pipes	M9.10.0
Waterproof Jackets	M9.11.5

Valve boxes, service boxes, corporation cocks, air relief valves, yokes and tie-rods, curb stops, plugs and any other materials which are required shall be the type used by the particular municipality involved or as specified in the Special Provisions. Air relief valves shall be installed at the high points of the main or where and as directed.

Construction Methods

301.60 General

The installation or removal and reinstallation of water systems or parts thereof shall conform to the following construction procedures:

A. Pipe Fittings, etc.

All pipe fittings, valves, hydrants and other heavy accessories shall be carefully handled by the use of hoists or skidways to avoid shock or damage. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. The Contractor shall replace or repair, at his own expense, any materials that have been damaged due to his negligence.

Where pipes are required in less than standard lengths, the cutting shall be done in a neat and workmanlike manner without damage to the pipe.

B. Excavation.

See Subsection 140.60.

C. Bedding Pipe.

See Subsection 230.61.

D. Bridging.

Where required, the Contractor shall provide suitable bridges for traffic to cross open trenches at streets and driveways.

E. Cleaning and Plugging Pipe.

The pipes and fittings shall be thoroughly cleaned before being laid and shall be kept clean until accepted in the finished work. The ends of all uncompleted lines shall be tightly closed with temporary plugs at all times when the pipe laying is not in progress, and no trench water or debris shall be permitted to enter the pipe.

F. Removal of Castings.

In the work of removing hydrants and other castings to be reset, or stacked for the municipality, the castings shall be exposed, care being taken that they are not damaged by excavating or other machinery, the joints shall then be opened and the castings carefully removed.

Any materials damaged during this work due to the Contractor's negligence shall be replaced by the Contractor at his own expense.

G. Laying Pipe.

Proper tools and equipment for the safe and convenient handling and laying of the pipes shall be used. The Contractor shall exercise reasonable caution during his operations in order to avoid damaging the pipes, castings, or fittings and any which are damaged shall be replaced by him at his own expense.

The Contractor shall furnish the necessary pumps and tools to handle any water encountered in the pipe trench, and shall maintain the trench in a satisfactory condition, free from water, during the laying of the pipe. The pipe, after being laid in place, shall not under any circumstances be used as a drain pipe for the trench.

Cast iron pipe sections shall be laid with the bell on the upgrade end, unless otherwise directed. Before laying the pipe, the outside of the spigot and the inside of the bell shall be wire brushed and wiped clean and dry. When placing a length of pipe, the yarning material for the joint shall be held around the bottom of spigot so that it will enter the bell as the pipe is shoved into position.

H. Setting Gates and Hydrants.

Gates and gate boxes shall be set in the pipe lines as directed. Care shall be taken to see that the spigot ends are securely seated in the bell ends. Blocking or supports of a permanent nature shall be placed under each valve to insure against settlement. The blocking or permanent supports shall conform to Owner's Specifications. Each gate shall be tightly closed before being placed in the line and shall remain so until the joints on each side are completely made. Gate boxes shall be set for all gates. They shall be carefully fitted together and to the gate and securely held during backfilling. The earth around them shall be thoroughly tamped in place and the cover set to the finished grade.

~~New gate and service boxes, and existing gate and service boxes that are designated to be removed and reset or adjusted to line or grade, which are located in roadway pavement areas shall have concrete collars constructed around them. The concrete collars shall conform to the details of design shown in the Department's Standards for Concrete Collars.~~

Hydrants shall be properly supported and held plumb while the joints are being made and during backfilling. One cubic foot of crushed stone or screened gravel stone shall be placed as directed to drain each hydrant drip. The hydrants shall be satisfactorily braced near the bottom of the stem.

I. Thrust Blocks and Pipe Anchors.

Reaction or thrust blocks of concrete shall be constructed at all tees, plugs, and bends as directed or as detailed on the drawings with 3,000 psi, 1 ½", 470 Cement Concrete Masonry. The blocks shall be poured against undisturbed original ground and shall be so placed that pipe joints will be accessible for any possible future repairs. Yokes and tie-rods shall be installed in addition to or in lieu of thrust blocks. Pipe anchors shall be used when and as directed.

J. Testing.

After completion, the trenches shall be partially backfilled leaving the joints exposed for examination, and the pipe line then subjected to a hydrostatic pressure of 50 percent above the normal operating pressure. The pipe shall be tested between points as designated by the Engineer by slowly filling the test section with water by means of a pump connected to the pipe but not before the pipe has been relieved of air through taps made where required. Any defects in the pipe or joints revealed by this pressure test shall be repaired or replaced and the pipe line again subjected to a hydrostatic pressure test as described above for possible leakage over the allowable limits. Pump, connections, gauges and a measuring device shall be furnished by the Contractor. The pressure test shall be maintained for at least 2 hours during which time all exposed joints, fittings, valves and hydrants will be carefully examined.

No pipe installation will be accepted until the leakage during a 2 hour test period measured by pumping at the specified test pressure from a calibrated container into the section of pipe being tested is less than that determined by the formula

$$L = \frac{ND\sqrt{P}}{1850}$$

L = Allowable Leakage in gallons per hour

N = Number of joints

D = Nominal pipe diameter in inches

P = Average test pressure in pounds per square inch

Any defective joints, and any defects in new pipe fittings, valves or hydrants revealed during the leakage test or before final acceptance of the project shall be removed and replaced with other new material and again tested until the work is satisfactory, with no additional compensation.

K. Disinfection.

After the testing has been successfully completed, the water mains shall be disinfected in accordance with the AWWA Standard Procedure C601.

L. Adjusting Boxes.

Gate boxes and service boxes shall be adjusted to required grades and shall be securely held during backfilling – See Subsection 301.60H.

M. Backfilling.

Subsection 150.64.

N. Installing Insulation and Jacket.

1. General.

Where water pipe is installed or hung on structures, the insulating material shall be fiber glass, cellular glass, expanded polystyrene, or urethane. Section lengths and thickness shall depend on the pipe size and the recommendations of the insulation manufacturers. When urethane insulating material is used the total thickness shall be not less than 2 inches; when any other type of insulating material is used the total thickness shall be not less than 3 inches.

2. Construction Requirements.

a. Cellular glass pipe insulation for use or water pipes shall be applied as follows: Insulation shall cover all fittings, flanges and pipe clamps. The pipe shall be covered with the required thickness of cellular glass insulation of the premolded rigid type. It shall be molded and cut to conform to the size and shape of the pipe. All joints shall be tightly butted and sealed with adhesive as recommended by the manufacturer. The cellular glass insulation shall be applied to clean, dry pipe surfaces and secured with ¾"x .015 stainless steel strapping spaced 9" on center. After insulation is in place, a tack coat of fibrated adhesive mastic shall be applied at the rate of 2 gallons per 100 square feet. Into this, a layer of asphalt coated 20x20 mesh glass fabric overlapping all edges at least 3 inches shall be embedded. A second layer of the same fabric shall then be applied together with additional adhesive mastic to completely embed the layer of fabric. Finally, apply another coating of mastic at the rate of four gallons per 100 square feet. A weatherproof seal shall be provided at the ends of the insulation. Insulation covering flanges, fittings, and pipe clamps shall be cut to make a tight fit with the pipe insulation overlapping 3" on each end.

b. Fiber glass insulation for use on water pipes shall be premolded with an integral vapor barrier jacket and applied as follows: The fiber glass insulation shall be applied to the clean, dry pipe surface. Adjoining sections shall be butted firmly together and taped. The tape shall be composed of a three-ply system consisting of 1 layer of creped kraft paper, 1 layer of aluminum foil and 1 layer of asphalt impregnated creped kraft paper. The three layers shall be tightly bonded together with an asphalt adhesive.The tape shall be applied so that it overlaps the butt joint a minimum of 2 inches on each side. The longitudinal seam of the vapor barrier shall be sealed with a suitable adhesive. All flanges, fittings and pipe clamps shall be insulated with cement applied to the same total thickness as the pipe insulation and covered with 1 inch galvanized wire netting stretched tightly over the surface and wired in place with 16 gauge galvanized wire. A weather-proof jacket of .020 inch thick corrugated aluminum shall be placed over the insulation, all edges to lap a minimum of two inches. Longitudinal joints shall be placed in the most suitable direction for shedding water. An adhesive mastic cement shall be applied to all joints and seams, making them completely water tight. The aluminum jacket shall be secured with ¾" x .015 stainless steel strapping and stainless steel clips spaced 12 inches on center.

c. Expanded polystyrene or urethane insulation for use on water pipes shall be premolded and applied as follows: The polystyrene or urethane insulation shall be applied to clean dry pipe surfaces. All joints shall be tightly butted and sealed with a suitable polystyrene or urethane adhesive. The insulation shall be secured with 3/1" x .015 stainless steel strapping and corrugated aluminum with integrated vapor barrier shall be applied over the insulation, all edges to lap a minimum of two inches. Longitudinal joints shall be placed in the most suitable direction for shedding water. The jacket shall be secured with ¾" x .015 stainless steel strapping and stainless steel clips spaced 12 inches on center. A suitable adhesive that is compatible with polystyrene or urethane shall be applied to all joints and seams of the

aluminum jacket making them completely watertight. All flanges, fittings and pipe clamps shall be covered with the same insulating material remolded and sized to make a tight fit with the pipe insulation and overlapping the pipe insulation three inches on each end. Prior to the application of the aluminum jacket all open ends of insulation covering flanges, fittings and pipe clamps shall be covered with a layer of 20x20 mesh, asphalt coated glass fabric embedded in suitable adhesive mastic cement.

O. Push-On Restrained Joint Gasket

All water mains shall restrained with push-on restrained joint gaskets, such as Field-Lok gaskets or approved equal.

Compensation

301.80 Method of Measurement

Water pipe will be measured in place along the axis of the pipe without deduction for the space occupied by valves, excluding however, the length occupied by new fittings. Where two pipes join, measurement will be made to the intersection of the axes, excluding the length occupied by new cast iron fittings.

Fittings, consisting of bends, tees, caps, wyes, sleeves, reducers, increasers, blow-off fittings and other specials, applies only when new materials are necessary and which are not specifically provided for under other items in the Proposal. Fittings other than new will not be paid separately but only under the applicable linear foot items. When new fittings are measured for payment under the pound price for Item 309, the length occupied by the fittings will not be measured for payment under the linear foot items.

The fittings (excluding accessories comprised of Rings, Gaskets, Bolts, Nuts, Washers and Clamps) will be measured by the pound and the quantity to be paid for shall be the weight stated on the invoice of the supplier or the manufacturer's rated weight as listed in the catalog whichever is the lesser.

For new special fittings not listed in the catalog the weight payable will be the invoice weight. The Contractor shall furnish a copy of the Manufacturer's catalog at the start of work. Concrete collars required for gate and service boxes shall be included in the contract unit price for the relevant gate and service box items.

Insulation will be measured by the linear foot under the applicable water pipe insulation item.

Trench excavation in excess of 5 feet in depth and rock excavation shall be measured as specified in Subsection 140.80 for Class B Trench Excavation ~~and Class B Rock Excavation, respectively~~.

Push-on restrained joint gaskets will be measured per each gasket installed.

301.81 Basis of Payment

Water system work will be paid for at the contract unit price under the respective items for the kind of work involved as set forth in the Proposal.

New yokes and tie-rods will be paid for at the contract unit price per pound under Item 309. Payment for fittings other than new will be paid for at the contract unit price per linear foot under the relevant pipe items.

The prices shall also include all excavation (except rock) to a maximum depth of 5 feet (as measured from the top of the trench to the bottom of the pipe barrel).

Trench excavations greater than 5 feet and rock excavation will be paid for as specified in Subsection 140.81 for Class B Trench Excavation ~~and Class B Rock Excavation~~.

Backfill for trenches 5 feet or less in depth shall be included in the various items of pipe. Backfill for that part of a trench which is more than 5 feet in depth shall be included in the item for Class B Trench Excavation.

If the material for backfill is obtained from borrow, it will be paid for at the contract unit price per cubic yard of the kind of borrow required.

Payment for the restoration of surfaces over trenches shall be made at the contract unit price for the kind of materials used.

Thrust blocks, where required, will be paid for at the contract unit price per cubic yard under Item 903, 3000 psi, 1 ½", 470 Cement, Concrete Masonry.

Insulation will be paid for at the contract unit price per linear foot under Item 373. Water Pipe Insulation, complete in place.

Push-on restrained joint gaskets will be paid for at the contract unit price per each gasket installed, which includes removal and disposal of the rubber gasket that comes with the water pipe as well as providing and installing the push-on restrained joint gasket.

301.82 Payment Items

302.06	**6 Inch Ductile Iron Water Pipe (Rubber Gasket)**	**Foot**
302.08	**8 Inch Ductile Iron Water Pipe (Rubber Gasket)**	**Foot**
302.12	**12 Inch Ductile Iron Water Pipe (Rubber Gasket)**	**Foot**
~~***303.**~~	~~**Ductile Iron Water Pipe (Mechanical Joint)**~~	~~**Foot**~~
304.08	***Push-On Restrained Joint Gasket (8")***	***Each***
309.	**Ductile Iron Fittings for Water Pipe**	**Pound**
~~***313.**~~	~~**Water Main Removed and Relaid**~~	~~**Foot**~~
~~***315.**~~	~~**Water Main Removed and Stacked**~~	~~**Foot**~~
347.1	**1 Inch Copper Tubing Type K**	**Foot**
~~***349.**~~	~~**Gate Valve**~~	~~**Each**~~
350.06	**6 Inch Gate and Gate Box**	**Each**
350.08	**8 Inch Gate and Gate Box**	**Each**
350.12	**12 Inch Gate and Gate Box**	**Each**
~~***351.**~~	~~**Gate and Gate Box Removed and Reset**~~	~~**Each**~~
~~***354.**~~	~~**Gate Box Removed and Reset**~~	~~**Each**~~
~~***355.**~~	~~**Gate and Gate Box Removed and Stacked**~~	~~**Each**~~
~~***357.**~~	~~**Gate Box**~~	~~**Each**~~
358.	**Gate Box Adjusted**	**Each**
363.1	**1 Inch Corporation Cock**	**Each**
~~***367.**~~	~~**Cast Iron Plug**~~	~~**Each**~~
~~***373.**~~	~~**Water Pipe Insulation**~~	~~**Foot**~~
~~**376.**~~	~~**Hydrant**~~	~~**Each**~~
376.2	**Hydrant Removed and Reset**	**Each**
~~**376.3**~~	~~**Hydrant Removed and Stacked**~~	~~**Each**~~
~~**381.**~~	~~**Service Box**~~	~~**Each**~~
~~**381.1**~~	~~**Service Box Removed and Reset**~~	~~**Each**~~
~~**381.2**~~	~~**Service Box Removed and Stacked**~~	~~**Each**~~
~~**381.3**~~	~~**Service Box Adjusted**~~	~~**Each**~~
~~**384.**~~	~~**Curb Stop**~~	~~**Each**~~
~~**384.1**~~	~~**Curb Stop Removed and Reset**~~	~~**Each**~~
142.	**Class B Trench Excavation**	**Cubic Yard**
~~**144.**~~	~~**Class B Rock Excavation**~~	~~**Cubic Yard**~~
~~**150.**~~	~~**Ordinary Borrow**~~	~~**Cubic Yard**~~
151.	**Gravel Borrow**	**Cubic Yard**
156.	**Crushed Stone ~~for Drainage.~~ ~~Revetment or Water Work Foundations~~**	**Ton**
~~**903.**~~	~~**3000 psi, 1 ½", 470 Cement Concrete Masonry**~~	~~**Cubic Yard**~~

***Pipe or appurtenance size will be included as part of the item number in order to differentiate between the sizes.**

Description

310.20 General.

The work under this section consists of the cleaning and cement mortar lining of existing cast iron water mains in place within the limits specified on the contract drawings.

The Temporary Water By-pass System (Section 311) is required to be in place prior to the start of any work in this Section. Payment for the Temporary Water By-pass System is included under Item 311 and is not part of this Section.

All work done under this section shall be done in accordance with AWWA Specification C602-83 unless otherwise stated herein.

It is the intent of these specifications to secure the best workmanship consistent with the job conditions and the Contractor's skill. No provision in these specifications shall be construed by the contractor as an excuse for poor workmanship or results. Any requirements which are in conflict with the Contractor's usual methods shall be brought to the attention of the Engineer prior to the start of any work.

Materials

All materials used for the cleaning and cement lining work shall conform to all applicable AWWA Standards unless specifically altered in these specifications.

Construction Methods

310.60 Opening Water Main.

A. *The Contractor shall open the water main at:*

1. Each end of the section to be cleaned and lined,

2. Each main valve being retained for use,

3. Each bend, fitting and obstruction shown on the contract drawings,

4. Each location where a new valve is to be installed, and all other locations necessary to perform the work.

B. *All openings required for bends, fittings or obstructions not shown or noted on the contract drawings shall be paid for under pay item 304. Obstructions.*

C. *All openings shall be made by:*

1. Guillotine saw cuts

2. An approved power operated pipe cutter.

3. Removing existing couplings or sleeves, or other approved method resulting in the cut ends of pipe being square and true.

D. *The Contractor shall salvage, clean and cement line, and re-use any undamaged pipe.*

E. *At openings in sections under pressure or in service, the Contractor shall install adequate blocking to prevent movement during the time the pipe is open.*

310.61 Temporary Pipeline Seals.

A. *The Contractor shall install, maintain and remove temporary pipeline seals to prevent inflow of water into the pipeline to be cement-mortar lined and to allow for the proper curing of the cement lining. The seals shall be braced tightly. The design of the seals shall be submitted to the Engineer for approval before installation.*

310.62 Cleaning.

A. All rust, tubercles, deposits, old coatings, oil, grease, dirt, debris and other foreign materials shall be removed by the Contractor to produce a surface satisfactory to the Engineer for the application of cement mortar lining.

B. Old tar, if satisfactorily adhered to the pipe, may be left in place providing there are no sharp edges between coated and uncoated areas.

C. Several passages of the cleaning apparatus, in both directions, may be required to produce these specified results.

D. Nothing shall be left on the pipe surfaces which in any way, or at any time, may harm the cement mortar lining or cause it to be less adherent.

E. Suitable provisions shall be made to prevent any damage by water used for cleaning the pipe, and in the event of damage, the Contractor shall be fully responsible.

F. All sediment deposits shall be removed from the service lines after cleaning the main and before any final flushing of the main.

310.63 Cement Mortar Lining.

A. As soon as practically possible after a section has been cleaned to the satisfaction of the Engineer, it shall be cement mortar lined.

B. The lining shall consist of one course of continuously applied cement mortar placed by a centrifugal machine. Such machine shall project the mortar against the wall of the pipe without rebound and at a sufficient velocity to cause the mortar to be densely packed and to adhere in place.

C. The Contractor shall limit the maximum distance of a cement lining run to 500 linear feet.

D. The mortar shall be mechanically troweled or dragged to produce a satisfactorily smooth surface.

E. The thickness of the lining for cast iron pipes shall be in accordance with Table 1 of Section 3 of the AWWA C602-83 Standard Specifications for Cement Mortar Lining of water pipes in place. In all instances, tolerance for lining thickness shall be plus 1/8 inch with no minus tolerance. The minimum thickness of the lining shall be 3/16 inch.

F. After lining operation is completed, the newly lined water main shall be filled with water within 24 hours. This water shall not be under pressure.

G. All openings to the pipe section shall be kept closed to prevent air circulation in order to create a moist atmosphere for adequate curing.

310.64 Repairing Water Main Openings and Defective Piping.

A. Closures shall be made with cleaned and lined pipe salvaged from opening the main and new sleeve couplings.

B. All new materials used to close water main openings must meet all specifications in Section 301-Water Systems, contained herein.

310.65 Building Service and Branch Connection Cleaning.

A. The Contractor shall clean debris or cement mortar from all building services, branch connections, laterals, blow-offs, pitometer taps, and all other connections.

B. The cleaning of building services shall be done by "blowing-back" with air pressure (max. 20 psi.) or excavation, opening and reaming where their operation is impaired by the cleaning and lining operation.

C. In the event that the "blowing-back" method is used (see B. above), the air source shall be regulated to deliver a maximum of 20 psi. Such regulation of the pressure shall be visible on a gauge at all times.

310.66 Television Inspection of Cement Lining

All water lines cement lined under this section shall be inspected by means of television camera and video recording.

Television inspection shall be accomplished by the use of closed circuit television and DVD video recorder. The inspection shall be conducted so as to produce continuous video recordings of the various pipes lined under this section corresponding to each continuous pipeline section. The total pipeline shall be described by the narrator stating the size, location and limits of each section recorded.

The television camera used for this inspection shall be one especially designed and constructed for pipe inspection and shall have its own lighting system providing light levels from 50 to 100 foot candles. Picture quality shall be such as to produce a continuous 600-line resolution picture showing the entire periphery of the pipe. Picture quality and delineation shall be such that the interior of the pipe can be clearly seen without static interference of any kind.

All excess water shall be removed from the pipeline prior to television inspection.

The videos furnished to the Engineer shall be of DVD color format and shall have a distance indicator present at all times on the video. The distance shown on the video shall not be used for payment purposes, but shall be used for general purposes of locating the section.

Continuous DVD videos with voice narration shall be supplied to the Engineer, and shall become the property of the City.

All television inspection work shall be monitored by a City Inspector unless other action is specifically authorized by the Engineer. The Engineer shall be notified three (3) days in advance of the proposed inspection to facilitate the assigning of an Inspector.

The Engineer shall view the tape within 48 hours of receipt and make a determination as to activating the water pipe.

Videos which are taken when there is water in the pipe are not acceptable. The Contractor must re-video the pipe when it is completely free of water.

310.67 Chlorination.

Upon completion of all cleaning and lining operations and approval of the work by the Engineer, the contractor shall disinfect the mains with water containing not less than fifty (50) parts per million of chlorine in accordance with the AWWA C601 "Procedure for Disinfecting Water Mains" and City of Somerville Standards.

310.68 Obstructions.

The contractor shall make additional openings in the water main, if necessary, at all bends, fittings or other items which hinder the cleaning and cement lining operations.

Only those bends, fittings or other items NOT SHOWN OR NOTED ON THE PLANS will be considered Obstructions for payment purposes.

310.69 Guarantee of Cement Mortar Lining.

A. *The Contractor shall guarantee all materials and workmanship furnished under this contract against deterioration and failure for a period of one (1) year after acceptance of the work.*

B. *During this period, any portion of the cement-mortar lining found to be deteriorated or to have failed shall be repaired by patching or by removal and re-placement of the cement-mortar lining by the Contractor, as may be deemed necessary by the Engineer, to provide a sound, durable cement-mortar lining. Repairs or replacements shall be done at the sole expense of the Contractor, and in full conformity with these specifications, including removal of defective lining, cleaning of the pipe, cutting and repairing, closing access openings and all other incidental work.*

C. *Contractors shall be required to guarantee all cleaned and cement lined water mains, meet the following "C" coefficients, with proper allowance being made for bends and fittings, in accordance with accepted practice.*

Nominal Pipe Diameter	*Guaranteed Coefficient "C" (Hazen-Williams formula)*
8" and 12" C.I.	*120*

D. *The Contractor shall make loss of head tests after the mains under this contract have been cleaned and cement-mortar lined to determine "C" coefficients for the various diameter mains.*

E. *For such cleaned and cement-mortar lined water mains that fail to meet the "C" coefficient determined by loss of head tests, two percent (2%) will be deducted from the contract price after the drop of "C" coefficient to four (4) points below the guarantee and a one percent (1%) additional deduction from the contract price for each two (2) point drop in "C" coefficient thereafter.*

F. *It shall be understood, for the purposes of establishing the "C" coefficient on such mains where it is not practical to carry the loss of head test through sections thereof, that they shall be tested and the weighted average coefficient "C" from tests of such portions shall be considered to be acceptable for the whole of the cleaned and cement-lined mains.*

G. *For such cleaned and cement-mortar lined water mains that fall below the guaranteed coefficient "C" to the extent of ten (10) points or more because of poor workmanship, the Engineer shall decide whether the deduction in payment shall be made in accordance with the terms indicated above, or if the cement-mortar lining shall be removed and the water main properly cement-mortar lined at no added expense to the City.*

H. *It shall be understood that all tests for establishing the coefficient "C" for water mains cleaned and cement-mortar lined under this contract shall be completed within one (1) year after contract work is finished.*

Compensation

310.80 Method of Measurement.

Obstructions will be measure per obstruction.

The length of Cleaning and Cement Lining of iron water main to be paid for under the appropriate size designated shall be measured by the linear foot, along the finished grade over the pipe from end to end. No deduction for the length of valves or fittings in the pipe shall be made.

The length of Water Main Televised shall be measured by the linear foot as above for the Clean and Cement Line items.

310.81 Basis of Payment.

The quantity of Obstructions to be paid for under this item shall be the actual number of additional openings made by the Contractor at bends, fittings or other obstructions NOT SHOWN OR NOTED ON THE PLANS that prevent the proper cleaning and cement lining of an existing water main. Additional openings required by the Contractor for cleaning gate valves, services or laterals that have become plugged because of the cement lining or because his apparatus cannot properly clean or cement line continuously a full section of straight pipe, shall not be included for payment under this item. The fixed price paid under this item shall be full compensation for excavation, cutting the pipe, removing the obstruction, replacing all fittings (or re-using salvaged fittings after cement lining them) and pipe, furnishing and setting couplings as needed, and placing and compacting backfill materials. Furnishing backfill materials and any necessary rock excavations shall be paid for under the appropriate separate items.

The unit price paid for Cleaning and Cement Lining of water mains shall be full compensation for cutting and disposal of pavement, trench excavation, sheeting and bracing as required, dewatering, placing and compacting backfill material, removal and disposal of any existing water main or fittings shown on the plans, removal and delivery to City storage yard of any valves or appurtenances shown on the plans, furnishing and laying new ductile iron pipe to replace existing pipe damaged by the Contractor, cutting existing water mains for access to clean and cement line, all labor, equipment and materials necessary to clean and cement line the existing pipe, disinfection and testing, all couplings which may be needed and all other work necessary to clean and cement line the water pipe which are not paid for under other items. No payment will be made until the Engineer has reviewed the video recording of the cleaning and cement lining of each section of pipe and accepted the work.

The unit price paid for Water Main Televised shall constitute full compensation for all labor, tools, equipment, DVDs, and related work necessary to satisfactorily inspect the cement lined pipe. There shall be no additional payments for delays or work necessary to overcome obstructions to the passage of the camera.

310.82 Payment Items.

304.	***Obstructions***	***Each***
305.	***Cleaning and Cement Lining of Iron Water Mains***	***Foot***
306.	***Television Inspection***	***Foot***

Description

311.20 General.

The work under this section consists of furnishing, installing, chlorinating, maintaining, removing the by-pass, restoration of disturbed areas and installation of temporary service pipe of the size required to adequately service water customers.

It is the intent of these specifications to secure the best workmanship consistent with the job conditions and the Contractor's skill. No provision in these specifications shall be construed by the contractor as an excuse for poor workmanship or results. Any requirements which are in conflict with the Contractor's usual methods shall be brought to the attention of the Engineer prior to the start of any work.

The Contractor shall provide temporary services for the customers whose permanent service line is:

a. *Out of service due to the main pipe to which it is connected to being replaced*
b. *Out of service due to the main pipe to which it is being connected to being cleaned and cement lined*

The Contractor shall locate all services to be fed by the by-pass system. Customer's service lines, which will be out of service for a limited period of time, in the opinion of the Engineer, need not be by-passed but all other provisions regarding adequate notice and hours of shut down shall be strictly adhered to.

The Contractor will be responsible for the adequate temporary feed of all fire service lines in accordance with the following:

Fire Systems with Fire Pump

1. *The Contractor will* ***not be*** *allowed to connect to the Siamese connection except as noted in item 3 below.*
2. *The Contractor shall dig, tap and connect to the fire pipe below grade. The following minimum requirements shall apply depending upon the size of the existing connection:*
   a. *8" fire pipe shall be fed at a minimum with (three) 2 ½" hoses or equivalent*
   b. *6" fire pipe shall be fed at a minimum with (two) 2 ½" hoses or equivalent*
   c. *4" fire pipe shall be fed at a minimum with (one) 2 ½" hose*
3. *The Contractor shall provide an additional temporary hydrant on the by-pass system at each building that has a Siamese connection. This temporary hydrant connection shall only be used to feed to the Siamese connection as an interim fire protection when the Contractor is installing new pipe work or valves that require the closure of the existing feed. Note: This hydrant is in addition to those required to replace the existing hydrants.*
4. *The Contractor shall notify the Somerville Fire Department in writing upon installation of the temporary by-pass and schedule a site visit with the Somerville Fire Department. A copy of this notice shall be provided to the Engineer.*
5. *The Contractor shall notify the Somerville Fire Department in writing of the date and item for any disconnection of a fire pipe as noted in Item 3 above.*
6. *The Contractor shall coordinate with each building owner and the building owner's sprinkler contractor for the connection of the fire service on a temporary basis as outlined in Item 3 above.*

Fire Systems without Fire Pump

1. *The Contractor shall install temporary by-pass to the Siamese connection. The following requirements shall apply depending upon the size of the existing connection:*
   a. *8" fire pipe shall be fed at a minimum with (two) 2 ½" hoses or equivalent via a wye connection at one connection at the Siamese.*

b. *6" fire pipe shall be fed at a minimum with (two) 2 ½" hoses or equivalent via a wye connection at one connection at the Siamese.*

c. *4" fire pipe shall be fed at a minimum with (one) 2 ½" hose at the Siamese.*

2. *One nozzle at the Siamese connection shall always be available for connection by the Somerville Fire Department.*
3. *The Contractor shall notify the Somerville Fire Department in writing upon installation of the temporary by-pass and schedule a site visit with the Somerville Fire Department. A copy of this notce shall be provided to the Engineer.*
4. *The Contractor shall coordinate with each building owner and the building owner's sprinkler contractor the disconnection of the fire service on a temporary basis as outlined in Item 3 above.*

311.20 General Conditions.

The contract drawings provide the approximate size and location of each known fire pipe impacted by the work, including side streets. However, the Contactor will be required to locate all fire pipes affected by the work. There will be no additional compensation for by-pass of fire pipes not shown on the plans.

The Contractor shall provide temporary connection to fire pipes impacted by a shutdown.

The by-pass plan submitted shall demonstrate compliance with these provisions.

Buildings that have backup fire service for the entire building that will remain active do not need to be by-passed. The Contractor shall coordinate this closure with the building owner.

The Contractor shall review City water distribution plans, available at the Department of Public Works to determine the extent of the by-pass, especially where dead ends and division gates may require by-pass piping. No additional payment shall be considered for the extension of the by-pass to feed services fed from dead ended pipe or pipe where flow is interrupted by a division gate. This may or may not be noted on the plan. In either case the Contractor is responsible for determining the locations of all dead ends.

All by-pass shall be fed from two (2) sources unless allowance is made for in writing by the Engineer for a submitted by-pass plan.

In the event a by-pass is dead-ended, it shall terminate with a 2-inch valve for flushing and chlorination.

No by-pass will be activated prior to approval by the Engineer. The Contractor will be responsible for written notification to the Somerville Fire Department that by-pass has been installed and shall provide a copy of the Engineer.

Materials

All by-pass shall be galvanized steel, high density polyethylene (HDPE) or polyvinylchloride (PVC) pipe. All plastic pipe or hose shall bear the imprint of the National Sanitary Foundation approval for potable water NSF-PW or shall be capable of meeting the standards established by the NSF for this use.

The materials selected shall be adequate to operate at the pressure to which they will be subject to and adequate to withstand whatever forces, such as traffic loading, they will encounter. Joints for all pipes shall be watertight.

The City reserves the right to reject at any time materials that do not meet the requirements set forth herein.

Construction Methods

In general, by-pass piping shall be laid along the side of the roadway adjacent to the curb line edge of the pavement line.

At locations where the pipe is subject to minimal traffic, such as at driveways, the pipe shall be adequately protected by excavating and setting the pipe below grade or "ramping" it with HMA or other suitable material.

All by-pass pipes that cross handicapped ramps, intersections, or extends around the radius of an intersection street shall be installed below the surface grade.

Where necessary to feed large services, the Contractor may be required to excavate the sidewalk or other areas adjacent to a building to cut into the existing service or fire pipe. The cost of this work shall be included in the bid price for Temporary Water By-pass System including backfill and paving.

In addition, the Contactor will be required, where necessary, to ramp over all by-pass piping to provide for wheelchair access on affected sidewalks. Ramping shall be in accordance with ADA (Americans with Disabilities Act) and MAAB (Massachusetts Architectural Access Board) regulations.

For all by-pass piping used to feed temporary hydrants, an intermediate main line valve shall be provided after every third hydrant and shall be required on each street regardless of the number of hydrants.

At locations where the pipe is subject to regular traffic, such as where it crosses travel lanes, the pipe ***MUST*** *be set below grade and the trench adequately filled to withstand the traffic loads. At such areas all work must be done in accordance with the applicable sections contained herein relating to trench excavation and paving. These requirements shall include, but are not limited to, cutting the pavement neatly to avoid excess damage to existing pavement.*

The interior of all by-pass pipe, temporary service pipe and service hoses shall be flushed to remove any dirt or other objects and shall be disinfected in accordance with AWWA C651-86 "AWWA Standard for Disinfecting Water Mains". The appropriate section of the Pressure Testing and Disinfection Report in the Appendix of these specifications shall be completed by the Contractor and submitted to the Engineer for approval prior to any payments being made for by-pass piping.

At all locations where hydrants are out of service due to work under this contract, the Contractor shall provide temporary hydrants. A hydrant being used to feed temporary hydrants must be fed by 6-inch by-pass pipe including whip connections and must be fitted with a butterfly valve with pentagonal operating nut, which can be turned with a hand wrench. The valve shall be painted blue for easier identification. The valve shall be equipped with a ¼ turn stop, which will not allow the operating nut to go beyond the closed position. All temporary hydrants shall have one (1) 4 ½" outlet, located with the centerline of the outlet parallel to the road surface. A threaded cap with a standard pentagonal nut is to be installed at the end of each 4 ½" hydrant connection. The outlet pipe shall have a 1"x1/2" diameter steel rod welded to the pipe to prevent the pipe from spinning in the coupling.

Adequate precautions shall be taken to protect all vehicular and pedestrian traffic from injury due to by-pass piping and temporary service lines. These precautions shall include, but are not limited to, "ramping", barricades and other devices.

All by-pass pipe and service hoses shall be bubble tight at all times. No leakage shall be acceptable.

No by-pass pipe shall remain in place after November 1st and none shall be put in service prior to March 1st, unless approved in writing by the Engineer.

Compensation

311.81 Basis of Payment.

The lump sum price shall constitute full compensation for all labor, tools and equipment necessary for the installation, maintenance, removal of the Temporary Water By-pass System and restoration of impacted areas to original condition.

Partial payments shall be made in accordance with the following:

a. *The lump sum price shall be divided into segments based upon the proportion of the linear footage of mainline pipe to be lined or relayed as served by the by-pass.*
b. *Where the existing main is used for the temporary by-pass, the Contractor will be required to maintain this pipe and will be compensated for the proportion of the main replaced as described in Item a above.*

Payments made for the installation of by-pass shall include furnishing all pipes, fittings, temporary hydrants, valves, hoses, HMA, barricades, temporary meter pit covers, chlorine and other materials necessary to install and test the by-pass system. This payment shall also include all labor, tools and equipment necessary to adequately temporarily serve all water customers with domestic and fire service lines, including the removal of all meters as required.

Payments made for the maintenance and removal of all by-pass piping shall include all labor, tools and equipment necessary to remove all temporary piping, hydrants, fittings, valves and hoses and all else installed to temporarily serve all water customers and return the disturbed areas to their original condition.

311.82 Payment Items.

311.	***Temporary Water By-pass System***	***Lump Sum***

Description

401.20 General.

The gravel sub-base shall consist of approved gravel placed on the subgrade and in close conformity with the lines and grades shown on the plans or established by the Engineer.

Materials

401.40 General.

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

Gravel Borrow	M1.03.0, Type a or b
~~Processed Gravel~~	~~M1.03.1~~

Construction Methods

401.60 General.

The gravel shall be spread and compacted in layers not exceeding 8 inches in depth, compacted measurement, except the last layer of gravel Sub-Base course (conforming to M1.03.0 Type b, or M1.03.1) will be 4" in depth compacted measurement and all layers shall be compacted to not less than 95% of the maximum dry density of the material as determined by the Standard AASHTO Test Designation T99 compaction test Method C at optimum moisture content as determined by the Engineer. If the material retained on the #4 sieves is 50% or more of the total sample this test shall not apply and the material shall be compacted to the satisfaction of the Engineer. The specific density of the Gravel Sub-base shall be maintained by determining the number of passes of a roller required to produce a constant uniform density, after conducting a series of tests either using the sand/volume or the nuclear device.

Any stone with a dimension greater than that permitted for the type of gravel specified shall be removed from the sub-base before the gravel is compacted. Compaction shall continue until the surface is even and true to the proposed lines and grades within a tolerance of 3/8 inch above or below the required cross sectional elevations and to a maximum irregularity not exceeding 3/8 inch under a 10 foot line longitudinally. In locations when the 8" of gravel is used as a base for Item 405 this tolerance shall be ¾" under a 10' line. Any specific area of gravel sub-base which, after being rolled, does not form a satisfactory, solid, stable foundation shall be removed, replaced and recompacted by the Contractor without extra compensation. ~~The gravel foundation for cement concrete surfacing shall be conditioned in accordance with the provisions of Subsection 476.61.~~

Compensation

401.80 Method of Measurement

Gravel for sub-base shall be measured as specified in Subsection 150.80.

401.81 Basis of Payment

Gravel for sub-base will be paid for at the contract unit price per cubic yard for Gravel Borrow.

Payment for shaping and compacting of the sub-base as specified herein shall be included in the item of Gravel Borrow.

401.82 Payment Items

151.	**Gravel Borrow**	**Cubic Yard**
~~**152.**~~	~~**Processed Gravel**~~	~~**Cubic Yard**~~

Description

430.20 General.

Cement concrete base course shall be constructed in one course on the prepared sub-base in accordance with these specifications and in close conformity with the lines and grades on the plans or established by the Engineer.

Materials

430.40 General.

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

*3,000 psi, 1 ½", 470 Cement Concrete	M4.02.00
Preformed Joint Filler	M9.14.0
Hot Poured Joint Sealer	M3.05.0

*The concrete shall have a slump of 2 inches with a tolerance of plus or minus ½ inch.

Construction Methods

430.60 General.

~~The cement concrete base course may be constructed by the Slip Form Method or the Fixed Form Method.~~

Equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer as to design, capacity, and mechanical condition.

Grade control survey and staking shall conform to Subsection 5.07 *of the MassDOT Standard Specifications*. The Contractor shall furnish, set, and maintain all line and grade stakes for grading and paving.

The Contractor shall use High Early Strength Cement Concrete Base Course for roadway patches, and as directed by the Engineer.

~~430.61 Side Forms.~~

~~The forms where required shall be an approved wood or metal type, of a width equal to the depth of the concrete, true to line, free from warp and of sufficient strength, when staked, to resist the pressure of the concrete without springing and so designed that the various sections may be fastened together in such a manner as to prevent the vertical or horizontal movement of the ends.~~

~~The forms shall be jointed neatly and tight, shall be set true to line and grade, well staked and braced, and shall have uniform bearing on the sub base through their entire length. In general the setting of forms shall proceed at least 500 feet in advance of the mixing and placing of concrete. The forms shall be thoroughly cleaned before any concrete is placed against them and shall be made tight to prevent the leaking or mortar from the concrete~~.

430.62 Fine Grading.

The fine grading of the foundation shall conform to Subsection 476.61.

~~430.63 Joints.~~

~~The Contractor shall construct weakened plane transverse contraction joints in the concrete base course every 30 to 50 feet or as shown on the plans. These joints shall consist of surface slots constructed in accordance with the requirements of Subsection 476.68C for transverse contraction joints.~~

~~Expansion joints shall be formed about all structures and features projecting through or into the pavement and between the pavement slab and adjacent curbing. Unless otherwise indicated, such joints shall be ½ inch~~

~~in width and shall be filled with preformed joint filler as specified in Subsection M9.14.0 and sealed with joint filler compound as specified in Subsection M3.05.0 in the same manner as specified for transverse expansion joints in Subsection 476.68B. There will be no additional compensation for joints.~~

430.64 Placing Concrete.

Concrete shall be placed on a moist, firm and smooth sub-base in accordance with the requirements of Subsection 476.64 except that it shall be placed in one layer.

~~**430.65 Finishing Concrete.**~~

The surface of the concrete shall be struck off ~~with a template shaped~~ so as to leave the concrete with a smooth, even contour surface. ~~and crown as shown on the plans and in the typical cross section. The template shall be so constructed that it shall have sufficient strength to retain its shape under all working conditions. This template shall be moved with a longitudinal and crosswise motion and always in the direction in which the work is progressing~~. The surface of the concrete shall be finished to the elevations, contours and crowns required with a tolerance allowance of ¼ inch in 10 feet.

The surface of the concrete shall be made free of footprints, ruts, depressions or other imperfections and shall then be lightly broomed, as directed, with approved stable or wire brooms.

430.66 Protection and Curing.

The pavement shall be protected and cured as required in Subsection 476.71 except that membrane compounds not compatible with bituminous materials shall not be used.

Compensation

430.80 Method of Measurement

Cement concrete base course will be measured in place by the ~~square~~ *cubic* yard conforming to the length, width and depth required by the plans or as directed. The Contactor shall have no claim for extra payment if thickness of pavement exceeds that shown on the plans or as directed.

430.81 Basis of Payment.

~~Standard cement concrete base course will be paid for at the contract unit price per square yard under the item for Cement Concrete Base Course.~~

High early strength concrete base course will be paid for at the contract unit price per ~~square~~ *cubic* yard under the item for High Early Strength Cement Concrete Base Course.

The price paid per ~~square~~ *cubic* yard shall also include all sprinkling or treated the roadway to keep down dust.

430.82 Payment Items

~~**430. Cement Concrete Base Course — Square Yard**~~

431.1 High Early Strength Cement Concrete Base Course — ~~Square~~ *Cubic* Yard

Description

460.20 General

This type of pavement shall be composed of mineral aggregates, mineral filler and bituminous material. The pavement shall be constructed in courses as shown on the plans and as directed on the prepared or existing base in accordance with these specifications and in close conformity with the lines, grades, compacted thickness and typical cross section shown on the plans.

Materials

460.40 General.

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

Mineral Aggregates	M3.11.04
Mineral Filler	M3.11.05
Bituminous Materials	M3.11.06
Composition and Compaction Acceptance Tests	M3.11.09

Construction Methods

460.60 General

The Engineer may require the Contractor to remove and replace at his own expense, any defective mix not conforming to the specified job mix formula within the stipulated tolerances; on the basis of the ~~Department~~ testing. Samples of the actual mixture in use will be taken as many times daily as necessary and the mixtures shall be maintained uniform for the project as specified herein. The Engineer may suspend further approval for use of the Plant mixtures in ~~Department~~ *City* work if the mixtures are not uniformly furnished as specified; until any necessary changes have been made so that the mixtures do conform to the specified requirements.

If, at any time before the final acceptance of the work, any soft, imperfect places or spots shall develop in the surface all such places shall be removed and replaced with new materials and then compacted until the edges at which the new work connects with the old become invisible.

Grade control survey shall conform to Subsection 5.07 *of the MassDOT Standard Specifications*. The Contractor shall furnish, set, and maintain all line and grade stakes as necessary to guide the automated grade control equipment. Where required these control stakes shall be maintained by the Contractor and used throughout the operations, from the grading of the sub-base material up to and including the final layers of the pavement.

With prior approval of the Engineer and with no increase in cost, a plant may substitute a limited amount (up to 1000 tons per project) of binder mix for black base. The substitution will only be within the station limits, locations, depths and tonnage as permitted by the Engineer.

The Contractor will supply an approved dial type thermometer with a temperature range of 50° to 500°F and an infrared pistol thermometer for each paving machine in operation on the project. The infrared pistol thermometer shall be Fahrenheit or Celsius selectable and conform to the following requirements:

Portable and battery operated	Accuracy of ±2%
Repeatability of ±5°F	Emissivity preset at 0.95
LCD display to nearest 1°	Temperature operating range 0° to 750°F

The thermometers will remain the property of the Contractor upon completion of the project.

Under normal conditions, where more than one course of bituminous concrete is to be constructed, the use of the stringline for grade control may be eliminated or discontinued after the construction of the initial layer of bituminous concrete. For resurfacing projects, where only one course of bituminous concrete is to be constructed, the use of the stringline for grade control may be eliminated. The use of an approved "ski" may then be substituted for the stringline where lines and grades are found to be satisfactory by the Engineer.

On each contract specifying 5,000 tons of pavement or more, the Contractor shall submit for approval a schedule of proposed paving and compaction equipment. The schedule shall project approximate daily production for the "paving train" and provide sufficient data for proper evaluation of paving and compaction procedures.

460.61 Transportation and Delivery of Mixtures

The mixtures shall be transported from the plant to the work in vehicles previously cleaned of all foreign materials. During transportation of the mixture from the plant to the spreader of the work, each load shall be fully covered at all times, without exception, with canvas or other suitable material of sufficient size and thickness to furnish complete protection. The mixture shall not be transported such a distance that segregation of the ingredients takes place or that any crust is formed on the surface, bottom or sides of said mixture which will not crumble or flatten out when the mixture is dumped or shall otherwise be deleterious to the mixture in place on the roadway.

The vehicles for transporting the mixture shall be tight and inside of the bodies shall be evenly and lightly coated with a suitable thin oil or approved soap solution, but no excess of lubricant shall be allowed to accumulate in low spots in the body.

During paving operations, the Contractor shall provide continuous radio communications between the plant and the project to ensure immediate response due to breakdowns, emergencies such as accidents, and to insure the best quality results possible.

When necessary, proper insulation of the vehicles transporting the mixture shall be made to insure that the mixture is delivered for placing at the proper temperature.

The dispatching of trucks from the plant shall be so arranged that all material which is to be delivered at or on the road surface during any day may be placed and shall have received final compaction before nightfall of the same day; unless artificial light, satisfactory to the Engineer is provided.

The temperature of the mixture, within a tolerance of plus or minus 15°, when delivered at the project site will be governed by the temperature of the base upon which the mix is placed as follows:

Base Temp F	MAT THICKNESS					
On Which mix is Placed	1/2"	3/4"	1"	1 1/2"	2"	3" or Greater
35-40				305	295	280
40-50			310	300	285	275
50-60		310	300	295	280	270
60-70	310	300	290	285	275	265
70-80	300	290	285	280	270	265
80-90	290	280	275	270	265	260
90+	290	275	270	265	260	255

460.62 Tack Coat.

All pavement surfaces shall be tack coated immediately prior to placing each HMA lift. HMA placed over milled surfaces shall be tack coated at an application rate of 0.07 gallons per square yard. HMA placed over smooth pavements (unmilled) shall be tack coated at an application rate of 0.05 gallons per square yard.

Tack coat shall meet the requirements of M3.11.06.

The existing surface shall be cleaned of all foreign matter and loose material and shall be dry before the tack coat is placed.

460.63 Spreading and Finishing.

The equipment for spreading and finishing shall be mechanical, self-powered pavers, capable of spreading and finishing the mixture true to line, grade, width, and crown by means of fully automated controls for both longitudinal and transverse slope.

The pavers shall be equipped with hoppers and distributing screws of the reversing type to place the mixture evenly in front of adjustable screeds. They shall be equipped with a quick and efficient steering device and shall have reverse as well as forward traveling speeds.

The pavers shall employ mechanical devices such as equalizing runners, straight edge runners, evener arms or other compensating devices to adjust the grade and confine the edges of the mixture true to lines. They shall be capable of spreading the mixture without segregation in layers to the depths and widths required. They shall be equipped with automatic joint matching attachment for use on adjacent mat or curb; automatic grade and slope control with a floating beam mobile reference system with minimum length of beam ("ski") of thirty feet for averaging longitudinal errors in the grade over which paving is being performed. The joint matching attachment and floating beam mobile reference system shall be employed on all paving courses unless otherwise directed by the Engineer.

When extensions are added to the paver, they shall be provided with the same vibrating screed or tamper action as the main unit of the paver, except for paving variable width areas. The extensions shall also be equipped with a continuation of the automatically controlled spreading augers. The screed and any extensions shall be provided with an approved method of heat distribution.

The screed shall be adjustable for profile and shall have an indicating level attached.

An approved device will be required for heating the screed to the temperature required for the laying of the mixtures without pulling or marring.

The term "screed" includes any "strike-off" device operated by cutting, crowding, or other practicable action, which is effective on the mixtures at permissible workable temperatures without tearing, shoving, or gouging and which produces a finished surface of the evenness and texture required.

The pavers employed on projects requiring in excess of 15,000 tons shall be capable of operating by the use of a sensing grid for operation to a stringline and matching shoe for joints.

The pavers shall operate while bituminous mixture is being spread at a speed which will produce a uniform surface texture free of any rippling or unevenness.

The paver employed on deep lift construction shall be capable of satisfactorily feeding the mix without intermittent stopping during the discharge of the mix from the trucks into the paving machine.

If during construction, it is found that the spreading and finishing equipment in use leaves tracks or indented areas or produces other permanent blemishes in the pavement which are not satisfactorily corrected by the scheduled operations: the use of such equipment shall be discontinued and other satisfactory spreading and finishing equipment shall be provided by the Contractor.

The mixtures shall be placed and compacted only at such times as to permit the proper inspection and checking by the Engineer.

The mixtures shall only be placed in the work when they can be efficiently and satisfactorily placed by the methods stipulated herein. Unless otherwise permitted by the Engineer for special particular conditions, only machine methods of placing shall be used.

Hot mix asphalt shall not be placed after November 15 or before April 1 without the written permission of the Engineer.

When the air temperature falls below 50°F, extra precautions shall be taken in drying the aggregates, controlling the temperatures of the materials, placing, and compacting the mixtures.

No HMA mixture shall be placed unless the breakdown and intermediate rolling can be completed by the time the material has cooled to 175°F, and provided that the density of the completed pavement attains at least 92% of the maximum theoretical density as determined by AASHTO T 209.

No mix shall be placed on wet or damp surfaces.

~~OGFC mixtures shall only be placed when both the surface and ambient temperatures are at least 50°F and rising when measured in the shade and away from artificial heat. Regardless of any temperature~~

~~requirements, OGFC mixtures shall not be placed after October 31 or before May 1 without the written permission of the Engineer~~.

The mixtures shall be placed only upon approved surfaces that are clean from foreign materials and dry; and when weather conditions are suitable. The Engineer may however, at the entire responsibility of the Contractor, permit work to continue when overtaken by sudden rain, but only with material which may be in transit from the plant at the time, and then only when the temperature of the mixture is within the temperature limits specified and the existing surface on the roadway is not excessively wet.

A tack coat shall be applied where required as per Subsection 460.62.

The bituminous concrete shall be placed in courses as shown on the plans, as specified and as directed by the Engineer.

When an existing surface or new base upon which the bottom course is to be placed contains unsatisfactory irregularities, in the Engineer's judgment, such irregularities shall be eliminated by an adequate placing and compaction of mixture so as to furnish a surface with true contour and grade before placing any specified course of mixture.

The contact surfaces of ~~bridge~~ curbings, manholes, catch basins or other appurtenant structures in pavment shall be painted thoroughly with a thin uniform coating of bitumen (Specifically RS-1) just before any mixture is placed against them.

Special attention shall be given to proper testing of the surface of each course with a straightedge. The finished surfaces shall be even and uniform throughout. (See Subsection 460.67 for "Testing Surfaces").

Any mixture which becomes loose or broken, mixed with dirt, or in any way defective shall be removed and replaced with new mixture which shall be compacted to conform with the surrounding area. Areas of one square foot or more showing an excess of bitumen shall be removed and replaced.

The methods of spreading the bituminous concrete mixtures shall be as follows:

A. Machine Spreading.

All mixtures shall be deposited in an approved mechanical spreader and immediately spread thereby; and then struck off in a uniform layer to the full width required and of such depth that each course, when compacted, shall have the required thickness and shall conform to the grade and cross section contour specified.

The mixture shall be deposited in the center of the hoppers and care exercised to avoid overloading and spilling. The pavers shall operate, while the mixture is being spread, at a speed which will produce a uniform surface texture.

Immediately after any course is screeded and before roller compaction is started, the surface shall be checked, any irregularities adjusted, any accumulation from the screed removed by rake or lute, and all fat spots in any course removed and replaced with satisfactory material. Irregularities in alignment and grade along outside edges shall be corrected by the addition or removal of mixture before the edges are rolled. Indiscriminate castings of mix on the new screeded surface, where irregularities are not evident, shall not be permitted.

All edges shall be true and uniform.

B. Hand Spreading.

Spreading by hand methods will be permitted only for particular locations in the work which because of irregularity, inaccessibility or other unavoidable obstacles do not allow mechanical spreading and finishing.

460.64 Compaction.

After the paving mixture has been properly spread, initial compaction shall be obtained by the use of power rollers of approved design and weight per inch width of roller. The rollers shall be steel wheeled supplemented with pneumatic-tires rollers where required, or where permitted by the specifications, vibratory rollers.

Steel wheel rollers for initial and intermediate rolling shall have a weight of not less than 240 pounds per inch width of roller.

Pneumatic-tired rollers, when conditions warrant, shall be provided with devices capable of varying tire pressures. When the mixture being spread by each paver requires more than the minimum number of steel wheel rollers, at least one (1) of the additional rollers for each paver shall be a pneumatic-tired roller, except where the use of a vibratory roller is permitted. When using an pneumatic-tired roller, care should be taken in that initial rolling by the steel wheel roller be restricted to one pass where upon the pneumatic-tired roller shall immediately follow the initial steel wheel rolling.

Vibratory rollers may be used on base, binder and surface courses subject to the conditions set forth herein. Vibratory rollers to be used may be of the single drum type with pneumatic tired drive wheels or the double steel drum type with vibratory mechanism in one or both drums. All vibratory rollers shall have a static weight of at least eight tons and shall be equipped with an automatic disconnect device to disconnect the vibratory mechanism when the roller is not in motion. They should also be equipped with a manual over-ride device to disconnect the vibratory mechanism if the automatic device should fail.

All vibratory rollers shall also be equipped with the following equipment: a large and clearly visible speed indicator; an amplitude setting indicator and a frequency setting indicator. They shall also have instructional plates attached which shall include operational instructions and recommended amplitude and frequency settings. A vibratory tachometer shall also be provided with each roller for use by the Engineer.

Vibratory rollers shall not be used on bridges or other structures and their use in urban areas may be restricted. They shall not be used on thin overlays one inch (1") or less in thickness, except that vibratory rollers of the double drum type may be used in a static condition to compact such overlays, provided that when so operated they shall be able to obtain the degree of density and smoothness required to conform to the specifications.

When vibratory rollers are used for the compaction of base and binder material they shall be operated at a high amplitude setting and a low frequency setting in the range of 1500 to 1700 VPM. When used for the compaction of surface courses that shall be operated at a low amplitude setting at a minimum frequency setting of at least 2200 VPM or higher, if a higher frequency setting is recommended by the manufacturer of the roller. The use of a vibratory roller incapable of being operated at a frequency setting of at least 2200 VPM will not be permitted on surface courses. No deviation from this latter requirement will be allowed. In compacting surface courses a vibratory roller shall not be operated a speed in excess of three (3) miles per hour.

A vibratory roller shall be operated with the vibration drum or drums in the direction of the paver and the vibrating action of the roller shall be completely shut off during change of direction. Due care shall be exercised to start the vibratory action only when the roller is in motion. During the rolling of layered pavement, in order to prevent creeping and aggregate crushing, care shall be taken not to exceed two passes with the vibrator in action. For deep lift pavements, these passes shall normally not exceed two in each direction, except that the number of vibratory passes in either direction may be varied in order to obtain the required density.

The final rolling of all courses shall be performed with a steel wheeled roller of sufficient weight for final smoothing of the surface.

The used of a vibratory roller may be suspended by the Engineer if, in his opinion, satisfactory results are not being obtained and no further amount of mix shall be spread in such case until a sufficient number of approved rollers are on the project site to satisfy compaction requirements.

A plate shall be attached to each conventional roller which shall show the ballasted and unballasted weight per inch of tread.

The number of rollers required shall be governed by the tonnage of hot-mix being placed daily. A sufficient number shall be provided to compact the mixture in accordance with the specifications. The number of

passes required may be varied and shall be governed by compaction results. The Engineer may require that a stand-by roller be provided if in his opinion it is necessary in the event of a breakdown.

~~For Open Graded Friction Course, OGFC, initial rolling may be accomplished with the breakdown roller within a short distance of the paver, allowing earlier compaction. Any subsequent rolling shall be adjusted in order not to over roll the mixture. No mixture shall be placed unless the breakdown and intermediate rolling can be completed by the time the material has cooled to 195°F. Vibratory rollers or rubber tire rollers will NOT be permitted on OGFC mixtures.~~

Each roller shall be operated by a competent, experienced roller operator and shall be kept in as nearly continuous operation as practicable while work is underway. The mixture shall be rolled longitudinally, diagonally and transversely as may be necessary to produce the required contour of the surface. Longitudinal rolling shall start at the side and proceed toward the center of the pavement, except on superelevated curves where the rolling shall begin on the low side and progress to the high side, overlapping on successive trips by at least 12 inches. The rolling shall be continued and so executed that all roller marks, ridges, porous spots and impressions are eliminated and the resulting surface has the required grade and contour. The motion of the rollers shall at all times be slow enough to avoid any displacement of the hot mixture. Any displacement or marring of the surface occurring as a result of reversing the direction of the rollers, or from any other cause, shall be corrected. To prevent adhesion with the mixture, the wheels of the steel rollers shall be kept lightly moistened with water but excess water will not be permitted. The use of oil for this purpose will not be allowed.

To prevent "rolloff" of the pavement edges and longitudinal joints in deep lift paving, the outer 8"± of the deep lift mixture shall be left unrolled until the temperature of the mix ranges between 150°F and 180°F, whereupon it shall be compacted by the steel roller.

Along curbs, structures and all places not accessible with a roller, the mixture shall be thoroughly compacted with mechanical tamping devices. The surface of the mixture after compaction shall be smooth and true to the established line and grade.

The Engineer will obtain all core samples with the Contractor's assistance. The cost of all labor and equipment provided to assist the Engineer in obtaining core samples and all material required for filling all core holes shall be considered incidental to the HMA pay items. The in place density shall be 95% ±2.5% of the maximum theoretical density as determined by AASHTO T 209.

460.65 Joints.

Placing of the mixture shall be as nearly continuous as possible and the roller shall pass over the unprotected end of the newly placed mixture only when the placing of the course is to be discontinued for such length of time as would permit the mixture to attain initial stability. In all such cases, including the formation of joints as here specified, provision shall be made for proper bond with the new surface for the full specified depths of the courses.

All transverse joints, all longitudinal joints of the surface course and all longitudinal joints ~~in the Dense Binder Course under Open Graded Friction Course or Open Graded Friction Course Modified~~ shall be treated prior to laying the next lane of hot mix asphalt as follows:

The joint shall be coated with a hot poured rubberized asphalt sealant meeting the requirements of M3.05.0.

When using pavers in tandem, the use of the hot poured rubberized asphalt sealer may be omitted at the discretion of the Engineer, if the temperature of the mixture at the longitudinal joint does not fall below 200°F prior to the placement of the adjacent mat. No re-heating of the joint shall be permitted.

The hot poured rubberized asphalt shall be applied to the joints from a double jacketed heating kettle with a positive drive gear pump that is connected to a suitable applicator. The nozzle of the applicator shall be set to deliver sufficient sealant to effectively bond and seal the transverse and longitudinal paving joint between two adjacent lanes of hot mix asphalt.

Longitudinal and transverse joints shall be made in a careful manner, well bonded and sealed, and true to line and grade. Where and as directed, transverse joints for all courses and longitudinal joints for the top

course placed under this or previous contracts shall be cut back to expose the full depth of the course and, when the laying of the course is resumed, the exposed edge of the joint shall be treated as above.

In making joints along any adjoining edge such as curb, gutter or an adjoining pavement, and after the mixture is placed by the mechanical spreader, just enough of the hot material shall be placed by hand method to fill any space left open. These joints shall be properly "set-up" with the back of a rake at the proper height and level to receive the maximum compaction. The work of "setting-up" these joints shall be performed only by competent workmen.

Where and as directed, the first width of any course shall be placed not less than one foot wider than the first width of top course, and successive widths of top and as any other courses shall be so placed that there will be at least a one foot overlap between the joints in the top course and the other course.

The rolling of the successive widths of courses shall overlap and shall be performed so as to leave smooth, uniform joints and cross sections.

~~**460.66 Pavement on Bridges.**~~

~~The bituminous concrete mixtures for protective course paving on bridges shall consist of "Dense Binder Course" as specified hereinafter for such mix and work performance requirements. The mixtures shall be treated with an approved antistripping compound as specified under M3.10.0.~~

~~The protective course over any area shall be placed within 24 hours after the membrane waterproofing over the area has been placed unless exception is granted by the Engineer.~~

~~The use of smaller rollers may be permitted, with the approval of the Engineer for compaction of the protective course only.~~

~~No vehicular traffic shall be permitted over any bare membrane waterproofing except as provided under Subsection 965.62.~~

~~The top course of pavement on bridges shall consist of "Top Course" and be placed only after the curbing and edging are in place in the work.~~

460.67 Testing Surfaces.

The plane of the finished surfaces of the base courses and/or binder course and the top course of compacted mixtures, shall be tested with a 16-foot straightedge, except that a 10-foot straightedge may be used on vertical curves. The straightedge shall be carefully applied immediately after first compaction by rolling and, from then on, as may be necessary until and after the final compaction of the material in place. The straightedge shall be held in successive positions parallel to the road centerline and in contact with the road surface; and the entire area checked from one side to the other of the pavement. Any irregularities which vary ¼" from a true surface in base or binder course shall be corrected.

The top course of resurfaced streets which contain manholes covers, water gate boxes, etc., shall be tested as specified hereinafter except that a ten (10) foot straightedge shall be used. Any irregularities which vary ¼ inch or more from a true finished surface or 3/8 inch or more from a true surface in base or binder shall be corrected.

Irregularities which may develop before the completion of rolling and while the material is still workable, may be remedied by loosening the surface mixture and removing or adding material as necessary. Should any irregularities or surface defects remain after final compaction the defective work shall be corrected by removing and replacing the new material, as specified to form a true and even surface of regular texture. All minor surface projections, joints and minor honeycombed surfaces shall be ironed out smoothly to grade, as may be directed.

Adequate and approved straightedges shall be furnished and used by the Contractor with supervision and inspection by the Engineer. The Contractor shall provide or designate a competent employee whose duty shall be to carefully use the straightedge to check the compacted surfaces.

The entire cost for furnishing adequate and approved straightedges with the use of same and the repair or removal and replacement of pavement, as may be required by the Engineer, shall be borne by the Contractor as part of the payment made to him for the relevant contract items.

460.68 Opening to Traffic.

No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate stability has been attained and the material has cooled sufficiently to 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.

Compensation

460.80 Method of Measurement

Hot Mix Asphalt shall be measured by the ton and shall be the actual and verified tonnage, complete in place and approved. The quantity shall be determined only by weight slips that have been properly countersigned by the Engineer at the time of delivery.

Bitumen for tack coat, if required by plans or specifications or ordered by the Engineer, will be measured *by actual quantity used* ~~as specified in Subsection 468.80~~.

~~Measurement for sealing of longitudinal joints in asphalt pavement shall be by the foot of joint sealed.~~

460.81 Basis of Payment

The tonnage of hot mix asphalt, determined as provided above, will be paid for at the contract unit price per ton of the kind of hot mix asphalt required, complete in place including butt joint sealant, if required.

Bitumen as specified herein to be paid for as tack coat, if required, will be paid for at the contract unit price per gallon under the item for Bitumen for Tack Coat, complete in place.

Sealing of longitudinal joints in asphalt pavement will be paid for at the unit bid price and shall be complete payment for sealing the edge of the previously laid mat with hot poured rubberized asphalt sealer and all incidentals required to complete the item.

460.82 Payment Items

460.	**Hot Mix Asphalt**	**Ton**
~~**460.2**~~	~~**Hot Mix Asphalt - Open Graded**~~	~~**Ton**~~
~~**461.**~~	~~**Class I Dense Hot Mix Asphalt, Type ST**~~	~~**Ton**~~
~~**462.**~~	~~**Class I Dense Binder Course for Bridges**~~	~~**Ton**~~
464.	**Bitumen for Tack Coat**	**Gallon**
~~**464.5**~~	~~**Hot Poured Rubberized Asphalt Sealer**~~	~~**Foot**~~

Description

472.20 General.

The work under this section shall consist of placing small quantities or permanent or temporary curbing, berm, sidewalk, roadway patches, or other incidental work performed primarily by hand methods.

The material used under this item shall be composed of mineral aggregates, mineral filler, and bituminous material. This work shall be at locations directed by the Engineer, except that Item 472. shall not be used when the work is included under other items in the contract.

Materials

472.40 General.

Permanent materials shall meet the requirements listed under Section 460.

Temporary materials shall meet the requirements for permanent materials specified above, except if hot mix asphalt is not available due to seasonal limitations the Contactor shall use approved stockpiled mixtures (cold patch) meeting the requirements specified in the following Subsection of Division III, Materials:

General Composition of Mixture	M3.11.0
Mineral Aggregate	M3.11.04
Bitumen (MC-250 or MC-800)	M3.02.0
Hydrated Lime	M9.13.0
Plant Requirements	M3.11.07
*Curing of Mixture	

*The mixture shall be cured by placing in a stockpile for a period of 1 week prior to delivery.

Construction Methods

472.60 General.

The Contractor shall obtain asphalt pavement of the type specified by the Engineer. The work shall meet the requirements of Section 460.

Cold patch material shall be completely removed from roadway, berm and curbing areas before a permanent surface is placed.

The placing of the various asphalt pavement mixtures is intended to be primarily by hand methods.

Hot mix asphalt pavement shall be laid to the required thickness and be compacted to the satisfaction of the Engineer.

Compensation

472.80 Method of Measurement

Hot Mix Asphalt Pavement for Miscellaneous Work will be measured as required under Section 460.

472.81 Basis of Payment.

Hot Mix Asphalt Pavement for Miscellaneous Work will be paid for at the contract unit price per ton complete in place which includes full compensation for the satisfactory removal and disposal of temporary material at a later date.

472.82 Payment Items

472. Hot Mix Asphalt for Miscellaneous Work **Ton**

Description

476.20 General.

This work shall consist of a pavement composed of air entrained Portland cement concrete, plain or reinforced as specified, constructed on an approved foundation in accordance with these specifications and in close conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer.

Materials

476.40 General.

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

Concrete, (Air Entrained) 5,000 psi, 1 ½" 660	M4.02.00
Scored Concrete Pavement-Air Entrained-5000 psi, ¾", 705	M4.02.0
Steel Reinforcement	
Reinforcing Bars	M8.01.0
Welded Steel Fabric	M8.01.2
Steel Bar Mats	M8.01.3
Tie Bars and Bolts	M8.01.4
Load Transfer Assembly	M8.14.0
Preformed Joint Filler	M9.14.0
Joint Compound Filler	M3.05.0
Polyurethane Joint Sealer	M9.14.3
Asphaltic Paint	
RC-70	M3.02.0
RS-1	M3.03.0
Curing Materials	
Impervious Liquid Membrane	M9.06.5
Waterproof Paper	M9.06.0
Burlap	M9.06.3
Polyethylene Coated Burlap	M9.06.1B
Base Stabilization Materials	
Portland Cement	M4.01.0
Bitumen	M3.02.0

Fine aggregate for use in concrete to be placed with a slip-form paver shall meet the grading requirements as specified for fine aggregates for cement concrete except that the maximum passing the #100 sieve may be increased to 10% and the maximum of 4% passing the #200 sieve may be established in order to increase the cohesiveness of the cement concrete. Also, the concrete when tested in accordance with AASHTO Designation T-119 shall have a slump of not more than 2 inches nor less than 1 inch.

Construction Methods

476.60 General.

~~The cement concrete pavement may be constructed by the Slip-Form Method or the Fixed-Form Method.~~

Equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer as to design, capacity, and mechanical condition. The equipment shall be at the job site sufficiently ahead of the start of construction operations to be examined thoroughly and approved. Any equipment or tools which are not maintained in full working order or which, as used by the Contactor, prove

inadequate to obtain the results prescribed, shall be improved or new equipment or tools substituted or added as directed.

Grade control survey and staking shall conform to Subsection 5.07 *of the MassDOT Standard Specifications*. The Contractor shall furnish, set, and maintain all line and grade stakes for grading and paving.

476.61 Preparation of Grade.

The sub-base shall consist of gravel or dense-graded crushed stone conforming to Section 401 ~~or Section 402,~~ or of soil cement, and shall be as specified on the plans. The sub-base shall be conditioned and perfected ~~not less than 500 ft.~~ in advance of the placing of concrete. If any traffic is allowed to use the prepared grade, the grade shall be checked and corrected immediately ahead of the placing of concrete.

~~Sub-base prepared for the slip-form method shall be placed to a compacted depth approximately one inch higher than the grade called for on the plans to allow for planing by approved mechanical means to the proper profile. It shall also be placed to a width 3 ft. greater (18 in. on each side) than the required pavement slab width. After the sub-base has been placed and compacted to the required density, and will adequately support the subgrade machine and the slip-form paver, the track areas shall be cut to the proper elevation by the use of a mechanical form grading machine.~~

~~Behind the form grading machine the track areas shall be rolled to a smooth, firm, and uniform surface.~~

~~The grade on which the pavement is to be constructed shall then be brought to the profile by means of a track mounted subgrade machine operation on the prepared track line or by other mechanical means approved by the Engineer. When concrete is placed, the surface of the sub-base shall not be above, not more than ¾ inch below the plan subgrade elevation. If the density of the subgrade is disturbed by the subgrade machine, it shall be corrected by additional compaction before the concrete is placed.~~

~~The sub-base, after being conditioned, shall provide a firm unyielding support which will not be displaced under the movement of the paver. If the sub-base is displaced by the movement of the paver to the extent that the finished pavement will be affected, the two areas that will support the slip form paver tracks shall be stabilized as provided herein. The areas to be stabilized will be immediately outside the edge lines of the pavement slab on both sides and are each to be not less than 18 in. in width, measured from the exterior edges of the proposed pavement slab.~~

~~If cement is used for stabilization, the material to be stabilized shall be loosened and pulverized before any cement is added. Cement shall be uniformly spread on the loosened and pulverized material at the rate of approximately 4.5 lb. per square foot. The final depth of stabilization shall be not less than 3 ½ in. in the completed track area after it is brought to proper elevation. The exact amount of cement to be used to adequately harden the mixture of cement and subgrade will be determined by the Engineer.~~

~~The cement and subgrade material shall be thoroughly mixed by means of a power driven mixer until the mixture is of a uniform color throughout the full required depth.~~

~~After the cement and subgrade material have been mixed, water shall be added to the mixture and mixing continued until the water is uniformly distributed throughout the mixture. The amount of water to be added will be determined by the Engineer. The moist mixture when ready for compaction shall be near its optimum moisture content.~~

~~The mixture shall be uniformly compacted for the full depth until it is firm and unyielding, and within 2 hours after the addition of the water. Compaction shall be with a 10 ton three wheeled or tandem roller, approved rubber tired roller or approved mechanical vibrator.~~

~~After compaction, the surface of the area that will support the paver tracks shall be cut to true profile and elevation by approved mechanical equipment and then rolled to obtain a smooth, true surface.~~

~~The stabilization shall be protected from drying by the application of approved bituminous material (approximately 0.2 gal. per sq. yd.) or cover of straw, sand or earth. If straw, sand or earth is used for cover, it must be broomed off before the area is used in further operations. The curing material shall be applied immediately after final rolling and maintained for at least 2 days.~~

~~In lieu of the above method and procedure for stabilization of the track area, other proven methods and materials will be considered subject to equivalent and acceptable performance.~~

~~Regardless of the method, materials and procedures used, the burden of responsibility for the acceptability of the work shall rest with the Contractor.~~

~~If stabilization of the track area is required such stabilization will not be paid for separately, but will be included under Item 476., Cement Concrete Pavement.~~

~~Where fixed form construction is specified, the use of a subgrade machine may follow the setting.~~

~~When side forms have been securely set to grade, the sub-base shall be brought to proper cross section. The fine grading shall be compacted by means of approved equipment to a condition similar to that of surrounding grade. A sub-base check template shall be used as a final check. The surface of the sub-base shall not be above nor more than 3/8 inch below the plan sub-base elevation. Any deviation from the required sub-base surface exceeding this tolerance will be corrected.~~

~~The template shall span the width being paved and be supported on the side forms. It may be power or hand operated, with scratch teeth or pins which can be adjusted readily to the required cross section and supported on a frame of sufficient weight and strength to withstand the loads. The points of the teeth or pins shall be adjusted to be at the plan sub-base elevation. High areas shall be trimmed to proper elevation. Low areas shall be filled and compacted to a condition similar to that of the surrounding grade except that areas which are not more than ¾ inch below sub-base elevation may be filled with concrete integral with the pavement. The finished grade shall be maintained in a smooth and compacted condition until the pavement is placed.~~

The sub-base shall be uniformly moist when the concrete is placed. When the sub-base is dry, it shall be sprinkled with as much water as can be readily absorbed immediately in advance of placing concrete. It shall also have been similarly sprinkled not less than 8 hours or more than 24 hours before concrete is placed thereon.

~~476.62 Forms and Form Setting.~~

~~Where fixed form construction is specified, the straight side forms shall be made of metal and shall be furnished in sections not less than 10 ft. in length. Forms shall have a depth equal to the prescribed edge thickness of the concrete without horizontal joint and base width equal to the depth of the forms but not less than 8 inches. Flange braces shall extend outward on the base not less than 2/3 the height of the form. Flexible or curved forms or proper radius shall be used for curves of 200 ft. radius or less and be of a design acceptable to the Engineer. Satisfactory wooden forms, as approved by the Engineer, may be used for curves of 200 ft. radius or less or where the design of the pavement is such that the metal forms cannot be used. Forms shall be provided with adequate devices for secure setting so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall be removed from the work. Repaired forms shall not be used until inspected and approved by the Engineer. The top face of the form shall not vary from a true plane by more than 1/8 inch in 10 feet, and the upstanding leg shall not vary from a true plane by more than 1/8 inch in 10 feet. The forms shall contain provisions for locking the ends of abutting form sections together tightly and for secure setting. Forms to be used for concrete which is to be furnished by hand shall have a base not less than 6 inches in width.~~

~~The foundation under the forms shall be hard and true to grade so that the form, when set, will be firmly in contact for its whole length and at the specified grade. Any grade which at the form line is found below established grade shall be filled to grade with granular material in lifts of ½ inch or less for a distance of 18 inches on each side of the base of the form, and thoroughly compacted. Imperfections or variations above grade shall be corrected by tamping or by cutting as necessary.~~

~~After the forms have been set to correct grade, the grade shall be thoroughly tamped, mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be joined neatly and tightly and staked securely with not less than 3 pins for each 10 ft. section. A pin shall be placed at each side of every~~

~~joint. Form sections shall be tightly locked free from play or movement in any direction. If any play or movement of the forms occurs, additional pins shall be required by the Engineer. The entire base of forms shall be directly in contact with the finished sub-base. If a form does not have satisfactory bearing area for its full length, it shall be removed, the bearing area of sub-base reshaped and compacted, and the form replaced. Building of pedestals of earth or other materials upon which to reset the forms in order to bring them to the required grade is not permitted. Forms shall be set at least 500 ft. in advance of the point of placing concrete. They shall be thoroughly cleaned and greased or soaped before concrete is placed against them. No excessive settlement or springing of forms under the finishing machine will be tolerated.~~

~~The forms shall be set to correct line and grade. Smooth alignment and grade shall be checked by sighting and with an approved 10 foot straight edge. The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked. Use of a straight edge will not be required on vertical curves. A mechanical tamper of approved type and design will be permitted for use in the preparation of a firm, even sub-base for form installation.~~

476.63 Batching and Mixing Concrete.

The materials shall be batched at a central plant. The batch plant site, layout, equipment, and provisions for transporting material shall be such to assure a continuous operation of the paver employed on the project. The work shall be done in accordance with the relevant provisions of Subsection M4.02.08.

~~Concrete may be mixed at the site of construction or at a central point. Mixers shall conform to the applicable requirements of Subsection M4.02.09~~.

Concrete mixed at a central plant shall be hauled to the paving site by agitation trucks or other approved haul units in accordance with the relevant provisions of Subsection M4.02.10.

~~Concrete mixed completely in truck mixers in accordance with Subsection M4.02.10(A-1), may be allowed when approved by the Engineer~~.

The Contractor shall obtain approval of his proposed central mix plant site, its capacity, concrete materials sources, hauling equipment, proposed haul routes, etc. prior to moving said equipment onto project.

~~Concrete mixed in pavers at the site shall be mixed for a period of not less than 60 second including transfer time but no less than 50 seconds, exclusive of transfer time, after all materials, except water, are in the drum. The mixer shall be operated at drum speed shown on the manufacturer's name plate. The manufacturer's guaranteed capacity of the mixer shall not be less than 27 cubic feet. Except by written permission of the Engineer, the mixer shall not be operated in excess of its guaranteed capacity nor more than 10% above its rated capacity as shown on the standard rating plate on the machine, when operating on grades not exceeding 6%.~~

The batch shall be so charged into the drum that a portion of the mixing water shall enter in advance of the cement and aggregates. The flow of water shall be uniform and all water shall be in the drum by the end of the first 20 seconds of the mixing period. The entire contents shall be removed from the drum before the succeeding batch is introduced. The inside of the drum shall be kept free from hardened concrete. The skip and throat of the mixer drum shall be kept clean and free of accumulation or encrustation of inert materials and the admission of these materials to the mixer shall be cause for rejection of the batch in which they are included. The concrete, as discharged from the mixer, shall be uniform in composition and consistency. If this condition is not produced with the maximum size of batch, the size of the batch shall be reduced or the mixing time increased, or both, until an acceptable mixture is obtained.

As required above, all materials except water shall be admitted to the mixer simultaneously and thereafter no additional amount of any ingredient shall be admitted to the mixer, except on specific instructions of the Engineer or his representative, for each individual batch. Such instructions shall not be given for more than three consecutive batches after which the proportions of the mix shall be correct prior to the initial charging of the mixer, and further, such instructions shall not relax the following restrictions concerning the retempering of concrete.

Retempering of concrete by the addition of water will not be permitted. The addition of water to the batch in the mixer after 10 minutes have elapsed after the initial charging, or the addition of water to the concrete after removal from the mixer, shall be construed as retempering. Batches of concrete prepared contrary to these restrictions shall be rejected and immediately removed from the site. The concrete shall be mixed only in the quantity required for immediate use and concrete not in place within 30 minutes from the time the ingredients were charged into the mixing drum, or that has developed initial set, shall not be used.

The concrete shall have a slump of between 1 ½ and 3 inches if not vibrated, or between 1 and 2 inches if vibrated throughout, as measured in accordance with AASHTO Designation T119.

Batches shall be discharged in a manner to facilitate placing the concrete in its final position with a minimum of rehandling and without damage to forms, concrete previously placed, or other parts of the work.

The interval between loads shall be controlled in order that concrete in place will not become partially hardened prior to placing succeeding batches and in no case shall it exceed 30 minutes. Plant capacity and transportation facilities shall be sufficient to insure delivery of concrete at the rate required.

Sample of concrete for test and test specimens will be taken from transportation units at the point of discharge or from concrete in place as determined by the Engineer.

When cement concrete paving operations are done during cold weather, the stipulations as outlined in Subsection 901.72 *of the MassDOT Standard Specifications* shall apply.

476.64 Placing Concrete.

Concrete shall be placed only on an approved sub-base.

The Contractor shall notify the Engineer at least 24 hours in advance of placing the concrete. In the event he desires to operate after the daylight hours, the Contractor shall provide a lighting system sufficiently adequate to illuminate all of the operations to the satisfaction of the Engineer.

No finishing of concrete will be permitted after daylight hours unless an adequate and approved lighting system is provided by the Contractor and operated in a satisfactory manner. Approval of the lighting system by the Engineer must be obtained prior to its use.

The ~~At least 500 ft. of~~ foundation shall have been prepared ahead of the mixer or concrete operations at all times. The depositing of concrete on excessively wet subgrades or sub-base or a frozen foundation will not be permitted. No concrete shall be placed around manholes or other structures until they have been installed to the required grade and alignment.

During dry weather, when traffic on the foundation or adjacent roadways would deposit wind-blown dust and dirt on the freshly placed concrete before it can be protected, the Contractor shall sprinkle the foundation or adjacent roadways with water or otherwise apply satisfactory treatment to keep down the dust.

Unless otherwise permitted by the Engineer, all equipment used for mixing, hauling and placing the concrete shall be operated outside of the area being paved. Should operations of such equipment be permitted on the prepared foundation, suitable planks or platforms shall be provided and used for the equipment to run on, so that the foundation will be maintained in the approved condition.

The concrete shall be deposited on the grade in such a manner as to require as little handling as possible. Concrete shall be distributed in such a manner that when consolidated and finished, the slab thickness and surface grade required by the plans will be obtained at all points. Unless truck-mixers, truck-agitators, or nonagitating hauling equipment demonstrate that they will discharge concrete without segregation of the materials, the concrete shall be unloaded into an approved spreading device and mechanically spread on the grade in such a manner as to prevent segregation of the materials. Placing shall be continuous between transverse joints without the use of intermediate bulkheads except as specified under Subsection 476.68 for continuous joints. Necessary hand spreading shall be done with shovels, not rakes. Workmen shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or foreign substances.

The concrete shall be deposited carefully at and around contraction and expansion joints. It shall be shoveled against both sides of expansion joints simultaneously, maintaining equal pressure on both sides.

~~Care shall be taken that the concrete is worked under all metal parts of the load transfer assemblies. The concrete shall not be dumped directly upon or against the joints in any manner which displaces the load transfer assemblies or joint material from the true position.~~

Should any concrete materials fall on or be worked into the surface of a completed slab, they shall be removed immediately by approved methods.

~~Where concrete is to be placed adjoining a previously constructed lane of pavement and mechanical equipment will be operated upon the existing lane of pavement, that lane may be opened to traffic when curing operations have been completed provided the beam tests show that the concrete has attained a modulus of rupture of at least 550 lb. per square inch. Curing operations will not be considered completed unless a curing period of at least 7 days has elapsed since the concrete was placed. However, the pavement may be used at the end of 5 days if only rubber tired finishing equipment is permitted to operate upon it and the concrete has attained a modulus of rupture of at least 550 lb. per square inch.~~

When high early strength concrete is used, mechanical equipment may be operated upon the pavement after a shorter period of curing or as beam tests show that the concrete has attained a modulus of rupture of at least 550 lb. per square inch.

Pavers will not be permitted to operate on the finished pavement unless permission is given by the Engineer.

~~Gaps in the pavement for crossovers will not be permitted. Should crossings be necessary, suitable bridging of slabs or sand cushioning will be provided, as approved by the Engineer.~~

476.65 Spreading and Strike-Off of Concrete.

As soon as concrete has been placed on the sub-base, it shall be immediately struck-off accurately, by means of an approved mechanical spreading device, leaving a surface uniform in texture, true to grade, elevation and contour. The strike-off shall be so adjusted for elevation that when the concrete is consolidated, as herein described, sufficient material remains above grade as is required for the final finished surface of the pavement.

~~When reinforced concrete pavement is placed in two layers, the entire width of the bottom layer shall be struck off to such length and depth that the sheet of fabric or bar may be laid the full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of concrete shall be placed, struck off and screeded. Any portion of the bottom layer of concrete which has been placed more than 30 minutes without being covered with the top layer shall be removed and replaced with freshly mixed concrete at the Contractor's expense.~~

~~**A. Slip-Form Method.**~~

~~The slip form paver shall be an approved machine designed to spread, consolidate, screed, and float finish the freshly placed concrete in one complete pass of the machine in such a manner that a minimum of hand finish will be necessary to provide a dense and homogeneous pavement in conformance with the plans and specifications.~~

~~The slip form paver shall be of the self propelled type, equipped with crawler type tracks not less than 22 feet in length.~~

~~The machines shall vibrate the concrete for the full width and depth of the strip of pavement being placed. Such vibration shall be accomplished with vibrating tubes or arms working in the concrete or with a vibrating screed or pan operating on the surface of the concrete. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The forms shall trail behind the paver for such a distance that no appreciable slumping of the concrete will occur, and that necessary final finishing can be accomplished while the concrete is still within the forms.~~

~~The slip form paver shall be adjustable as to crown and super elevation and shall shape and compact the concrete to the required cross section as shown on the plans. Such adjustments shall be readily controllable for accuracy in transitions. No tractive force shall be applied to the machine except that which is controlled from the machine.~~

The concrete shall be of uniform consistency such that there will be no appreciable slumping at the edge of the pavement after the slip forms have passed. The following tolerances on edge slump shall apply: Edge slump exclusive of edge rounding, shall not exceed ¼ inch within 6 inches of the edge at the extreme outside limits of the concrete pavement: at the longitudinal joint along the pavement crown and along the longitudinal joint between the travel lanes and speed change lanes. The edges along the longitudinal joint between the two travel lanes of the same cross slope shall be at true finish grade. Any deviation from these tolerances shall be corrected while the concrete is plastic.

The slip form paver shall be operated with as nearly continuous forward movement as possible and all operations of mixing, delivering and spreading concrete shall be so coordinated as to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately.

For reinforced pavement and where necessary, more than one machine and/or complimentary equipment will be allowed, subject to the Engineers approval.

B. Fixed Form Method.

The spreading machine shall be mechanical, self propelled, and of an approved type. It shall be capable of spreading the concrete evenly between the side forms, without segregation, and without introducing thrust on the side form. It shall be equipped with a spreading device, adjustable in height for distributing the concrete longitudinally and transversely, and a blade adjustable in height to strike off the concrete at the required elevation above or below the top of the side form.

Immediately after the concrete has been struck off, it shall be thoroughly consolidated against and along the faces of all forms and along the full length and around all parts of joint assemblies, by means of vibrators inserted in the concrete.

Vibrators, for full width vibration of concrete paving slabs, may be either the surface pan type or the internal type with either immersed tube or multiple spuds. They may be attached to the spreader or the finishing machine, or may be mounted on a separate carriage. They shall not come in contact with the joint, load transfer devices, subgrade, or side forms. The frequency of the surface vibrators shall not be less than 3,500 impulses per minute and the frequency of the internal type shall not be less than 5,000 impulses per minute for tube vibrators and not less than 7,000 impulses per minute for spud vibrators.

When spud type internal vibrators, either hand operated or attached to spreaders or finishing machines, are used adjacent to forms, they shall have a frequency of not less than 3,500 impulses per minute.

Vibrators shall not cause the displacement of the side forms nor cause undue delay due to mechanical difficulties. Should these problems arise, they shall be removed from the work and be replaced by equipment meeting these specifications.

Surface vibrating apparatus shall be only used on the top course or layer of the pavement and must be completely out of use when moving over transverse joints or when spreading the bottom course of concrete in two course construction. It shall not be operated where the surface of the concrete, as spread, is below the elevation of the finished surface of the pavement.

476.66 Placing Steel Reinforcement.

All reinforcing metal must be kept clean and free from dirt, oil, paint, grease, mill scale, loose of thick rust or any foreign material which could impair bond of the steel with the concrete. Welded sheet fabric and clipped bar mats shall be furnished in flat sheets and shall be handled carefully during placing, and kept straight until installed.

The reinforcement shall be placed as shown on the plans. The reinforcement shall be placed so that the extreme longitudinal member will be located not more than 4 in. from the edge of the slab section and the ends of all longitudinal members shall extend to within 3 in. of the ends of the slab sections. Adjacent sheets of welded fabric and clipped bar mats shall be lapped as shown on the plans.

Mats or sheets of reinforcement shall be preformed in accordance with the schedule shown on the plans, and placed in the concrete by the strike off method without chairs or other supporting devices. Laps between

~~adjacent mats or sheets and positions of same with respect to longitudinal joints, transverse joints and edges of pavement shall be as shown on the plans.~~

~~Concreting operations shall be performed in a manner so that the mats and sheets will be left in required position.~~

~~When reinforced concrete is specified, or permitted by the Engineer, to be placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means immediately after the concrete has been spread and struck off.~~

476.67 Finishing Concrete.

Immediately after placement, concrete shall be properly finished. The sequence of operations shall be as follows: strike-off, consolidation, transverse screening, longitudinal floating, straightedging, texturing and finally edging the formed joints. ~~The machine method of finishing shall be employed, except that odd widths or shapes of slab may be finished by hand method~~.

The addition of superficial water to the surface of the concrete to assist in finishing operations will not be permitted.

~~A. Machine Finishing.~~

~~When the concrete paver is not designed to screed and float finish the freshly placed concrete, the surface shall be struck off and screeded by an approved finishing machine.~~

~~The transverse finishing machine for the pavement shall be mechanical, self propelled, and of an approved type. It shall be equipped with at least two oscillating screeds. It shall have an independent screed and traction speeds to permit the operator to choose a combination of speeds that will produce the required finish with the consistency of concrete being used. The tops of the forms shall be kept clean by an effective device attached to the machine and the travel of the machine on the forms shall be maintained true without lift, wobbling, or other variation tending to affect the precision finish.~~

~~The transverse finishing machine shall consolidate and screed the concrete with no more than two passages over the slab, except with the special permission of the Engineer. The operation of the machine shall be controlled so as to prevent excess mortar and water from being worked to the top of the slab, and from forming a watery mortar in the roll of concrete in front of the screeds.~~

~~If excess mortar does form, it shall be removed form the site and wasted. It shall not, under any circumstances, be placed on the slab base or shoveled ahead on top of the slab. Segregated particles of coarse aggregate which may collect in front of the screed shall be wasted outside the forms.~~

~~A uniform depth roll of concrete shall be maintained in front of the screeds at all times, in order to secure uniform consolidation and to prevent lifting of the screed by irregular amount or overload of concrete.~~

~~When vibration is permitted vibrators for full width vibration of concrete paving slabs shall meet the requirement herein of Subsection 476.65(B). If uniform and satisfactory density of the concrete is not obtained by the vibratory method at joints, along forms, at structures, and throughout the pavement, the Contractor shall furnish equipment and methods which will produce pavement conforming to the Specifications.~~

B. Longitudinal Finishing.

As soon as possible after the transverse finishing has been completed as specified above, the surface of the concrete shall be further smoothed and finished by use of an approved longitudinal float.

~~Mechanical Method~~ ~~The float in contact with the pavement shall be at least 12 ft. in length and at least 12 in. wide. The type of float and details of its construction shall be approved by the Engineer, and it shall be in good working condition.~~

~~The tracks from which the float operates shall be accurately adjusted to the required crown. The float shall be accurately adjusted and coordinated with the adjustments of the transverse finishing machine so that a small amount of mortar is carried ahead of the float at all times. The forward speed shall be adjusted so that the float will lap the distance specified by the Engineer on each transverse trip. The float shall pass over each~~

~~area of pavement no more than twice except with the special permission of the Engineer. Any excess water or soupy material shall be wasted over the side forms on each pass~~.

Hand Method – When strike-off and consolidation are done by hand methods and longitudinal floating by hand is required the float shall be not less than 16 ft. in length, not less than 10 in. in width, suitably stiffened against flexibility and warping and equipped with suitable handles. ~~It shall be operated from bridges spanning the pavement~~. It shall be operated with a sawing motion parallel to the center line while passing gradually from one side of the pavement to the other. Movement head shall be in successive advances of not more than one-half the length of the float. Excess water or soupy material shall be wasted over the side forms of each pass.

~~C. Alternate Finishing and Floating.~~

~~As an alternative to the mechanical finishing and floating method in Subsection 476.67(A) and (B) preceeding, the Contactor may use a long wheel base combination float finishing machine in lieu of the transverse finishing machine and longitudinal float, providing the combination machine can be adjusted to produce satisfactory results and final finishing is properly timed. Any combination of screeding, floating and finishing machines shall include at least two transverse oscillating screeds~~.

D. Hand Finishing.

Unless otherwise specified, hand finishing methods will ~~not~~ be permitted. ~~except under the following conditions~~:

> ~~In the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade when the breakdown occurs. Narrow widths or areas of irregular dimensions where operations of the mechanical equipment is impractical may be finished by hand methods.~~

The surface of the concrete shall be struck-off immediately after it is placed and leveled by means of an adjustable steel template 10 inches wide and 2 feet longer than the width of the pavement. A second adjustable steel template 8 inches wide and 2 feet longer than the width of the pavement shall be used directly behind this template. Both templates shall be constructed to produce pavement of the desired cross section and shall have sufficient strength to retain their shape under all working conditions. The templates shall be moved forward with a combined longitudinal and crosswise motion fully resting at all times on the forms, and during the operation, the distance between the two templates shall at no time exceed 10 ft. The template shall be used until a true surface is obtained. While the concrete is being struck-off with the first template, ~~three or more~~ men shall be at work leveling, spading and tamping the concrete in front of the template.

Consolidation shall be attained by the use of a suitable vibrator or other approved equipment.

After the concrete has been struck-off with the hand templates described previously, other finishing operations described as following the screeding ~~by the finishing machines~~ shall be carried out.

Straightedging operations following the screeding shall be sufficient to remove surface irregularities or produce a riding surface equivalent to that produced by machine operation.

Experienced skilled operators and concrete finishers shall be employed. Any laxity in this respect shall be cause for immediate suspension of concreting operations.

E. Finishing at Joints.

The concrete adjacent to joints shall be compacted or firmly placed without voids or segregation against the joint material, under and around all load transfer devices, joint assembly units, and other features designed to extend into the pavement. Concrete adjacent to joints shall be mechanically vibrated as required in Subsection 476.65. ~~After the concrete has been placed and vibrated adjacent to the joints the machine shall be brought to forward operating in a manner to avoid damage or misalignment of joints. If uninterrupted operation of the finishing machine, to, over, and beyond the joints causes segregation of concrete, damage to or misalignment of the joints, the finishing machine shall be stopped when the front screed is approximately 8 in from the joint. Segregated concrete shall be removed from in front of and off the joint: the front screed shall be lifted and set directly on top of the joint and the forward motion of the finishing machine resumed~~.

When the second screed is close enough to permit the excess mortar in front of it to flow over the joint, it shall be lifted and carried over the joint. Thereafter, the finishing machine may be run over the joint without lifting the screeds, provided there is no segregated concrete immediately between the joint and the screed or on top of the joint.

The edges of the slabs on both sides of the transverse expansion joint shall be finished to the same grade. The top transverse edge of formed joints shall then be rounded to a radius of 1/8 of an inch by means of approved edging tools. The transverse edges of formed joints shall be rounded with an edging tool having a vertical leg of sufficient length to contact the vertical side of the preformed filler. The lateral edge adjacent to pavement already in place shall be rounded with an edging tool having a vertical leg of ¼ in. wide and slightly longer than that used on the first slab. Tool marks shall be eliminated.

The finishing of the concrete at joints shall be done from a bridge which shall not rest on the concrete at any point. The finishers shall use a short straightedge not less than 4 ft. in length when finishing transverse formed joints to insure that both slab ends will be at the same elevation or grade.

F. Straightedge Testing and Surface Corrections.

Following the longitudinal finishing operations all remaining irregularities shall be eliminated by use of scraping straightedges 19 ft. in length, equipped with handles 2 ft. longer than the width of one lane. Straightedges shall be made of redwood or aluminum. For wood the cross section shall be 2 in. by 7 in. tapered from 7 in. depth at center to 4 in. depth at ends. For aluminum the preferred shape is the "T" section with bearing width of not more than 3 in. For both metal and wood the approximate weight should be 30 to 35 lb. for the 19 ft. length exclusive of handle. The handle shall be attached to form an angle of about 10 degrees with the horizontal so as to present a cutting edge when in operation.

The scraping straightedge shall be employed directly after the longitudinal finisher.

The straightedge shall be placed on the form or edge of completed pavement nearest the operator. The handle shall be lowered to knee height and pushed transversely over the pavement surface. When it reaches the opposite form or center of full width paving, the handle shall be raised to shoulder height and the straightedge drawn back across the pavement in the same path. Additional passes shall be made if all irregularities are not removed by these two passes. Each pass shall be lapped one half of the length of the straightedge as the work progresses. Any depressions found shall be immediately filled with freshly mixed concrete struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the requirements for smoothness.

Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from a straightedge and the slab conforms to the required grade and cross section.

Where a wood straightedge is used, the Contractor shall maintain a master straightedge on the job. Wood straightedges are required to be checked on the master straightedge twice a day, once in the morning before use and again at noon. Any variation from a true plane shall be corrected before further use.

G. Final Finish.

Following the scraping straightedges, the final surface texture shall be developed by use of a wet burlap strip dragged longitudinally over the pavement. The burlap shall not be less than 3 ft. nor more than 6 ft. wide without seams and the leading edges fastened to a wood pole for purpose of keeping burlap in proper position. The burlap shall be a minimum of 2 ft. longer than the pavement width being dragged. At least 2 ft. of the burlap drag shall be in contact with the surface when dragging the pavement. Generally, two such drags should be used so that the complete operation me be in a forward direction without backing up.

The drags shall be cleaned of mortar when necessary so as to maintain uniform and satisfactory surface texture. Drags that cannot be cleaned shall be discarded and new drags substituted. When not in use, the drag shall be removed from the pavement surface.

The surface of the concrete, after burlap drag operation shall be uniform in appearance with a gritty texture, shall have the required grade and contour, shall be free from surplus water, rough and porous spots,

~~irregularities, depressions and other objectionable surface features resulting from the improper handling of the tools. The entire operation shall be executed to the satisfaction of the Engineer~~.

~~Mechanically operated wire or plastic bristle~~ *Bristle* brooms shall be used where specified to provide an adequate skid resistant surface.

H. Edging at Forms and Joints.

After the final finish has been completed, but before the concrete has taken its initial set, the edges of slabs along forms and at formed joints shall be carefully finished and tooled to form a smooth rounded surface of the radius required on the plans. Corners or edges of slabs which have crumpled and any areas which lack sufficient mortar for proper finishing shall be cleaned by removing all loose fragments and soupy mortar, and shall be solidly filled and finished with a mixture of correct proportions and appropriate consistence. Tool marks shall be eliminated and all edges shall be smooth and true to line.

The surface of the slab shall not be unduly disturbed by tilting of the tool during use. All concrete on top of the joint shall be completely removed.

476.68 Joints.

Joints shall be constructed of the types and dimensions and at the locations required by the plans, or specifications, or as directed by the Engineer. They shall be placed to a true alignment as shown on the plans or as directed. The sides of the joints shall be protected during the curing period. Joint spaces shall be protected against infiltration of foreign materials before the time of sealing. ~~All joints shall be sealed before the pavement is opened to any kind of traffic. Dowels, tie bars and tie bolts shall be prepared and placed across joints where indicated on the plans.~~

If joints become adulterated with dirt, sand, gravel, or other foreign material during the construction period, they shall be reopened, cleaned and resealed prior to opening the job to traffic. This shall be done in conjunction with final clean-up. The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing with a water-cooled diamond edge saw blade or an abrasive wheel to the required dimensions and at the required rate, and he shall provide at least one standby saw in good working order. An ample supply of saw blades shall be maintained at the sides of the work at all times during sawing operations. The Contractor shall provide adequate artificial lighting facilities for night sawing. All of this equipment shall be on the job both before and continuously during concrete placement.

The Contractor shall submit for approval by the Engineer his proposed equipment for lighting and sawing prior to commencing work on the project.

~~**A. Longitudinal Joints.**~~

~~Longitudinal joints shall consist of construction joints between adjacent lanes and surface groove joints when the paving is placed more than one lane wide. They shall be located as shown on the plans or as directed.~~

~~Deformed steel bars or tie bolts of specified length, size, spacing and material shall be placed perpendicular to the longitudinal joints; they shall be placed by approved hand or mechanical methods or rigidly secured by chains or other approved supports to prevent displacement. Tie bars and tie bolts shall not be painted or coated with asphalt or other material or enclosed in tubes or sleeves.~~

~~When fixed forms are used, tie bolts shall be placed across longitudinal construction joints as shown on the plans or as directed. Tie bolts shall be installed in two major parts to form an integral tie bolt unit. Such device, as approved, shall result in proper installation as specified, and shall conform to all standard requirements specified herein for strength and design.~~

~~Tie bars in full width paving shall be of the size and length shown on the plans and placed at right angle to and across the locations of the longitudinal joint. The mid point of the tie bar shall be at the longitudinal joint. When supported above the final grade before placing concrete, the tie bars shall be at the mid depth of the pavement. Tie bars may be placed under the distributed reinforcement by approved hand or mechanical methods before the reinforcement is placed and before the top layer of concrete is placed. If placed under the~~

distributed reinforcement, the tie bars shall not be less than 2 ¾ inches nor more than 4 ½ inches below the finished pavement surface.

Longitudinal construction joints shall extend for the full depth of the pavement, be perpendicular to the pavement surface and keyed and tied as shown on the plans. The upper edges of the slab shall be rounded as shown on the plans. The slab placed second shall be edged with a tool having a vertical leg ¼ inch thick and longer than that used in the first slab. The joint shall be filled with sealing material.

All honeycombed areas on the vertical faces of longitudinal joints shall be cleaned with a wire brush and thoroughly wetted and patched with mortar of the same composition as that used in the pavement.

The faces of the concrete slabs at the longitudinal joints shall be painted with asphaltic material specified in Subsection 476.40 before the adjacent slab is placed against it.

Longitudinal surface groove joints shall be constructed by sawing with an approved concrete saw to the depth, width and line shown on the plans. The width of the cut shall not be less than ¼ of an inch and the depth shall not be less than one fourth of the pavement thickness plus ¼ in. Suitable grade lines or devices shall be used to assure cutting the joint in the true line as shown on the plans. The joint shall be sawed before any equipment or vehicles are allowed on the pavement. If sawing is done before the end of the curing period, the faces of the joint shall be cured as provided for transverse joints. The joints shall be filled with joint sealer compound as specified under Subsection 476.40.

Where there is more than one longitudinal joint, the cutting of this joint shall be done by tandem sawing, which saws shall be fixed to assure lines parallel and true, as shown on the plans.

B. Transverse Expansion Joints.

Transverse expansion joints shall be constructed where shown on the plans or directed by the Engineer. They shall consist of a preformed filler ¾ of an inch thick (476.40), a top sealing cap of poured joint filler compound (476.40), and an approved load transfer assembly (476.40).

The expansion joint filler shall be continuous from edge to edge shaped to the subgrade and to the keyway along the edge. It shall extend from the subgrade to one inch below the pavement surface.

Preformed joint filler shall be furnished in lengths equal to the paving width or equal to the width of one lane. Where more than one section is used in a joint, the sections shall be securely laced or clipped together. Damaged or repaired joint filler shall not be used unless approved by the Engineer.

A removable metal cap shall be placed over the top of the preformed joint during the concreting operations to maintain proper grade and alignment. Concrete shall be placed as specified and shall be carefully spaded against the joint filler. The metal cap shall be removed immediately after the final pass of the finishing machine. A suitable strip of the exact dimensions of the filler shall then be inserted in the joint as a guide and the concrete edged with a 1/8 in. radius edging tool. The strip shall then be removed and any rough or torn places in the concrete shall be corrected.

Particular care shall be taken to keep the concrete in exactly the same plane on the sides of the joint. No concrete shall extend across the joint. No plugs of concrete shall be permitted anywhere within the expansion surface.

C. Transverse Contraction Joints.

These joints shall consist of planes of weakness created by sawing grooves in the surface of the pavement at the locations indicated on the plans.

Approved load transfer assemblies shall be installed at each contraction joint as shown on the plans and in accordance with the Specifications.

When approved by the Engineer, a vibrating bar may be used to move coarse aggregate off the line of the saw cut. The vibrating bar shall be used only in plastic concrete and so as not to produce areas of segregated mortar.

The Contractor's sawing equipment and method of sawing shall be subject to the approval of the Engineer. The timing and sawing and the order in which joints are sawed shall be subject to such control by the

Engineer as in his judgment is necessary to protect the pavement from raveling, spalling cracking, or other damage. Normally, contraction joints will be sawed progressively with an approved circular saw at not less than 6 nor more than 24 hours after finishing. All joints shall be sawed before uncontrolled shrinkage cracking takes place. If necessary, the sawing operations shall be carried on both during the day and the night regardless of weather conditions.

The pavement shall be cut for not less than 1/8 inch in width to a depth of at least one fourth of the pavement thickness.

Secondary saw cuts shall be made as necessary so that the final joint width is at least 3/8 of a inch or as shown on the plans. In the event of excessive relief of the joint, care should be taken to secure this minimum opening.

To control random cracking the Engineer may require that initial curing (for the first 24 hours) be done with wet burlap. The sawing of any joint shall be omitted if a crack occurs at or near the joint location prior to the time of sawing. Sawing shall be discontinued when a crack develops ahead of the saw. In general, all joints shall be sawed before uncontrolled cracking occurs.

D. Transverse Construction Joints.

Transverse construction joints shall be placed at the end of each day's work and when placing concrete will be interrupted for more than 30 minutes. No transverse construction joint shall be placed closer than 15 ft. to another transverse joint. If sufficient concrete has not been mixed at the time of interruption to form a slab at least 15 ft. long, the excess concrete back to the last preceeding joint shall be removed and disposed as directed.

Substantial temporary wood or metal bulkheads shall be used to form construction joints. Particular care will be taken to provide a good riding joint and hand finishing shall be kept to a minimum. Poor riding joints will be corrected.

When the construction joint is placed at a regular location of an expansion or contraction joint, a standard load transfer assembly will be used. When the construction joint is at other than the regular joint location, deformed bars will be used to create a bonded tie across the joint. Minimum tie steel shall be #8 round deformed bars, 48 in. long at 12 in. center to center.

E. Load Transfer Devices.

Dowels shall be held in position parallel to the surface and centerline of the slab by a metal device meeting the requirements of Subsection 476.40 or shall be placed by an approved mechanical placing device.

The sub-base at the locations where expansion, contraction, and construction joint load transfer assemblies are to be installed shall be trimmed accurately to the required cross section and depth of pavement. Where used, the complete joint assembly shall be carefully placed. If the sub-base is trimmed too low or if there are any open spaces beneath the preformed joint filler, the joint assembly shall be removed, the sub-base correctly graded and tamped, and the joint assembly reset.

One half the length of each slip dowel bar of load transfer units shall be rendered bondless with a coat of either a graphite lubricant or a wax base grease meeting the requirements of Subsection M8.14.0. The graphite lubricant shall be applied by daubing, mopping or gloved hand to produce a thorough coating approximately 1/16 inch thick. Brushes shall not be used for the application of graphite lubricant.

The wax base grease shall be pre-heated to temperatures of 170°F to 190°F and applied either by dipping or by brush to produce a coating approximately 1/16 inch thick.

Dowels shall be coated at least one hour before the concrete is placed around the dowel assembly.

The assembly shall be held in the required position at line and grade by metal stakes or pins throughout the operation of placing and striking off the concrete. No concrete shall be placed unless the methods and devices used by the Contractor for installing and securing the joint assembly, including any joint filler required, and finishing the joint meet with the approval of the Engineer. Immediately prior to depositing the concrete, the position of dowels shall be checked and the assemblies tightened as necessary. The installation

~~of dowel assemblies and the placement of the surrounding concrete shall result in dowels tightly encased in concrete and parallel to both the pavement surface and center line at plan locations. In lieu of using dowel assemblies at contraction joints, dowel bars may be placed in the plastic concrete by a mechanical device approved by the Engineer.~~

~~476.69 Numbering Slabs.~~

~~The pavement slabs shall be numbered consecutively as the work progresses, and the last slab placed each day shall be stamped with the date. The marking shall be on the right hand corner at the beginning of each slab, and so placed that it can be read traveling in the direction the pavement was laid. The figures and letters shall be 1 ½ in. high and plainly and neatly stamped after the final finish of the concrete as directed. When two or more paver mixers are working, the distinguishing letter for each mixer shall be stamped adjacent to the number.~~

476.70 Surface Test.

The entire surface shall be checked while the concrete is still plastic with an approved metal straightedge ~~10 ft. in length~~, and any deviation from the general surface shall be corrected at once. ~~The surface shall be checked again immediately after the removal of the burlap where an initial burlap covering is used, or at the end of 72 hours where 72 hour covering is used~~. The straightedge shall be placed at several points across the pavement parallel to the centerline and shall be advanced in 5 ft. steps. Areas showing high spots or more than 1/8 in. but not exceeding ½ in. in 10 ft. shall be marked and immediately ground or rubbed down with an approved tool to an elevation where the area or spot will not show surface deviations in excess of 1/8 in. when tested with a ~~10 ft~~. straightedge. This grinding or rubbing shall be conducted carefully so as to avoid loosening coarse aggregate or otherwise damaging the slab.

Where the departure from correct cross section exceeds ½ inch, the pavement shall be removed and replaced by and at the expense of the Contractor.

~~Any area or section so removed shall not be less than 15 ft. in length nor less than the full width of the lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab adjacent to the joints that is less than 15 ft. in length, shall also be removed and replaced~~.

476.71 Curing.

Immediately after the finishing operations have been completed and as soon as marring of the concrete will not occur, the entire surface of the newly placed concrete shall be covered and cured in accordance with one of the following methods. In all cases in which curing requires the use of water, the curing shall have prior rights to all water supply or supplies. Failure to provide sufficient cover material or whatever kind the Contractor may elect to use, or lack of water adequate to take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than ½ an hour between stages of curing or during the curing period. Whenever fixed-forms are not used, exceptional care shall be taken in the use of paper or burlap to prevent any damage to the unsupported edges of the pavement. The curing media shall be applied at the appropriate time and shall be applied uniformly and completely to all surfaces and edges of the pavement.

~~A. Moist Curing.~~

~~Initial Curing – Strips of burlap saturated with water shall be placed on the fresh concrete surface carefully so as to avoid marring, and the strips shall overlap not less than 3 inches. This burlap shall be kept thoroughly and continuously wet by sprinkling it with a fine spray of water until it is removed. Initial curing with wet burlap shall be for a period of not less than 24 hours. Burlap which has been used for any purpose other than curing concrete shall not be used.~~

~~Final Curing – Following completion of initial curing the curing shall be continued using an additional layer of burlap or cotton mats. This double layer shall remain in place and shall be kept thoroughly and continuously saturated with water for a period of not less than 5 days.~~

~~Cotton mats may be used for final curing if approved by the Engineer. Such covering shall be as effective in preventing evaporation of mixing water and controlling variance in temperature of the concrete as the two~~

~~thicknesses of wet burlap. If cotton mats are used for final curing, the burlap shall be removed in such a manner that not more than 60 lineal feet of pavement is exposed at one time, followed at once by application of cotton mats.~~

~~**B. Waterproof Paper Curing.**~~

~~The top surface and sides of the pavement shall be entirely covered with waterproof paper. Each paper cover shall be not less than 20 or more than 75 ft. in length, and shall be of such width that, when in place, it will extend to at least 18 in. beyond the edges of the slab to be covered.~~

~~Paper covers may be furnished in widths corresponding to that of the slab provided supplemental stringer sheets, at least 18 in. wide are used, in which case such sheets shall be placed along the edges of the slab under the paper covers. On removal of forms the paper shall be brought down over the slab side and held with a continuous bank of earth. The junctions between the paper covers shall be lapped approximately 12 in. and held in place with a bank of earth.~~

~~All rips or holes occurring in the paper covers while in use shall be immediately repaired with a sealed patch to render them airtight. Covers which have become damaged or soiled to the extent that they will not provide satisfactory curing or will mar the concrete shall not be used.~~

~~The paper shall be left in place for a period of 72 hours or longer, if necessary to obtain the required strength. The surface of the pavement shall be moist when the paper is placed.~~

C. Impervious Membrane Curing.

After finishing operations have been completed, and immediately after the free water has left the surface, the surface of the slab shall be completely coated and sealed with a uniform layer of white pigmented curing compound. The compound shall be applied in a 2-coat continuous operation and at a total coverage of not less than one gallon per 150 sq. ft. of surface.

The compounds shall be applied by means of a mechanical pressure sprayer mounted on a self-propelled carriage. The compound shall form a uniform, continuous, coherent film that shall not check, crack or peel and shall be free from pin holes, or other imperfections. If discontinuities, pin holes or abrasion exist, an additional coat shall be applied within 30 minutes to the affected areas. The equipment shall provide adequate stirring of the compound during application. Also, wind protection to the spray fog shall be provided by an adequate shield when the compound is applied to the pavement. The equipment for applying the compound shall be approved by the Engineer before work is started. Should the method of applying the compound not produce a uniform film, its use shall be discontinued and the curing shall be done by one of the other approved methods specified herein.

The curing compound shall be of such character that the film will harden within 30 minutes after application. Should the film become damaged from any cause within the required curing period, the damaged portions shall be repaired immediately with additional compound.

Liquid membrane material shall not be placed on the faces of joints. Immediately after the contraction joints are sawed, they shall be protected and moist-cured with strips of waterproof paper or plastic. Ropes made of jute or cotton may also be used. The method used shall insure proper curing of the portion of the slab adjacent to the joints.

Immediately after the forms are removed, the entire area of the sides of the slab shall be coated with the curing compound at the rate specified for the pavement surface. This spraying shall be a continuous process, and waiting until all forms have been removed before making the application will not be permitted. Hand spray equipment will be permitted for the application of the curing compound over the sides of the slab. Care shall be used to prevent coating of the ends of the sawed contraction joints. If hair cracking develops before the curing compound can be applied, the concrete shall be moist-cured for at least 24 hours before applying any membrane curing compound. If rain falls on the newly coated pavement before the film has dried sufficiently to resist damage, or if the film is damaged in any other way, the Contractor will be required to apply a new coat of material to the affected areas, equal to that specified for the original coat. The treated surface shall be protected by the Contractor from injury for a period of at least 3 days. All traffic, foot or

otherwise, will be considered injurious to the film of the applied compound. A minimum of foot traffic will be permitted on the dried film as necessary to carry on the work properly, providing any damage to the film is immediately repaired by the application of an additional coat of compound.

~~**D. White Polyethylene Sheeting.**~~

~~The general requirements for the use of white polyethylene sheets shall be those for waterproof paper curing in Subsection 476.71B.~~

E. Curing in Cold Weather.

During cold weather, when the air temperature may be expected to drop below 40°F, a sufficient supply of loose dry hay or straw or other suitable blanketing material for covering shall be provided along the line of the work, and at any time when the air temperature may be expected to reach the freezing point during the day or night, the material so provided shall be spread to a sufficient depth to prevent freezing of the concrete. The period of time such protection shall be maintained shall be not less than 5 days or until the concrete has hardened thoroughly. The use of such hay or straw does not take the place of the burlap or other covering specified herein, but shall be applied in addition to the covering. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather, and any concrete injured by frost action shall be removed and replaced at the Contactor's expense.

~~**476.72 Removing Forms.**~~

~~Forms shall not be removed for 12 hours after the concrete has been placed, or for a longer period if directed. Extreme care shall be taken in removing forms in order that no damage will be done to the concrete. Under no condition shall any bar, pick, or other tool be used which depends upon leverage on the concrete, for removal of the pins or forms.~~

~~As soon as side forms are removed and prior to sealing joints, the ends of all joints shall be opened and all mortar or foreign material shall be removed from the joint opening above the filler or other space as provide so that there will be complete freedom for required movement of the joint. After the forms have been removed, the side of the slab shall be cured as outlined in one of the methods indicated previously.~~

~~All holes or honeycomb shall be patched promptly with mortar, of the same composition as that used in the pavement, which has been allowed to set for about one half hour after mixing. Major honeycombed areas will be considered as defective work and shall be removed and replaced. Any area or section so removed shall not be less than 15 ft. in length nor less than full width of the lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab adjacent to the joints that is less than 15 ft. in length, shall also be removed and replaced.~~

~~**476.73 Sealing Joints.**~~

~~Joints shall be sealed after curing and before any kind of traffic is permitted on the pavement.~~

~~The sealing of joints shall be undertaken only when the atmospheric temperature is above 40°F, and when the weather is not foggy or rainy.~~

~~Just prior to sealing, each joint shall be thoroughly cleaned of all foreign material, including curing compound, by means of a mechanical, power operated concrete grooving machine or a power wire brush. The concrete grooving machine or wire brush shall be operated in such a manner that the vertical faces of the concrete in the joint opening will present thoroughly clean concrete surfaces for application of the joint sealing compound. Following this operation, each joint shall then be further cleaned by means of a powerful jet of compressed air.~~

~~No joints shall be filled when there is any free water in or adjacent to the joints. Joint walls and all surfaces to which the sealing compound is to be applied shall be surface dry for at least 3 hours prior to placing. No joints shall be sealed until the joints have been approved by the Engineer as being clean and dry in accordance with the foregoing provisions.~~

~~Joints shall be sealed with an approved joint sealing compound conforming to M3.05.0.~~

~~The melting devices used for heating the joint sealing material shall be of the double boiler, indirect heating type using high flash oil for heat transfer. Constant mechanical agitation during the entire melting period shall be provided and no material shall be subjected for more than 60 minutes to the high temperature required for melting of the material. Positive temperature control (preferably by thermostat) of the heating medium of the sealing compound shall be provided at all times.~~

~~Hot poured sealing compound shall not be subjected to temperatures in excess of 450°F at any stage of the melting operation. Sealing material that has remained in the kettle in a molten state overnight will not be acceptable for use.~~

~~Hot poured filler for use in sealing all joints, except expansion joints, shall be applied under pressure. When hot poured filler is applied under pressure, the material shall be applied by means of a heavy duty air operated pump, or other approved device. The material shall be discharged through a suitable nozzle in such a way as to fill the joint opening solid and uniformly in a neat and workmanlike manner.~~

~~When the atmospheric temperature at the time of sealing is below 50°F, the surface of the sealing compound in the finished joint shall not be less than 3/16 in. below the level of the pavement surface. Otherwise, the surface of the finished joint shall be within ¼ in. of the pavement surface.~~

~~The sealing shall be done in such a manner that the material will not be spilled on the exposed surfaces of the concrete. Any excess material on the surface of the concrete pavement will be removed immediately and the pavement surface cleaned.~~

~~In the event paving and construction operations must close down in the Fall because of cold weather and the contract cannot be completed until the following year, the Engineer shall require the Contractor to clean and seal all joints in the part of the pavement completed at the time of the shut down, in the manner prescribed in this Specification. Under no circumstances shall any joint remain unsealed between the period of shut down in the Fall and resumption of construction in the Spring.~~

476.74 Protection of Pavement.

The Contractor shall erect and maintain suitable barricades and employ watchmen to exclude traffic from the newly constructed pavement for the period herein prescribed. These barriers shall be so arranged as not in any way to interfere with or impede public traffic on any lane intended to be kept open. Necessary signs shall be maintained by the Contractor clearly indicating the open lanes to the public. ~~When it is necessary to provide for traffic across the pavement, the Contractor shall construct as his expense, immediately after the finishing of the concrete, the necessary bridges over the pavement clear of the forms and at least 3 in. clear of the concrete and sufficiently strong to carry the traffic. He shall maintain these bridges until the concrete has attained the strength required in these Specifications for opening to traffic.~~

Prior approval shall be obtained from the Engineer for crossing of existing structures with the paving train.

~~When fixed forms are not used, the Contractor shall be required to have available at all times, materials for the protection of the edges and surface of the unhardened concrete in order that the concrete may be properly protected against the effects of rain before the concrete has sufficiently hardened. Such protective materials shall consist of standard metal forms or wood plank having a nominal thickness of not less than 2 inches and a nominal width of not less than the thickness of the pavement at its edge for the protection of the pavement edges, and covering material such as burlap or cotton mats, curing paper, or plastic sheeting material for the protection of the surface of the pavement.~~

An adequate quantity of the materials described above shall be available, loaded on vehicles which can be promptly driven or towed to the scene of paving operations and be located not more than one-half mile from the place where the paving operations are in progress.

When rain appears imminent, all paving operations shall stop and all available personnel shall begin placing forms against the sides of the pavement and covering the surface of the unhardened concrete with the protective covering.

~~The Contractor shall have on hand at the paving site sufficient burlap or paper to cover at least 6,000 square feet of freshly laid pavement as a protection against sudden thunder showers or heavy downpours of rain.~~

Any part of the pavement damaged by traffic or other causes occurring prior to its final acceptance shall be repaired or replaced by and at the expense of the Contractor in a manner satisfactory to the Engineer. The Contractor shall protect the pavement against both public traffic and the traffic caused by his own employees and agents. ~~The pavement shall be so protected until the beam test shows a strength of at least 550 lb. per square inch.~~

476.75 Opening to Traffic.

Upon completion of curing operations as specified, the pavement may be opened to traffic ~~provided that beam tests show that the concrete has attained a modulus of rupture of at least 550 lb. per square inch~~. However, curing operations will not be considered completed unless a curing period of at least 7 days has elapsed since the concrete was placed.

Where high-early strength concrete is used, the pavement may be opened to traffic after a shorter period of curing ~~or as beam tests show that the concrete has attained a modulus of rupture of at least 550 lb. per square inch.~~

~~**476.76 Test Specimens.**~~

~~Test specimens shall conform to the requirements of Subsection M4.02.13. They will be taken in the field from batches used in the pavement to determine the adequacy of control of the materials, the proportioning and mixing of the concrete and compliance with the minimum strength requirements. Test beams shall be 6"x6"x36" in length and shall be made, cured, and used in accordance with AASHTO Designations T 23 and T 97. At least two beams shall be made for each 2,000 sq. yd. or fraction thereof of pavement placed.~~

~~Payment for the forms, materials and assistance as the Engineer may require to make, cure and test the field specimens will not be paid for directly but shall be include in the contract unit price for the pavement~~.

476.77 Tolerance in Pavement Thickness.

It is the intent of these Specifications that the pavement shall be constructed in accordance with the thickness shown on the plans. ~~Before final acceptance of the work or during the progress of the work, as may be advisable or necessary, the thickness or depth of concrete pavement will be determined by cores taken by the Contractor under the direction of the Engineer or his designee, and unsatisfactory work shall be repaired, replaced, or will be paid for at an adjusted unit price. Where any pavement is found deficient in thickness, the following rules relative to replacement of the faulty pavement and adjustment of unit price shall govern.~~

~~The thickness of the pavement will be determined by average caliper measurement of cores tested in accordance with AASHTO Designation T 148.~~

~~For the purpose of establishing an adjusted unit price for the pavement, units to be considered separately are defined as not more than 1,000 linear feet of pavement in each traffic lane starting at the end of the pavement bearing the smaller station number. A traffic lane is defined as being between longitudinal joints or between a longitudinal joint and a pavement edge. The last unit in each lane shall be 1,000 ft. plus the fractional part of 1,000 ft. remaining~~.

~~One core will be taken at random in each unit by the Contractor~~.

~~When the measurement of the core from a unit is not deficient by more than ¼" from the plan thickness, the pavement in the unit represented will be paid for at full unit price~~.

~~When such measurement is deficient by more than ¼" but less than ½", two additional cores at intervals of not less than 300 ft. will be taken. The thickness of the unit will be considered to be the average of the three cores provided none is deficient by ½" or more. Payment for the pavement in the unit will be at an adjusted unit price as provided in Subsection 476.81.~~

~~In calculating the average thickness of the pavement, measurements in excess of the specified thickness will be considered as the specified thickness. Measurements which are less than the specified thickness by ½" or more will not be included in the average.~~

~~When any core is deficient by ½" or more, additional cores will be taken at 25 ft. intervals in each direction until a core is found in each direction that is deficient by less than ½". Each such exploratory core will~~

represent the depth of 25 lineal feet of pavement one traffic lane in width. The pavement so represented will be deducted from the unit of pavement being measured and the remaining area cored and measured as described previously.

Pavement deficient by ½" or more but less than ¾" may be accepted by the Engineer at no payment to the Contractor. However, the Contractor may, at his own expense, remove and replace the pavement, which will then be cored and measured for payment as herein provided.

Pavement deficient by ¾" or more shall be removed and replaced by the Contractor at his own expense. Payment for such replaced pavement will be as provided herein.

Other areas such as intersections, entrances, crossovers, ramps, etc., will be considered as one unit and the thickness of each unit will be determined separately. Small irregular units areas may be included as part of another unit. At such points as the Engineer may select in each unit, one core will be taken for each 2,000 sq. yd. of pavement, or fraction thereof, in the unit. Thickness of each unit will be determined as described previously except that when additional cores in any unit are required, they will be taken at locations as directed by the Engineer.

Compensation

476.80 Method of Measurement.

Cement concrete pavement will be measured by the square yard and the quantity paid for shall be the number of square yards as determined by the actual area of the finished pavement, complete in place and accepted, but subject to adjusted proportional payment or non payment as stated in Subsection 476.81 for all pavement areas found to be deficient.

The width for measurement of the pavement shall be as shown on the typical cross sections, including additional widening where called for, or as otherwise directed in writing by the Engineer. The length will be measured horizontally along the center line of each roadway or ramp.

476.81 Basis of Payment.

Standard cement concrete pavement will be paid for at the unit price per square yard complete in place subject to price adjustments as set forth below. No additional payment over the unit contract price will be made for any pavement having an average thickness in excess of that shown on the plans. Average thickness shall be calculated as stated in Subsection 476.77. Where the average thickness of pavement is deficient in thickness by more than ¼ inch, but less than ½ inch, payment will be made as follows:

CONCRETE PAVEMENT DEFICIENCY

Deficiency in Thickness, Determined by Cores	Proportional Part of Contract Prices Allowed
¼ inch or less	100 Percent
More than ¼ inch but less than 3/8 inch	80 Percent
3/8 inch or more but less than ½ inch	70 Percent

Where core measurements indicate that the pavement is deficient in thickness by ½" but less than ¾" the pavement may be accepted without any payment being made to the Contractor, or it may be replaced at the option of the Contractor with pavement of the specified thickness at his entire expense. If the deficiency in thickness is ¾" or more, the Contractor shall be required to remove such deficient areas and replace them with cement concrete pavement conforming with all requirements of these Specifications and to the thickness shown on the plans. Such areas when accepted will then be duly included in the yardage for which payment shall be made at the contract unit price. The Contractor shall receive no compensation for materials or labor involved in removing and replacing deficient areas.

When high early strength concrete is specified at the direction of the Engineer, in order to expedite the opening of pavement to traffic, the high early strength will be obtained by means of an increase in the cement

~~factor and a reduction of the water-cement ratio. The extra cement will be paid for at the actual unit cost per barrel to the Contractor for the extra quantity of cement actually incorporated in the pavement, plus an allowance of 5% of the cost of the barrel, which cost shall include all equipment, labor, storage, transportation and work incidental to its inclusion in the concrete and incorporation into the finished pavement.~~

476.82 Payment Items

~~**476. Cement Concrete Pavement — Square Yard**~~

Description

501.20 General.

This item of work shall consist of furnishing and setting curb, curb inlets, curb corners and edging on a gravel foundation ~~except for bridge curb which is set in full mortar bed and bituminous concrete curb which is placed on a bituminous concrete base~~, in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer.

Materials

501.40 General.

Materials shall conform to the requirements specified in the following Subsection of Division III, Materials:

Granite Curb	M9.04.1
Granite Curb Inlets	M9.04.5
Granite Curb Corners	M9.04.6
Granite Edging	M9.04.2
Mortar	M4.02.15
Gravel	M1.03.0 Type c
~~Anchors~~	~~M8.01.0~~
~~Cement Concrete Precast Units~~	~~M4.02.14~~
Joint Material	
Tar Impregnated Felted Paper	M9.06.2
Preformed Expansion Joint Filler	M9.14.0
~~Bituminous Concrete Curb Types 1, 2 & 3~~	~~M3.12.0~~
~~Cement Concrete Curb~~	~~M4.04.00~~
Liquid Concrete Penetrant/Sealer	M9.15.0

Construction Methods

501.60 Excavating Trench.

The trench for the curb shall be excavated to a width of 18 inches. The subgrade of the trench shall be a depth below the proposed finished grade of the curb equal to 6 inches plus the depth of the curbstone.

501.61 Preparing Foundation.

The foundation for the curb shall consist of gravel spread upon the subgrade and after being thoroughly compacted by tamping shall be 6 inches in depth.

The gravel foundation for edging shall be as shown on the plans and shall be thoroughly rammed or tamped until firm and unyielding.

The foundation for the curb inlet shall consist of a full bed of Portland cement mortar on the supporting back wall of the catch basin or gutter inlet and sufficient gravel on each side to support the overhang. The trench for the gravel foundation shall be at least 6 inches in depth and 18 inches in width. The trench shall be filled with gravel thoroughly tamped to the required grade.

The trench for the curb shall be excavated so that there shall be constructed a foundation of gravel which when thoroughly compacted will be 6 inches in depth, and extending 6 inches beyond the front and back of curb corner to the full depth of foundation. Other acceptable material may be used for backing.

501.62 Setting Curb and Edging.

Curbing, curb corners or edging shall be set on additional gravel spread upon the foundation.

All spaces under the curb, curb corners or edging shall be filled with gravel thoroughly compacted so that the curb, curb corners or edging will be completely supported throughout their length. The curb shall be set at the line and grade required as shown on the plans unless otherwise directed.

Curb, curb corners or edging shall be fitted together as closely as possible except for VA5 curb which shall not fit closer to each other than ¼ inch.

If curb, curb corners, curb inlets or edging of different quarries is used on the same project, curbing of each particular quarry shall be segregated and set to give uniform appearance.

~~**501.63 Concrete Curb, Corners, and Edging.**~~

~~**A. General**~~

~~The curb shall consist of concrete castings moulded in place in sections 6 feet long, 24 inches in depth, 6 inches in width at the top, and 7 inches in width at the bottom and with front vertical face. The top front edge of curb shall be rounded to ¾ inch radius. The ends of curb sections shall be chamfered ¼ inch.~~

~~The edging shall consist of concrete castings conforming to the size and dimensions shown on the plans. Straight edging shall be cast in lengths of 4 feet. Edging for curves with radii 300 feet or less shall be straight edging but shall be cast in lengths less than 4 feet in order to avoid angles at joints. The ends of all edging shall be normal to the line of face. The edges of edging shall be chamfered ¼ inch.~~

~~Corners shall match the adjacent curb in size, color and finish. The front arris line shall extend through ¼ of a circle having a radius of 2 feet or 3 feet respectively for Type A or Type B curb corner. The back of arris line shall be straight. The plane of the back shall be normal to the top.~~

~~All forms shall be set true to lines and grades indicated on plans and as directed and held rigidly in proper position. They shall be either metal or of acceptable planed and matched lumber of such construction that a smooth surface will be provided.~~

~~Expansion joints shall be formed at the intervals shown on the plans using preformed expansion joint filler having a thickness of ½ inch. When curb is constructed adjacent to or on concrete pavement, expansion joints shall be located opposite or at expansion joints in the pavement.~~

~~**B. Mixing and Placing Concrete.**~~

~~The concrete shall be of such consistency and be so spaded and worked that a smooth mortar face will be produced.~~

~~**C. Protection, Curing and Finishing of Concrete.**~~

~~1. Protection. The forms shall be left in place for 24 hours or as directed until the concrete has set sufficiently so that they can be removed without injury to the castings. Particular care will be required to prevent any discoloration of the exposed surface.~~

~~2. Curing. When the concrete has hardened sufficiently the concrete shall be covered with acceptable burlap or other approved material and kept wet for 3 days or longer. Under extreme weather or other particular conditions proper curing shall be carried out as directed.~~

~~3. Finishing. The castings shall, immediately upon removal of the forms, be rubbed down to a smooth and uniform surface, but no plastering will be allowed. For this work a competent and skillful finisher shall be employed.~~

~~4. Protective Coating. The Concrete Penetrant/Sealer shall conform to the requirements of M9.15.0. After the concrete is at least 14 days old and after a 48 hour minimum drying period (a longer period shall be required if castings do not appear dry) just prior to the time of treatment, the exposed surface shall be cleaned to remove all oil, grime and loose particles which would prevent the mixture from penetrating the concrete. Immediately before the application of the mixture, an air blast shall be directed over the surface to be treated so that all dust will be removed. Unless otherwise directed, the temperature of the concrete and air shall be 50°F. or higher at the time of application. For rate of application see Section M4.02.14D.~~

~~The second application of the surface treatment mixture shall not be made until the concrete, in the judgment of the Engineer, has regained its dry appearance.~~

~~Traffic shall be prohibited from the area until the concrete has regained its dry appearance.~~

~~501.64 Bituminous Concrete Curb.~~

~~The bituminous concrete mixture shall be placed and compacted with a machine acceptable and approved by the Engineer. The machine shall be capable of spreading the mixture true to line and grade and to the shape stipulated.~~

~~The bituminous concrete curb shall be placed as shown in the current Department Standards.~~

~~If at any time before the acceptance of the work any soft or imperfect spots develop in the exposed surface of the curb, such material placed shall be removed and replaced with new material and compacted, without additional compensation.~~

501.65 Filling About Trench.

After the curb, curb corners, curb inlets, and edging is set, the space between it and the wall of the trench shall be filled with gravel thoroughly tamped to the depth directed, care being taken not to affect the line or grade of the curb, curb corners, curb inlets and edging.

~~501.66 Bridge Curb.~~

~~On bridges, after the concrete base has set and before the concrete in back of the curb is placed, Type VA5 curb shall be set to line and grade in full mortar beds and full mortar end joints with the anchors in the stone grouted in place.~~

~~Each curb shall be brushed clean and free from loose particles, and thoroughly wetted with clean, fresh water before setting. The stone shall be carefully bedded in a full bed of mortar and in such a way as not to slide the stone on the mortar bed.~~

~~Each stone shall be held securely in position by 2 steel anchors. The anchors shall be of the required dimensions and shapes and shall extend 3 inches into the curb and 6 inches into the concrete. Care shall be taken in placing the concrete in back of the curb to avoid disturbing the line or grade of the curb.~~

~~Wherever plans indicate a construction joint in the sidewalk, or paraffin joint in coping, the curb shall be laid out so that a joint in the curb will be opposite the joint in the sidewalk, or coping.~~

501.67 Pointing.

The joints between curbstones (both front and back) or edging shall be carefully filled with cement mortar and neatly pointed on the top and front exposed portions. After pointing, the curbstones or edging shall be satisfactorily cleaned of all excess mortar that may have been forced out of the joints.

501.68 Transition Curb for Wheelchair Ramps.

Transitions from normal curb settings to wheelchair ramps shall be accomplished with transition curb as directed. Transitions shall be of the same type curb and similar to that abutting and, if on a curve, of the same radius.

Compensation

501.80 Method of Measurement

The length of curb ~~(except bituminous concrete curb)~~ and edging shall be as measured along the front arris of the curb and edging, except that where the edging is set on a curve having a radius of 10 feet or less, the measurement will be made along the edging at the lowest exposed level after completion of shoulder or pavement.

~~The quantity of bituminous concrete curb to be paid for will be the length actually measured along curb at its lowest exposed edge or by tonnage actually used, complete in place.~~

~~Weight slips shall be countersigned upon delivery by the Engineer and slips not countersigned shall not be included for payment.~~

Each curb corner and curb inlet set, complete in place, will be considered one unit.

501.81 Basis of Payment.

Curb will be paid for at the contract unit price per linear foot under the item for the particular type of curb, complete in place.

Curved granite curb shall include all curb (except curb corners), cut to specified radius and set on curve.

~~The steel anchors used with Type VA5 curb will be paid for under the Item for VA5 curb.~~

~~Edging will be paid for at the contract unit price per linear feet for the particular type of edging, complete in place.~~

~~Where granite edging is set on a curve having a radius of 10 feet or less the work will be paid for at the contract unit price per linear foot, complete in place, under the respective item for the particular type of edging required.~~

~~Curb inlets will be paid for at the contract unit price each under the respective item for the particular type of inlet, either straight or curved, complete in place.~~

~~All curb corners will be paid for at the contract unit price for each, under the item for the particular type of corner required, complete in place.~~

The initial excavation, ~~except Class A Rock Excavation,~~ when done in conjunction with excavation for sub-base will be paid for under the item for ~~Roadway Earth~~ *Unclassified* Excavation. ~~The price of the curbing will include compensation for any other required excavation.~~

Gravel borrow for the foundations and backfilling will be paid for at the contract unit price per cubic yard under the item for Gravel Borrow.

~~Rock excavation, if necessary, will be paid for at the contract unit price per cubic yard under the item for Class A Rock Excavation.~~

501.82 Payment Items

~~501.~~	~~Granite Curb Type VA1 Straight~~	~~Linear Foot~~
~~501.1~~	~~Granite Curb Type VA1 Curved~~	~~Linear Foot~~
~~502.~~	~~Granite Curb Type VA Straight~~	~~Linear Foot~~
~~502.1~~	~~Granite Curb Type VA2 Curved~~	~~Linear Foot~~
~~503.~~	~~Granite Curb Type VA3 Straight~~	~~Linear Foot~~
~~503.1~~	~~Granite Curb Type VA3 Curved~~	~~Linear Foot~~
~~504.~~	~~Granite Curb Type VA4 Straight~~	~~Linear Foot~~
~~504.1~~	~~Granite Curb Type VA4 Curved~~	~~Linear Foot~~
~~505.~~	~~Granite Curb Type VA5 Straight~~	~~Linear Foot~~
~~505.1~~	~~Granite Curb Type VA5 Curved~~	~~Linear Foot~~
~~506.~~	~~Granite Curb Type VB Straight~~	~~Linear Foot~~
~~506.1~~	~~Granite Curb Type VB Curved~~	~~Linear Foot~~
~~509.~~	~~Granite Transition Curb for Wheelchair Ramps Straight~~	~~Linear Foot~~
~~509.1~~	~~Granite Transition Curb for Wheelchair Ramps Curved~~	~~Linear Foot~~
~~510.~~	~~Granite Edging Type SA~~	~~Linear Foot~~
~~510.1~~	~~Granite Edging Type SA (Radius 10 feet or less)~~	~~Linear Foot~~
~~511.1~~	~~Granite Edging Type SB Straight~~	~~Linear Foot~~
~~512.1~~	~~Granite Edging Type SB (Radius 10 feet or less)~~	~~Linear Foot~~
~~513.~~	~~Granite Edging Type SC~~	~~Linear Foot~~
~~513.1~~	~~Granite Edging Type SC (Radius 10 feet or less)~~	~~Linear Foot~~
~~514.~~	~~Granite Curb Inlet Straight~~	~~Each~~
~~515.~~	~~Granite Curb Inlet Curved~~	~~Each~~
~~516.~~	~~Granite Curb Corner Type A~~	~~Each~~
~~517.~~	~~Granite Curb Corner Type B~~	~~Each~~
~~520.~~	~~Concrete Curb Type VA~~	~~Linear Foot~~
~~521.~~	~~Concrete Curb Corner Type A~~	~~Linear Foot~~
~~521.1~~	~~Concrete Curb Corner Type B~~	~~Linear Foot~~
~~522.~~	~~Concrete Edging Type SA~~	~~Linear Foot~~
~~570.1~~	~~Bituminous Concrete Curb Type 1~~	~~Linear Foot~~
~~570.2~~	~~Bituminous Concrete Curb Type 2~~	~~Linear Foot~~
~~570.3~~	~~Bituminous Concrete Curb Type 3~~	~~Linear Foot~~
~~572.1~~	~~Bituminous Concrete Curb Type 1~~	~~Ton~~
~~572.2~~	~~Bituminous Concrete Curb Type 2~~	~~Ton~~
~~572.3~~	~~Bituminous Concrete Curb Type 3~~	~~Ton~~
~~121.~~	~~Class A Rock Excavation~~	~~Cubic Yard~~
151.	Gravel Borrow	Cubic Yard

SECTION 580

CURB OR EDGING REMOVED AND RESET; REMOVED AND STACKED OR REMOVED AND DISCARDED

Description

580.20 General.

This work shall consist of removing the present curb, edging, curb corners and curb inlets of every type and cross section made of granite, concrete or granite-faced and resetting or stacking them or discarding them in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer.

Materials

580.40 Curb Edging, Curb Inlets and Curb Corners.

Curb, edging, curb inlets and curb corners shall consist of so much of the same as is suitable, in the Engineer's judgment to be reset or stacked.

580.41 Gravel.

Gravel shall conform to the requirements of Subsection M1.03.0 Type c of Division III, Materials.

Construction Methods

580.60 Removal.

A trench of sufficient width and depth shall be excavated so that the present curb, edging, curb corners and curb inlets can be removed without damage.

580.61 Protection.

The Contactor shall protect all curb or edging and keep it in satisfactory condition until the acceptance of the entire contact. Particular care will be required to prevent any unsatisfactory discoloration of the curb or edging. The Contractor shall replace any existing curb, edging, curb corners and curb inlets that is to be reset, which is lost or damaged as a result of his operations, or because of his failure to store and protect it in a manner that would eliminate its loss or damage.

580.62 Adustment.

Any length of any section of curb or edging, shall be altered by cutting in order to fit closures as necessary. The ends of all stones shall be square with the planes of the top and face so that when the stones are placed end-to-end as closely as possible no space shall show in the joint at the top and face of more than ¾ inch for the full width of the top and for 8 inches down on the face.

580.63 Relaying.

The Construction methods for resetting all curbing or edging, in the final location shall conform to the requirements of Subsections 501.60 to 501.62, 501.65 and 501.67.

580.64 Stacking.

The Contractor shall accept and hold entire responsibility for the removal, handling, stacking at a location convenient for removal by owner, and protection of all curbing or edging until its final removal as designated in accordance with the following:

Any curbing or edging damaged through lack of protection or carelessness by the Contractor shall be replaced at his expense. The Contractor's responsibility will cease upon final acceptance of the work or 60 days from the time a certified notice, with copy to the Engineer, is sent by the Contractor to owner of material that all material is available for removal.

580.65 Discarding.

Any curb, edging, curb corners and curb inlets not damaged through lack of protection or carelessness by the Contractor but deemed by the Engineer as unsatisfactory for relaying or stacking, will ~~be discarded~~ *become the property of the Department of Public Works. Such curbing will be delivered by the Contractor to a location within the City of Somerville to be determined by the DPW Commissioner. Any curbing not wanted by the City, will become the property of the Contractor.* It will be the Contractor's responsibility to *deliver to the City or* dispose of any discarded curb, edging, curb corners and curb inlets without additional compensation.

Compensation

580.80 Method of Measurement

The quantity of curb and edging to be paid for will be the length actually removed and reset, and measured as specified in Subsection 501.80.

The quantity of curb or edging measured will be the length actually removed and stacked, and measured along the front arris line at the location stacked.

The quantity of curb or edging removed and discarded will be the length ordered to be removed and actually removed, but not included for payment under the items of Removed and Reset or Removed and Stacked.

Each curb inlet or curb corner removed and stacked or discarded will be considered as 1 unit.

Any remaining curb or edging removed which is not included for payment under the items listed above shall be classified as Earth Excavation ~~(See Subsection 120.21)~~.

580.81 Basis of Payment

Removing and resetting curb and edging will be paid for at the contract unit price per linear foot of Curb Removed and Reset or Edging Removed and Reset at new location.

~~Removing and resetting curb inlets will be paid for at the contract unit price for Curb Inlets Removed and Reset.~~

~~Removing and resetting curb corners will be paid for at the contract unit price each, Curb Corners Removed and Reset.~~

~~Removing and stacking curb or edging will be paid for at the contract unit price per linear foot under the respective item.~~

~~Removing and stacking of curb inlets and curb corners will be paid for under the items for Curb Inlets Removed and Stacked, and Curb Corners Removed and Stacked, respectively.~~

~~Removing and discarding curb or edging will be paid for at the contract unit price per linear foot under the respective item.~~

~~Removing and discarding of curb inlets and curb corners will be paid for under the items for Curb Inlets Removed and Discarded, and Curb Corners Removed and Discarded, respectively.~~

580.82 Payment Items

580.	Curb Removed and Reset	Linear Foot
~~581.~~	~~Curb Inlet Removed and Reset~~	~~Each~~
~~582.~~	~~Curb Corner Removed and Reset~~	~~Each~~
~~583.~~	~~Edging Removed and Reset~~	~~Linear Foot~~
~~590.~~	~~Curb Removed and Stacked~~	~~Linear Foot~~
~~591.~~	~~Curb Inlet Removed and Stacked~~	~~Each~~
~~592.~~	~~Curb Corner Removed and Stacked~~	~~Each~~
~~593.~~	~~Edging Removed and Stacked~~	~~Linear Foot~~
~~594.~~	~~Curb Removed and Discarded~~	~~Linear Foot~~
~~595.~~	~~Curb Inlet Removed and Discarded~~	~~Each~~
~~596.~~	~~Curb Corner Removed and Discarded~~	~~Each~~
~~597.~~	~~Edging Removed and Discarded~~	~~Linear Foot~~
~~121.~~	~~Class A Rock Excavation~~	~~Cubic Yard~~
151.	Gravel Borrow	Cubic Yard

Description

701.20 General.

This work shall consist of the construction of ~~cement concrete wheelchair ramps,~~ hot mix asphalt ~~or cement concrete~~ sidewalks and driveways in accordance with the specifications and within the tolerances established in the standard drawings or on the plans.

Materials

701.40 General.

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

Gravel Borrow	M1.03.0 (Type b)
~~Cement Concrete, (4000 psi, ¾", 610)~~	~~M4.02.00~~
~~Preformed Expansion Joint Filler~~	~~M9.14.0~~
Hot Mix Asphalt	M3.11.00

Construction Methods

701.60 General.

The subgrade for the sidewalks, ramps and driveways shall be shaped parallel to the proposed surface of the walks, ramps and driveways and thoroughly compacted. All depressions occurring shall be filled with suitable material and again compacted until the surface is smooth and hard.

After the subgrade has been prepared, a foundation of gravel shall be placed upon it. After being compacted thoroughly, the foundation shall be at least 8 inches thick and parallel to the proposed surface of the walk.

~~**701.61 Cement Concrete Sidewalks, Sidewalks at Driveways and Wheelchair Ramps.**~~

~~**A. Forms.**~~

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

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

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

~~All forms shall be oiled before placing concrete.~~

~~**B. Placing and Finishing Cement Concrete.**~~

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

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

~~On the foundation as specified above, the concrete shall be placed in such quantity that after being thoroughly consolidated in place it shall be 4 inches deep. At driveways, the sidewalks shall be 6 inches deep. No finishing operations shall be performed while free water is present. Finishing operations shall be delayed until all bled water and water sheen has left the surface of the concrete and the concrete has started to stiffen. After water sheen has disappeared, edging operations, where required, shall be completed. After~~

~~edging and joining operations, the surface shall be floated. 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. After troweling, the surface shall be brushed by drawing a soft bristled pushbroom with a long handle over the surface of the concrete to produce a nonslip surface.~~

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

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

~~The application of neat cement to surfaces in order to hasten hardening is prohibited.~~

~~The finishing of concrete surface shall be done by experienced and competent cement finishers.~~

~~When completed the walks shall be kept moist and protected from traffic and weather for at least 3 days in accordance with the applicable provisions of Subsection 476.74~~

701.62 Hot Mix Asphalt Sidewalks and Driveways.

A. Forms.

Where walls, curbing or other suitable permanent supports are not present ~~or where an approved mechanical spreader is not used~~, satisfactory forms shall be installed to assist in securing proper alignment and adequate compaction of the base and surface courses.

B. Placing Hot Mix Asphalt Concrete.

The hot mix asphalt walk surface shall be laid in 2 courses to a depth after rolling *as shown on the drawings.* ~~of 2 ½ inches. The bottom course shall be 1 ¼ inches thick, and its surface after rolling shall be 1 ¼ inches below and parallel to the proposed grade of the finished surfaces. The top course shall be 1 ¼ inches thick after rolling.~~

The hot mix asphalt driveway surface shall be laid in 2 courses to a depth, after rolling, *as shown on the drawings.* ~~of 3 ½ inches. The bottom course shall be 2 inches thick, and its surface, after rolling shall be 1 ½ inches below and parallel to the proposed grade of the finished surface. The top course shall be 1 ½ inches thick after rolling.~~

A pedestrian path of travel must be maintained across the driveway opening. The dimensions, cross slope, grades and tolerances of the pedestrian path shall be in conformance with the standard construction drawings.

The surfaces shall have sufficient pitch to the roadside edge to provide for surface drainage.

The courses shall be constructed in accordance with the applicable requirements of Section 460 and the following provisions:

Spreading Mixture for Sidewalks – The mixture shall be dumped, as needed, in wheelbarrows or on approved steel dump sheets outside the areas on which it is to be placed. It shall then be immediately distributed into place by means of shovels and raked into a uniformly loose layer to the full width required and of such depth that, when the work is completed, it shall conform to the grade and surface contour required. An approved mechanical spreader may be used.

Spreading Mixture for Driveways – The mixture shall spread with an approved spreader. In areas not accessible to a spreader, the mix shall be placed as specified for hot mix sidewalks above.

Rolling Sidewalks – The surface shall be rolled with a self-propelled tandem roller with a mass not less than 1 ½ tons and not more than 5 tons. In places inaccessible to a power roller, compaction shall be obtained by means of mechanical rammers or hand tampers with a mass not less than 50 pounds and having a tamping face not exceeding 100 square inches.

Rolling Driveways – The surface shall be rolled with a self-propelled tandem roller with a mass not less than 3 tons nor more than 5 tons, or an approved roller as designated by the Engineer.

Testing surface – When tested with a 10-foot straightedge placed parallel to the center line of the courses, there shall be no deviation from a true surface in excess of ¼ of an inch.

Compensation

701.80 Method of Measurement

~~Cement Concrete Sidewalks, Wheelchair Ramps and Sidewalks at Driveways will be measured in square yards.~~

Hot Mix Asphalt Walk Surface, and Hot Mix Asphalt Driveway will be measured by the ton *and will be paid for under Item 460.*

Gravel borrow will be measured by the cubic yard as specified in Subsection 150.80.

Fine grading and compacting will be measured by the square yard.

701.81 Basis of Payment.

~~Cement Concrete Sidewalk, Cement Concrete Wheelchair Ramp and Cement Concrete Sidewalk at Driveway will be paid for at the contract unit price per square yard complete in place.~~

Hot Mix Asphalt Walk Surface and Hot Mix Asphalt Driveway will be paid for at the contract unit price per ton complete in place *and will be paid for under Item 460.*

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

Fine Grading and Compacting will be paid for at the contract unit price per square yard under Item 170., Fine Grading and Compacting.

Excavation will be paid for at the contract unit price per cubic yard under *Item 120.1 Unclassified Excavation* ~~120., Earth Excavation, or Item 121., Class A Rock Excavation~~.

701.82 Payment Items

~~**701.**~~	~~**Cement Concrete Sidewalk**~~	~~**Square Yard**~~
~~**701.1**~~	~~**Cement Concrete Sidewalk at Driveways**~~	~~**Square Yard**~~
~~**701.2**~~	~~**Cement Concrete Wheelchair Ramp**~~	~~**Square Yard**~~
~~**702.**~~	~~**Hot Mix Asphalt Walk Surface**~~	~~**Ton**~~
~~**703.**~~	~~**Hot Mix Asphalt Driveway**~~	~~**Ton**~~
~~**120.**~~	~~**Earth Excavation**~~	~~**Cubic Yard**~~
~~**121.**~~	~~**Class A Rock Excavation**~~	~~**Cubic Yard**~~
151.	**Gravel Borrow**	**Cubic Yard**
170.	**Fine Grading and Compacting**	**Square Yard**

SECTION 850

TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE OPERATIONS

Description

850.20 General.

Work under this section consists of furnishing, installing and maintaining in proper operating condition various traffic control devices for the protection of the traveling public and working personnel during construction and maintenance operations. The design, application and installation of all devices shall conform to MassDOT's "Standard Details and Drawings for the Development of Temporary Traffic Control Plans" and the "Manual on Uniform Traffic Control Devices" latest edition, Part VI, hereinafter referred to as MUTCD, and/or as directed.

The Contractor shall be responsible for the installation of adequate safety precautions for the protection of the traveling public and all project personnel.

All construction vehicles not protected by any form of traffic control device on a project which is open to traffic shall have an amber flashing light mounted on the cab roof or on the highest practical point of the machinery. The light shall be in operation whenever the equipment is working on the ~~highway or~~ travelway. Amber flashers must be a minimum of 40 candelas and have a flashing frequency of 50 to 60 times per minute. Either rotating beacons or strobe lights meeting these requirements are acceptable.

All materials provided by the Contractor under the items of this section shall remain the property of the Contractor upon completion of the project, unless otherwise specified below.

All work under this Section shall conform to the approved Temporary Traffic Control Plan.

~~**850.21 Roadway Flagger.**~~

~~The Contractor shall provide the number of flaggers required in either the appropriate Temporary Traffic Control Plan (TTCP) template (see MassDOT's website at http://www.massdot.state.ma.us/), the Temporary Traffic Control Plan or that the Engineer deems necessary for the direction and control of traffic within the site. A flagger shall be used as directed by the Engineer in accordance with 701 CMR 7.00, this Section, and the TTCP. Any flagger determined by the Engineer to be ineffective in controlling traffic may be removed at the discretion of the Engineer. If a flagger is directed to be removed, the Contractor shall immediately comply with the directive from the Engineer and shall suspend operations as necessary until a qualified replacement can be provided. Such a suspension of operations shall not be considered as a basis for a claim or an extension of time.~~

850.22 Traffic Cones for Traffic Management.

Traffic Cones for Traffic Management consists of furnishing, positioning, repositioning, maintaining and removing, as needed and/or as directed, traffic cones and necessary ballast for the purpose of closing a lane, shifting traffic, channelizing, or otherwise re-directing traffic.

850.23 Safety Signing for Traffic Management.

Safety Signing for Traffic Management consists of furnishing, positioning, repositioning, covering and uncovering, maintaining and removing, as needed and/or as directed: regulatory, warning and guide signs together with their supports. If additional supports are needed due to site conditions they will be considered incidental to the work.

~~Signs over 50 square feet will require approval of design calculations and shop drawings of the breakaway support system if the signs are installed at an unprotected location.~~

~~**850.24 Temporary Pavement Markings and Temporary Raised Pavement Markers.**~~

~~Temporary Pavement Markings and Temporary Raised Pavement Markers consist of furnishing, applying, maintaining and removing temporary white and yellow reflectorized pavement markings and temporary raised pavement markers during construction and maintenance operations.~~

~~Temporary markings shall be effective for a period of 90 days. Re-application or replacement within the 90 day period shall be done at no additional cost to the Department.~~

~~850.25 Arrow Board.~~

~~Arrow Board consists of providing, operating, positioning, repositioning, maintaining and removing a portable truck-mounted or trailer-mounted flashing arrow unit on the project at designated locations.~~

850.26 Reflectorized Drums.

Reflectorized Drums consists of furnishing, positioning, maintaining, and removing reflectorized plastic drums and necessary ballast, as needed and/or as directed by the Engineer.

~~850.27 Pavement Marking Removal and Raised Pavement Marker Removal.~~

~~Pavement Marking Removal consists of removing existing pavement markings as required to support the Temporary Traffic Control Plan and as directed by the Engineer. Raised Pavement Marker Removal consists of removal and disposal of the existing raised pavement markers including filling the void.~~

~~850.29 Temporary Barrier and Temporary Barrier Removed and Reset.~~

~~Temporary Barrier consists of furnishing, installing, maintaining and final removal of temporary barriers, including delineation, for traffic control or work zone protection in construction zones. This barrier shall be continuous as a unit across bridges and other limited construction areas unless designated on the plans as "Temporary Restrained Barrier."~~

~~Temporary Barrier Removed and Reset consists of removing, transporting and resetting of temporary barrier units from alignments established along the roadway to new alignments as required by the construction and staged construction operations for the control of traffic or work zone protection.~~

~~850.30 Temporary Restrained Barrier and Temporary Restrained Barrier Removed and Reset.~~

~~Temporary Restrained Barrier consists of furnishing, installing, maintaining and final removal of temporary restrained barriers on bridge decks and other locations including delineation, in accordance with details as shown on the traffic management plans and/or bridge plans and as directed by the Engineer. The work shall also include installing all hardware and associated materials necessary to restrain the barriers in position, or attach the barriers to the roadway or the bridge deck.~~

~~Only barrier systems that have been crash tested and approved by FHWA are acceptable for the intended use.~~

~~Temporary Restrained Barrier Removed and Reset consists of removing, transporting and resetting of temporary restrained barriers in accordance with details as shown on the plans and as directed by the Engineer. The work shall also include furnishing and installing all hardware and associated materials necessary to restrain the barrier or attach the barriers to the roadway or bridge deck.~~

850.31 Portable Breakway Barricades Type III.

Portable Breakaway Barriers Type III consists of furnishing, positioning, repositioning, maintaining and removing Portable Breakaway Barricades Type III where indicated on the plans and/or as directed by the Engineer.

~~850.32 Temporary Impact Attenuators and Temporary Impact Attenuators Removed and Reset.~~

~~Temporary Impact Attenuators consists of furnishing, installing, maintaining and final removal of temporary impact attenuators in conformance with the specifications of the manufacturer and in close conformance with the locations, lines, and grades shown on the plans and/or designated in the special provisions.~~

~~Temporary Impact Attenuators Removed and Reset includes maintaining, removing and reinstalling temporary impact attenuators where indicated on the plans or as indicated by the Engineer.~~

~~850.33 Portable Changeable Message Sign.~~

~~Portable Changeable Message Sign consists of furnishing, positioning, repositioning, operating, maintaining, and removing a portable changeable message sign as needed and/or as directed by the Engineer. All messages displayed shall be approved by the Engineer prior to being displayed.~~

~~850.34 Truck Mounted Attenuator.~~

~~Truck Mounted Attenuator consists of furnishing a moveable impact attenuator equipped with a flashing arrow board. The impact attenuator can be either a truck mounted or tow behind unit.~~

~~850.35 Temporary Illumination.~~

~~Temporary Illumination shall conform to the relevant provisions of Section 800, the Massachusetts Electrical Code and OSHA Safety Standards. The work consists of illuminating the work areas and lane drops on a temporary basis as designated by the Engineer.~~

~~All lighting equipment shall be approved by the Engineer prior to use. The Contractor shall submit to the Engineer a lighting plan for approval. No nighttime work shall be performed until the plan is approved by the Engineer. The lighting plan shall be prepared by a Professional Electrical Engineer and consist of the means and methods of the proposed lighting and contain supporting calculations.~~

850.36 Traffic Signs Removed and Reset

The Contractor shall carefully remove and reset or remove and stack existing signs as required by the Engineer.

Materials

850.40 General.

Devices required under this Section need not be new but must be in first class condition and acceptable to the Engineer. The condition of the work zone traffic control devices shall meet the quality standards set forth in the *Quality Standards for Work Zone Traffic Control Devices* compiled by the American Traffic Safety Services Association (ATSSA). Any devices that, in the judgment of the Engineer, are unsatisfactory in appearance and/or performance shall be removed and immediately replaced by acceptable devices.

~~850.41 Roadway Flagger.~~

~~Each flagger shall be equipped with the following high visibility clothing, signaling, and safety devices:~~

1. ~~A white protective hard hat with a minimum level of reflectivity per the requirements of ANSI, Type I, Class E&G;~~
2. ~~A clean, non faded, non torn lime/yellow reflective safety vest and safety pants meeting the requirements of ANSI 107 Class 3;~~
3. ~~A 24 inch "STOP / SLOW" traffic paddle conforming to the requirements of Part 6E.03 of the Manual on Uniform Traffic Control Devices (MUTCD), a weighted, reflectorized red flag, flagger station advance warning signage, and two way radios capable of providing clear communication within the work zone between flaggers, the Contractor, and the Engineer. The traffic paddle shall be mounted on a pole of sufficient length to be seven feet above the ground as measured from the bottom of the paddle;~~
4. ~~A working flashlight with a minimum of 15,000 candlepower and a six inch red attachable wand, a whistle with an attached lanyard, and a First Aid kit that complies with the requirements of ANSI Z308.1.~~
5. ~~An industrial/safety type portable air horn that complies with the requirements of the U.S. Coast Guard.~~

850.42 Traffic Cones for Traffic Management.

Traffic cones shall meet the requirements of M9.30.11.

850.43 Safety Signage for Traffic Management.

Rigid signs shall be fabricated form plywood, aluminum or approved alternate substrate material. Plywood sign material shall be 5/8 inch exterior MDO – General (one sided). Aluminum sign material shall be Type A, 0.080 inch thick, as specified in Subsection 828.42.

The entire sign face shall be retro-reflectorized. Reflective sheeting shall conform to M9.30.0. Background sheeting for all construction warning signs shall be of a fluorescent orange color. The minimum spectral radiance factor, in accordance with Section 5.1 of ASTM E991, for the fluorescence shall be as follows:

New	110% minimum
Weathered	60% minimum

~~**850.44 Temporary Pavement Markings and Temporary Raised Pavement Markers.**~~

~~Glass beads, tapes and paints used for temporary pavement markings shall be lead free and conform to Subsections M7.01.07, M7.01.16, M7.01.23 and M7.01.24 and meet the retroreflectivity requirements of the MUTCD for a period of 90 days. Final determination as to pavement marking quality shall be made by the Engineer. If so required the Contractor shall supply a retroreflectometer for this purpose.~~

~~The colors of the marking materials shall be the standard highway colors of white or yellow and as outlined in the MUTCD.~~

~~Temporary Raised Pavement Markers shall conform to Subsection M9.30.6.~~

~~**850.45 Arrow Board.**~~

~~The unit shall consist of a black background panel meeting the requirements of MUTCD Type C and shall contain at least 15 amber lamps of approximately 8,000 initial maximum candelas each.~~

~~Panels shall have the capability of the following mode selections: (1) left or right flashing or sequential arrows; (2) left or right sequential chevrons; (3) flashing double arrow; (4) flashing caution and (5) alternating diamond caution.~~

~~Panels shall automatically provide for a minimum of 50% dimming from their rated lamp voltage at night. The flashing rate of the lamps shall not be less than 25 or more than 40 flashes per minute.~~

~~Minimum mounting height should be 7 feet above the roadway to the bottom of the panel, except on vehicle mounted panels, which should be as high as practicable.~~

~~The arrow board shall include a radar detector activator meeting the requirements of Subsection 850.47.~~

850.46 Reflectorized Drums.

Reflectorized drums shall conform to Subsection M9.30.9. Warning lights shall conform to the MUTCD Type A. All drums shall be maintained in a satisfactory manner including the removal of dirt and road film that causes a reduction in sheeting retroreflective efficiency.

~~**850.47 Radar Detector Activator.**~~

~~Radar Detector Activator is an electronic device that activates all types of on-board radar detectors as they approach a work zone. The radar detector activator shall be weatherproof, capable of being securely mounted to a vertical or horizontal surface, operate efficiently from and have an effective range of one mile.~~

~~The device shall bear an FCC Equipment Authorization for unlicensed use by the general public under FCC Title 47, Part 15. All applicable FCC equipment regulations shall be met without any additional licensing required of the Department or the Contractor.~~

~~The radar detector activator shall utilize circuitry that enables continuous verification of the device's operational status by means of a light or other device that indicates the device is operational.~~

~~**850.49 Temporary Concrete Barrier.**~~

~~Temporary barriers shall be precast and manufactured in accordance with the plans and section 629 of the Standard Specifications. The Contractor shall supply a barrier and anchorage system that was crash tested in accordance with NCHRP 350, TL 3 or MASH, TL 3 and accepted by FHWA.~~

~~850.50 Temporary Restrained Barrier.~~

~~Temporary restrained barriers for use on roadways or on bridges shall be restrained by blocking or other system, affixed to the roadway by pinning, set into the roadway surface or other tested system or bolted down to the bridge deck, and shall be manufactured in accordance with the plans and Section 629 of the Standard Specifications.~~

~~The Contractor shall supply a barrier and anchorage system that was crash tested in accordance with NCHRP 350, TL-3 or MASH, TL-3 and accepted by FHWA. The Contractor shall provide evidence of FHWA acceptance.~~

850.51 Portable Breakaway Barricades Type III.

Portable Breakaway Barricades shall conform to the plans and the following requirements:

1. MUTCD
2. Reflectorized sheeting conforming to M9.30.0 Type VI. Pipe shall be Polyvinyl Chloride (PVC) pressure rated SDR 21 or SDR 26 ASTM D2241. Fittings may be PVC ASTM D2665 or Acrylonitrile Butadiene Styrene (ABS) ASTM D2661 (Drainage Waste and Vent).
3. The alternating 6 inch wide reflectorized diagonal stripe shall be orange and white and shall slope downward at 45° toward the end by which the traffic is to pass. Barricades that block the passage of traffic or designate the end of the traveled way shall have alternating vertical orange and white stripes on the rails.

~~850.52 Temporary Impact Attenuators.~~

~~Only those Temporary Impact Attenuators previously approved for the purpose intended and listed on the Qualified Construction Materials List may be used. The temporary impact attenuator shall be designed to fit within reasonable close tolerance of the dimensions given on the plans or in the special provisions for a given location. The Contractor shall provide a design for temporary impact attenuator at the design speed shown on the plans or other speed designated by the Engineer.~~

~~850.53 Portable Changeable Message Sign.~~

~~The Portable Changeable Message Sign shall be capable of performing all functions at ambient temperatures ranging from -31° to 165°F. There shall be no degradation of operation due to fog, rain or snow. A radar detector activator meeting the requirements of Subsection 850.47 shall be considered part of this item.~~

~~Maintenance shall include periodic cleaning. When not being used the sign shall be stored in a secure area approved by the Engineer.~~

~~The Portable Changeable Message Sign shall consist of the following major components:~~

~~A. Message Sign.~~

~~1. Type – The technology can be LED or a combination of both Flip Disk and LED (Hybrid)~~

~~2. Matrix Displays – Shall be character, line or full matrix.~~

~~3. Size – The message sign shall have a minimum height of 6 feet, maximum height of 6.5 feet and a minimum width of 8 feet, maximum width of 12 feet.~~

~~4. Colors – The display shall be either fluorescent yellow or ITE amber.~~

~~5. Lines – The message sign shall have the capability of displaying at least three lines of 18 inch characters with a minimum of 8 characters per line.~~

~~6. The sign shall be illuminated for nighttime visibility.~~

~~B. Operator Interface.~~

~~A means of creating and controlling the display message(s) on site and remotely through an NTCIP compatible IP addressable modem, shall be provided with each sign. The operator interface shall contain as a minimum the following:~~

1. Display terminal with keyboard to allow previewing the message content and format before it is sent to the sign panel. The keyboard shall be of a standard design.

2. Controller (CPU).

3. Lockable weatherproof enclosure for interface components.

C. Controller.

The controller shall possess, at a minimum, the following features:

1. Full 32K user memory with the option of additional archive memory.

2. Capacity to store a minimum of 50 messages.

3. Changeable message flash rate capability.

4. A minimum of 24 hour battery backup.

5. Password activation shall be software available.

D. Power Supply.

The sign shall be capable of operation from a diesel powered generator, a battery or solar power. The power supply shall be protected from the weather and be locked for security.

E. Trailer.

The trailer shall have at least the following features:

1. A current Registry of Motor Vehicles registration as per Section 7.04.

2. Swivel jacks capable of leveling the trailer on a 1:6 (1 vertical to 6 horizontal) slope and capable of stabilizing the trailer in winds of up to 80 miles per hour.

3. The sign shall be capable of being locked in a stowed position while being towed.

4. A lift mechanism shall be provided to elevate the sign to its operating position.

5. The capability to lock the sign panel in several off angle positions with respect to the trailer axis.

850.54 Truck-Mounted Attenuator.

Only those truck mounted attenuators previously approved for the purpose intended and listed on the Qualified Construction Materials List may be used. Since most approvals are conditional, any associated issues including but not limited to anticipated conditions, model, variations, modifications, proper installation of truck mounted units and tow vehicle specifications shall be resolved to the satisfaction of the Engineer before use in the field. The submitted information shall include estimated displacement characteristics for a variety of impacts (assumptions regarding both impacting vehicle weight and speed) so that appropriate temporary traffic control set-ups can be undertaken in the field.

The flashing arrow board shall conform to the requirements of Section 850.45 of the Standard Specifications.

850.55 Temporary Illumination for Work Zone.

All temporary illumination for lane drops shall provide a minimum of 2 foot candles over entire lane drop. All temporary illumination for work zones shall provide a minimum of 10 foot candles.

All floodlights shall have flat lenses securely fastened to the housing. All floodlight fixtures shall be mounted at a sufficient to allow for an aiming angle of 45 degrees from the vertical to the job site. An inventory of spare lamps and fixtures shall be maintained on the job site and all lamp or fixture failures shall be repaired or replaced immediately.

Illumination Standards for Work Area

The entire work area shall be illuminated to a minimum average of 10 foot candles measured on a horizontal plane 6 inches above the work surface. A uniformity ratio (average to minimum) of 4 to 1 or better shall be maintained at all times in the work area. This shall apply to the work areas only. Any area where all phases of the work are completed need not be illuminated except for the safety and lane drop lighting. All

lighting units shall be placed in such a manner as to avoid shadows on the work area or the travel area and to prevent excessive glare to the motorist.

Illumination Standards for Lane Drops

The traveled way within the lane drop areas and all cones, barrels, or other physical barriers placed on the roadway for the purpose of channelizing or restricting vehicular traffic shall be illuminated to a minimum average of 2 foot candles measured on a horizontal plane 6 inches above the work surface. The lane drop areas to be illuminated shall be defined as beginning at the first cone, barrel or any other physical channelizing device, continuing through the full roadway width transition area, and ending where the traveled way attains the constant width which will be maintained through the construction area. A uniformity ratio (average to minimum) of 4 to 1 or better shall be maintained at all times in the transition area.

Lighting Equipment Mounting

Mounting shall be designed and constructed by the Contractor to suit the configuration of the equipment to which the lighting is attached.

Mounting shall be secure to prevent excessive vibration. Care shall be exercised to ensure that fixture mounting will clear all overhead structures.

All equipment lighting shall be aimed in such a manner as to maximize the illumination on each individual task.

An inventory of spare lamps and spare fixtures shall be maintained on the job site by the Contractor and all lamp fixture failures shall be repaired or replaced immediately.

850.56 Temporary Illumination for Paving and Planing Operations.

Rollers

Each roller shall be equipped with floodlights on both the front and back. Two floodlights (one wide beam and one narrow beam) shall be aimed towards the front and two floodlights (one wide beam and one narrow beam) shall be aimed towards the back.

All floodlights shall be securely mounted to minimize vibrations during roller operations.

Floodlights shall be mounted above the top platform surface of the roller but less than 15 feet above ground level.

Mounting height and placement shall be designed to allow the operator to run the roller from a standing position without blocking the lighting beams onto the roadway.

Floodlights shall meet the requirements of the table below.

Pavers

Fixtures shall be adjustable and tilt toward the work area. Illumination shall be provided at the guideline, the auger area, and for the full width of the screed including 15 feet immediately behind the screed where manual raking operations are taking place.

Care shall be taken in the placement of these floodlights to avoid aiming of the lights into oncoming traffic.

Floodlights shall meet the requirements of the table below.

Planing Machines

The work area for the planning operation shall be illuminated for a minimum of 20 feet to the front and to the rear of the planer. Floodlights providing the illumination may be separate from the planer to avoid excessive vibrations. Floodlights shall meet the requirements of the table below.

Lighting Equipment Schedule

Location	# of fixtures	Remarks
Rollers	4	Aim 2 forward, 2 back

~~Pavers (Single Width)~~	~~3~~	~~Screed Area~~
	~~2~~	~~Auger & Guide Line~~
~~Pavers (Double Width)~~	~~6~~	~~Screed Area~~
	~~2~~	~~Auger & Guide Line~~
~~Planers~~	~~4~~	~~Aim 2 forward, 2 back~~

Construction Methods

~~850.61 Roadway Flagger.~~

~~Flaggers used during the performance of the Work shall be at least 18 years of age. Flaggers used during the performance of the Work shall possess a current certificate of satisfactory completion from a Department approved flagger training program within the previous 2 years.~~

~~Prior to the start of work, the Contractor shall provide to the Engineer a written list of certified flaggers to be used, including the most recent date of certification or re-certification for each person listed.~~

~~All flaggers shall carry their approved flagging training certification card with them while performing flagging duties. Flagger certifications shall remain valid for the duration of the project or the flagger shall be removed from the project.~~

~~Flaggers shall have completed a first Aid training course according to the standards and guidelines of the American Heart Association or the American Red Cross. Flaggers shall carry their First Aid certification cards with them while performing flagging duties. First Aid certifications need not be renewed once the initial certification has expired.~~

850.62 Traffic Cones for Traffic Management.

Traffic Cones shall be in good condition and sufficiently ballasted as determined by the Engineer. Any cones damaged by traffic shall be immediately replaced. The Contractor shall keep an adequate supply of spare cones on hand to replace any damaged cones.

The Contractor shall take steps to prevent cones from being blown over or displaced by wind or moving vehicular traffic. Cones shall not be left in position or on the ~~highway~~ *roadway* when the construction operations have ceased. If it becomes necessary for the ~~Department~~ *City* to remove any cones from the project due to negligence by the Contractor, all costs for this work will be charged to the Contractor.

850.63 Safety Signs for Traffic Management.

Signs which are damaged or are missing from their locations shall be replaced by the Contractor without additional compensation except as described in Section 7.17.

All signs shall be maintained in a satisfactory manner including the removal of dirt or road film that causes a reduction in sign reflective efficiency.

All signs shall be mounted in compliance with the requirements of the MUTCD.

All signs not consistent with the use of the roadway shall be removed, completely covered, or turned away from traffic each day. In no case shall signs or their portable supports be left in the traveled way when the traffic management set-up has been removed.

Rollup signs shall only be used for single work shift setups.

~~850.64 Temporary Pavement Markings and Temporary Raised Pavement Markers.~~

~~The Contractor shall install all necessary temporary pavement markings and temporary raised pavement markers, or both, prior to opening the roadway to traffic following the completion of each day's operations. Temporary raised pavement markers shall be supplemented with tape or painted markings to assure lane delineation. The contractor shall make all necessary arrangements for this work beforehand so that it may be properly coordinated with construction operations. Temporary pavement markers and temporary raised pavement markers shall be installed in accordance with the requirements of the MUTCD.~~

~~**850.65 Arrow Board.**~~

~~The arrow board shall be deployed as shown on the approved Temporary Traffic Control Plan or as directed. The unit shall be properly maintained throughout its use on the project.~~

850.66 Reflectorized Drums.

Reflectorized drums are to be used as channeling devices in ~~highway~~ *roadway* work zones. The first five drums used for any taper or as designated on the Temporary Traffic Control Plan shall be equipped with flashing lights.

~~**850.67 Pavement Marking Removal.**~~

~~Existing pavement markings shall be removed to the fullest extent possible by an approved method. Pavement marking removal methods shall not cause damage to the pavement or cause drastic change in texture, which could be construed as delineation at night, and shall be approved by the Engineer. It is not permissible to paint over existing markings with black paint in lieu of removal. Approved methods include but are not limited to:~~

~~1. High pressure air.~~

~~2. High pressure water (cold weather use not permitted).~~

~~3. Sand blasting.~~

~~4. Mechanical devices such as grinders, sanders, scrapers, scarifiers and wire brushes.~~

~~Painting over a pavement marking line by use of asphaltic liquids or paints will not be permitted.~~

~~Conflicting pavement markings shall be removed before any change is made in the traffic pattern.~~

~~Material deposited on the pavement as a result of removing markings shall be removed as the work progresses. Accumulations of sand or other material, which might interfere with drainage or could constitute a hazard to traffic, will not be permitted.~~

~~Any damage to the pavement or surfacing caused by pavement marking removal shall be satisfactorily repaired at no additional cost to the Department.~~

~~Where the removal operation is being performed near a lane occupied by traffic, a vacuum attachment operating concurrently with the removal operation must be in use. All residue shall be removed immediately from the surfaces being treated.~~

~~**850.68 Raised Pavement Marker Removal.**~~

~~Existing raised pavement markers shall be removed by a method approved by the Engineer. Any damage to the pavement or surfacing caused by pavement marking removal shall be repaired at no additional cost by methods acceptable to the Engineer. Voids in the pavement shall be filled with like materials with adhesive bonding to the substrate.~~

~~**850.69 Temporary Barrier and Temporary Barrier Removed and Reset.**~~

~~The Temporary Barrier shall be installed as shown on the plans, in accordance with these provisions and/or as directed by the Engineer.~~

~~Each run of temporary barrier units shall be fastened together to form a continuous chain.~~

~~Temporary impact attenuators with delineation shall be installed at ends of barriers within 30 feet of approaching traffic. The Contractor shall not leave a barrier leading end unprotected.~~

~~Delineators shall be installed in conformance with manufacturer's recommendations on the barriers at their termini; at 20 foot intervals on tangent sections; and at 10 foot intervals on curved sections depending on radius as determined by the Engineer.~~

~~Delineators mounted on top of barriers separating opposing traffic shall have two sided amber reflectors delineating the left edge. Side mounted delineators shall have amber delineating the left edge, white delineating the right edge and have red as the back color. If mounted on the sides they shall be 6 inches below the top and on the side of traffic. Delineators shall be mounted at angles that provide maximum reflectorization.~~

~~Temporary Barriers shall be removed from existing locations and reset in accordance with above requirements, as directed by the Engineer.~~

850.70 Temporary Restrained Barrier and Temporary Restrained Barrier Removed and Reset.

The Contractor shall ensure that where the restrained barrier is to be pinned on the roadway, the pin holes are filled with a sand mortar mix upon removal of the barrier. If the barrier is to be restrained by setting it into the roadway in a planed slot, the roadway surface shall be restored by appropriate full depth HMA or Cement Concrete roadway reconstruction.

The Contractor shall ensure that where the plans require the restrained barrier to be bolted into the bridge deck, the deck reinforcement shall not be damaged during the installation of the proposed barrier anchor bolts. Any damage to the deck reinforcement, which occurs during the course of the Contractor's operations, shall be repaired to the satisfaction of the Engineer at the Contractor's expense.

Impact or percussion drills are allowed if no distress occurs to the existing concrete. Their use is subject to the approval of the Engineer.

If core drilling, the holes may be cored using either a carbide or diamond bit. The diameter of the cored holes shall be in accordance with the recommendations of the resin manufacturer. If a diamond bit is used to core the holes in the proposed deck, a sandblast, high pressure water blast, or other mechanical means must be used to properly roughen the inner surface of the holes. The type of abrasive surface roughening used shall be approved by the Engineer.

On the concrete deck all holes shall be blown clear of any debris prior to placement of resin. The Contractor shall have the approval of the Engineer signifying that the holes are clean prior to placing the resin adhesive. The Contractor shall strictly follow the recommendations of the manufacturer for mixing and placing the adhesive material prior to the placement of the bolts. The Contractor shall not place adhesive material when the existing concrete temperature is below 40° F. Any excessive resin adhesive around the hole after placement of the bolt shall be struck off smooth while the resin adhesive is still workable.

The anchor bolt holes shall be repaired as needed by methods acceptable to the Engineer at no additional cost to MassDOT. Damage to the concrete to remain shall be repaired to a condition equal to or better than that prior to the beginning of these operations, at no additional cost to the Department.

High strength bolts shall be installed through pockets formed in the barriers and bonded in holes drilled in either the existing or proposed concrete deck. The bolts shall be suitably coated to facilitate removal from the mating threads of the cured resin adhesive once the barriers are no longer needed. The process of removing the bolts shall cause no distress to the proposed deck concrete.

The bolt embedment length and resin adhesive shall be adequate to develop a minimum of 36 kips of tension in the bolts. The embedment length shall not be less than 6 ½" in concrete and shall not extend below the bottom of the proposed deck.

Where the condition of the existing deck is unsuitable due to deterioration or insufficient embedment depth, bolts extending through the deck and fastened to an appropriately sized steel member which will provide the required pull strength may be used.

The details of the proposed bolted anchorage system and all installation and removal procedures shall be in accordance with the recommendations of the manufacturer, and shall be submitted to the Engineer for approval.

Field tests shall be performed to verify the effectiveness of the anchorage detail including the drilled hole diameter, embedment length, and the resin adhesive capacity. Two test bolts in both the existing concrete and the new concrete shall be installed and tested by the contractor for pullout as required by the system manufacturer. If the desired strength is not achieved, the Contractor shall adjust the hole size, embedment length, bolt size, and/or adhesive material to meet this test requirement. Retesting as required by the Engineer shall be performed by the Contractor, at no additional cost to the Department.

All testing shall be performed by the Contractor and is incidental to the work under this item. The method of applying the tension test load to the bolts shall be in accordance with ASTM E488. The testing equipment used and the locations and details of the test bolts shall be submitted to the Engineer for approval. The

~~Contractor shall perform this test as soon as possible in order to eliminate delays in construction due to the approval process. Bolts shall not be ordered until the embedment lengths have been approved.~~

~~The delineators shall be single units, with yellow or white lenses on both sides, placed 6" below the top and on the traffic side of the median barrier at 20' on center. The delineators shall be the type designed expressly for this type of attachment and may be made entirely of plastic.~~

~~Temporary impact attenuators with delineation shall be installed at ends of barriers within 30 feet of approaching traffic. The Contractor shall not leave a barrier leading end unprotected.~~

~~Temporary Barriers on Bridge shall be removed from existing locations and reset in accordance with above requirements, as directed by the Engineer.~~

850.71 Portable Breakaway Barricades Type III.

The Contractor shall furnish, set up, move and remove Portable Breakaway Barricades Type III as required or directed by the Engineer.

Portable Breakaway Barricades Type III shall be maintained in a good and serviceable condition throughout the project and shall be moved from place to place as required during construction and as directed by the Engineer.

~~850.72 Temporary Impact Attenuators and Temporary Impact Attenuators Removed and Reset.~~

~~Excavation for temporary attenuator foundations and anchorage shall be made to the required depth and to a width that will permit the installation and bracing of forms where necessary. All soft and unsuitable material shall be replaced with compacted gravel borrow.~~

~~The temporary impact attenuator shall be installed in accordance with the manufacturer's specifications and recommendations. Copies of these specifications and recommendations shall be provided to the Engineer.~~

~~Temporary impact attenuators damaged by traffic shall be replaced by the Contractor within 24 hours or as directed by the Engineer.~~

~~Temporary Impact Attenuators Removed and Reset consists of removing temporary impact attenuators furnished above, relocating and re installing it at new locations in accordance with the specifications and recommendations of the manufacturer.~~

~~850.73 Portable Changeable Message Sign.~~

~~The changeable message unit shall be available for immediate use throughout the duration of the project and be positioned in accordance with the Temporary Traffic Control Plan and/or at the direction of the Engineer. The sign shall be visible from a minimum distance of 900 feet with a viewing angle of no less than 30 degrees. The Contractor shall take the appropriate measures as needed within the roadway layout to provide the required minimum sight distance. The Contractor shall be responsible for the maintenance of each device and appurtenance. If the unit is found to be defective in any way it shall be replaced immediately at the Contractor's expense.~~

~~850.74 Truck Mounted Attenuator.~~

~~The truck mounted attenuator shall be utilized as shown on the plans or as directed by the Engineer, at the proper orientation and height above the paved surface.~~

~~A damaged truck mounted attenuator shall not be used. Any repairs to the attenuator shall be accompanied by a statement from the product manufacturer certifying the repairs that were performed. Any work that becomes delayed due to the lack of a properly functioning truck mounted attenuator will not constitute justification for an extension of time.~~

~~850.75 Temporary Illumination.~~

~~All portable lighting shall be located off the travel way. Whenever possible the lighting shall be located on the side of the road opposite the closed lanes.~~

~~The Contractor shall provide power to adequately energize the lighting equipment specified. Generator placement and wiring shall be in compliance with the Massachusetts Electrical Code and OSHA safety standards.~~

~~The Contractor shall furnish to the Engineer a multi function digital luminance meter, complete with instructions and capable of measuring from 0.01 to 200 foot candles. The illumination on the project shall be measured at random intervals for conformance to the specifications set forth herein. Substandard illumination shall be sufficient reason for the Engineer to stop all affected work until the substandard illumination is corrected.~~

850.76 Traffic Signs Removed and Reset

Signs, attachment hardware and sign support posts shall be satisfactorily stored and protected until reset.

Signs, attachment hardware and sign support posts lost, damaged or otherwise made unsuitable for reuse while being removed, transported, stored or reset shall be replaced with new materials at the Contractor's expense. New attachment hardware shall be furnished as necessary to replace any missing or unusable existing hardware. Signs removed and stacked should be delivered to the Somerville DPW Yard at 1 Franey Way in Somerville, or disposed of by the Contractor if they are not wanted by the City.

Included under this item are warning-regulatory signs, route marker signs, miscellaneous directional signs and monument signs.

Compensation

850.80 Method of Measurement.

Construction Vehicle Warning Devices and Personal Protective Safety Equipment shall be incidental to the work of the Contract and shall not be measured for payment.

~~Roadway Flagger will be measured on an hourly basis for only the actual time spent flagging. Partial hours shall be measured in ½ hour increments rounded up to the next ½ hour if a portion of that ½ hour is worked.~~

Traffic Cones for Traffic Management will be measured by the day. Traffic Cones for Traffic Management will be measured for payment only when 50 or more cones are used together in a string, spaced in accordance with the Traffic Control Plan and the MUTCD, for the purpose of closing a traffic lane, shifting traffic, channelizing, or otherwise directing traffic. The use of less than 50 cones in a string shall be incidental to the work with no additional compensation. Other uses of traffic cones shall be incidental to the work activity with which the cones are associated. Each period of up to 24 hours during which traffic cones for traffic management are in place will be measured as one day, regardless of the number of times that the cones are positioned, repositioned, removed or returned to service and regardless of the number of locations at which traffic cones are used. Ballast to weight the cones shall be incidental to the work with no additional compensation.

Safety Signing for Traffic Management will be measured by the square foot and the quantity will be only that which is actually used on the project. Regardless of the number of times that a sign may be reused on the project, it will not be measured for payment more than once.

~~Temporary Pavement Markings will be measured by the foot using the procedure outlined for Permanent Pavement Markings in Subsection 860.80.~~

~~Temporary Raised Pavement Markers will be measured by the unit each.~~

~~Arrow Board will be measured by the day. Each period of up to 24 hours during which an arrow board is in use will be measured as one day, regardless of the number of times that the unit is repositioned, positioned, removed or returned to service.~~

Reflectorized Drums will be measured by the day. Each period of up to 24 hours during which a reflectorized drum is in use will be measured as one day regardless of the number of times that the drum is positioned, repositioned, removed or returned to service.

~~Pavement Marking Removal will be measured by the square foot of existing pavement marking actually removed.~~

~~Raised Pavement Marker Removal will be measured by the unit each.~~

~~Temporary Barrier and Temporary Barrier Removed and Reset will be measured by the foot, in place. Barrier removal and reset for the purpose of gaining access to the construction work zone shall not be measured for payment. Any barrier removed and reset for the convenience of the Contractor will not be measured for payment.~~

~~Temporary Restrained Barrier and Temporary Restrained Barrier Removed and Reset will be measured by the foot in place.~~

Proposed Breakaway Barricade Type III will be measured as one unit each regardless of size.

~~Temporary Impact Attenuators will be measured as a single unit each.~~

~~Temporary Impact Attenuator Removed and Reset will be measured as a single unit each.~~

~~Portable Changeable Message Signs will be measured by the day. Each period of up to 24 hours during which a Portable Changeable Message Sign is in place will be measured as one day, regardless of the number of times that the sign is positioned or repositioned, removed or returned to service.~~

~~Truck Mounted Attenuator will be measured by the day which shall include the attenuator, the truck or tow vehicle, the operator or driver, maintenance of the vehicle and components, and arrow board. Each period of up to 24 hours during which a Truck Mounted Attenuator is in place will be measured as one day, regardless of the number of times that the Truck Mounted Attenuator is positioned, repositioned, removed or returned to service during that period. In either case, the unit and the accompanying truck are considered one unit for measurement and payment purposes.~~

~~Temporary Illumination for Work Zone will be measured by the day for each period of up to 24 hours during which temporary illumination is used, regardless of the number of operations requiring lighting, or the number of times that the illumination is positioned, repositioned, removed or returned to service.~~

Traffic Signs Removed and Reset shall be measured per each sign removed and reset.

850.81 Basis of Payment.

The contract prices under these items shall constitute full payment for all material, labor and equipment required or incidental to the satisfactory completion of the work as described above. Any devices provided under this section which are lost, stolen, destroyed or deemed unacceptable while their use is required on the project shall be replaced without additional compensation. Devices damaged by traffic will be compensated in accordance with Subsection 7.17 including temporary impact attenuators. This shall not include other temporary traffic control devices such as cones, drums and temporary signs.

~~Roadway Flagger will be paid for at the contract unit price per hour which shall include full compensation for all costs for providing flaggers. No allowance or additional payment will be made for required training, equipment, travel time, transportation, or any administrative charges associated with the costs of flaggers. No allowance shall be made for overtime payment rates.~~

Traffic Cones for Traffic Management will be paid for at the contract unit price per day which shall provide full compensation for furnishing, positioning, repositioning, and removing traffic cones as directed by the Engineer. A day shall cover all traffic cones for traffic management necessary in that time period, regardless of the total number of cones and regardless of the number of locations at which cones are used. The Contractor shall receive the day payment for the period in which the Traffic Cones for Traffic Management are deployed.

Safety Signage for Traffic Management will be paid for at the contract unit price per square foot which shall include full compensation for furnishing, installing, maintaining, positioning, repositioning, and removing the signs.

~~Temporary Pavement Markings will be paid for at the contract unit price per foot which shall include full compensation for furnishing, installing, maintaining and removing, the markings and markers.~~

~~Temporary Raised Pavement Markers will be paid for at the contract unit price each which shall include full compensation for furnishing, installing, maintaining and removing, the markings and markers.~~

~~Arrow Boards will be paid for at the contract unit price per day which shall include full compensation for furnishing, positioning, repositioning, and removing Arrow Boards as directed by the Engineer and shall include the radar detector activator.~~

Reflectorized Drums will be paid for at the contract unit price per day which shall include full compensation for furnishing, positioning, repositioning, and removing Reflectorized Drums as directed by the Engineer. Flashing lights as shown on the Temporary Traffic Control Plan shall be considered incidental to Item 859. Reflectorized Drum.

~~Pavement Marking Removal will be paid for at the contract unit price per square foot which shall provide full compensation for removing existing markings including any necessary repairs to the roadway surface.~~

~~Raised Pavement Markers Removal will be paid for at the contract unit price each which shall provide full compensation for removing the existing markers and filling the voids in the pavement.~~

~~Temporary Barrier will be paid for at the contract unit price per foot which shall provide full compensation for furnishing, installing, delineating, aligning, maintaining and final removal of the temporary barrier.~~

~~Temporary Barrier Removed and Reset will be paid for at the contract unit price per foot which shall provide full compensation for removing, relocating, re-setting, re-aligning, transporting and maintaining the temporary barrier including delineation, as specified above. The Contractor will be paid Removed and Reset each time the barrier is relocated either to a new work zone, to off-season storage, or back to the project from storage. The Contractor will not be separately compensated for any work necessary to maintain or re-align units or replace damaged units. No payments will be made for removing and resetting barriers for the purpose of gaining access to the construction work zone. No payment will be made for removing, relocating and resetting any barriers moved for the convenience of the Contractor.~~

~~Temporary Restrained Barriers as shown on the plans will be paid for at the contract unit price per foot which shall provide full compensation for furnishing, initial installation, planing operations, delineation, testing, maintaining and temporary barrier and delineation, final removal and transportation of the temporary barriers, restoration of the planed surfaces or pin holes, and shall include all hardware, materials, equipment, and labor necessary to restrain the barriers. The Contractor shall have no claim for extra compensation for any variations in the system due to diameter of the bolt hole, the embedment length, the method of producing the hole, repairing the hole or the type of adhesive used in anchoring the proposed barriers.~~

~~Temporary Restrained Barriers Removed and Reset will be paid for at the contract unit price per foot which shall provide full compensation for removing, relocating, re-setting, testing, re-aligning, maintaining the temporary barrier and delineation, and transportation of the temporary barrier including delineation, restoration of the planed surfaces or pin holes, and shall include all hardware, materials, equipment, and labor necessary to restrain the barriers. The Contractor shall have no claim for extra compensation for any variations in the system due to diameter of the bolt hole, the embedment length, the method of producing the hole, repairing the hole or the type of adhesive used in anchoring the proposed barriers. The Contractor shall be paid Remove and Reset each time the barrier is relocated either to a new work zone, to off-season storage, or back to the project from storage.~~

Portable Breakaway Barricades Type III will be paid for at the contract unit price each which shall constitute full payment for all material, labor and equipment necessary to furnish, install, maintain, move and remove the barricades.

~~Temporary Impact Attenuators will be paid for at the contract unit price each which will provide full compensation for furnishing, installing and removing the attenuator, as well as all labor, equipment, materials, foundation and anchorage, and all incidental work necessary to complete the work as specified.~~

~~Gravel Borrow for any foundation and anchorage work for Temporary Impact Attenuators will be paid for at the contract unit price under Item 151, Gravel Borrow.~~

~~Portable Changeable Message Signs will be paid for at the contract unit price per day which shall provide full compensation for furnishing, positioning, repositioning and removing Portable Changeable Message Signs as specified or as directed by the Engineer and shall include the radar detector activator. The Contractor shall receive the day payment only once for each calendar day in which the portable changeable message sign is deployed.~~

~~Truck Mounted Attenuator will be paid for at the contract unit price per day which shall provide full compensation for positioning, repositioning, removing or returning to service as required or as directed by the Engineer. The Contractor will receive the day payment for each continuous work period in which the Truck Mounted Attenuator is deployed.~~

~~Temporary Illumination for Work Zone will be paid for at the contract unit price per day which shall include full compensation for all lighting specified for use in lane drops, work areas, and other lighting locations as directed by the Engineer. The work includes the lighting plan, delivery, removal, setting and resetting of all floodlight equipment, staging or tripods, generators, wiring, the light meter, adjustment, maintenance and any equipment necessary or incidental to the operation of a lighting system.~~

~~Temporary Illumination for Paving and Planing Operations consists of illuminating the paving, planning, or rolling operations and equipment within the immediate work area. The cost of illumination as described above shall be incidental to the payment item of the work being performed and shall include the light plan.~~

Traffic Signs Removed and Reset will be paid for at the contract unit price complete in place, which price shall constitute full payment for all materials, labor, equipment and other incidentals necessary to complete the work.

850.82 Payment Items.

~~850.41~~	~~Roadway Flagger~~	~~Hour~~
851.1	Traffic Cones for Traffic Management	Day
852.	Safety Signing for Traffic Management	Square Foot
853.1	Portable Breakaway Barricade Type III	Each
~~853.2~~	~~Temporary Barrier~~	~~Foot~~
~~853.21~~	~~Temporary Barrier Removed and Reset~~	~~Foot~~
~~853.3~~	~~Temporary Restrained Barrier~~	~~Foot~~
~~853.31~~	~~Temporary Restrained Barrier Removed and Reset~~	~~Foot~~
~~853.403~~	~~Truck Mounted Attenuator~~	~~Day~~
~~853.41~~	~~Temporary Impact Attenuator for Shoulder, Incapable of Redirection~~	~~Each~~
~~853.411~~	~~Temporary Impact Attenuator for Shoulder, Incapable of Redirection~~	~~Each~~
~~853.42~~	~~Temporary Impact Attenuator for Shoulder, Capable of Redirection~~	~~Each~~
~~853.421~~	~~Temporary Impact Attenuator for Shoulder, Incapable of Redirection, Removed and Reset~~	~~Each~~
~~853.43~~	~~Temporary Impact Attenuator for Median, Incapable of Redirection~~	~~Each~~
~~853.431~~	~~Temporary Impact Attenuator for Median, Incapable of Redirection, Removed and Reset~~	~~Each~~
~~853.44~~	~~Temporary Impact Attenuator for Median, Capable of Redirection~~	~~Each~~
~~853.441~~	~~Temporary Impact Attenuator for Median, Capable of Redirection, Removed and Reset~~	~~Each~~
~~853.8~~	~~Temporary Illumination for Work Zone~~	~~Day~~
~~854.~~	~~Temporary Raised Pavement Markers~~	~~Each~~
~~854.016~~	~~Temporary Pavement Markings – 6 In. (Painted)~~	~~Foot~~
~~854.036~~	~~Temporary Pavement Markings – 6 In. (Removable Tape)~~	~~Foot~~
~~854.1~~	~~Pavement Marking Removal~~	~~Square Foot~~
~~854.5~~	~~Raised Pavement Marking Removal~~	~~Each~~
~~856.~~	~~Arrow Board~~	~~Day~~
~~856.12~~	~~Portable Changeable Message Sign~~	~~Day~~
859.	Reflectorized Drum	Day
874.2	*Traffic Signs Removed and Reset*	*Each*
~~151.~~	~~Gravel Borrow~~	~~Cubic Yard~~

Description

860.20 General.

This item of work consists of furnishing materials and the application of Reflectorized Pavement Markings in accordance with the Commonwealth of Massachusetts, Department of Public Works, Manual of Uniform Traffic Control Devices, current edition.

Materials

860.40 General.

Materials shall be as specified under the particular payment item being used and shall meet the appropriate requirements specified in the following Subsections of Division III, Materials:

General Requirements for Paints and Protective Coatings	M7.00.00
White Thermoplastic Reflectorized Pavement Markings	M7.01.03
Yellow Thermoplastic Reflectorized Pavement Markings	M7.01.04
White Traffic Paint	M7.01.05
Yellow Traffic Paint	M7.01.06
Glass Beads	M7.01.07
White High Heat Rapid Drying Traffic Marking Material	M7.01.08
Yellow High Heat Rapid Drying Traffic Marking Material	M7.01.09
Fast Drying White Traffic Paint	M7.01.10
Fast Drying Yellow Traffic Paint	M7.01.11
Striping Powder	M7.01.12
Preformed Permanent Plastic Pavement Markings or Legends	M7.01.18
Green Pavement Coatings	M7.01.21
Fast Drying White Water-borne Traffic Paint	M7.01.23
Fast Drying Yellow Water-borne Traffic Paint	M7.01.24

Construction Methods

860.60 General.

All equipment used for the application of pavement markings shall be of standard commercial manufacture. All other equipment and devices necessary for the application of the pavement markings and protection thereof and for the protection to the traveling public shall be as usually required for work of this type and shall be furnished by the Contractor.

The pavement marking equipment shall be operated at the speed and in accordance with other requirements of the manufacturer, unless otherwise directed by the Engineer.

Truck mounted equipment shall be approved for the application of pavement markings except in such cases where in the Engineer's judgment travel will be unreasonably delayed and/or the quality of the work performed by the machine is unsatisfactory.

The Contractor will supply an infrared pistol thermometer meeting the requirements of Section 460.60 for each traffic marking operation on the project. The thermometers will remain property of the Contractor upon completion of the project.

860.61 Layout of Work.

A schedule of pavement marking operations shall be furnished by the Contractor for the approval of the Engineer prior to the application of any pavement markings. This schedule must be in the office of the Engineer 7 days prior to the proposed date of application of any pavement markings.

The Engineer will provide at a convenient location on the roadway line a line of reference for use by the Contractor in establishing the location of markings. The line of reference shall be at a maximum of 50 foot intervals by means deemed satisfactory by the Engineer. All markings shall follow the line of reference without deviation. Any line deviating from the establishing control of incorrect width shall be reapplied, as directed by the Engineer in accordance with Subsection 860.62.

860.62 Application of Markings.

Pavement markings shall be applied as follow:

Material	Material Application Temperature	Line Thickness Above Roadway Surface	Reflectorized Bead Application
M7.01.03 M7.01.04	400-425F	125-188 mils	Drop on 1 pound/10 square feet
M7.01.23 M7.01.24	135-150F	15 mils	6 pounds/gallon

No thinners shall be used for the above listed pavement marking applications except in accordance with the manufacturer's specifications and at the direction of the Engineer.

No paint or pavement marking material shall be heated above the temperature marked on the container.

Markings shall be applied only in seasonable weather and in accordance with good painting practices. The surface shall be dry and free of sand, grease, oil or other foreign substances prior to the application. The Contactor shall prepare the surface to accept the application as part of this item, with no additional compensation. The Engineer will make final determination for all of the foregoing.

Bituminous concrete pavements shall have been in place for 48 hours prior to the application of pavement markings except preformed permanent plastic pavement markings which can be applied immediately. When it is necessary to expedite the flow of traffic, Engineer may reduce the waiting period as deemed necessary.

If for any reason material is spilled or tracked on the highway, or any markings applied by the Contractor, in the Engineer's judgment, fail to conform to Subsection 860.61, because of a deviation from the desired pattern, the Contractor shall remove such material by a method that is not injurious to the roadway surface and is acceptable to the Engineer, clean the roadway surface and prepare the surface for a reapplication of markings and reapply the markings as directed without additional compensation for any of the foregoing corrective operations.

The ambient (air) temperature for thermoplastic application is to be a minimum of 45°F and rising at the time of marking operations. If work has started and air temperatures fall below 45°F and continuous cooling is indicated, work shall be stopped. In cool weather conditions, temporary drops down to 40°F will be tolerated, providing temperatures also vary upwards. Sustained striping (greater than one hour) at 40°F shall not be allowed. Starting work at air temperatures lower than 45°F shall not be allowed.

860.63 Protection of Markings.

Markings shall be protected until sufficiently dry to bear traffic on *roadways* ~~highways~~ that are open to traffic. Markings shall be protected by traffic cones of not less than 28" in height except in the case of markings which cure to a no tack condition in 180 seconds or less in the latter case protection may be provided by a convoy of vehicles with suitable warning devices to warn overtaking or oncoming traffic that the pavement marking operation is in progress.

A. Broken Lines.

On tangents and on curves of 1000 foot radius or greater at least 1 cone shall be placed on every other bar. On curves of less than 1000 foot radius 1 cone shall be placed on every bar unless otherwise directed by the Engineer.

B. Solid Lines.

On tangents and on curves of 1000 foot radius or greater, cones shall be spaced not over 80 feet apart and on curves of less than 1000 foot radius the spacing shall be not over 50 fete unless otherwise directed by the Engineer. On edge line adjacent to the median wider spacing may be used at the direction of the Engineer. In order to control the proper positioning of the cones during the drying period, the Contractor shall assign sufficient personnel as determined by the Engineer. Such control is dependent on traffic density, cone widths, etc.

860.64 Accompanying of Traffic.

All warning signs and traffic control devices as required shall be in accordance with Section 850 of these Specifications.

No work shall be done on this item on roadways open to traffic on Saturdays, Sundays, the day before a holiday or on a holiday except when otherwise specifically directed by the Engineer.

Both lanes of two-lane highways shall remain open to traffic at all times. On multi-lane highways only one lane shall be closed to traffic at any time.

Work under this item may be suspended, at the discretion of the Engineer, during peak traffic hours or at any other time when, in his judgment, traffic is being unduly hampered or delayed by the work, under this item.

Compensation

860.80 Method of Measurement.

Markings are to be paid for on the actual length of lines applied under the various items of the Contract.

The lengths of solid lines will be obtained by:

1. Calculation from established base line stations or
2. Use of a measuring wheel or
3. Vehicle odometer readings.

The length of broken lines (except for broken lines less than 10 feet, the actual length will be used) will be obtained by using ¼ of the results obtained above for solid lines. Patterns, other than lines, are to be paid for by the square foot area under the line item of the Contract.

860.81 Basis of Payment.

The work under these items will be paid for at the contract unit price under each item of the Contract based on the measurement as determined by the Engineer.

The contract prices shall include all material, labor, and equipment required or incidental to the satisfactory completion of the work.

860.82 Payment Items.

860.04~~-860.12~~	*4*-inch Reflectorized White Line (painted)	Linear Foot
~~861.04-861.12~~	~~*-inch Reflectorized Yellow Line (painted)~~ ~~*(4 In. – 12 In)~~	~~Linear Foot~~
~~862.~~	~~Gore Lines – Reflectorized White (painted)~~	~~Square Foot~~
~~863.~~	~~Gore Lines – Reflectorized Yellow (painted)~~	~~Square Foot~~
~~864.~~	~~Pavement Arrow Reflectorized White (painted)~~	~~Square Foot~~
~~864.01~~	~~Pavement Arrow and Legends Reflectorized White Tape (inlay)~~	~~Square Foot~~
~~864.02~~	~~Pavement Arrow and Legends (surface applied tape)~~	~~Square Foot~~
~~864.04~~	~~Pavement Arrows and Legends Reflectorized White (thermoplastic)~~	~~Square Foot~~
~~865.~~	~~Cross Walks and Stop Lines Reflectorized White (painted)~~	~~Square Foot~~
~~865.1~~	~~Cross Walks and Stop Lines Reflectorized White (thermoplastic)~~	~~Square Foot~~
~~866.04-866.12~~	~~*-inch Reflectorized White Line (thermoplastic)~~	~~Linear Foot~~
~~867.04-867.12~~	~~*-inch Reflectorized Yellow Line (thermoplastic)~~ ~~*(4 In. – 12 In.)~~	~~Linear Foot~~
~~868.~~	~~Gore Lines – Reflectorized White (thermoplastic)~~	~~Square Foot~~
~~869.~~	~~Gore Lines – Reflectorized Yellow (thermoplastic)~~	~~Square Foot~~
~~870.04~~	~~4 In. White Reflective Tape (inlay)~~	~~Linear Foot~~
~~871.04~~	~~4 In. Yellow Reflective Tape (inlay)~~	~~Linear Foot~~
~~872.04~~	~~4 In. White Reflective Tape (surface applied)~~	~~Linear Foot~~
~~873.04~~	~~4 In. Yellow Reflective Tape (surface applied)~~	~~Linear Foot~~

Description

950.20 General.

This work shall consist of furnishing and placing lumber, wood or steel sheeting of the kinds and dimensions required, complying with these specifications, where indicated on the plans or where directed *or where required to complete the work.* All dimensions specified for lumber are nominal dimensions.

Materials

950.40 General.

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

Lumber Sheeting	M9.05.0
Wood Sheeting	M9.05.0
Steel Sheeting	M8.05.4

Construction Methods

950.60 General.

Work shall not be started until all material and equipment necessary for their construction are either on the site of the work or satisfactorily available for immediate use as required. Sufficient labor and equipment shall be employed to insure the completion of the excavation, placing of the concrete and backfilling in the shortest possible time.

Where no other direction is given, sheeting shall be driven to such depth that the footing may be lowered at least 2 feet below the elevation shown on the plans without any change in the sheeting as driven.

~~Sheeting that is to be paid as sheeting left in place shall be driven to a minimum depth of 5 feet below the proposed bottom of the concrete footing unless otherwise directed. After sufficient progress has been made on the construction of the sheeting shall be cut off at the tops of the footings or as otherwise directed.~~

950.61 Placing of Sheeting.

The sheeting shall be securely and satisfactorily braced to withstand all pressures to which it may be subjected and be sufficiently tight to prevent any flow of ~~water or~~ material into the space in which *work is to be completed* ~~concrete is deposited~~. The bottom edge of each piece of lumber and wood sheeting shall be so sharpened as to lead the toe of the sheeting away from the excavation. Jetting may be done only with the approval of the Engineer, but it will not be permitted when excess of water may endanger railroad tracks or other structures.

~~Where sheeting is to be used as a form for placing concrete the sheeting shall be driven entirely outside the neat lines shown on the plans for the concrete.~~

~~When, in the Engineer's judgment, the foundations must be altered to such an extent that changes must be made in the depths to which sheeting has been driven, or the area enclosed by the sheeting must be changed, the Contractor shall make the directed changes in accordance with the provisions of Subsection 9.03, Payment for Extra Work.~~

~~950.62 Cut-Off.~~

~~The sheeting may be driven down or cut off to the elevation shown on the plans or directed by the Engineer. No sheeting may be left so as to create a possible hazard to navigation of a stream, safety of public, obstruction to flow of water, or a hindrance to traffic of any kind.~~

~~**950.63 Care Near Railroads.**~~

~~When sheeting is driven adjacent to railroad tracks, the Contractor shall keep on the work site, quickly available for use, such equipment and operators needed to immediately burn or cut off any sheeting that cannot be driven into the clear before the arrival of trains.~~

950.64 Disposal of ~~Cut-off and~~ Waste Materials.

~~No cut-off shall be allowed to float away in a stream or left in such a manner as to obstruct the flow of water.~~

All *waste material* ~~cut-off~~ will become the property of the Contractor and shall be removed by him from the site.

~~At the option of the Contractor, steel sheeting cut offs may be used as sheet piling or parts of sheet piling. If welding is used, such welds shall be full butt welds designed to develop the full strength of the sheet pile, both in bearing and bending, and shall conform to any of the prequalified joints shown in the specifications for welded Highway and Railroad Bridges of the American Welding Society.~~

950.65 Defective Work.

The responsibility of the exact satisfactory and maintenance of sheeting complete in place shall rest with the Contractor and any work done which in the performance of incidental construction is not acceptable for the intended purpose shall be either repaired or removed and reconstructed by the Contractor at his expense.

Compensation

950.80 Method of Measurement

The items of Lumber Sheeting, Wood Sheeting, or Steel Sheeting *are considered incidental to the work which they are being installed for and no additional payment will be provided* ~~will be a pay item only if indicated on the plans or in the Special Provisions to be left in place or when ordered left in place by the Engineer as a permanent part of the foundation. Otherwise the Contractor may remove the sheeting or abandon it at his option, provided that sheeting may be abandoned only to the extent permitted by the Engineer.~~

~~Lumber or Wood Sheeting, when indicated on the plans or in the Special Provisions to be left in place or when ordered by the Engineer to be left in place as a permanent part of the foundation, will be measured by the thousand feet board measure of lumber or wood sheeting. The quantity to be paid for will be the area of sheeting left in place multiplied by the nominal thickness.~~

~~Steel sheeting, when indicated on the plans or in the Special Provisions to be left in place or when ordered by the Engineer to be left in place as a permanent part of the foundation, will be measured by the pound. The weight of the quantity to be paid for shall be calculated on the basis of 22 pounds per square foot of wall in place. No additional compensation will be allowed if a heavier sheeting is used unless such heavier sheeting is specified in the Special Provisions, or shown on the plans.~~

~~**950.81 Basis of Payment**~~

~~Steel sheeting, when indicated on the plans, in the Special Provisions, or when ordered by the Engineer, to be left in place as a permanent part of the foundation, will be paid for at the contract unit price per pound under the item for Steel Sheeting. The contact unit price per pound shall also include full compensation for anchors, when required, for the sheeting.~~

~~Lumber or Wood when indicated on the plans or in the Special Provisions to be left in place or when ordered by the Engineer in writing to be left in place as a permanent part of the foundation will be paid for at the contract unit price per thousand feet board measure for Lumber Sheeting or Wood Sheeting.~~

~~No direct payment will be made for any sheeting not indicated on the plans or in the Special Provisions or not ordered in writing by the Engineer to be left in place as a permanent part of the foundation. Such sheeting will be considered as incidental work necessary for the proper prosecution and protection of the work during construction operations and compensation therefor shall be included in the prices bid for the various items of~~

~~work for which the sheeting was used. If the Contractor elects to leave such sheeting in place with the approval of the Engineer, no payment will be made for same sheeting left in place.~~

~~For the purposes of partial payment, except as noted below, the sheeting item will be considered 90 percent done when the sheeting has been completely driven and the area within the sheeting is ready for such work as may be required to be done therein.~~ The sheeting item will be considered completed when the sheeting has been cut at the required elevation.

950.82 Payment Items

~~**950.**~~	~~**Lumber Sheeting**~~	~~**MBM**~~
~~**951.**~~	~~**Wood Sheeting**~~	~~**MBM**~~
~~**952.**~~	~~**Steel Sheeting**~~	~~**Pound**~~

PREVAILING WAGE RATES

PAYROLL REPORT FORM
COMPLIANCE FORM

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

Prevailing Wage Rates

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

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

JOANNE F. GOLDSTEIN
Secretary
HEATHER E. ROWE
Director

Awarding Authority: City of Somerville

Contract Number: **City/Town:** SOMERVILLE

Description of Work: Beacon Street Utility Works - Rehab/replace existing water mains, sewer lines and manholes

Job Location: Beacon Street

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$31.55	$8.91	$8.00	$0.00	$48.46
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$31.62	$8.91	$8.00	$0.00	$48.53
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$31.74	$8.91	$8.00	$0.00	$48.65
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$84.21	$9.80	$18.17	$0.00	$112.18
	08/01/2014	$87.36	$9.80	$18.17	$0.00	$115.33
	08/01/2015	$90.51	$9.80	$18.17	$0.00	$118.48
AIR TRACK OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	12/01/2013	$34.55	$7.10	$12.45	$0.00	$54.10
	06/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	12/01/2014	$36.05	$7.10	$12.45	$0.00	$55.60
	06/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	12/01/2015	$37.55	$7.10	$12.45	$0.00	$57.10
	06/01/2016	$38.30	$7.10	$12.45	$0.00	$57.85
	12/01/2016	$39.30	$7.10	$12.45	$0.00	$58.85
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	06/01/2013	$29.88	$10.40	$5.95	$0.00	$46.23
	12/01/2013	$30.68	$10.40	$5.95	$0.00	$47.03
	06/01/2014	$31.58	$10.40	$5.95	$0.00	$47.93
	12/01/2014	$32.48	$10.40	$5.95	$0.00	$48.83
	06/01/2015	$33.43	$10.40	$5.95	$0.00	$49.78
	12/01/2015	$34.38	$10.40	$5.95	$0.00	$50.73
ASPHALT RAKER *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 1*	06/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	12/01/2013	$34.55	$7.10	$12.45	$0.00	$54.10
	06/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	12/01/2014	$36.05	$7.10	$12.45	$0.00	$55.60
	06/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	12/01/2015	$37.55	$7.10	$12.45	$0.00	$57.10
	06/01/2016	$38.30	$7.10	$12.45	$0.00	$57.85
	12/01/2016	$39.30	$7.10	$12.45	$0.00	$58.85
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2010	$37.70	$6.97	$11.18	$0.00	$55.85

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2010

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

Notes:

Apprentice to Journeyworker Ratio:1:5

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (BOSTON)*	08/01/2013	$48.06	$10.18	$18.15	$0.00	$76.39
	02/01/2014	$48.62	$10.18	$18.15	$0.00	$76.95
	08/01/2014	$49.52	$10.18	$18.22	$0.00	$77.92
	02/01/2015	$50.08	$10.18	$18.22	$0.00	$78.48
	08/01/2015	$50.98	$10.18	$18.29	$0.00	$79.45
	02/01/2016	$51.55	$10.18	$18.29	$0.00	$80.02
	08/01/2016	$52.45	$10.18	$18.37	$0.00	$81.00
	02/01/2017	$53.02	$10.18	$18.37	$0.00	$81.57

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Boston*

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.03	$10.18	$18.15	$0.00	$52.36
2	60	$28.84	$10.18	$18.15	$0.00	$57.17
3	70	$33.64	$10.18	$18.15	$0.00	$61.97
4	80	$38.45	$10.18	$18.15	$0.00	$66.78
5	90	$43.25	$10.18	$18.15	$0.00	$71.58

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.31	$10.18	$18.15	$0.00	$52.64
2	60	$29.17	$10.18	$18.15	$0.00	$57.50
3	70	$34.03	$10.18	$18.15	$0.00	$62.36
4	80	$38.90	$10.18	$18.15	$0.00	$67.23
5	90	$43.76	$10.18	$18.15	$0.00	$72.09

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2013	$34.20	$7.10	$12.60	$0.00	$53.90
	12/01/2013	$34.95	$7.10	$12.60	$0.00	$54.65
	06/01/2014	$35.70	$7.10	$12.60	$0.00	$55.40
	12/01/2014	$36.45	$7.10	$12.60	$0.00	$56.15
	06/01/2015	$37.20	$7.10	$12.60	$0.00	$56.90
	12/01/2015	$37.95	$7.10	$12.60	$0.00	$57.65
	06/01/2016	$38.70	$7.10	$12.60	$0.00	$58.40
	12/01/2016	$39.70	$7.10	$12.60	$0.00	$59.40
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2013	$33.05	$7.10	$12.60	$0.00	$52.75
	12/01/2013	$33.80	$7.10	$12.60	$0.00	$53.50
	06/01/2014	$34.55	$7.10	$12.60	$0.00	$54.25
	12/01/2014	$35.30	$7.10	$12.60	$0.00	$55.00
	06/01/2015	$36.05	$7.10	$12.60	$0.00	$55.75
	12/01/2015	$36.80	$7.10	$12.60	$0.00	$56.50
	06/01/2016	$37.55	$7.10	$12.60	$0.00	$57.25
	12/01/2016	$38.55	$7.10	$12.60	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2013	$33.05	$7.10	$12.60	$0.00	$52.75
	12/01/2013	$33.80	$7.10	$12.60	$0.00	$53.50
	06/01/2014	$34.55	$7.10	$12.60	$0.00	$54.25
	12/01/2014	$35.30	$7.10	$12.60	$0.00	$55.00
	06/01/2015	$36.05	$7.10	$12.60	$0.00	$55.75
	12/01/2015	$36.80	$7.10	$12.60	$0.00	$56.50
	06/01/2016	$37.55	$7.10	$12.60	$0.00	$57.25
	12/01/2016	$38.55	$7.10	$12.60	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 1 (Metro Boston)*	09/01/2013	$40.35	$9.80	$15.61	$0.00	$65.76
	03/01/2014	$41.18	$9.80	$15.61	$0.00	$66.59
	09/01/2014	$42.20	$9.80	$15.61	$0.00	$67.61
	03/01/2015	$43.22	$9.80	$15.61	$0.00	$68.63

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER - Zone 1 Metro Boston*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.18	$9.80	$1.57	$0.00	$31.55
2	60	$24.21	$9.80	$1.57	$0.00	$35.58
3	70	$28.25	$9.80	$10.90	$0.00	$48.95
4	75	$30.26	$9.80	$10.90	$0.00	$50.96
5	80	$32.28	$9.80	$12.47	$0.00	$54.55
6	80	$32.28	$9.80	$12.47	$0.00	$54.55
7	90	$36.32	$9.80	$14.04	$0.00	$60.16
8	90	$36.32	$9.80	$14.04	$0.00	$60.16

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.59	$9.80	$1.57	$0.00	$31.96
2	60	$24.71	$9.80	$1.57	$0.00	$36.08
3	70	$28.83	$9.80	$10.90	$0.00	$49.53
4	75	$30.89	$9.80	$10.90	$0.00	$51.59
5	80	$32.94	$9.80	$12.47	$0.00	$55.21
6	80	$32.94	$9.80	$12.47	$0.00	$55.21
7	90	$37.06	$9.80	$14.04	$0.00	$60.90
8	90	$37.06	$9.80	$14.04	$0.00	$60.90

Notes:

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (BOSTON)*	07/01/2013	$42.68	$10.90	$18.71	$1.30	$73.59
	01/01/2014	$43.60	$10.90	$18.71	$1.30	$74.51
	07/01/2014	$44.20	$10.90	$18.71	$1.30	$75.11
	01/01/2015	$45.14	$10.90	$18.71	$1.30	$76.05
	07/01/2015	$45.72	$10.90	$18.71	$1.30	$76.63
	01/01/2016	$46.64	$10.90	$18.71	$1.30	$77.55

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.34	$10.90	$12.21	$1.30	$45.75
2	60	$25.61	$10.90	$13.71	$1.30	$51.52
3	65	$27.74	$10.90	$14.71	$1.30	$54.65
4	70	$29.88	$10.90	$15.71	$1.30	$57.79
5	75	$32.01	$10.90	$16.71	$1.30	$60.92
6	80	$34.14	$10.90	$17.71	$1.30	$64.05
7	90	$38.41	$10.90	$18.71	$1.30	$69.32

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.80	$10.90	$12.21	$1.30	$46.21
2	60	$26.16	$10.90	$13.71	$1.30	$52.07
3	65	$28.34	$10.90	$14.71	$1.30	$55.25
4	70	$30.52	$10.90	$15.71	$1.30	$58.43
5	75	$32.70	$10.90	$16.71	$1.30	$61.61
6	80	$34.88	$10.90	$17.71	$1.30	$64.79
7	90	$39.24	$10.90	$18.71	$1.30	$70.15

Notes:

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

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$41.34	$10.00	$13.55	$0.00	$64.89
	12/01/2013	$42.12	$10.00	$13.55	$0.00	$65.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$28.19	$10.00	$13.55	$0.00	$51.74
	12/01/2013	$28.74	$10.00	$13.55	$0.00	$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 1*	07/01/2013	$45.41	$7.85	$15.85	$0.00	$69.11
	01/01/2014	$45.91	$7.85	$16.10	$0.00	$69.86
	07/01/2014	$46.76	$7.85	$16.10	$0.00	$70.71
	01/01/2015	$47.66	$7.85	$16.10	$0.00	$71.61
	07/01/2015	$48.56	$7.85	$16.10	$0.00	$72.51
	01/01/2016	$49.51	$7.85	$16.10	$0.00	$73.46
	07/01/2016	$50.46	$7.85	$16.10	$0.00	$74.41
	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.71	$7.85	$0.00	$0.00	$30.56
2	55	$24.98	$7.85	$3.58	$0.00	$36.41
3	60	$27.25	$7.85	$3.90	$0.00	$39.00
4	65	$29.52	$7.85	$4.23	$0.00	$41.60
5	70	$31.79	$7.85	$13.90	$0.00	$53.54
6	75	$34.06	$7.85	$14.23	$0.00	$56.14
7	80	$36.33	$7.85	$14.55	$0.00	$58.73
8	90	$40.87	$7.85	$15.20	$0.00	$63.92

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.96	$7.85	$0.00	$0.00	$30.81
2	55	$25.25	$7.85	$3.66	$0.00	$36.76
3	60	$27.55	$7.85	$3.99	$0.00	$39.39
4	65	$29.84	$7.85	$4.32	$0.00	$42.01
5	70	$32.14	$7.85	$14.11	$0.00	$54.10
6	75	$34.43	$7.85	$14.44	$0.00	$56.72
7	80	$36.73	$7.85	$14.77	$0.00	$59.35
8	90	$41.32	$7.85	$15.44	$0.00	$64.61

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 1*	12/01/2011	$31.80	$7.10	$12.45	$0.00	$51.35
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 1*	12/01/2011	$32.80	$7.10	$12.45	$0.00	$52.35
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 1*	12/01/2011	$32.55	$7.10	$12.45	$0.00	$52.10
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 1*	12/01/2011	$32.80	$7.10	$12.45	$0.00	$52.35

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 1*	12/01/2011	$32.55	$7.10	$12.45	$0.00	$52.10
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 1*	12/01/2011	$31.80	$7.10	$12.45	$0.00	$51.35
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$56.14	$9.80	$18.17	$0.00	$84.11
	08/01/2014	$58.24	$9.80	$18.17	$0.00	$86.21
	08/01/2015	$60.34	$9.80	$18.17	$0.00	$88.31
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$40.10	$9.80	$18.17	$0.00	$68.07
	08/01/2014	$41.60	$9.80	$18.17	$0.00	$69.57
	08/01/2015	$43.10	$9.80	$18.17	$0.00	$71.07
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$60.15	$9.80	$18.17	$0.00	$88.12
	08/01/2014	$62.40	$9.80	$18.17	$0.00	$90.37
	08/01/2015	$64.65	$9.80	$18.17	$0.00	$92.62
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$84.21	$9.80	$18.17	$0.00	$112.18
	08/01/2014	$87.36	$9.80	$18.17	$0.00	$115.33
	08/01/2015	$90.51	$9.80	$18.17	$0.00	$118.48
DRAWBRIDGE OPERATOR (Construction) *ELECTRICIANS LOCAL 103*	09/01/2013	$43.96	$13.00	$14.42	$0.00	$71.38
	03/01/2014	$44.45	$13.00	$14.68	$0.00	$72.13
	09/01/2014	$45.12	$13.00	$14.70	$0.00	$72.82
	03/01/2015	$45.84	$13.00	$14.72	$0.00	$73.56
	09/01/2015	$46.80	$13.00	$14.75	$0.00	$74.55
	03/01/2016	$47.75	$13.00	$14.78	$0.00	$75.53
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN *ELECTRICIANS LOCAL 103*	09/01/2013	$43.96	$13.00	$14.42	$0.00	$71.38
	03/01/2014	$44.45	$13.00	$14.68	$0.00	$72.13
	09/01/2014	$45.12	$13.00	$14.70	$0.00	$72.82
	03/01/2015	$45.84	$13.00	$14.72	$0.00	$73.56
	09/01/2015	$46.80	$13.00	$14.75	$0.00	$74.55
	03/01/2016	$47.75	$13.00	$14.78	$0.00	$75.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.58	$13.00	$0.53	$0.00	$31.11
2	40	$17.58	$13.00	$0.53	$0.00	$31.11
3	45	$19.78	$13.00	$10.78	$0.00	$43.56
4	45	$19.78	$13.00	$10.78	$0.00	$43.56
5	50	$21.98	$13.00	$11.11	$0.00	$46.09
6	55	$24.18	$13.00	$11.45	$0.00	$48.63
7	60	$26.38	$13.00	$11.77	$0.00	$51.15
8	65	$28.57	$13.00	$12.11	$0.00	$53.68
9	70	$30.77	$13.00	$12.43	$0.00	$56.20
10	75	$32.97	$13.00	$12.77	$0.00	$58.74

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.78	$13.00	$0.53	$0.00	$31.31
2	40	$17.78	$13.00	$0.53	$0.00	$31.31
3	45	$20.00	$13.00	$11.04	$0.00	$44.04
4	45	$20.00	$13.00	$11.04	$0.00	$44.04
5	50	$22.23	$13.00	$11.37	$0.00	$46.60
6	55	$24.45	$13.00	$11.70	$0.00	$49.15
7	60	$26.67	$13.00	$12.03	$0.00	$51.70
8	65	$28.89	$13.00	$12.37	$0.00	$54.26
9	70	$31.12	$13.00	$12.69	$0.00	$56.81
10	75	$33.34	$13.00	$13.03	$0.00	$59.37

Notes: :

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

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2012	$52.45	$8.78	$6.96	$0.00	$68.19

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2012

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

Notes:

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

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2012	$38.59	$8.78	$6.96	$0.00	$54.33
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2013	$38.50	$10.00	$13.02	$0.00	$61.52
	11/01/2013	$38.73	$10.00	$13.55	$0.00	$62.28
	05/01/2014	$39.50	$10.00	$13.55	$0.00	$63.05
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2013	$39.91	$10.00	$13.02	$0.00	$62.93
	11/01/2013	$40.15	$10.00	$13.55	$0.00	$63.70
	05/01/2014	$40.92	$10.00	$13.55	$0.00	$64.47
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2013	$21.17	$10.00	$13.02	$0.00	$44.19
	11/01/2013	$21.10	$10.00	$13.55	$0.00	$44.65
	05/01/2014	$21.55	$10.00	$13.55	$0.00	$45.10
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 103*	09/01/2013	$43.96	$13.00	$14.42	$0.00	$71.38
	03/01/2014	$44.45	$13.00	$14.68	$0.00	$72.13
	09/01/2014	$45.12	$13.00	$14.70	$0.00	$72.82
	03/01/2015	$45.84	$13.00	$14.72	$0.00	$73.56
	09/01/2015	$46.80	$13.00	$14.75	$0.00	$74.55
	03/01/2016	$47.75	$13.00	$14.78	$0.00	$75.53
For apprentice rates see "Apprentice- ELECTRICIAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING *ELECTRICIANS*	09/01/2013	$32.97	$13.00	$12.77	$0.00	$58.74
LOCAL 103	03/01/2014	$33.44	$13.00	$13.03	$0.00	$59.47
	09/01/2014	$33.84	$13.00	$13.05	$0.00	$59.89
	03/01/2015	$34.38	$13.00	$13.06	$0.00	$60.44
	09/01/2015	$35.10	$13.00	$13.08	$0.00	$61.18
	03/01/2016	$35.81	$13.00	$13.10	$0.00	$61.91
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER)	06/01/2013	$33.73	$10.00	$13.55	$0.00	$57.28
OPERATING ENGINEERS LOCAL 4	12/01/2013	$34.39	$10.00	$13.55	$0.00	$57.94
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER	06/01/2013	$20.50	$7.10	$12.45	$0.00	$40.05
LABORERS - ZONE 1	12/01/2013	$20.50	$7.10	$12.45	$0.00	$40.05
	06/01/2014	$20.50	$7.10	$12.45	$0.00	$40.05
	12/01/2014	$20.50	$7.10	$12.45	$0.00	$40.05
	06/01/2015	$20.50	$7.10	$12.45	$0.00	$40.05
	12/01/2015	$20.50	$7.10	$12.45	$0.00	$40.05
	06/01/2016	$20.50	$7.10	$12.45	$0.00	$40.05
	12/01/2016	$20.50	$7.10	$12.45	$0.00	$40.05
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER	09/01/2013	$38.61	$9.80	$16.71	$0.00	$65.12
FLOORCOVERERS LOCAL 2168 ZONE I	03/01/2014	$38.61	$9.80	$16.71	$0.00	$65.12

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.31	$9.80	$1.79	$0.00	$30.90
2	55	$21.24	$9.80	$1.79	$0.00	$32.83
3	60	$23.17	$9.80	$11.34	$0.00	$44.31
4	65	$25.10	$9.80	$11.34	$0.00	$46.24
5	70	$27.03	$9.80	$13.13	$0.00	$49.96
6	75	$28.96	$9.80	$13.13	$0.00	$51.89
7	80	$30.89	$9.80	$14.92	$0.00	$55.61
8	85	$32.82	$9.80	$14.92	$0.00	$57.54

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.31	$9.80	$1.79	$0.00	$30.90
2	55	$21.24	$9.80	$1.79	$0.00	$32.83
3	60	$23.17	$9.80	$11.34	$0.00	$44.31
4	65	$25.10	$9.80	$11.34	$0.00	$46.24
5	70	$27.03	$9.80	$13.13	$0.00	$49.96
6	75	$28.96	$9.80	$13.13	$0.00	$51.89
7	80	$30.89	$9.80	$14.92	$0.00	$55.61
8	85	$32.82	$9.80	$14.92	$0.00	$57.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$28.19	$10.00	$13.55	$0.00	$51.74
	12/01/2013	$28.74	$10.00	$13.55	$0.00	$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 1)*	07/01/2013	$40.70	$7.85	$15.85	$0.00	$64.40
	01/01/2014	$41.20	$7.85	$16.10	$0.00	$65.15
	07/01/2014	$42.05	$7.85	$16.10	$0.00	$66.00
	01/01/2015	$42.95	$7.85	$16.10	$0.00	$66.90
	07/01/2015	$43.85	$7.85	$16.10	$0.00	$67.80
	01/01/2016	$44.80	$7.85	$16.10	$0.00	$68.75
	07/01/2016	$45.75	$7.85	$16.10	$0.00	$69.70
	01/01/2017	$46.70	$7.85	$16.10	$0.00	$70.65

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *GLAZIER - Local 35 Zone 1*

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.35	$7.85	$0.00	$0.00	$28.20
2	55	$22.39	$7.85	$3.58	$0.00	$33.82
3	60	$24.42	$7.85	$3.90	$0.00	$36.17
4	65	$26.46	$7.85	$4.23	$0.00	$38.54
5	70	$28.49	$7.85	$13.90	$0.00	$50.24
6	75	$30.53	$7.85	$14.23	$0.00	$52.61
7	80	$32.56	$7.85	$14.55	$0.00	$54.96
8	90	$36.63	$7.85	$15.20	$0.00	$59.68

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.60	$7.85	$0.00	$0.00	$28.45
2	55	$22.66	$7.85	$3.66	$0.00	$34.17
3	60	$24.72	$7.85	$3.99	$0.00	$36.56
4	65	$26.78	$7.85	$4.32	$0.00	$38.95
5	70	$28.84	$7.85	$14.11	$0.00	$50.80
6	75	$30.90	$7.85	$14.44	$0.00	$53.19
7	80	$32.96	$7.85	$14.77	$0.00	$55.58
8	90	$37.08	$7.85	$15.44	$0.00	$60.37

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.19	$10.00	$0.00	$0.00	$32.19
2	60	$24.20	$10.00	$13.55	$0.00	$47.75
3	65	$26.22	$10.00	$13.55	$0.00	$49.77
4	70	$28.24	$10.00	$13.55	$0.00	$51.79
5	75	$30.26	$10.00	$13.55	$0.00	$53.81
6	80	$32.27	$10.00	$13.55	$0.00	$55.82
7	85	$34.29	$10.00	$13.55	$0.00	$57.84
8	90	$36.31	$10.00	$13.55	$0.00	$59.86

Effective Date - 12/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.62	$10.00	$0.00	$0.00	$32.62
2	60	$24.67	$10.00	$13.55	$0.00	$48.22
3	65	$26.73	$10.00	$13.55	$0.00	$50.28
4	70	$28.78	$10.00	$13.55	$0.00	$52.33
5	75	$30.84	$10.00	$13.55	$0.00	$54.39
6	80	$32.90	$10.00	$13.55	$0.00	$56.45
7	85	$34.95	$10.00	$13.55	$0.00	$58.50
8	90	$37.01	$10.00	$13.55	$0.00	$60.56

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	09/01/2013	$42.35	$9.82	$19.08	$2.14	$73.39
	02/01/2014	$43.20	$9.82	$19.08	$2.14	$74.24
	08/01/2014	$44.05	$9.82	$19.08	$2.14	$75.09
	02/01/2015	$44.95	$9.82	$19.08	$2.14	$75.99
	08/01/2015	$45.95	$9.82	$19.08	$2.14	$76.99
	02/01/2016	$46.95	$9.82	$19.08	$2.14	$77.99
	08/01/2016	$48.10	$9.82	$19.08	$2.14	$79.14
	02/01/2017	$49.20	$9.82	$19.08	$2.14	$80.24
	08/01/2017	$50.30	$9.82	$19.08	$2.14	$81.34
	02/01/2018	$51.45	$9.82	$19.08	$2.14	$82.49

For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 103*	09/01/2013	$43.96	$13.00	$14.42	$0.00	$71.38
	03/01/2014	$44.45	$13.00	$14.68	$0.00	$72.13
	09/01/2014	$45.12	$13.00	$14.70	$0.00	$72.82
	03/01/2015	$45.84	$13.00	$14.72	$0.00	$73.56
	09/01/2015	$46.80	$13.00	$14.75	$0.00	$74.55
	03/01/2016	$47.75	$13.00	$14.78	$0.00	$75.53

For apprentice rates see "Apprentice- ELECTRICIAN"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	09/01/2013	$42.35	$9.82	$19.08	$2.14	$73.39
	02/01/2014	$43.20	$9.82	$19.08	$2.14	$74.24
	08/01/2014	$44.05	$9.82	$19.08	$2.14	$75.09
	02/01/2015	$44.95	$9.82	$19.08	$2.14	$75.99
	08/01/2015	$45.95	$9.82	$19.08	$2.14	$76.99
	02/01/2016	$46.95	$9.82	$19.08	$2.14	$77.99
	08/01/2016	$48.10	$9.82	$19.08	$2.14	$79.14
	02/01/2017	$49.20	$9.82	$19.08	$2.14	$80.24
	08/01/2017	$50.30	$9.82	$19.08	$2.14	$81.34
	02/01/2018	$51.45	$9.82	$19.08	$2.14	$82.49
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 1*	06/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	12/01/2013	$34.55	$7.10	$12.45	$0.00	$54.10
	06/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	12/01/2014	$36.05	$7.10	$12.45	$0.00	$55.60
	06/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	12/01/2015	$37.55	$7.10	$12.45	$0.00	$57.10
	06/01/2016	$38.30	$7.10	$12.45	$0.00	$57.85
	12/01/2016	$39.30	$7.10	$12.45	$0.00	$58.85
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2013	$42.11	$10.95	$12.10	$0.00	$65.16
	09/01/2014	$44.11	$10.95	$12.10	$0.00	$67.16

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.06	$10.95	$9.00	$0.00	$41.01
2	60	$25.27	$10.95	$9.62	$0.00	$45.84
3	70	$29.48	$10.95	$10.24	$0.00	$50.67
4	80	$33.69	$10.95	$10.86	$0.00	$55.50

Effective Date - 09/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.06	$10.95	$9.00	$0.00	$42.01
2	60	$26.47	$10.95	$9.62	$0.00	$47.04
3	70	$30.88	$10.95	$10.24	$0.00	$52.07
4	80	$35.29	$10.95	$10.86	$0.00	$57.10

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (BOSTON AREA)*	09/16/2013	$40.85	$7.70	$18.60	$0.00	$67.15

Apprentice - *IRONWORKER - Local 7 Boston*

Effective Date - 09/16/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$24.51	$7.70	$18.60	$0.00	$50.81
2	70	$28.60	$7.70	$18.60	$0.00	$54.90
3	75	$30.64	$7.70	$18.60	$0.00	$56.94
4	80	$32.68	$7.70	$18.60	$0.00	$58.98
5	85	$34.72	$7.70	$18.60	$0.00	$61.02
6	90	$36.77	$7.70	$18.60	$0.00	$63.07

Notes:
** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER *LABORERS - ZONE 1*	06/01/2013	$33.05	$7.10	$12.45	$0.00	$52.60
	12/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	06/01/2014	$34.55	$7.10	$12.45	$0.00	$54.10
	12/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	06/01/2015	$36.05	$7.10	$12.45	$0.00	$55.60
	12/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	06/01/2016	$37.55	$7.10	$12.45	$0.00	$57.10
	12/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10

Apprentice - *LABORER - Zone 1*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$19.83	$7.10	$12.45	$0.00	$39.38
2	70	$23.14	$7.10	$12.45	$0.00	$42.69
3	80	$26.44	$7.10	$12.45	$0.00	$45.99
4	90	$29.75	$7.10	$12.45	$0.00	$49.30

Effective Date - 12/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.28	$7.10	$12.45	$0.00	$39.83
2	70	$23.66	$7.10	$12.45	$0.00	$43.21
3	80	$27.04	$7.10	$12.45	$0.00	$46.59
4	90	$30.42	$7.10	$12.45	$0.00	$49.97

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 1*	06/01/2013	$33.05	$7.10	$12.45	$0.00	$52.60
	12/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	06/01/2014	$34.55	$7.10	$12.45	$0.00	$54.10
	12/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	06/01/2015	$36.05	$7.10	$12.45	$0.00	$55.60
	12/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	06/01/2016	$37.55	$7.10	$12.45	$0.00	$57.10
	12/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10

For apprentice rates see "Apprentice- LABORER"

LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 1*	06/01/2013	$33.05	$7.10	$12.45	$0.00	$52.60
	12/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	06/01/2014	$34.55	$7.10	$12.45	$0.00	$54.10
	12/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	06/01/2015	$36.05	$7.10	$12.45	$0.00	$55.60
	12/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	06/01/2016	$37.55	$7.10	$12.45	$0.00	$57.10
	12/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 1*	12/01/2011	$31.80	$7.10	$12.45	$0.00	$51.35
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 1*	06/01/2013	$33.05	$7.10	$12.45	$0.00	$52.60
	12/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	06/01/2014	$34.55	$7.10	$12.45	$0.00	$54.10
	12/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	06/01/2015	$36.05	$7.10	$12.45	$0.00	$55.60
	12/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	06/01/2016	$37.55	$7.10	$12.45	$0.00	$57.10
	12/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 1*	06/01/2013	$33.05	$7.10	$12.45	$0.00	$52.60
	12/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	06/01/2014	$34.55	$7.10	$12.45	$0.00	$54.10
	12/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	06/01/2015	$36.05	$7.10	$12.45	$0.00	$55.60
	12/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	06/01/2016	$37.55	$7.10	$12.45	$0.00	$57.10
	12/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10
This classification applies to the wholesale removal of standing trees including all associated trimming of branches and limbs, and applies to the removal of branches at locations not on or around utility lines. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2013	$36.66	$10.18	$16.83	$0.00	$63.67
	02/01/2014	$37.11	$10.18	$16.83	$0.00	$64.12
	08/01/2014	$37.82	$10.18	$16.90	$0.00	$64.90
	02/01/2015	$38.27	$10.18	$16.90	$0.00	$65.35
	08/01/2015	$38.98	$10.18	$16.97	$0.00	$66.13
	02/01/2016	$39.43	$10.18	$16.97	$0.00	$66.58
	08/01/2016	$40.13	$10.18	$17.05	$0.00	$67.36
	02/01/2017	$40.59	$10.18	$17.05	$0.00	$67.82

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

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.33	$10.18	$16.83	$0.00	$45.34
2	60	$22.00	$10.18	$16.83	$0.00	$49.01
3	70	$25.66	$10.18	$16.83	$0.00	$52.67
4	80	$29.33	$10.18	$16.83	$0.00	$56.34
5	90	$32.99	$10.18	$16.83	$0.00	$60.00

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.56	$10.18	$16.83	$0.00	$45.57
2	60	$22.27	$10.18	$16.83	$0.00	$49.28
3	70	$25.98	$10.18	$16.83	$0.00	$52.99
4	80	$29.69	$10.18	$16.83	$0.00	$56.70
5	90	$33.40	$10.18	$16.83	$0.00	$60.41

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2013	$48.10	$10.18	$18.15	$0.00	$76.43
	02/01/2014	$48.66	$10.18	$18.15	$0.00	$76.99
	08/01/2014	$49.56	$10.18	$18.22	$0.00	$77.96
	02/01/2015	$50.12	$10.18	$18.22	$0.00	$78.52
	08/01/2015	$51.02	$10.18	$18.29	$0.00	$79.49
	02/01/2016	$51.59	$10.18	$18.29	$0.00	$80.06
	08/01/2016	$52.49	$10.18	$18.37	$0.00	$81.04
	02/01/2017	$53.06	$10.18	$18.37	$0.00	$81.61

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.05	$10.18	$18.15	$0.00	$52.38
2	60	$28.86	$10.18	$18.15	$0.00	$57.19
3	70	$33.67	$10.18	$18.15	$0.00	$62.00
4	80	$38.48	$10.18	$18.15	$0.00	$66.81
5	90	$43.29	$10.18	$18.15	$0.00	$71.62

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.33	$10.18	$18.15	$0.00	$52.66
2	60	$29.20	$10.18	$18.15	$0.00	$57.53
3	70	$34.06	$10.18	$18.15	$0.00	$62.39
4	80	$38.93	$10.18	$18.15	$0.00	$67.26
5	90	$43.79	$10.18	$18.15	$0.00	$72.12

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 1) *MILLWRIGHTS LOCAL 1121 - Zone 1*	10/01/2013	$35.45	$9.80	$15.76	$0.00	$61.01
	04/01/2014	$36.23	$9.80	$15.76	$0.00	$61.79
	10/01/2014	$37.18	$9.80	$15.76	$0.00	$62.74
	04/01/2015	$38.14	$9.80	$15.76	$0.00	$63.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 1*

Effective Date - 10/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$19.50	$9.80	$4.32	$0.00	$33.62
2	65	$23.04	$9.80	$13.01	$0.00	$45.85
3	75	$26.59	$9.80	$13.80	$0.00	$50.19
4	85	$30.13	$9.80	$14.58	$0.00	$54.51

Effective Date - 04/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$19.93	$9.80	$4.32	$0.00	$34.05
2	65	$23.55	$9.80	$13.01	$0.00	$46.36
3	75	$27.17	$9.80	$13.80	$0.00	$50.77
4	85	$30.80	$9.80	$14.58	$0.00	$55.18

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$21.17	$10.00	$13.55	$0.00	$44.72
	12/01/2013	$21.59	$10.00	$13.55	$0.00	$45.14
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$24.57	$10.00	$13.55	$0.00	$48.12
	12/01/2013	$25.06	$10.00	$13.55	$0.00	$48.61
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 1*	07/01/2013	$45.41	$7.85	$15.85	$0.00	$69.11
	01/01/2014	$45.91	$7.85	$16.10	$0.00	$69.86
	07/01/2014	$46.76	$7.85	$16.10	$0.00	$70.71
	01/01/2015	$47.66	$7.85	$16.10	$0.00	$71.61
	07/01/2015	$48.56	$7.85	$16.10	$0.00	$72.51
	01/01/2016	$49.51	$7.85	$16.10	$0.00	$73.46
	07/01/2016	$50.46	$7.85	$16.10	$0.00	$74.41
	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.71	$7.85	$0.00	$0.00	$30.56
2	55	$24.98	$7.85	$3.58	$0.00	$36.41
3	60	$27.25	$7.85	$3.90	$0.00	$39.00
4	65	$29.52	$7.85	$4.23	$0.00	$41.60
5	70	$31.79	$7.85	$13.90	$0.00	$53.54
6	75	$34.06	$7.85	$14.23	$0.00	$56.14
7	80	$36.33	$7.85	$14.55	$0.00	$58.73
8	90	$40.87	$7.85	$15.20	$0.00	$63.92

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.96	$7.85	$0.00	$0.00	$30.81
2	55	$25.25	$7.85	$3.66	$0.00	$36.76
3	60	$27.55	$7.85	$3.99	$0.00	$39.39
4	65	$29.84	$7.85	$4.32	$0.00	$42.01
5	70	$32.14	$7.85	$14.11	$0.00	$54.10
6	75	$34.43	$7.85	$14.44	$0.00	$56.72
7	80	$36.73	$7.85	$14.77	$0.00	$59.35
8	90	$41.32	$7.85	$15.44	$0.00	$64.61

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	07/01/2013	$42.10	$7.85	$15.85	$0.00	$65.80
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. *PAINTERS LOCAL 35 - ZONE 1*	01/01/2014	$42.60	$7.85	$16.10	$0.00	$66.55
	07/01/2014	$43.45	$7.85	$16.10	$0.00	$67.40
	01/01/2015	$44.35	$7.85	$16.10	$0.00	$68.30
	07/01/2015	$45.25	$7.85	$16.10	$0.00	$69.20
	01/01/2016	$46.20	$7.85	$16.10	$0.00	$70.15
	07/01/2016	$47.15	$7.85	$16.10	$0.00	$71.10
	01/01/2017	$48.10	$7.85	$16.10	$0.00	$72.05

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 1 - Spray/Sandblast - New*

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.05	$7.85	$0.00	$0.00	$28.90
2	55	$23.16	$7.85	$3.58	$0.00	$34.59
3	60	$25.26	$7.85	$3.90	$0.00	$37.01
4	65	$27.37	$7.85	$4.23	$0.00	$39.45
5	70	$29.47	$7.85	$13.90	$0.00	$51.22
6	75	$31.58	$7.85	$14.23	$0.00	$53.66
7	80	$33.68	$7.85	$14.55	$0.00	$56.08
8	90	$37.89	$7.85	$15.20	$0.00	$60.94

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.30	$7.85	$0.00	$0.00	$29.15
2	55	$23.43	$7.85	$3.66	$0.00	$34.94
3	60	$25.56	$7.85	$3.99	$0.00	$37.40
4	65	$27.69	$7.85	$4.32	$0.00	$39.86
5	70	$29.82	$7.85	$14.11	$0.00	$51.78
6	75	$31.95	$7.85	$14.44	$0.00	$54.24
7	80	$34.08	$7.85	$14.77	$0.00	$56.70
8	90	$38.34	$7.85	$15.44	$0.00	$61.63

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 1*	07/01/2013	$40.16	$7.85	$15.85	$0.00	$63.86
	01/01/2014	$40.66	$7.85	$16.10	$0.00	$64.61
	07/01/2014	$41.51	$7.85	$16.10	$0.00	$65.46
	01/01/2015	$42.41	$7.85	$16.10	$0.00	$66.36
	07/01/2015	$43.31	$7.85	$16.10	$0.00	$67.26
	01/01/2016	$44.26	$7.85	$16.10	$0.00	$68.21
	07/01/2016	$45.21	$7.85	$16.10	$0.00	$69.16
	01/01/2017	$46.16	$7.85	$16.10	$0.00	$70.11

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 1 - Spray/Sandblast - Repaint*

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.08	$7.85	$0.00	$0.00	$27.93
2	55	$22.09	$7.85	$3.58	$0.00	$33.52
3	60	$24.10	$7.85	$3.90	$0.00	$35.85
4	65	$26.10	$7.85	$4.23	$0.00	$38.18
5	70	$28.11	$7.85	$13.90	$0.00	$49.86
6	75	$30.12	$7.85	$14.23	$0.00	$52.20
7	80	$32.13	$7.85	$14.55	$0.00	$54.53
8	90	$36.14	$7.85	$15.20	$0.00	$59.19

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.33	$7.85	$0.00	$0.00	$28.18
2	55	$22.36	$7.85	$3.66	$0.00	$33.87
3	60	$24.40	$7.85	$3.99	$0.00	$36.24
4	65	$26.43	$7.85	$4.32	$0.00	$38.60
5	70	$28.46	$7.85	$14.11	$0.00	$50.42
6	75	$30.50	$7.85	$14.44	$0.00	$52.79
7	80	$32.53	$7.85	$14.77	$0.00	$55.15
8	90	$36.59	$7.85	$15.44	$0.00	$59.88

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) *LABORERS - ZONE 1*	06/01/2013	$33.05	$7.10	$12.45	$0.00	$52.60
	12/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	06/01/2014	$34.55	$7.10	$12.45	$0.00	$54.10
	12/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	06/01/2015	$36.05	$7.10	$12.45	$0.00	$55.60
	12/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	06/01/2016	$37.55	$7.10	$12.45	$0.00	$57.10
	12/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10
For Apprentice rates see "Apprentice- LABORER"						
PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 1*	07/01/2013	$40.70	$7.85	$15.85	$0.00	$64.40
	01/01/2014	$41.20	$7.85	$16.10	$0.00	$65.15
	07/01/2014	$42.05	$7.85	$16.10	$0.00	$66.00
	01/01/2015	$42.95	$7.85	$16.10	$0.00	$66.90
	07/01/2015	$43.85	$7.85	$16.10	$0.00	$67.80
	01/01/2016	$44.80	$7.85	$16.10	$0.00	$68.75
	07/01/2016	$45.75	$7.85	$16.10	$0.00	$69.70
	01/01/2017	$46.70	$7.85	$16.10	$0.00	$70.65

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 1 - BRUSH NEW*

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.35	$7.85	$0.00	$0.00	$28.20
2	55	$22.39	$7.85	$3.58	$0.00	$33.82
3	60	$24.42	$7.85	$3.90	$0.00	$36.17
4	65	$26.46	$7.85	$4.23	$0.00	$38.54
5	70	$28.49	$7.85	$13.90	$0.00	$50.24
6	75	$30.53	$7.85	$14.23	$0.00	$52.61
7	80	$32.56	$7.85	$14.55	$0.00	$54.96
8	90	$36.63	$7.85	$15.20	$0.00	$59.68

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.60	$7.85	$0.00	$0.00	$28.45
2	55	$22.66	$7.85	$3.66	$0.00	$34.17
3	60	$24.72	$7.85	$3.99	$0.00	$36.56
4	65	$26.78	$7.85	$4.32	$0.00	$38.95
5	70	$28.84	$7.85	$14.11	$0.00	$50.80
6	75	$30.90	$7.85	$14.44	$0.00	$53.19
7	80	$32.96	$7.85	$14.77	$0.00	$55.58
8	90	$37.08	$7.85	$15.44	$0.00	$60.37

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 1*	07/01/2013	$38.76	$7.85	$15.85	$0.00	$62.46
	01/01/2014	$39.26	$7.85	$16.10	$0.00	$63.21
	07/01/2014	$40.11	$7.85	$16.10	$0.00	$64.06
	01/01/2015	$41.01	$7.85	$16.10	$0.00	$64.96
	07/01/2015	$41.91	$7.85	$16.10	$0.00	$65.86
	01/01/2016	$42.86	$7.85	$16.10	$0.00	$66.81
	07/01/2016	$43.81	$7.85	$16.10	$0.00	$67.76
	01/01/2017	$44.76	$7.85	$16.10	$0.00	$68.71

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 1 - BRUSH REPAINT*

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.38	$7.85	$0.00	$0.00	$27.23
2	55	$21.32	$7.85	$3.58	$0.00	$32.75
3	60	$23.26	$7.85	$3.90	$0.00	$35.01
4	65	$25.19	$7.85	$4.23	$0.00	$37.27
5	70	$27.13	$7.85	$13.90	$0.00	$48.88
6	75	$29.07	$7.85	$14.23	$0.00	$51.15
7	80	$31.01	$7.85	$14.55	$0.00	$53.41
8	90	$34.88	$7.85	$15.20	$0.00	$57.93

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.63	$7.85	$0.00	$0.00	$27.48
2	55	$21.59	$7.85	$3.66	$0.00	$33.10
3	60	$23.56	$7.85	$3.99	$0.00	$35.40
4	65	$25.52	$7.85	$4.32	$0.00	$37.69
5	70	$27.48	$7.85	$14.11	$0.00	$49.44
6	75	$29.45	$7.85	$14.44	$0.00	$51.74
7	80	$31.41	$7.85	$14.77	$0.00	$54.03
8	90	$35.33	$7.85	$15.44	$0.00	$58.62

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$31.38	$8.91	$8.00	$0.00	$48.29
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$40.10	$9.80	$18.17	$0.00	$68.07
	08/01/2014	$41.60	$9.80	$18.17	$0.00	$69.57
	08/01/2015	$43.10	$9.80	$18.17	$0.00	$71.07
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2013	$40.10	$9.80	$18.17	$0.00	$68.07
	08/01/2014	$41.60	$9.80	$18.17	$0.00	$69.57
	08/01/2015	$43.10	$9.80	$18.17	$0.00	$71.07

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.05	$9.80	$18.17	$0.00	$48.02
2	60	$24.06	$9.80	$18.17	$0.00	$52.03
3	70	$28.07	$9.80	$18.17	$0.00	$56.04
4	75	$30.08	$9.80	$18.17	$0.00	$58.05
5	80	$32.08	$9.80	$18.17	$0.00	$60.05
6	80	$32.08	$9.80	$18.17	$0.00	$60.05
7	90	$36.09	$9.80	$18.17	$0.00	$64.06
8	90	$36.09	$9.80	$18.17	$0.00	$64.06

Effective Date - 08/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.80	$9.80	$18.17	$0.00	$48.77
2	60	$24.96	$9.80	$18.17	$0.00	$52.93
3	70	$29.12	$9.80	$18.17	$0.00	$57.09
4	75	$31.20	$9.80	$18.17	$0.00	$59.17
5	80	$33.28	$9.80	$18.17	$0.00	$61.25
6	80	$33.28	$9.80	$18.17	$0.00	$61.25
7	90	$37.44	$9.80	$18.17	$0.00	$65.41
8	90	$37.44	$9.80	$18.17	$0.00	$65.41

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPEFITTER & STEAMFITTER *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48

Apprentice - *PIPEFITTER - Local 537*

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.74	$8.75	$6.50	$0.00	$34.99
2	45	$22.20	$8.75	$14.39	$0.00	$45.34
3	60	$29.60	$8.75	$14.39	$0.00	$52.74
4	70	$34.54	$8.75	$14.39	$0.00	$57.68
5	80	$39.47	$8.75	$14.39	$0.00	$62.61

Notes:

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

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
PLUMBERS & GASFITTERS *PLUMBERS & GASFITTERS LOCAL 12*	03/01/2013	$49.31	$9.32	$13.29	$0.00	$71.92

Apprentice - *PLUMBER/GASFITTER - Local 12*

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.26	$9.32	$4.97	$0.00	$31.55
2	40	$19.72	$9.32	$5.61	$0.00	$34.65
3	55	$27.12	$9.32	$7.53	$0.00	$43.97
4	65	$32.05	$9.32	$8.81	$0.00	$50.18
5	75	$36.98	$9.32	$10.09	$0.00	$56.39

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic$53.29 Step5 with lic$59.49

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER *LABORERS - ZONE 1*	06/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	12/01/2013	$34.80	$7.10	$12.45	$0.00	$54.35
	06/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	12/01/2014	$36.30	$7.10	$12.45	$0.00	$55.85
	06/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	12/01/2015	$37.80	$7.10	$12.45	$0.00	$57.35
	06/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10
	12/01/2016	$39.55	$7.10	$12.45	$0.00	$59.10
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$28.19	$10.00	$13.55	$0.00	$51.74
	12/01/2013	$28.74	$10.00	$13.55	$0.00	$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS LOCAL 25a*	05/01/2011	$29.99	$7.75	$5.91	$0.00	$43.65
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RESIDENTIAL WOOD FRAME (All Other Work) *CARPENTERS -ZONE 1 (Residential Wood)*	04/01/2011	$37.25	$8.67	$15.51	$0.00	$61.43
RESIDENTIAL WOOD FRAME CARPENTER ** ** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement. *CARPENTERS -ZONE 1 (Residential Wood)*	05/01/2011	$27.49	$6.34	$6.23	$0.00	$40.06

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

Apprentice - *CARPENTER (Residential Wood Frame) - Zone 1*

Effective Date - 05/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$16.49	$6.34	$0.00	$0.00	$22.83
2	60	$16.49	$6.34	$6.23	$0.00	$29.06
3	65	$17.87	$6.34	$6.23	$0.00	$30.44
4	70	$19.24	$6.34	$6.23	$0.00	$31.81
5	75	$20.62	$6.34	$6.23	$0.00	$33.19
6	80	$21.99	$6.34	$6.23	$0.00	$34.56
7	85	$23.37	$6.34	$6.23	$0.00	$35.94
8	90	$24.74	$6.34	$6.23	$0.00	$37.31

Notes:

Apprentice to Journeyworker Ratio:1:5

RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	08/01/2013	$38.31	$10.50	$10.70	$0.00	$59.51
	02/01/2014	$39.21	$10.50	$10.70	$0.00	$60.41
	08/01/2014	$40.11	$10.50	$10.70	$0.00	$61.31
	02/01/2015	$41.01	$10.50	$10.70	$0.00	$62.21
	08/01/2015	$41.91	$10.50	$10.70	$0.00	$63.11
	02/01/2016	$42.81	$10.50	$10.70	$0.00	$64.01

Apprentice - *ROOFER - Local 33*

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.16	$10.50	$3.38	$0.00	$33.04
2	60	$22.99	$10.50	$10.70	$0.00	$44.19
3	65	$24.90	$10.50	$10.70	$0.00	$46.10
4	75	$28.73	$10.50	$10.70	$0.00	$49.93
5	85	$32.56	$10.50	$10.70	$0.00	$53.76

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.61	$10.50	$3.38	$0.00	$33.49
2	60	$23.53	$10.50	$10.70	$0.00	$44.73
3	65	$25.49	$10.50	$10.70	$0.00	$46.69
4	75	$29.41	$10.50	$10.70	$0.00	$50.61
5	85	$33.33	$10.50	$10.70	$0.00	$54.53

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	08/01/2013	$38.56	$10.50	$10.70	$0.00	$59.76
	02/01/2014	$39.46	$10.50	$10.70	$0.00	$60.66
	08/01/2014	$40.36	$10.50	$10.70	$0.00	$61.56
	02/01/2015	$41.26	$10.50	$10.70	$0.00	$62.46
	08/01/2015	$42.16	$10.50	$10.70	$0.00	$63.36
	02/01/2016	$43.06	$10.50	$10.70	$0.00	$64.26
For apprentice rates see "Apprentice- ROOFER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	09/01/2013	$42.35	$9.82	$19.08	$2.14	$73.39
	02/01/2014	$43.20	$9.82	$19.08	$2.14	$74.24
	08/01/2014	$44.05	$9.82	$19.08	$2.14	$75.09
	02/01/2015	$44.95	$9.82	$19.08	$2.14	$75.99
	08/01/2015	$45.95	$9.82	$19.08	$2.14	$76.99
	02/01/2016	$46.95	$9.82	$19.08	$2.14	$77.99
	08/01/2016	$48.10	$9.82	$19.08	$2.14	$79.14
	02/01/2017	$49.20	$9.82	$19.08	$2.14	$80.24
	08/01/2017	$50.30	$9.82	$19.08	$2.14	$81.34
	02/01/2018	$51.45	$9.82	$19.08	$2.14	$82.49

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

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$16.94	$9.82	$4.82	$0.00	$31.58
2	40	$16.94	$9.82	$4.82	$0.00	$31.58
3	45	$19.06	$9.82	$8.45	$1.12	$38.45
4	45	$19.06	$9.82	$8.45	$1.12	$38.45
5	50	$21.18	$9.82	$9.24	$1.21	$41.45
6	50	$21.18	$9.82	$9.49	$1.21	$41.70
7	60	$25.41	$9.82	$10.80	$1.38	$47.41
8	65	$27.53	$9.82	$11.59	$1.47	$50.41
9	75	$31.76	$9.82	$13.16	$1.64	$56.38
10	85	$36.00	$9.82	$14.23	$1.80	$61.85

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.28	$9.82	$4.82	$0.00	$31.92
2	40	$17.28	$9.82	$4.82	$0.00	$31.92
3	45	$19.44	$9.82	$8.45	$1.12	$38.83
4	45	$19.44	$9.82	$8.45	$1.12	$38.83
5	50	$21.60	$9.82	$9.24	$1.21	$41.87
6	50	$21.60	$9.82	$9.49	$1.21	$42.12
7	60	$25.92	$9.82	$10.80	$1.38	$47.92
8	65	$28.08	$9.82	$11.59	$1.47	$50.96
9	75	$32.40	$9.82	$13.16	$1.64	$57.02
10	85	$36.72	$9.82	$14.23	$1.80	$62.57

Notes:
Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SIGN ERECTOR *PAINTERS LOCAL 35 - ZONE 1*	06/01/2013	$25.81	$7.07	$7.05	$0.00	$39.93

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SIGN ERECTOR - Local 35 Zone 1*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$12.91	$7.07	$0.00	$0.00	$19.98
2	55	$14.20	$7.07	$2.45	$0.00	$23.72
3	60	$15.49	$7.07	$2.45	$0.00	$25.01
4	65	$16.78	$7.07	$2.45	$0.00	$26.30
5	70	$18.07	$7.07	$7.05	$0.00	$32.19
6	75	$19.36	$7.07	$7.05	$0.00	$33.48
7	80	$20.65	$7.07	$7.05	$0.00	$34.77
8	85	$21.94	$7.07	$7.05	$0.00	$36.06
9	90	$23.23	$7.07	$7.05	$0.00	$37.35

Notes:
Steps are 4 mos.

Apprentice to Journeyworker Ratio:1:1

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$31.84	$8.91	$8.00	$0.00	$48.75
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$32.13	$8.91	$8.00	$0.00	$49.04
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section A)*	03/01/2013	$52.58	$8.42	$12.60	$0.00	$73.60

Apprentice - *SPRINKLER FITTER - Local 550*

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$18.40	$8.42	$8.00	$0.00	$34.82
2	40	$21.03	$8.42	$8.00	$0.00	$37.45
3	45	$23.66	$8.42	$8.00	$0.00	$40.08
4	50	$26.29	$8.42	$8.00	$0.00	$42.71
5	55	$28.92	$8.42	$8.00	$0.00	$45.34
6	60	$31.55	$8.42	$8.00	$0.00	$47.97
7	65	$34.18	$8.42	$8.00	$0.00	$50.60
8	70	$36.81	$8.42	$8.00	$0.00	$53.23
9	75	$39.44	$8.42	$8.00	$0.00	$55.86
10	80	$42.06	$8.42	$8.00	$0.00	$58.48

Notes:
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:1

STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 103*	09/01/2013	$32.97	$13.00	$12.77	$0.00	$58.74
	03/01/2014	$33.44	$13.00	$13.03	$0.00	$59.47
	09/01/2014	$33.84	$13.00	$13.05	$0.00	$59.89
	03/01/2015	$34.38	$13.00	$13.06	$0.00	$60.44
	09/01/2015	$35.10	$13.00	$13.08	$0.00	$61.18
	03/01/2016	$35.81	$13.00	$13.10	$0.00	$61.91

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 103*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$13.19	$13.00	$0.40	$0.00	$26.59
2	40	$13.19	$13.00	$0.40	$0.00	$26.59
3	45	$14.84	$13.00	$10.04	$0.00	$37.88
4	45	$14.84	$13.00	$10.04	$0.00	$37.88
5	50	$16.49	$13.00	$10.29	$0.00	$39.78
6	55	$18.13	$13.00	$10.53	$0.00	$41.66
7	60	$19.78	$13.00	$10.78	$0.00	$43.56
8	65	$21.43	$13.00	$11.03	$0.00	$45.46
9	70	$23.08	$13.00	$11.28	$0.00	$47.36
10	75	$24.73	$13.00	$11.53	$0.00	$49.26

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$13.38	$13.00	$0.40	$0.00	$26.78
2	40	$13.38	$13.00	$0.40	$0.00	$26.78
3	45	$15.05	$13.00	$10.29	$0.00	$38.34
4	45	$15.05	$13.00	$10.29	$0.00	$38.34
5	50	$16.72	$13.00	$10.54	$0.00	$40.26
6	55	$18.39	$13.00	$10.79	$0.00	$42.18
7	60	$20.06	$13.00	$11.04	$0.00	$44.10
8	65	$21.74	$13.00	$11.29	$0.00	$46.03
9	70	$23.41	$13.00	$11.54	$0.00	$47.95
10	75	$25.08	$13.00	$11.79	$0.00	$49.87

Notes:

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2013	$47.00	$10.18	$18.15	$0.00	$75.33
	02/01/2014	$47.56	$10.18	$18.15	$0.00	$75.89
	08/01/2014	$48.46	$10.18	$18.22	$0.00	$76.86
	02/01/2015	$49.02	$10.18	$18.22	$0.00	$77.42
	08/01/2015	$49.92	$10.18	$18.29	$0.00	$78.39
	02/01/2016	$50.49	$10.18	$18.29	$0.00	$78.96
	08/01/2016	$51.39	$10.18	$18.37	$0.00	$79.94
	02/01/2017	$51.96	$10.18	$18.37	$0.00	$80.51

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

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.50	$10.18	$18.15	$0.00	$51.83
2	60	$28.20	$10.18	$18.15	$0.00	$56.53
3	70	$32.90	$10.18	$18.15	$0.00	$61.23
4	80	$37.60	$10.18	$18.15	$0.00	$65.93
5	90	$42.30	$10.18	$18.15	$0.00	$70.63

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.78	$10.18	$18.15	$0.00	$52.11
2	60	$28.54	$10.18	$18.15	$0.00	$56.87
3	70	$33.29	$10.18	$18.15	$0.00	$61.62
4	80	$38.05	$10.18	$18.15	$0.00	$66.38
5	90	$42.80	$10.18	$18.15	$0.00	$71.13

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	06/01/2013	$34.45	$7.10	$12.60	$0.00	$54.15
	12/01/2013	$35.20	$7.10	$12.60	$0.00	$54.90
	06/01/2014	$35.95	$7.10	$12.60	$0.00	$55.65
	12/01/2014	$36.70	$7.10	$12.60	$0.00	$56.40
	06/01/2015	$37.45	$7.10	$12.60	$0.00	$57.15
	12/01/2015	$38.20	$7.10	$12.60	$0.00	$57.90
	06/01/2016	$38.95	$7.10	$12.60	$0.00	$58.65
	12/01/2016	$39.95	$7.10	$12.60	$0.00	$59.65

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	06/01/2013	$33.17	$7.10	$12.60	$0.00	$52.87
	12/01/2013	$33.92	$7.10	$12.60	$0.00	$53.62
	06/01/2014	$34.67	$7.10	$12.60	$0.00	$54.37
	12/01/2014	$35.42	$7.10	$12.60	$0.00	$55.12
	06/01/2015	$36.17	$7.10	$12.60	$0.00	$55.87
	12/01/2015	$36.92	$7.10	$12.60	$0.00	$56.62
	06/01/2016	$37.67	$7.10	$12.60	$0.00	$57.37
	12/01/2016	$38.67	$7.10	$12.60	$0.00	$58.37
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2013	$33.05	$7.10	$12.60	$0.00	$52.75
	12/01/2013	$33.80	$7.10	$12.60	$0.00	$53.50
	06/01/2014	$34.55	$7.10	$12.60	$0.00	$54.25
	12/01/2014	$35.30	$7.10	$12.60	$0.00	$55.00
	06/01/2015	$36.05	$7.10	$12.60	$0.00	$55.75
	12/01/2015	$36.80	$7.10	$12.60	$0.00	$56.50
	06/01/2016	$37.55	$7.10	$12.60	$0.00	$57.25
	12/01/2016	$38.55	$7.10	$12.60	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$32.42	$9.07	$8.00	$0.00	$49.49
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	06/01/2013	$45.33	$7.10	$13.00	$0.00	$65.43
	12/01/2013	$46.08	$7.10	$13.00	$0.00	$66.18
	06/01/2014	$46.83	$7.10	$13.00	$0.00	$66.93
	12/01/2014	$47.58	$7.10	$13.00	$0.00	$67.68
	06/01/2015	$48.33	$7.10	$13.00	$0.00	$68.43
	12/01/2015	$49.08	$7.10	$13.00	$0.00	$69.18
	06/01/2016	$49.83	$7.10	$13.00	$0.00	$69.93
	12/01/2016	$50.83	$7.10	$13.00	$0.00	$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	06/01/2013	$47.33	$7.10	$13.00	$0.00	$67.43
	12/01/2013	$48.08	$7.10	$13.00	$0.00	$68.18
	06/01/2014	$48.83	$7.10	$13.00	$0.00	$68.93
	12/01/2014	$49.58	$7.10	$13.00	$0.00	$69.68
	06/01/2015	$50.33	$7.10	$13.00	$0.00	$70.43
	12/01/2015	$51.08	$7.10	$13.00	$0.00	$71.18
	06/01/2016	$51.83	$7.10	$13.00	$0.00	$71.93
	12/01/2016	$52.83	$7.10	$13.00	$0.00	$72.93
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	06/01/2013	$37.40	$7.10	$13.00	$0.00	$57.50
	12/01/2013	$38.15	$7.10	$13.00	$0.00	$58.25
	06/01/2014	$38.90	$7.10	$13.00	$0.00	$59.00
	12/01/2014	$39.65	$7.10	$13.00	$0.00	$59.75
	06/01/2015	$40.40	$7.10	$13.00	$0.00	$60.50
	12/01/2015	$41.15	$7.10	$13.00	$0.00	$61.25
	06/01/2016	$41.90	$7.10	$13.00	$0.00	$62.00
	12/01/2016	$42.90	$7.10	$13.00	$0.00	$63.00
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	06/01/2013	$39.40	$7.10	$13.00	$0.00	$59.50
	12/01/2013	$40.15	$7.10	$13.00	$0.00	$60.25
	06/01/2014	$40.90	$7.10	$13.00	$0.00	$61.00
	12/01/2014	$41.65	$7.10	$13.00	$0.00	$61.75
	06/01/2015	$42.40	$7.10	$13.00	$0.00	$62.50
	12/01/2015	$43.15	$7.10	$13.00	$0.00	$63.25
	06/01/2016	$43.90	$7.10	$13.00	$0.00	$64.00
	12/01/2016	$44.90	$7.10	$13.00	$0.00	$65.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$31.84	$8.91	$8.00	$0.00	$48.75
WAGON DRILL OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12*	03/01/2013	$49.31	$9.32	$13.29	$0.00	$71.92
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$25.66	$8.70	$4.48	$0.00	$38.84
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$36.55	$8.70	$6.58	$0.00	$51.83
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$29.94	$8.70	$6.05	$0.00	$44.69
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$23.52	$8.70	$5.24	$0.00	$37.46
For apprentice rates see "Apprentice- LINEMAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$36.35	$8.70	$9.43	$0.00	$54.48
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$32.08	$8.70	$6.59	$0.00	$47.37
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$23.52	$8.70	$3.72	$0.00	$35.94
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$19.25	$8.70	$2.85	$0.00	$30.80
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$42.77	$8.70	$11.78	$0.00	$63.25

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

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$25.66	$8.70	$4.24	$0.00	$38.60
2	65	$27.80	$8.70	$4.71	$0.00	$41.21
3	70	$29.94	$8.70	$5.43	$0.00	$44.07
4	75	$32.08	$8.70	$6.16	$0.00	$46.94
5	80	$34.22	$8.70	$6.88	$0.00	$49.80
6	85	$36.35	$8.70	$7.62	$0.00	$52.67
7	90	$38.49	$8.70	$8.83	$0.00	$56.02

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$26.33	$4.18	$2.79	$0.00	$33.30
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$24.78	$4.18	$2.74	$0.00	$31.70
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$24.78	$4.18	$2.74	$0.00	$31.70
TREE TRIMMER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* This classification applies only to the trimming of branches on and around utility lines.	01/29/2012	$17.18	$3.37	$0.00	$0.00	$20.55
TREE TRIMMER GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* This classification applies only to the trimming of branches on and around utility lines.	01/29/2012	$15.15	$3.37	$0.00	$0.00	$18.52

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Additional Apprentice Information:

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

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

All steps are six months (1000 hours) unless otherwise specified.

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

MASSACHUSETTS WEEKLY CERTIFIED PAYROLL REPORT FORM

Company's Name:	Address:	Phone No.:	Payroll No.:

Employer's Signature:	Title:	Contract No:	Tax Payer ID No.	Work Week Ending:

Awarding Authority's Name:	Public Works Project Name:	Public Works Project Location:	Min. Wage Rate Sheet No.

General / Prime Contractor's Name:	Subcontractor's Name:

Employee Name & Complete Address	Employee is OSHA 10 Certified (?)	Work Classification	Appr. Rate (%)	Hours Worked Su.	Mo.	Tu.	We.	Th.	Fr.	Sa.	Project Hours (A) / All Other Hours	Hourly Base Wage (B)	"Employer" Hourly Fringe Benefit Contributions: Health & Welfare Insurance (C)	ERISA Pension Plan (D)	Supp. Unemp. (E)	Total Hourly Prev. Wage (B+C+D+E) (F)	Project Gross Wages (G) / Total Gross Wages (A x F)	Check No. (H)
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NOTE: Pursuant to MGL Ch. 149 s.27B, every contractor and subcontractor is required to submit a "true and accurate" copy of their weekly payroll records directly to the awarding authority. Failure to comply may result in the commencement of a criminal action or the issuance of a civil citation.

Date recieved by awarding authority
/ /

WEEKLY PAYROLL RECORDS REPORT
& STATEMENT OF COMPLIANCE

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

In addition, every contractor and subcontractor is required to submit a copy of their weekly payroll records to the awarding authority. For every week in which an apprentice is employed, a photocopy of the apprentice's identification card must be attached to the payroll report. Once collected, the awarding authority is also required to preserve those records for three years.

In addition, each such contractor, subcontractor, or public body shall furnish to the awarding authority directly, within fifteen days after completion of its portion of the work a statement, executed by the contractor, subcontractor or public body who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE

_____, 20_____

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

do hereby state:

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

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

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

Signature _____

Title _____

SOMERVILLE LIVING WAGE ORDINANCE CERTIFICATION FORM

CITY OF SOMERVILLE CODE OF ORDINANCES SECTION 2-397 et seq*.

Instructions: This form shall be included in all Invitations for Bids and Requests for Proposals which involve the furnishing of labor, time or effort (with no end product other than reports) by vendors contracting or subcontracting with the City of Somerville, where the contract price meets or exceeds the following dollar threshold: $10,000. If the undersigned is selected, this form will be attached to the contract or subcontract and the certifications made herein shall be incorporated as part of such contract or subcontract. **Complete this form and sign and date where indicated below on page 2.**

Purpose: The purpose of this form is to ensure that such vendors pay a "Living Wage" (defined below) to all covered employees (i.e., all employees except individuals in a city, state or federally funded youth program). In the case of bids, the City will award the contract to the lowest responsive and responsible bidder paying a Living Wage. In the case of RFP's, the City will select the most advantageous proposal from a responsive and responsible offeror paying a Living Wage. In neither case, however, shall the City be under any obligation to select a bid or proposal that exceeds the funds available for the contract.

Definition of "Living Wage": For this contract or subcontract, as of **7/1/2013** "Living Wage" shall be deemed to be an hourly wage of no less than **$11.89** per hour. From time to time, the Living Wage may be upwardly adjusted and amendments, if any, to the contract or subcontract may require the payment of a higher hourly rate if a higher rate is then in effect.

CERTIFICATIONS

1. The undersigned shall pay no less than the Living Wage to all covered employees who directly expend their time on the contract or subcontract with the City of Somerville.

2. The undersigned shall post a notice, (copy enclosed), to be furnished by the contracting City Department, informing covered employees of the protections and obligations provided for in the Somerville Living Wage Ordinance, and that for assistance and information, including copies of the Ordinance, employees should contact the contracting City Department. Such notice shall be posted in each location where services are performed by covered employees, in a conspicuous place where notices to employees are customarily posted.

3. The undersigned shall maintain payrolls for all covered employees and basic records relating hereto and shall preserve them for a period of three years. The records shall contain the name and address of each employee, the number of hours worked, the gross wages, a copy of the social

*Copies of the Ordinance are available upon request to the Purchasing Department.

security returns, and evidence of payment thereof and such other data as may be required by the contracting City Department from time to time.

4. The undersigned shall submit payroll records to the City upon request and, if the City receives information of possible noncompliance with the provisions the Somerville Living Wage Ordinance, the undersigned shall permit City representatives to observe work being performed at the work site, to interview employees, and to examine the books and records relating to the payrolls being investigated to determine payment of wages.

5. The undersigned shall not fund wage increases required by the Somerville Living Wage Ordinance by reducing the health insurance benefits of any of its employees.

6. The undersigned agrees that the penalties and relief set forth in the Somerville Living Wage Ordinance shall be in addition to the rights and remedies set forth in the contract and/or subcontract.

CERTIFIED BY:

Signature: _____
(Duly Authorized Representative of Vendor)

Title: _____

Name of Vendor:_____

Date: _____

INSTRUCTIONS: PLEASE POST

NOTICE TO ALL EMPLOYEES REGARDING PAYMENT OF LIVING WAGE

Under the Somerville, Massachusetts' Living Wage Ordinance (Ordinance No. 1999-1), any person or entity who has entered into a contract with the City of Somerville is required to pay its employees who are involved in providing services to the City of Somerville no less than a "Living Wage".

The Living Wage as of **7/1/2013** is **$11.89** per hour. The only employees who are not covered by the Living Wage Ordinance are individuals in a Youth Program. "Youth Program" as defined in the Ordinance, "means any city, state or federally funded program which employs youth, as defined by city, state or federal guidelines, during the summer, or as part of a school to work program, or in any other related seasonal or part-time program."

For assistance and information regarding the protections and obligations provided for in the Living Wage Ordinance and/or a copy of the Living Wage Ordinance, all employees should contact the City of Somerville's Purchasing Department directly.

CITY OF SOMERVILLE
ORDINANCE NO. 2008-08
IN THE BOARD OF ALDERMEN: June 12, 2008

Be it ordained by the Board of Aldermen, in session assembled, that the Code of Ordinances of the City of Somerville, is hereby amended by adding a new Section 2-355 as follows:

Sec. 2-355. Responsible Employer Ordinance.

(a) The Board of Aldermen hereby finds and determines that the failure of certain construction firms awarded contracts funded by the City to include and enforce provisions requiring compliance with state laws governing the payment of prevailing wages, the provision of workers compensation coverage, and the proper classification of individuals as employees and not as independent contractors, as well as provisions concerning health insurance coverage and state-certified apprenticeship programs, is injurious to the life, health and happiness of individuals employed by such firms and is deleterious to the quality of life in the City where most of such individuals reside.

(b) Every contract awarded by the City under G. L. c. 149, § 44A (2) where the amount of the contract is more than one-hundred thousand dollars, and any subcontract awarded in connection with any such general contract where the amount of such subcontract is more than twenty-five thousand dollars, shall be deemed to incorporate by reference the provisions of sub-parts (1) through (5) of this subsection together with the provisions of subsections (c), (d) and (e) of this section.

1. The bidder and all subcontractors under the bidder shall comply with the requirements of G. L. c. 149 concerning the payment of prevailing wage rates to their employees;
2. The bidder and all subcontractors under the bidder must maintain and participate in a bona fide apprentice training program as defined by G. L. c. 23, §§ 11H & 11I for each apprenticeable trade or occupation represented in its workforce that is approved by the division of apprentice training of the department of labor and workforce development of the Commonwealth and must abide by the apprentice to journeymen ratio for each trade prescribed therein in the performance of the contract;
3. The bidder and all subcontractors under the bidder must offer, at its expense, hospitalization and medical benefits for all individuals employed on the project or coverage which is comparable to the hospitalization and medical benefits provided by the health and welfare plans in the applicable craft recognized by G. L. c. 149, § 26, in establishing minimum wage rates. All such plans shall meet or exceed state requirements for such plans.
4. The bidder and all subcontractors under the bidder must maintain appropriate industrial accident insurance coverage in accordance with G. L. c. 152 for all individuals employed on the project;
5. The bidder and all subcontractors under the bidder must properly classify individuals employed on the project as employees rather than independent contractors and comply with all laws concerning workers' compensation insurance coverage, unemployment taxes, social security taxes and income taxes as respects all such employees.

(c) All bidders and all subcontractors under such bidders who are awarded, or otherwise obtain, contracts from the city on projects governed by G. L. c. 149, § 44A (2), shall comply with the obligations described in sub-parts (1) through (5) of subsection (b) of this section for the entire duration of their work on the project, and an officer of each such bidder or subcontractor under the

bidder shall certify under oath and in writing on a weekly basis that they are in compliance with these obligations.

(d) Any bidder or subcontractor under the bidder who fails to comply with any of the obligations described in sub-parts (1) through (5) of subsection (b) of this section for any period of time, or fails to comply with the weekly certification obligations described in subsection (c) of this subsection shall be subject to any or all of the following sanctions:

1. temporary suspension of work on the project until compliance is obtained; or,
2. withholding by the City of payment due under the contract until compliance is obtained; or,
3. permanent removal from any further work on the project; or,
4. recovery by the city from the general contractor of 1/10 of 1% of the general contract or $ 1,000.00, whichever sum is greater, in the nature of liquidated damages assessed for each week that the general contractor is in non-compliance or, if a subcontractor is in non-compliance, the recovery by the city from the general contractor as a back charge against the subcontractor of 1/10 of 1% of the subcontract price, or $ 400.00, whichever sum is greater, in the nature of liquidated damages assessed for each week that the subcontractor is in non-compliance.

(e) In addition to these sanctions a general bidder or contractor shall be equally liable for any violation of the obligations described in sub-parts (l) through (5) of subsection (b) of this section committed by any of its subcontractors or sub bidders, excepting only those violations which arise from work performed by subcontractors with subcontracts governed by G. L. c. 149, § 44F. Any contractor or subcontractor who has been determined to have violated any of the provisions of subsections (b) or (c) of this section shall be barred from performing any work on any future contracts awarded by the City for six months for the first violation, three years for the second violation, and permanently for a third violation.

(f) The provisions of this section shall not apply to construction projects for which the low general bid was less than one-hundred thousand dollars, or to work performed pursuant to subcontracts governed by G. L. 149, § 44F where the bid for such subcontract was less than twenty-five thousand dollars.

Receipt Acknowledged _____ day of _____, _____.

_____
Name of Vendor

By: _____
Name

Its: _____
Title

_____
Signature

CITY OF SOMERVILLE
Responsible Employer Ordinance

WEEKLY COMPLIANCE FORM

In accordance with the Code of Ordinances of the City of Somerville, Section 2-355, all general contractors and all subcontractors under such general contractors who are awarded, or otherwise obtain, contracts from the city on projects governed by G. L. c. 149, § 44A (2), shall comply with the obligations described in sub-parts (1) through (5) of subsection (b) of this section for the entire duration of their work on the project, and an officer of each such general contractor or subcontractor under the general contractor where the amount of such subcontract is more than $25,000.00, shall certify under oath and in writing on a weekly basis that they are in compliance with these obligations.

STATEMENT OF COMPLIANCE

Date _____

Period _____

I, _____, _____
(Print Name) (Title)

Do hereby state that _____ is in compliance with all
(Contractor or Subcontractor)

requirements of the City of Somerville's Responsible Employer Ordinance, City Ordinance Section 2-355, for the duration of all work performed on the

_____ by this general contractor or
(Building or Project)

subcontractor.

_____
(Signature)
Signed under the pains and penalties of perjury

CERTIFICATE IN GOOD STANDING

TO: Vendor

FROM: Purchasing Department

RE: **CERTIFICATE IN GOOD STANDING**

The **Awarded Vendor** must comply with our request for a **CURRENT "Certificate in Good Standing".**

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

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

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

IMPORTANT NOTICE

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

Thank You,
Purchasing Director

Certificate of Authority
(Corporations Only)

Instructions: Complete this form and sign and date where indicated below.

1. I hereby certify that I, the undersigned, am the duly elected Clerk/Secretary of

_____.
(Insert Full Name of Corporation)

2. I hereby certify that the following individual _____
(Insert the Name of Officer who Signed the Contract and Bonds)

is the duly elected _____ of said Corporation.
(Insert the Title of the Officer in Line 2)

3. I hereby certify that on _____
(Insert Date: Must be *on or before* Date Officer Signed Contract/Bonds)

at a duly authorized meeting of the Board of Directors of said corporation, at which a quorum was present, it was voted that

_____ _____
(Insert Name of Officer from Line 2) **(Insert Title of Officer from Line 2)**

of this corporation be and hereby is authorized to make, enter into, execute, and deliver contracts and bonds in the name and on behalf of said corporation, and affix its Corporate Seal thereto, and such execution of any contract of obligation in this corporation's name and on its behalf, with or without the Corporate Seal, shall be valid and binding upon this corporation; and that the above vote has not been amended or rescinded and remains in full force and effect as of the date set forth below.

4. **ATTEST**:
Signature: _____ *AFFIX CORPORATE SEAL HERE*
(Clerk or Secretary)
Printed Name: _____

Printed Title:_____

Date: _____
(Date Must Be *on or after* Date Officer Signed Contract/Bonds)

Certificate of Authority
(Limited Liability Companies Only)

Instructions: Complete this form and sign and date where indicated below.

1. I, the undersigned, being a member or manager of

_____,
(Complete Name of Limited Liability Company)

a limited liability company (LLC) hereby certify as to the contents of this form for the purpose of contracting with the City of Somerville.

2. The LLC is organized under the laws of the state of: _____.

3. The LLC is managed by **(check one)** a ☐ Manager or by its ☐ Members.

4. I hereby certify that each of the following individual(s) is:
   - a member/manager of the LLC;
   - duly authorized to execute and deliver this contract, agreement, and/or other legally binding documents relating to any contract and/or agreement on behalf of the LLC;
   - duly authorized to do and perform all acts and things necessary or appropriate to carry out the terms of this contract or agreement on behalf of the LLC; and
   - that no resolution, vote, or other document or action is necessary to establish such authority.

Name	Title

5. **Signature**:_____

Printed Name: _____

Printed Title:_____

Date: _____

Non-Collusion Form and Tax Compliance Certification

Instructions: Complete each part of this two-part form and sign and date where indicated below.

A. NON-COLLUSION FORM

I, the undersigned, hereby certify under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person.

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

Signature: _____
(Individual Submitted Bid or Proposal)
Duly Authorized

Name of Business or Entity:_____

Date: _____

B. TAX COMPLIANCE CERTIFICATION

Pursuant to M.G.L. c. 62C, §49A, I certify under the penalties of perjury that, to the best of my knowledge and belief, I am in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support, as well as paid all contributions and payments in lieu of contributions pursuant to MGL 151A, §19A(b).

Signature: _____
(Duly Authorized Representative of Vendor)

Name of Business or Entity:_____

Social Security Number or Federal Tax ID#:_____

Date: _____

CITY OF SOMERVILLE
SIGNATURE FORM

NAME OF COMPANY: _____

ADDRESS: _____

TELEPHONE #: _____ FAX #: _____

DATE: _____ EMAIL: _____

SIGNATURE OF AUTHORIZED CONTRACTING OFFICIAL:

_____

TITLE: _____

RESIDENCE: _____

IF COMPANY IS A PARTNERSHIP:

FULL NAME AND RESIDENCE OF EACH PARTNER:

_____

_____

IF COMPANY IS A CORPORATION:

THE CORPORATE NAME IS: _____

THE CORPORATION IS ORGANIZED UNDER THE LAWS OF: _____

THE PRESIDENT IS: _____

THE TREASURER IS: _____

THE CLERK/SECRETARY IS: _____

NAME OF CORPORATION THAT WILL APPEAR ON A POTENTIAL CONTRACTUAL AGREEMENT IF DIFFERS FROM ABOVE: _____

NAME AND TITLE OF PERSON WHO WILL BE RESPONSIBLE FOR THE SIGNING OF A POTENTIAL CONTRACTUAL AGREEMENT IF DIFFERS FROM ABOVE:

NAME: _____ TITLE: _____

NAME OF CLERK/SECRETARY WHO WILL ALSO BE SIGNING FOR A POTENTIAL CONTRACTUAL AGREEMENT IF DIFFERS FROM ABOVE: _____

_____

CITY OF SOMERVILLE, MASSACHUSETTS

JOSEPH A. CURTATONE
MAYOR

Vendor Certification

The vendor certifies that it has provided the City of Somerville with an accurate tax identification number (TIN). In the event that the City is fined by the IRS for an incorrect TIN provided by the vendor, the vendor agrees to reimburse the City for the amount of the fine.

_____

TIN

_____

Signature

_____

Printed Name of Person signing

_____

Company

_____

Date

Appendix A

Sample Contract

OWNER-CONTRACTOR PUBLIC CONSTRUCTION AGREEMENT
CITY OF SOMERVILLE

PURCHASING DEPARTMENT FOR end user department

AGREEMENT made this 1st day of month, year, by and between the City of Somerville, a Massachusetts municipal corporation, acting by and through its Purchasing Department, 93 Highland Ave., Somerville, MA 02143 (referred to variously in the Contract Documents as "City", "Owner", "Awarding Authority", and "School") and the following General Contractor (referred to in the Contract Documents as "Contractor" or "General Contractor"):

CONTRACTOR
Name: vendor name
Address: vendor address, city, MA zip

PROJECT
Name: project description
Location: project location

Brief Description: further project description

ARCHITECT: architect name

Address: architect address, city, MA zip

LANDSCAPE ARCHITECT
Name: n/a
Address:

ENGINEER
Name: n/a
Address:

(The Architect, Landscape Architect, or Engineer is described herein as the "Design Professional".)

THIS CONTRACT IS A

____ Public Works Contract under $10,000

____ Public Building Contract under $10,000, subject to the price quote requirements of Chapter 149 of the General Laws

____ Public Building Contract estimated to cost more than $10,000, but less than $25,000, subject to the written response requirements of Chapter 149 of the General Laws

_____ Public Works Contract estimated to cost more than $10,000 thereby subject to the bidding requirements of Mass. Gen. Laws, Chapter 30, Section 39M

___ Public Building Contract estimated to cost more than $25,000, but less than $100,000, subject to the bidding requirements of Mass. Gen. Laws, Chapter 30, Section 39M

__X__ Public Works Contract estimated to cost more than $100,000 subject to the bidding requirements of Mass. Gen. Laws, Chapter 149, Section 44A.

(Chapter 149 and Chapter 30 contain interrelated provisions. When a provision applies only to Chapter 149 s. 44A contracts or only to Chapter 30, s. 39M contracts, it is so noted herein. Otherwise, any section of Chapter 30 or Chapter 149 cited in this contract shall be deemed to apply to both types of contracts.)

Section 1: CONTRACT DOCUMENTS.

The Contract Documents consist of the Owner-Contractor Agreement, Advertisement, Bidding Documents, Technical Specifications, Drawings, General Conditions, Supplementary Conditions, and Addenda issued prior to execution of this Contract, and Modifications agreed to in writing after the execution of this Contract. The following Appendices are attached hereto and are hereby incorporated by reference.

__X__ Appendix A - Advertisement; Notice to Bidders;

__X__ Appendix B - Bid Documents - Contractor's Bid

__X__ Appendix C - Scope of Services - includes a brief description of the project and the Plans and Technical Specifications (Plans on File)

__X__ Appendix D - Insurance Requirements with Contractor's Insurance Certificate(s)

__X__ Appendix E - General Conditions

__X__ Appendix F - Wage Rates; Living Wage Ordinance form

__X__ Appendix G - Performance Bond and Payment Bond, if contract is over $2,000

The Contract Documents represent the entire Contract between the parties hereto and supersede prior negotiations, representations, or Contracts, whether written or oral.

Section 2: THE WORK.

The Contractor shall execute all work described in the Contract Documents, except to the extent that such work is specifically indicated in the Contract Documents to be the responsibility of others. In accordance with Chapter 30, section 39I of the General Laws, the contractor shall perform all of work in conformity with the plans and specifications included herein as Appendix A. No willful or substantial deviation from such plans and specifications shall be made unless authorized in writing by the Commissioner of Public Works, which authorization shall be confirmed by written change order within thirty days.

Section 3: PROJECT DATES

(a) Commencement: The Date of Commencement shall be stipulated by a written Notice to Proceed given by the City to the Contractor.

(b) Substantial Completion: The Contractor shall achieve substantial completion of the work no later than scheduled in the bid documents or date after the Date of Commencement, time being of the essence. For good cause shown, the Commissioner of Public Works may, in his sole discretion, extend the date of substantial completion by written change order.

(c) Damages for Delay. The Contractor and the Contractor's surety shall be liable for and shall pay the City the sum of $100.00 per calendar day, as liquidated damages, for each calendar day of delay until the work is substantially completed or, in the case of the portion of the work, for each calendar day of delay until the portion of the work is substantially completed. Substantial Completion shall mean either a) that the work, or portion of the work, has been completed, except for work having a contract price of less than one percent (1%) of the then adjusted total contract price; or b) that substantially all of the work has been completed and opened to public use, except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work.

(d) Suspension of the Work/Excusable Delays. If the City is required to suspend the work as a result of a request from the Office of the Attorney General in connection with a bid protest or an injunction, the Contractor shall not have a claim for damages, but the City shall extend the date of substantial completion for a period of time commensurate with the period of the suspension, and the liquidated damages clause shall not take effect until the extended date of substantial completion. If any of the following occurrences causes a delay in the work, the Contractor shall immediately notify DPW in writing. If, upon investigation, the City finds that the delay is excusable, the City shall extend the date of substantial completion for a period of time commensurate with the period of the excusable delay, and the liquidated damages clause shall not take effect until the extended date of substantial completion:

(1) any acts of the Government, including controls or restrictions upon or requisitioning of materials, equipment, tools, or labor by reason of war, National Defense, or any other national emergency;

(2) delays which are caused by the City and which are not occasioned by the Contractor's failure to supply DPW or its design professional with progress schedules, documents, samples, and the like, in a timely manner;

(3) causes not reasonably foreseeable by the parties to this Contract, which are beyond the reasonable control of the Contractor, such as blizzards, floods, hurricanes, tornadoes, and strikes;

(4) any delay of any subcontractor resulting from paragraphs (1), (2), or (3);

Section 4. CONTRACT SUM

The contract sum shall be $contract amount. The contract sum may be increased or decreased by change order, as quantities which have been estimated in the bid documents become known, or as other additions or deletions to the work are made, or if the work is interrupted or suspended by the City, all as set forth herein.

Section 5. CHANGES IN THE CONTRACT

(2) Suspension, Delay, or Interruption due to order of Awarding Authority.

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

(2) The General Contractor must submit the amount of a claim under provision (1) to the Awarding Authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the Awarding Authority shall not approve any costs in the claim incurred more than twenty days before the General Contractor notified the Awarding Authority in writing of the act or failure to act involved in the claim.

(3) A subcontractor shall have the same rights against the General Contractor for payment for an increase in the cost of its performance as provisions (1) and (2) give the General Contractor against the Awarding Authority, but nothing in provisions (1) and (2) shall in any way change, modify or alter any other rights which the General Contractor or the subcontractor may have against each other.

(b) Change Orders. No willful and substantial deviation from the plans and specifications shall be made unless authorized in writing by the Awarding Authority or by the Design Professional in charge of the work who is duly authorized by the Awarding Authority to approve such deviations. In order to avoid delays in the prosecution of the work required by the

contract, such deviation from the plans and specifications may be authorized by a written order of the Awarding Authority or Design Professional so authorized, to be confirmed at a later time by a written Change Order, signed under penalties of perjury, using AIA Document G701 (or its equivalent). The Change Order shall include the following: (1) if such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor; (2) that the specified deviation does not materially injure the project as a whole; (3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment [increase or decrease as the case may be] has been agreed upon between the Contracting Agency and the General Contractor and the amount in dollars of such adjustment; and (4) that the deviation is in the best interest of the Contracting Authority. The Change Order shall also indicate whether or not the date of substantial completion has been extended. The equitable adjustment in price shall be determined by the unit prices, if any, in the General Contractor's bid; otherwise, it shall be a number which is agreed to by both parties as a fair adjustment and which can be itemized and substantiated to the reasonable satisfaction of the Contracting Authority. Where increases and decreases to the Contract Sum are included in one Change Order, the negotiated allowance for overhead and profit shall be calculated on the basis of the net increase, if any.

(c) Differing Subsurface or Latent Physical Conditions. In accordance with Chapter 30, section 39N of the General Laws, if, during the progress of the work, the Contractor or the Awarding Authority discovers that the actual physical subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the contract documents, either the Contractor or the Contracting [Awarding] Authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a Contractor, or upon its own initiative, the Contracting Authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the Contracting Authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly.

Section 6. PAYMENTS TO THE CONTRACTOR

(a) Progress Payments. The Contractor may submit requests for progress payments (hereafter, "Periodic Estimates") for work completed during the preceding month and for materials not incorporated in the work, but delivered and suitably stored at the site (or some other location agreed upon in writing). The Contractor's progress schedule and schedule of values, as modified by agreement of the parties, may be used by the City as a basis for reviewing the Contractor's Periodic Estimates. In the case of contracts for construction, reconstruction, alteration, remodeling, repair, or demolition of a public building, where the amount is more than two thousand dollars, the Contractor's Periodic Estimate shall contain a separate item for each filed subtrade and sub-subtrade, and a column listing the amount paid to

each subcontractor and sub-subcontractor as of the date the periodic estimate is filed, as required by Chapter 30, Section 39K, of the General Laws.

(1) Time for Payment. In the case of contracts for construction, reconstruction, alteration, remodeling, repair or demolition of a public building, where the amount is more than two thousand dollars, the City shall, in accordance with Chapter 30, Section 39K, of the General Laws, make payment within fifteen days of receipt of the Contractor's Periodic Estimate; provided however, that the City may, within seven days of receipt of an estimate which is not in the required form or which is arithmetically incorrect, return the incorrect estimate to the Contractor for correction, whereupon the date of receipt shall be the date of receipt of the corrected Periodic Estimate. For all other construction contracts, progress payments are governed by Chapter 30, Section 39G of the General Laws, and the City is required to make payment within thirty-five days of receipt of a Periodic Estimate.

(2) Retainage prior to Substantial Completion. In all construction contracts, the City may hold back a retainage of up to five percent of each progress payment to ensure satisfactory completion of the work. In addition, the City may withhold any amounts in dispute, including disputed change orders and direct payments owed to subcontractors pursuant to Chapter 30, Section 39F of the General Laws.

(b) Payment upon Substantial Completion. In the case of contracts for construction, reconstruction, alteration, repair, remodeling, or demolition of a public building, where the amount is more than $2,000, Chapter 30, Section 39K, of the General Laws governs payment upon substantial completion. For all other contracts, Chapter 30, Section 39F of the General Laws governs payment upon substantial completion.

(1) Definition of Substantial Completion. Substantial Completion shall mean either a) that the work, or portion of the work, has been completed, except for work having a contract price of less than one percent (1%) of the then adjusted total contract price; or b) that substantially all of the work has been completed and opened to public use, except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work.

(2) Certificate of Substantial Completion. The Contractor shall give written notice to the City when the Contractor is of the opinion that the work has been substantially completed. Within twenty-one days of receipt of such notice, provided there is no dispute as to whether the work has been substantially completed, a Certificate of Substantial Completion signed by the City's Design Professional, or a written Declaration of Substantial Completion signed by the Executive Director of Mayor's Office of Strategic Planning and Community Development (on AIA form # G701 or its equivalent) shall be given to the Contractor. The date of such Certificate or Declaration shall be the Effective Date of Substantial Completion, subject to the provisions of Chapter 30, Section 39J, of the General Laws. If the City does not agree that the work has been substantially completed, the City or the City's Design Professional shall, within the twenty-one day period, present the Contractor with a written, itemized list of incomplete or unsatisfactory work items sufficient to demonstrate that the work has not been substantially completed. If the City fails to respond within the twenty-one day period, the date of the Contractor's notification of substantial completion shall become the "Effective Date of Substantial Completion". Within fifteen days after the effective date of the City's declaration of substantial completion, the City shall send to the Contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items and, unless delayed by causes beyond his control, the Contractor shall complete all such work items within forty-five

days after receipt of said list or before the date of substantial completion in the contract, whichever is later. If the Contractor fails to complete such work within such time, the City may send the Contractor a notice in writing by certified mail, return receipt requested, instructing the Contractor that if the work is not completed with seven days after receipt of the notice, the contract will be terminated and the City will complete the incomplete or unsatisfactory work items and charge the cost of the same to the Contractor and the Contractor's sureties.

(3) Retainage after Substantial Completion. Within sixty-five days after the Effective Date of Substantial Completion, the City shall pay the Contractor all but one percent retainage, minus: a) the amount of any disputed work item; and b) five (5) percent of the value of plant materials in the ground; and c) the City's estimated cost of completing all incomplete and unsatisfactory work items. The City shall also deduct an amount equal to the sum of all demands for direct payment filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to Chapter 30, Section 39F of the General Laws. The five (5) percent retainage of the value of all plant materials in the ground shall be withheld by the City until final acceptance of such plant materials at the end of the guarantee period.

(c) Final Payment. The City shall make final payment to the Contractor within thirty days of completion of the work and submission of all documentation required.

IF FORMS FOR WAGE CERTIFICATIONS AND OTHER DOCUMENTATION ARE SUPPLIED BY THE CITY TO THE CONTRACTOR, THE CONTRACTOR SHALL SUBMIT DOCUMENTATION ON SUCH FORMS.

(d) Interest. If the City fails to pay the Contractor within the time periods mandated by statute, the City shall pay interest to the Contractor in accordance with Chapter 30, Sections 39G and 39K, whichever is applicable.

Section 7. PAYMENT OF SUBCONTRACTORS.

In accordance with Chapter 30, Section 39F of the General Laws, the subparagraphs a) through h) of this section shall be binding on contracts awarded pursuant to Chapter 30, Section 39M of the General Laws, and paragraphs a) through i) shall be binding on contracts awarded pursuant to Chapter 149, Section 44A of the General Laws:

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

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

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

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

(e) Within fifteen days after receipt of the demand by the City, but in no event prior to the seventieth day after substantial completion of the subcontract work, the City shall make direct payment to the subcontractor of the balance due under the subcontract including any amount due for extra labor and materials furnished to the Contractor, less any amount (1) retained by the City as the estimated cost of completing incomplete or unsatisfactory items of work, (2) specified in any court proceedings barring such payment, or (3) disputed by the Contractor in the sworn reply; provided, that the City shall not deduct from a direct payment any amount as provided in part (3) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subparagraph (d). The City shall make further direct payment to the subcontractor immediately after the removal of any basis for deductions set forth in (1) or (2) above.

(f) The City shall promptly deposit disputed amounts in an interest-bearing, joint account in the names of the Contractor and the subcontractor, in a bank in Massachusetts selected by the City or agreed upon by the Contractor and the subcontractor, and shall notify the Contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the Contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.

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

(h) The City shall deduct from payments to the Contractor amounts which, together with the above-mentioned bank deposits, are sufficient to satisfy all unpaid demands for direct payment received from subcontractors. All such amounts shall be earmarked for direct payments to such subcontractors, whose claims shall have priority over all other creditors of the Contractor.

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

Section 8. PREVAILING WAGE REQUIREMENTS.

(2) The Contractor shall pay wages at no less than the wage rates set forth in Appendix G, incorporated as part of this Agreement: namely, State Prevailing Wage Rates; provided, however, that if any department of the City should make use of this Contract for a project which is federally funded, then the Contractor shall pay wages at the higher of the two rates. If a labor classification is not listed the Contractor shall notify DPW and request instructions. In addition, the Contractor shall:

(1) pay wages at least once a week;

(2) submit payroll information on a weekly basis in a format approved by DPW, numbered in numerical sequence and signed by the Contractor (including forms for weeks when the Contractor is not on the site, in which case there shall be a notation to the effect "no work this payroll period" and a date anticipated for resuming work);

(b) The Contractor shall submit to DPW within the first week of construction:

(1) a list of apprenticeship programs with which the Contractor is affiliated;

(2) the number of apprentices on the Project employed by the Contractor.

(3) a list of the Contractor's employee fringe benefits;

(4) a copy of each project schedule, including the anticipated commencement date for each Subcontractor; and

(5) a list of each Subcontractor's suppliers and material men.

(c) The contractor shall include language similar to the above in all subcontracts.

Section 9. EQUAL EMPLOYMENT OPPORTUNITY/NONDISCRIMINATION

a) the Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, marital status, sexual orientation, national origin, age, disability, Vietnam Era veteran status or because an employee or applicant is a recipient of federal, state, or local public assistance or housing subsidies; and

b) the Contractor shall not discriminate, in any stage of the contract from award to completion, in the selection or retention of subcontractors, suppliers, and materialmen, or in the procurement of materials or supplies, or the rental of equipment, on the basis of race, religion, sex, marital status, sexual orientation, national origin, age, disability, Vietnam Era veteran status, or because an individual is a recipient of federal, state, or local public assistance or housing subsidies; and

c) the Contractor shall post an equal employment opportunity notice in conspicuous places at the worksite, shall make copies of such notice available to employees and job applicants, and shall send such notice to each labor union or representative of workers with which the Contractor has a collective bargaining agreement or other contract or understanding; and

d) the Contractor shall, to the greatest extent feasible, give employment and on-site training opportunities, to lower-income, minority, women, and disabled members of the local community and shall award subcontracts, when possible, to Minority Business Enterprises (MBE) and Women Business Enterprises (WBE).

e) the contractor shall include language similar to the above in all subcontracts.

Section 10. COPELAND ANTI-KICKBACK ACT.

If this contract is in excess of $2,000 and is federally funded, the Contractor shall comply with the Copeland "Anti-Kickback Act" (18 U.S.C. 874 and 29 CFR Part 3) more fully set forth in Appendix G attached hereto, and shall not induce any person employed in the construction, completion, or repair of a public building or public work, to give up any part of the compensation to which he would otherwise be entitled.

Section 11. WORK HOURS AND SAFETY STANDARDS.

If this contract is in excess of $2,000 and is federally funded, the Contractor shall comply with Sections 103 and 107 of the Contract Work Hours Safety Standards Acts (40 U.S.C. 327-333), as supplemented by Department of Labor regulations at 29 CFR part 5. To that end, the Contractor shall compute the wages of every mechanic and laborer on the basis of a standard workweek of 40 hours. Work in excess of the standard workweek is permissible, provided that the worker is compensated at a rate of not less than 1-1/2 times the basic rate of

pay for all hours worked in excess of 40 hours in the workweek. The Contractor shall ensure that no laborer or mechanic is required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous.

Section 12. CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT.

If this contract is in excess of $100,000 and is federally funded, the Contractor shall comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401 et seq.) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251 et seq.)

Section 13. CONTRACTOR'S CERTIFICATIONS.

The Contractor hereby certifies under oath:

(a) That if this Contract is in excess of $100,000 and is federally funded, the Contractor will abide by the Byrd Anti-Lobbying Amendment (31 U.S.C.1352), and more specifically:

(1) That no federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress, in connection with the awarding of this Federal contract and the extension, continuation, renewal, amendment, or modification of this Federal contract; and

(2) That if any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, the Contractor will complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying", in accordance with its instructions; and

(3) That the Contractor will include the language of this certification in all subcontracts, and that all subcontractors shall certify and disclose accordingly.

THIS CERTIFICATION IS A MATERIAL REPRESENTATION OF FACT UPON WHICH RELIANCE WAS PLACED WHEN THIS THE AWARD OF THIS CONTRACT WAS MADE. ANY PERSON WHO FAILS TO FILE THE REQUIRED CERTIFICATION SHALL BE SUBJECT TO A CIVIL PENALTY OF NOT LESS THAN $10,000 AND NOT MORE THAN $100,000 FOR EACH FAILURE.

(b) Drug-Free Workplace Act of 1988 (42 U.S.C. 701):
That, if this Contract is federally funded, the Contractor will provide a drug-free workplace and comply with the HUD rules contained in 24 CFR part 24M, including notification to employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited; that action will be taken against employees violating the prohibition; and that an employee who is convicted of manufacturing, distributing, dispensing, possession, or use of a controlled substance may be terminated or required to participate in a drug abuse assistance or rehabilitation program approved for such purpose by a Federal, State, or local health, law enforcement, or other appropriate agency.

(c) Debarment and Suspension: That the Contractor is a duly licensed general contractor, and

(1) That neither the Contractor nor any of its principal employees are on the General Services Administration's List of Parties Excluded from Federal Procurement or Nonprocurement Programs [E.O. 12549 and E.O. 12689 at 24 CFR part 24, applicable to contracts exceeding the small purchase threshold of fixed by 41 U.S.C. 403 (11)]; and

(2) That the Contractor has not been debarred or suspended by any state agency or city or town in the Commonwealth of Massachusetts.

(d) Organization and Authority: That the Contractor is a duly organized and validly existing _____ (corporation/general partnership/limited partnership, trust, or sole proprietorship) and is qualified to do business and is in good standing in the Commonwealth of Massachusetts; that this Contract has been duly executed and delivered on behalf of the Contractor by its _____ pursuant to and in full compliance with the authority granted by the Contractor's organizational documents and/or (in the case of a corporation) by a vote taken at duly called meeting at which a quorum was present and voting; that such authority is still in full force and effect as of the date of execution of this Contract; and that the person executing this Contract is the present holder of the title which he or she purports to hold.

(e) Noncollusion: That the bid upon which this Contract was based was made without collusion or fraud with any other person and was in all respects bona fide and fair. As used in this paragraph, the word "person" shall mean any natural person, joint venture, partnership, corporation, or other business or legal entity.

(f) Tax Compliance: That the Contractor is in full compliance with all federal and state laws relating to income taxes, and has paid all real estate and personal property/excise taxes, water charges, fines and other municipal lien charges due to the City of Somerville, and the Contractor's Federal Tax Identification Number
is #_____.

Section 14. CONTRACTOR'S RECORDS.

(a) Federal Requirements: The Contractor shall permit the City, HUD and/or any other administering agency named herein, the Comptroller General of the United States, or any of their duly authorized representatives, to have access to any books, documents, papers, and records of the Contractor which are directly pertinent to a specific HUD program for the purpose of making audits, examinations, excerpts, and transcriptions.

(2) State Requirements: In accordance with G.L. Chapter 30, §39R, for contracts in an amount or estimated amount greater than $100,000: (i) the General Contractor shall make and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the Contractor; and (ii) until the expiration of six years after final payment, the office of the Inspector General and the Commissioner of Capital Asset Management and Maintenance shall have the right to examine any books, documents, papers or records of the Contractor or of his

subcontractors that directly pertain to and involve transactions relating to the Contractor or his subcontractors; and (iii) the Contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the Awarding Authority, including in his description the date of the change and reasons therefor and shall accompany said description with a letter from the Contractor's independent certified public accountant approving or otherwise commenting on the changes; and (iv) the Contractor shall have filed a Statement of Management on Internal Accounting Controls, as described in paragraph "(1)" below prior to the execution of the Contract; and (v) the Contractor has filed prior to execution of the Contract and will continue to file annually, an Audited Financial Statement for the most recent completed fiscal year as set forth in paragraph "(2)" below.

(1) The Statement of Management on Internal Accounting Controls is a written statement certifying that the system of internal accounting controls of the Contractor and its subsidiaries reasonably assures that transactions are executed in accordance with management's general and specific authorization; that transactions are recorded as necessary to permit preparation of financial statements in conformity with generally accepted accounting principles and to maintain accountability for assets; that access to assets is permitted only in accordance with management's general or specific authorization; and that recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

(2) The Audited Financial Statement is a statement prepared and signed by an independent certified public accountant, stating that he has examined the Statement of Management on internal accounting controls, and expressing an opinion as to (i) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amount which would be material when measured in relation to the applicant's financial statements.

The Contractor shall annually file with the Commissioner of Capital Asset Management and Maintenance during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountants report. Such statements shall be made available to the Awarding Authority upon request.

(c) Records and statements required to be made, kept or filed under the provisions of this section shall not be public records as defined in G.L. 4, §7 or equivalent federal legislation. They shall not be made available to the public, but shall be available only to the governmental authorities named herein.

Section 15. CONFLICT OF INTEREST LAWS.

The City and the Contractor shall comply with all federal and state conflict of interest statutes and regulations.

Section 16. EVENTS OF DEFAULT.

The following shall be considered Events of Default:

a. The Contractor makes a written admission of the Contractor's inability to pay debts; or the Contractor becomes the debtor or defendant in (i) a voluntary or involuntary petition in bankruptcy, (ii) a petition for appointment of a receiver, (iii) a levy of an attachment or execution, (iv) an assignment for the benefit of creditors, (v) a winding up or dissolution of a partnership or corporation; or (vi) any other proceeding under which a court of competent jurisdiction assumes custody or control over the Contractor.

b. The Contractor fails to prosecute the work with such diligence as will, in the reasonable estimation of the City, ensure substantial completion within the time specified in the Contract Documents; and/or

c. The Contractor is in breach of the Contract Documents and has failed to cure such breach after written notice from the City specifying 1) the breach, 2) what must be done to cure the breach; and 3) the time within which the breach must be cured.

Section 17. REMEDIES UPON DEFAULT.

a. HUD Action. If the Contractor is in default, HUD and/or any other administering agency named herein may, with or without the consent of the City, cancel,

suspend, or terminate this Contract in whole or in part; require the withholding or disallowance all or part of the funding for the project; declare the contractor ineligible for further Government contracts or avail itself of any other remedies available under the law.

b. City Action. If the Contractor is in default, the City may elect to do any or all of the following: 1) temporarily withhold cash payments pending correction of the deficiency; and/or 2) terminate this Contract, and

(a) hold the Contractor and its sureties liable in damages;

(b) require the Contractor's sureties to complete the Contract;

(c) take possession and use any materials, machinery, implements, and tools on the site, without liability for loss or damage, following which use, the Contractor shall be liable for their removal from the site;

(d) complete the work using the services of another contractor (in which case the City shall have no obligation to use a competitive process to obtain the lowest contract prices) and look to the Contractor and the Contractor's sureties for the difference between the cost to complete the work and the contract sum hereunder.

Section 18. TERMINATION WITHOUT CAUSE.

The City may terminate this Contract without cause by written notice to the Contractor, in which case, the Contractor shall be compensated for reasonable costs incurred up to the date of termination, calculated on a percentage completion basis using the progress schedule and schedule of values. The City shall also compensate the Contractor for non-terminable obligations properly incurred by the Contractor prior to termination; provided however, that the

Contractor shall use its best efforts to mitigate the cost of such non-terminable obligations and shall in no event incur any new obligations after the date of termination.

Section 19. INSURANCE

The Contractor shall obtain and maintain in full force and effect the insurance coverage required under Appendix C and shall furnish the City with current certificates of insurance **naming the City of Somerville as a certificate holder.**

Section 20. INDEMNIFICATION.

The Contractor shall indemnify, defend, and save harmless the City from and against any and all liabilities, losses, damages, costs, expenses (including reasonable attorneys' fees), causes of action, suits, claims, and demands and shall pay any judgment entered against the City on account of personal injuries or damage to property arising out of the work of this Contract.

Section 21. NOTICES.

Notices shall be in writing, and may be transmitted by mail, federal express, or fax, provided such transmittal is evidenced by a U.S. Mail or Federal Express return receipt or a fax-generated receipt showing the number to which the fax transmission was made:

(a) to the Contractor, at the address set forth in this Agreement or such other address as the Contractor may have designated from time to time in writing, or to FAX # _____.

(b) to the City, addressed to

Purchasing Director
93 Highland Avenue
Somerville, MA 02143
or to FAX # 617-625-1344

Notices shall be deemed given when mailed or faxed.

Section 22. MODIFICATION.

No amendment or modification to this Agreement shall take effect unless it is in writing, signed by all parties.

Section 23. ASSIGNMENT/SUBCONTRACTING.

The Contractor shall not assign or subcontract this Agreement or any portion of the work without the prior written consent of the City.

Section 24. GOVERNING LAW.

This Agreement shall be governed by the laws of the Commonwealth of Massachusetts and the United States of America.

Section 25. SEVERABILITY.

In the event that any provision of this Agreement is found to be legally unenforceable, the remainder of the Agreement shall remain in full force and effect.

Section 26. NON-APPLICABILITY OF FEDERAL REQUIREMENTS.

If this section is checked, it means that this contract has not been funded with federal funds and the obligations and requirements under federal law which are set forth in this contract do not apply.

____X____ (check here)

SPECIAL PROVISIONS

Completion Date

This contract will be in effect one year from the date of contract award.

Bonds

A labor and materials bond in the amount of $25,000 will be required by the successful bidder.

Note: The successful bidder agree that if he is selected as the contractor, he will, within five (5) days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the Awarding Authority, execute a contract in accordance with the terms of this bid and furnish a labor and materials bond from a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to the Award Authority in the amount stated.

Insurance

The contractor must provide the following insurance certificates before the contract can be fully executed:

General Liability:	$2,000,000
Automobile:	$2,000,000
Workers' Compensation:	as required by General Law

The Certificates of Insurance must show the City of Somerville as the Certificate Holder and as Additional Insured. Should any policies be cancelled before the expiration date, the issuing company must send written notice to the City 30 days prior to cancellation.

Prevailing Wage Law

Bidders will be required to comply with the Prevailing Wage Laws, M.G.L. c. 149. Every bidder will be required to submit a certified payroll to the City every week. The City will take an active roll in reviewing and monitoring these payrolls weekly. If the City suspects any violations, the City will report them to the Attorney General's Fair Labor and Business Practices Division. The Attorney General's office, after conducting an investigation and a hearing can order the bidder to halt work, if it finds prevailing wage violations. Within fifteen days after completion of its portion of the work, the bidder must submit a Statement of Compliance with the prevailing wage law. The City reserves the right to conduct hearings on bids that are significantly below the average bid price submitted on a project, to make findings of fact, and determinations. Weekly payrolls are public records and the bidder shall make them available upon request. The bidder is required to keep these records for a period of three years from the date of completion of this contract.

GENERAL TERMS AND CONDITIONS

1. CONTRACTOR'S OBLIGATION

The Contractor shall and will, in good workmanlike manner, do and perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by this contract, within the time herein specified, in accordance with the provisions of this contract and said specifications and in accordance with the plans and drawings, and in accordance with the directions of the Design Professional or DPW as given from time to time during the progress of the work. He shall furnish, erect, maintain and remove such construction plant and such temporary works as may be required.

The Contractor shall observe, comply with and be subject to all terms, conditions, requirements and limitations of the contract and specifications, and shall do, carry on and complete the entire work to the satisfaction of the Design Professional and DPW.

2. PERFORMANCE/PAYMENT BONDS

The Contractor shall furnish a performance bond in an amount at least equal to one hundred percent (100%) of the contract price as security for the faithful performance of this Contract and also a payment bond in an amount not less than one hundred percent (100%) of the contract price or in a penal sum not less than that prescribed by State, territorial or local law, as security for payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract. The performance bond and the payment bond may be in one or in separate instruments in accordance with local law, and shall to the extent feasible be in the form developed by the American Institute of Architects (AIA).

3. DESIGN PROFESSIONAL'S AUTHORITY

The Design Professional shall give orders and directions contemplated under the contract and specifications, relative to the execution of the work. The Design Professional shall determine the amount, quality, acceptability and fitness of several kinds of work and the construction thereof. The Design Professional's estimates and decisions shall be final and conclusive, except as herein otherwise expressly provided. In case any questions shall arise between the parties hereto relative to said contract or specifications, the determination or decision of the Design Professional shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected in any manner or to any extent by such question. The Design Professional shall decide the meaning and intent of any portion of the specifications and of any plans or drawings where the same may be found obscure or be in dispute. Any differences or conflicts in regard to their work which may arise between the Contractor under this contract and other Contractors performing work for DPW shall be adjusted and determined by the Design Professional. In accordance with Chapter 30, section 30P of the General Laws the Design Professional's decision on interpretation of the specifications, approval of equipment or material, or any other approval, or progress of the work, shall be made promptly and, in any event, no later than thirty days after a written submission for decision; but if such decision requires extended investigation and study, the Awarding Authority or the Design Professional shall give the party making the submission written notice of the reasons why the decision cannot be made within the thirty day period and the date by which the decision will be made.

4. SUBCONTRACTING

a. The Contractor may utilize the services of specialty subcontractors on those parts of the work which, under normal contracting practices, are performed by specialty subcontractors, subject to the provisions of this section.

b. The Contractor shall not award any work to any subcontractor without prior written approval of DPW, which approval will not be given until the Contractor submits a written approval statement concerning the proposed award to the subcontractor, which statement shall contain such information as DPW may require. All subcontracts subject to Mass. General laws, Chapter 149, Sections 44A-J, shall comply with the filed sub-bid requirements of that statute.

c. The Contractor shall be as fully responsible for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

d. The Contractor shall cause appropriate provisions to be inserted in all subcontractors relative to the work to bind subcontractors to the Contractor by the Terms of the General Conditions and other contract documents insofar as applicable to the work of subcontractors and to give the Contractor the same power as regards terminating any subcontract that DPW may exercise over the Contractor under any provision of the contract documents.

e. Nothing contained in this contract shall create any contractual relation between any subcontractor and DPW.

5. PERMITS AND CODES

a. It shall be the Contractor's responsibility to obtain and pay for all permits required in connection with the work. Unless otherwise agreed by the Awarding Authority in writing, the Contractor shall, prior to commencement of the work, (i) meet with the City of Somerville Inspectional Services Department to determine what permits are needed for the work; (ii) obtain all such permits; and (iii) provide copies of such permits to the Awarding Authority. Permits shall include, without limitation, demolition, foundation, digsafe, and building permits; permits for removal, sealing up, or installation of utilities, including gas, electrical, water and sewer; and permits for obstructing public streets and sidewalks.

b. The Contractor shall comply with all state and local laws, ordinances, and codes. Before installing any work, the Contractor shall examine the Drawings and Technical Specifications for compliance with applicable laws, ordinances, and codes and shall immediately report any discrepancy to OHCD. Where the requirements of the Drawings and Technical Specification fail to comply with applicable laws, ordinances, or codes, OHCD will adjust the Contract by change order to conform to such laws, ordinances or codes (unless waivers in writing covering the differences have been granted by the governing body or department) and make appropriate adjustment in the Contract Price or stipulated unit prices. Should the Contractor fail to observe the foregoing provisions and proceed with the construction, (notwithstanding the fact that such construction is in compliance with the

Drawings and Technical Specifications), the Contractor shall remove such work without cost to OHCD, and a change order will be issued to cover only the excess cost that the Contractor would have been entitled to receive if the change had been made before the Contractor commenced work on the items involved.

c. Notwithstanding the generality of the foregoing, the Contractor shall comply with federal, state and local laws, ordinances, and codes governing the disposal of excavation materials, and debris and rubbish on and off the Project site.

6. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

The Contractor will be furnished additional instructions and detail drawings as necessary to carry out the work included in the contract. The additional drawings and instructions thus supplied to the Contractor will coordinate with the Contract Documents and will be so prepared that they can be reasonably interpreted as part thereof. The Contractor shall carry out the work in accordance with the additional detail drawings and instructions. The Contractor and the Design Professional or DPW will prepare jointly (a) a schedule, fixing the dates at which special detail drawings will be required, such drawings, if any, to be furnished by the Design Professional or DPW in accordance with said schedule, and (b) a schedule fixing the dates for the submission of shop drawings, the beginning of manufacture, testing and installation of materials, supplies and equipment, and the completion of the various parts of the work; each such schedule to be subject to change from time to time in accordance with the progress of the work.

7. TECHNICAL SPECIFICATIONS AND DRAWINGS

Anything mentioned in the Technical Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Technical Specifications, shall be of like effect as if shown on or mentioned in both. In case of any discrepancy in Drawings, or Technical Specifications, the matter shall be immediately submitted to the Designer or DPW for a decision. Said discrepancy shall not be adjusted by the Contractor, save only at his own risk and expense.

8. SHOP DRAWINGS

a. All required shop drawings, machinery, details, layout drawings, etc. shall be submitted to the Designer or DPW for approval sufficiently in advance of requirements to afford ample time for checking, including time for correcting, resubmitting and rechecking if necessary. The Contractor may proceed, only at his own risk and expense, with manufacture or installation of any equipment or work covered by said shop drawings, etc. until they are approved, and no claim by the Contractor for extension of the Contract time will be granted by reason of his failure in this respect.

b. Any drawings submitted without the Contractor's stamp of approval will not be considered and will be returned to him for proper resubmission. If any drawings show variations from the requirements of the Contract because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment of Contract price and/or time. Otherwise the Contractor will not be relieved of the

responsibility for executing the work in accordance with the Contract even though the drawings have been approved.

c. If a shop drawing is in accord with the Contractor or involves only a minor adjustment in the interest of DPW not involving a change in Contract price or time, the Designer or DPW may approve the drawing. The approval shall be general and shall not relieve the Contractor from his responsibility for adherence to the contract or for any error in the drawing and shall contain in substance the following: "The modification shown on the attached drawing is approved in the interest of DPW to affect an improvement for the Project and is ordered with the understanding that it does not involve any change in the Contract Price or time; that it is subject generally to all Contract stipulation and covenants; and that it is without prejudice to any and all rights of DPW under the Contract and surety bond or bonds."

9. MATERIALS AND WORKMANSHIP

a. Unless otherwise specifically provided for in the Technical Specifications, all workmanship, equipment, materials and articles incorporated in the work shall be new and the best grade of the respective kinds for the purpose. Where equipment, materials, articles or workmanship are referred to in the Technical Specifications as "equal to" any particular standard, the Designer shall decide the question of equality.

b. The Contractor shall furnish to DPW for approval the manufacturer's detailed specifications for all machinery, mechanical equipment and other equipment articles and materials, together with complete information as to type, performance characteristics, and all other pertinent information. Machinery, mechanical and other equipment, materials or articles installed or used without such prior approval shall be at the risk of subsequent rejections.

c. Materials specified by reference to the number or symbol of a specific standard, such as an A.S.T.M. Standard, or a Federal Specification or other similar standard, shall comply with requirements in the latest revision thereof and any amendment or supplement thereto in effect on the date of the invitation for Bids, except as limited to type, class or grade, or modified in such reference. The standards referred to, except as modified in the Technical Specifications, shall have full force and effect as though printed therein.

f. DPW may require the Contractor to dismiss from the work such employee or employees as, DPW or the Designer may deem incompetent, careless, or insubordinate.

10. SAMPLES

a. The Contractor shall/promptly submit all material and equipment samples called for in the Contract Documents or required by the Designer or DPW. No such material or equipment shall be manufactured or delivered to the site, except at the Contractor's own risk and expense, until the required samples have been approved in writing by DPW or the Designer. Any delay in the work caused by late or improper submission of samples for approval shall not be considered just cause for an extension of the contract time.

Each sample submitted by the Contractor shall carry a label giving the name of the Contractor, the project for which it is intended, and the name of the producer. The

accompanying letter from the Contractor shall state that the sample complies with Contract requirements, shall give the name and brand of the product, its place of origin, the name and address of the producer and all specifications or other detailed information which will assist the Designer in passing upon the acceptability of the sample promptly. It shall also state that all materials or equipment furnished for use in the project will comply with the sample.

b. Approval of any sample shall be general only and shall not constitute a waiver of DPW's right to demand full compliance with Contract requirements. After actual deliveries, the Designer will have such check tests made as he deems necessary in each instance and may reject materials and equipment for cause, even though such materials and equipment have been given general approval. If materials or equipment which fail to meet check tests have been incorporated in the work, the Designer will have the right to cause their removal and replacement by proper materials and equipment or to demand and secure such reparation by the Contractor as is equitable.

c. Except as otherwise specifically stated in the Contract, the costs of samples and tests will be as follows:

(1) The Contractor shall furnish without extra cost, including packing and delivery charges, all samples required for testing purposes, except those samples taken on the Project by the Designer.

(2) The Contractor shall assume all costs of retesting materials which fail to meet contract requirement.

(3) The Contractor shall assume all costs of testing materials offered in substitution for those found deficient.

11. INSPECTION OF THE WORK

a. All materials and workmanship shall be subject to inspection, examination, and/or testing by DPW or its designated representative. DPW shall have the right to reject defective material and workmanship and require it to be promptly segregated and removed from the Project Area and replaced with materials and workmanship of specified quality without charge. If the Contractor fails to proceed at once with the correction of rejected materials and workmanship, DPW may proceed to correct the work itself and charge the cost of the same against any monies which may be due the Contractor, without prejudice to any other rights or remedies of DPW.

b. The Contractor shall furnish promptly all materials reasonably necessary for any tests which may be required. All tests will be performed in such manner as not to delay the work unnecessarily and will be made in accordance with the provisions of the Technical Specifications.

c. The Contractor shall notify DPW sufficiently in advance of covering or concealing any work in order to permit proper inspection. If any work is covered or concealed without the consent of DPW, the Contractor shall uncover and recover such work for inspection at the contractor's expense, when so requested by DPW. Should it be considered necessary or advisable by DPW to examine work already completed and covered, the Contractor shall on

request promptly uncover said work. If such work is found to be defective in any important or essential respect the Contractor shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the actual cost of labor and material necessarily involved in the examination and replacement, plus an additional amount equal to that allowed for change orders shall be allowed the Contractor and he shall, in addition, if completion of the work of the entire Contract has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.

d. Whenever the quantity justifies it, inspections of work may be made at the place of production, manufacture or shipment, in which case, acceptance shall be final, except as regards (1) latent defects, (2) damage or loss in transit; or (3) fraud or such gross mistakes as amount to fraud. Otherwise, inspections of materials shall take place at the Project Site.

e. No examination, inspection, or testing, by DPW or its agent shall relieve the Contractor or the Contractor's sureties of liability for defective materials or workmanship.

f. Any inspection party may include one or more HUD representatives and one or more representatives of each department of the City having jurisdiction over the work being inspected.

12. DEDUCTION FOR INCORRECTED WORK

If DPW deems it expedient not to require the Contractor to correct work not done in accordance with the Contract Documents, an equitable deduction from the Contract Price will be made by agreement between the Contractor and DPW. Any dispute regarding such deduction shall be subject to settlement, in case of dispute, as herein provided.

13. CONSTRUCTION SUPERINTENDENT

At the site of the work the Contractor shall employ a construction superintendent or foreman who shall have full authority to act for the Contractor. Such representative shall be acceptable to the Design Professional or DPW and shall continue in that capacity for the duration of the job unless he ceases to be on the Contractor's payroll.

14. ACCIDENT PREVENTION

a. The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of his prosecution of the work. The safety provisions of applicable laws and building and construction codes shall be observed and the Contractor shall take or cause to be taken such additional safety and health measures as DPW may determine to be reasonably necessary. Machinery, equipment and all hazards shall be guarded in accordance with the safety provisions of the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, Inc., to the extent that such provisions are not in conflict with applicable local laws.

b. The Contractor shall indemnify and save harmless DPW from any claims for damages resulting from personal injury and/or death suffered or alleged to have been suffered by any person as a result of any work conducted under this Contract.

15. EXISTING UTILITY LINES

Should the Contractor in the execution of his work uncover or discover utility service lines not indicated on the relevant drawings, or that do not show signs of singular service to any existing structures being demolished, the Contractor shall cease work in that area immediately and promptly notify the Public Works Department. Within forty-eight hours, the Public Works Department will inspect the site and issue written instructions to the Contractor. The Contractor shall proceed with only after such written instructions have been received and shall proceed in full compliance with such instructions.
The above mentioned situation or similar circumstances and/or modification if any, shall not relieve the Contractor from his responsibilities in this Contract and also it is without prejudice to any and all rights of DPW covering this said contract and surety or bonds.

16. CARE OF WORK

a. The Contractor shall be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence in connection with the prosecution of the work and shall be responsible for the proper care and protection of all materials delivered and work performed until completion and final acceptance by DPW.

b. The Contractor shall provide sufficient competent watchmen, both day and night, including Saturdays, Sundays and holidays, as necessary, from the time the work is commenced until final completion and acceptance. Sufficient lighting shall be provided to aid in the prevention of injury to passersby or vandalism to the property or other illegal activities.

c. In an emergency affecting the safety of life or property, including adjoining property, the Contractor, without special instructions or authorization from DPW is authorized to act at his discretion to prevent such threatened loss or injury, and he shall so act. He shall likewise act if instructed to do so by DPW. Any compensation claimed by the Contractor on account of such emergency work will be determined by DPW as provided in the Section - CHANGES IN THE WORK.

d. The Contractor shall avoid damage as a result of its operations to existing sidewalks, streets, curbs, pavements, utilities (except those which are to be replaced or removed), adjoining property, etc. and the Contractor shall at its own expense completely repair any damage thereto caused by its operations.

e. The Contractor shall shore up, brace, underpin, secure, and protect as may be necessary, all foundations and other parts of existing structure adjacent to, adjoining, and in the vicinity of the site, which may be in any way affected by the excavations or other operations connected with the construction of the improvements embraced in this Contract. The Contractor shall be responsible for the giving of any and all required notices to any adjoining or adjacent property owner or other party before the commencement of work. The Contractor shall indemnify and save harmless the City of Somerville and/or DPW from any liability for damages on account of settlement or the loss of lateral support of adjoining property resulting from the Contractor's failure to comply with this section.

17. WEATHER PROTECTION

a. In the event of temporary suspension of work, during inclement weather, the Contractor will carefully protect and will cause his subcontractors to carefully protect all work and materials against damage or injury from the weather. If, in the opinion of the Design Professional or DPW, any work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of his Subcontractors so to protect the work, such work or materials shall be removed and replaced at the expense of the Contractor.

b. It is the intent of these Specifications to require that, in all Chapter 149, s. 94A contracts, the General Contractor shall provide temporary enclosures and heat to permit construction work to be carried on during the months of November through March in compliance with M.G.L. Chapter 149, Section 44D (G). These Specifications are not to be construed as requiring enclosures or heat for operations that are not economically feasible to protect in the judgment of DPW. Included in the preceding category, without limitation, are such items as site work, excavation, pile driving, steel erection, erection of certain "exterior" wall panels, roofing, and similar operation:

(1) "WEATHER PROTECTION" shall mean the temporary protection of that work adversely affected by moisture, wind and cold, by covering, enclosing and/or heating. This protection shall provide adequate working areas during the months of November through March as determined by the Design Professional and consistent with the approved construction schedule to permit the continuous progress of all work necessary to maintain an orderly and efficient sequence of construction operations. The General Contractor shall furnish and install all "Weather Protection" material and be responsible for all costs, including heating required to maintain a minimum temperature of 40 degrees F, at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials or the applicable General Conditions set forth in the Contract Articles with added regard to performance obligations of the Contractor.

(2) Within 30 calendar days after his award of contract, the General Contractor shall submit in writing to DPW for approval, three copies of his proposed methods for "Weather Protection".

(3) Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices. Heating devices which may cause damage to finish surfaces shall not be used.

(4) The General Contractor shall furnish and install one accurate Fahrenheit thermometer at each work area as designated by the Designer. However, one additional accurate Fahrenheit thermometer shall be provided for every 2,000 square feet of floor space where the work areas exceed 2,000 square feet.

18. SANITARY FACILITIES

The Contractor shall furnish, install and/or maintain ample sanitary facilities for the workmen. As the needs arise, a sufficient number of enclosed temporary toilets shall be conveniently placed as required by the sanitary codes of the State and Local

Government. Drinking water shall be provided from an approved source, so piped or transported as to keep it safe and fresh and served from single service containers or satisfactory types of sanitary drinking stands or fountains. All such facilities and services shall be furnished in strict accordance with existing and governing health regulations. Nothing in this Section shall be construed as forbidding the use of facilities available in existing buildings on the job site if they meet the above requirements and the use of them will not interfere with the progress of the work.

19. USE OF PREMISES AND REMOVAL OF DEBRIS

The Contractor expressly undertakes at his own expense:

a. to store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the work as will not unduly interfere with the progress of his work or the work of any other contractors;

b. to place upon the work or any part thereof, only such loads as are consistent with the safety of that portion of the work.

c. to clean up frequently all refuse, rubbish, scrap materials and debris caused by his operations, to the end that at all times the site of the work shall present a neat, orderly and workmanlike appearance.

d. before final payment to remove all surplus material, false work, temporary structure, including foundations thereof, plant of any description and debris of every nature resulting from this operations, and to put the site in a neat, orderly condition.

e. to effect all cutting, fitting or patching of his work required to make the same to conform to the plans and specifications and, except with the consent of the Design Professional or DPW not to cut or otherwise work of any other contractor.

20. COORDINATION WITH OTHER CONTRACTORS

The Contractor shall coordinate his operations with those of other Contractors. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of work. The Contractor, including his subcontractors, shall keep informed of the progress and the detail work of other Contractors and shall notify the Design Professional or DPW immediately of lack of progress or defective workmanship on the part of other Contractors. Failure of a contractor to keep informed of the work progressing on the site and failure to give notice of lack of progress of defective workmanship by others shall be construed as acceptance by him of the status of the work as being satisfactory for proper coordination with his own work.

21. QUANTITIES OR ESTIMATES

Wherever the estimated quantities of work to be done and materials to be furnished under this contract are shown in any of the documents including the proposal, they are given for use in comparing bids and the right is especially reserved herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably

necessary or desirable by DPW to complete the work contemplated by the contract, nor shall any such increases or diminution shall in no way violate this contract, nor shall any such increase or diminution give cause for claims or liability for damages.

22. DISPUTES

a. All disputes arising under this Contract or its interpretation, whether involving law of fact or both, or extra work, and all claims for alleged breach of Contract shall within ten (10) days of commencement of the dispute be presented by the Contractor to DPW for decision. All papers pertaining to claims shall state the facts surrounding the claims in sufficient detail to identify the claim, with its character and scope. In the meantime, the Contractor shall proceed with the work as directed. Any claim not presented within the time limit specified in this paragraph shall be deemed to have been waived, except that if the claim is of a continuing character and notice of the claim is not given within ten (10) days of its commencement, the claim will be considered only for a period commencing ten (10) days prior to the receipt by DPW of notice thereof.

b. The Contractor shall submit proof of the Contractor's claim in detail. Each decision by DPW will be in writing and will be mailed to the Contractor by registered or certified mail, return receipt requested.

c. If the Contractor does not agree with DPW's decision the Contractor shall not delay the work, but shall notify DPW promptly that he is proceeding with the work under protest and he may then except the matter in question from the final release.

23. LAND AND RIGHTS-OF-WAY

Prior to the start of construction, DPW shall obtain all lands and rights-of-way necessary for the carrying out and completion of work to be performed under this contract.

24. WARRANTY OF TITLE

No material, supplies, or equipment to be installed as part of the work shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. The Contractor shall warrant good title to all materials, supplies, and equipment installed or incorporated in the work and, upon completion of all work, shall deliver the same to DPW free from any claims, liens, or charges. Neither the Contractor nor any person, furnishing any material or labor for any work covered by this Contract shall have any right to a lien. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any bond given by the Contractor for their protection, or to recover under any laws permitting such persons to look to funds due the Contractor in the hands of DPW. The provisions of this paragraph shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

25. GENERAL GUARANTY

Neither the final certificate of payment nor any provision in the Contract Documents, nor partial or entire occupancy of the premises by DPW shall constitute any acceptance of

work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from the date of final acceptance of the work unless a longer period is specified. DPW will give notice of observed defects with reasonable promptness.

26. REVIEW OF RECORDS

DPW, its authorized representative and agents and the HUD Representative for the Secretary shall, at all times have access to and be permitted to observe and review all work materials, equipment, payrolls, personnel records, employment conditions, material invoices, and other relevant data and records pertaining to this Contract, provided, however, that all instructions and approval with respect to the work will be given to the Contractor only by DPW through its authorized representatives or agents.