THE CITY OF WALTHAM
MASSACHUSETTS

PURCHASING DEPARTMENT
Christopher Road and Montclair Ave
Water Main Replacement

A D D E N D U M N O. 1 June 21, 2018

CHANGES, CORRECTIONS AND CLARIFICATIONS

The attention of bidders submitting proposals for the above subject project is called to the following addendum to the specifications. The items set forth herein, whether of omission, addition, substitution or clarification are all to be included in and form a part of the proposal submitted.

THE NUMBER OF THIS ADDENDUM (NO. 1) MUST BE ACKNOWLEDGED IN SECTION 00 300-3

ITEM 1: DELETE AND REPLACE

Please DELETE the current Section 00300, 00301, Attachment A and Attachment B Sections of the bid document and REPLACE it with the following updated ones.

Note that Section 00300 includes the Missing rodent control service which has been added in the new version of 00300.

ITEM 2: ANSWERS TO POSED QUESTIONS

Q1. This area is known to have lots of ledge, Is blasting permitted to remove the ledge?
A1. Blasting will not be permitted.

Q2. Can you clarify what is expected for the landscape work in the triangle area?
A2. The Contractor will be required to protect and exercise caution when working around trees and shrubs within the project area. Shrubs and vegetation which, in the opinion of the Engineer, require removal for the execution of work will be considered incidental to the work and shall be removed and disposed of by the Contractor at no additional cost to the City. Loam and seed shall be the method of

restoration of disturbed vegetated areas. Trees and shrubs removed and / or damaged by the Contractor shall be replaced by the Contractor at no additional cost to the Owner.

End of Addendum 1

SECTION 00300

BID FORM CHRISTOPHER ROAD

PART 1 GENERAL

1.01 SCHEDULE OF BID ITEMS

1.02 DEFINITIONS OF TERMS AND ABBREVIATIONS USED IN THE BID

PART 2 BID

PART 1 GENERAL

1.01 SCHEDULE OF BID ITEMS

A. The following Schedule of Bid Items shall be completed in ink or typewritten. All item prices must be entered in both words and figures and extended by the Bidder. In case there is a discrepancy between the item prices shown in words and figures, the amount shown in words shall govern.

B. Where the Schedule of Items consists of more than one (1) item, the total bid price for the Contract, calculated as above and entered at the end of the schedule, is not a part of the Bid, but is to be used solely for the comparison of bids to determine the apparent low bidder. The Low Bidder will be determined based on the sum of the individual bid items.

C. Failure to submit a formal Bid in accordance with the requirements of the INSTRUCTIONS AND INFORMATION FOR BIDDERS will be considered sufficient grounds for rejection of the entire Bid Proposal.

D. Bidders must fill in a price for all items in the bid

E. Project Award: The project will be awarded to the lowest bidder. The lowest bidder is defined as the bidder with the lowest price summing the Bid including chosen alternates and qualified by the City.

1.02 DEFINITIONS OF TERMS AND ABBREVIATIONS USED IN THE BID

A. Where any of the following abbreviations are used in the Bid, they shall have the meaning set forth opposite each. Periods may or may not be used in abbreviations.

Alt.	Alternate
CLDI	Cement Lined Ductile Iron
CMP	Corrugated Metal Pipe
C.Y.	Cubic Yard
D.I.	Ductile Iron
Dia.	Diameter
EA.	Each
F.A.	Fees Allowance
HMA	Hot Mix Asphalt
lbs.	Pounds
L.F.	Linear Feet
L.S.	Lump Sum
Min.	Minimum
MFBM	Thousand Board Feet
M.H.	Man-hour
N/A	Not Applicable
NIC	Not In Contract
PE	Polyethylene
psi	Pounds per Square inch
PVC	Polyvinylchloride
R.C.P.	Reinforced Concrete Pipe
R.O.W.	Right of Way
SDR	Standard Dimensional Ratio
S.F.	Square Foot
S.Y.	Square Yard
V.C.	Vitrified Clay
V.F.	Vertical Feet
w/	with
w/o	without

BID FORM FOR
CITY OF WALTHAM, MASSACHUSETTS
CHRISTOPHER ROAD WATER MAIN REPLACEMENT PROJECT

The undersigned Bidder declares that the only parties interested in this Bid as principals are as stated; that the bid is made without collusion with any other person, firm, or corporation; that no officer or agent is directly or indirectly interested in this Bid; that he has carefully examined all Contract Documents and Contract Drawings as prepared by City of Waltham Engineering Department, 119 School Street, Waltham Massachussetts and dated April 8, 2018.

The undersigned Bidder understands that the information relative to existing structures, apparent and latent conditions and natural phenomena as furnished to him on the Contract Drawings or in the Contract Documents or by the Owner or the Engineer, carries no guarantee expressed or implied as to its completeness or accuracy and he has made all due allowance therefore. The quantities of work tabulated in this Bid and indicated on the drawings or in the specifications are only approximate and are subject to increase or decrease.

The undersigned Bidder agrees that the amount of the bid security deposited with this Bid fairly and reasonably represents the amount of damages the Owner will suffer due to his failure to fulfill his agreements as hereinafter set forth and he further understands that should he so fail, the Owner shall have the right to retain as liquidated damages for the entire amount of the bid security.

In submitting this Bid the undersigned Bidder agrees:

A. To hold this Bid open for one hundred and twenty (120) calendar days.
B. To accept the provisions regarding disposition of security.
C. To enter into and execute a contract, if awarded on the basis of this Bid, and to furnish guarantee bonds.
D. To accomplish the work in accordance with the Contract Documents.
E. To complete the work by the time stipulated in the agreement.

The undersigned further understands and agrees that he is to furnish and provide for the respective bid price all the necessary material, machinery, tools, labor, services, and other items of whatever nature, and to do and perform all the work necessary under the aforesaid conditions, to complete the above mentioned project in accordance with the plans and specifications for the project.

The undersigned Bidder further understands that the Documents of the Contract for which his Bid is being submitted establish that liquidated damages in the amount of $500.00 per calendar day shall be applied for breach of Contract in accordance in with the provisions of AGREEMENT.

The undersigned Bidder acknowledges receipt of Addenda numbered_____

The undersigned Bidders also agree as follows:

A. To do any extra work, not covered by the Contract, which may be ordered by the Engineer, and to accept as full compensation therefore such prices as may be agreed upon in writing by the Engineer and the Contractor in accordance with SECTION 00700 - GENERAL CONDITIONS.

B. Within ten (10) days from the date of the "Notice of Award", to execute the Contract and to furnish the Owner a satisfactory Performance Bond and Labor and Material Payment Bond as set forth in INSTRUCTIONS AND INFORMATION FOR BIDDERS.

C. To begin work at the site on the day designated in the "Notice to Proceed" and to prosecute said work in such a manner that the entire project shall be completed within the time specified in the AGREEMENT.

Accompanying this Bid is a certified bid bond or check, for 5% of the bid, in the amount of $_____ (Bidder to fill in) payable to the Owner to secure said Owner against the failure of the undersigned to execute the Contract and furnished satisfactory bonds under the Conditions and within the time specified in this Bid.

BRIEF DESCRIPTION **BASE BID**

ITEM NO.	BID PRICE ENTERED IN BOTH WORDS AND FIGURES (UNIT PRICE)	ESTIMATED QUANTITY		TOTAL PRICE (UNIT PRICE X QUANTITY)
	1. WATER PIPE & FITTINGS			
1A.	Furnish and Install 8" Dia. Class 56, Cement Lined Ductile Iron (CLDI) Water Pipe, all depths of cover, per Linear Foot _____dollars and_____cents ($_____)	320	L.F.	$_____
1B.	Furnish and Install 6" Dia. Class 56 Cement Lined Ductile Iron (CLDI) Water Pipe, all depths of cover, per Linear Foot _____dollars and_____cents ($_____)	35	L.F.	$_____
1C.	Furnish and Install 8" Gate Valve, With Valve Box, as specified, Each _____dollars and_____cents ($_____)	3	EA.	$_____
1D.	Furnish and Install 6" Gate Valve, With Valve Box, as specified, Each _____dollars and_____cents ($_____)	1	EA.	$_____
1E.	Furnish and Install New Hydrant, American Darling B-62, Waltham Colors, as specified, Each _____dollars and_____cents ($_____)	1	EA.	$_____

Subtotal for Page **Base Bid** $_____

ITEM NO.	BID PRICE ENTERED IN BOTH WORDS AND FIGURES (UNIT PRICE)	ESTIMATED QUANTITY	TOTAL PRICE (UNIT PRICE X QUANTITY)
	1. WATER PIPE & FITTINGS CONT.		
1F.	Furnish and Install Ductile Iron Fittings, per Pound _____dollars and_____cents ($_____)	2,000 LBS.	$_____
1G.	Furnish and Install 1" Dia. Type K Copper Tubing for Water Services, As Specified, per Linear Foot _____dollars and_____cents ($_____)	200 L.F.	$_____
1H.	Furnish and Install 1" Dia. Corporation Cocks, As Specified, Each _____dollars and_____cents ($_____)	5 EA.	$_____
1I.	Furnish and Install 1" Dia. Curb Stops and Street Service Boxes, As Specified, Each _____dollars and_____cents ($_____)	5 EA.	$_____
1J.	Furnish and Install 4" Dia. Bypass Piping and Fittings, per Linear Foot _____dollars and_____cents ($_____)	400 L.F.	$_____

Subtotal for Page **Base Bid** $_____

ITEM NO.	BID PRICE ENTERED IN BOTH WORDS AND FIGURES (UNIT PRICE)	ESTIMATED QUANTITY		TOTAL PRICE (UNIT PRICE X QUANTITY)
	1. WATER PIPE & FITTINGS CONT.			
1K.	Furnish and Install 2" Dia. Bypass Piping and Fittings, per Linear Foot _____dollars and_____cents ($_____)	200	L.F.	$_____
1L.	Furnish and Install 1" Dia. Bypass Piping and Fittings, per Linear Foot _____dollars and_____cents ($_____)	250	LF.	$_____
1M.	Furnish and Install Temporary Hydrant As specified, each _____dollars and_____cents ($_____)	1	EA.	$_____
1N.	Temporary Water Main Bypass Connection to House Services, and reconnection to permanent City water, Each _____dollars and_____cents ($_____)	5	EA	$_____
	4. EARTHWORK			
4A.	Unclassified Excavation, Disposal and Backfill, per Cubic Yard _____dollars and_____cents ($_____)	100*	C.Y.	$_____
4B.	Rock Excavation, Disposal and Backfill, per Cubic Yard _____dollars and_____cents ($_____)	25*	C.Y.	$_____
		Subtotal for Page **Base Bid**		$_____

ITEM NO.	BID PRICE ENTERED IN BOTH WORDS AND FIGURES (UNIT PRICE)	ESTIMATED QUANTITY		TOTAL PRICE (UNIT PRICE X QUANTITY)
4.	EARTHWORK CONT.			
4C.	Gravel Borrow Fill and /or Gravel Borrow Refill of Unsuitable Material, per Cubic Yard. _____dollars and_____cents ($_____)	100*	C.Y.	$_____
4D.	Fine Grading and Compacting of Roadway Subgrade areas, per Square Yard _____dollars and_____cents ($_____)	1,400	S.Y.	$_____
5.	PAVEMENT			
5A	Reclaim Existing Pavement and prepare for Paving, per square yard _____dollars and_____cents ($_____)	1,400	S.Y.	$_____
5C.	Furnish and Place (Machine Method) Permanent Base Course Pavement, 3" minimum depth, per Ton _____dollars and_____cents ($_____)	300	TON	$ _____
5D.	Furnish and Place (Machine Method) Top and Leveling Course Pavement 1 1/2" minimum depth, per Ton _____dollars and_____cents ($_____)	150	TON	$ _____
			Subtotal for Page	$_____
			Base Bid	

*Indeterminate Quantity. These quantities are not guaranteed. Payment will be based upon actual quantities constructed.

ITEM NO.	BID PRICE ENTERED IN BOTH WORDS AND FIGURES (UNIT PRICE)	ESTIMATED QUANTITY		TOTAL PRICE (UNIT PRICE X QUANTITY)
5.	PAVEMENT CONT.			
5E.	Furnish and Place Bituminous Concrete Pavement (Hand Method) for Test Pits and Miscellaneous Areas, per Ton _____dollars and_____cents ($_____)	35	TON	$_____
5F.	Furnish and Place Temporary Trench Pavement, 3" minimum paving depth, per Linear Foot _____dollars and_____cents ($_____)	1,000	L.F.	$_____
6.	INCIDENTAL WORK			
6A.	Concrete (3000 psi) for Encasement Cradles and Miscellaneous Work, per Cubic Yard _____dollars and_____cents ($_____)	10*	C.Y.	$_____
6B.	Uniformed Police for Traffic Control, Per Man-hour Fourty-four dollars and No cents ($ 44.00)	450**	M.H.	$ 19,800
6D.	Unmarked Drain Service Repair, All Sizes up to 12" Inside Diameter As Specified, Each _____dollars and_____cents ($_____)	1*	EA.	$_____

*Indeterminate Quantity. These quantities are not guaranteed. Payment will be based upon actual quantities constructed.

Subtotal for Page **Base Bid** $_____

ITEM NO.	BID PRICE ENTERED IN BOTH WORDS AND FIGURES (UNIT PRICE)	ESTIMATED QUANTITY		TOTAL PRICE (UNIT PRICE X QUANTITY)
6.	INCIDENTAL WORK CONT.			
6F.	Remodel Existing Drain or Sewer Manhole or Catch Basin Structure, As Required, per Vertical Foot _____dollars and_____cents ($_____)	10*	V.F.	$_____
6G.	Furnish and Install Bituminous Concrete Sidewalk, All widths, 3" min. depth, per square yard _____dollars and_____cents ($_____)	50	S.Y.	$_____
6H.	Loam & Seeding or Mulch for Landscaping Repair, per Square Yard _____ dollars and_____cents ($_____)	500*	S.Y.	$_____
6I.	Furnish and Install Straw Filter Tubes, "Wattles", Per Linear Foot _____dollars and_____cents ($_____)	450	L.F.	$_____

*Indeterminate Quantity. These quantities are not guaranteed. Payment will be based upon actual quantities constructed.

**NOTE: Police Detail invoices will be paid by Contractor and reimbursed by the City of Waltham up to $19,800 for Base Bid. Contractor shall coordinate detail Assignments.

Subtotal for Page **Base Bid** $_____

BRIEF DESCRIPTION **BASE BID**

ITEM NO.	BID PRICE ENTERED IN BOTH WORDS AND FIGURES (UNIT PRICE)	ESTIMATED QUANTITY		TOTAL PRICE (UNIT PRICE X QUANTITY)
7.	LUMP SUM ITEMS			
7A.	Mobilization, the Lump Sum of _____dollars and_____cents ($_____)	1	L.S.	$_____
7B.	Miscellaneous Work and Cleanup, the Lump Sum of _____dollars and_____cents ($_____)	1	L.S.	$_____
7C.	Traffic Control System for Vehicle and Pedestrian Safety, the Lump Sum of _____dollars and_____cents ($_____)	1	L.S.	$_____
7D.	Rodent Control, the Lump Sum of _____dollars and_____cents ($_____)	1	L.S.	$_____

Subtotal for Page $_____

Base Bid

Total for Base Bid $_____

BRIEF DESCRIPTION **ADD ALTERNATE 1**

ITEM NO.	BID PRICE ENTERED IN BOTH WORDS AND FIGURES (UNIT PRICE)	ESTIMATED QUANTITY	TOTAL PRICE (UNIT PRICE X QUANTITY)

~ITEMS LISTED IN ADD ALTERNATE #1 THAT ARE ALSO INCLUDED IN THE BASE BID SHALL HAVE THE SAME UNIT BID PRICES IN BOTH THE BASE BID AND ADD ALTERNATE #1~

5F.	Furnish and Place Temporary Trench Pavement, 3" minimum paving depth, per Linear Foot _____dollars and_____cents ($_____)	250 L.F.	$ _____
6B.	Uniformed Police for Traffic Control, Per Man-hour _____Fourty-four_____dollars and_____zero_____cents ($____44.00_____)	100 MH.**	$ _____4,400.00_____
7E.	Mobilization of Additional Equipment and Materials Required for Add Alternate #1, the Lump Sum of _____dollars and_____cents ($_____)	1 L.S.	$ _____
7F.	Traffic Control System for Vehicle and Pedestrian Safety Required for Add Alternate #1, the Lump Sum of _____dollars and_____cents ($_____)	1 L.S.	$ _____
7G.	Rodent Control Required for Add Alternate #1, the Lump Sum of _____dollars and_____cents ($_____)	1 L.S.	$ _____

**NOTE: Police Detail Invoices will be paid by the Contractor and reimbursed by the City of Waltham up to $4,400 for Add Alternate #1. Contractor shall coordinate detail Asignments.

Subtotal for Page $_____

BRIEF DESCRIPTION **ADD ALTERNATE 1**

ITEM NO.	BID PRICE ENTERED IN BOTH WORDS AND FIGURES (UNIT PRICE)	ESTIMATED QUANTITY	TOTAL PRICE (UNIT PRICE X QUANTITY)
	8. SEWER PIPE AND FITTINGS, SEWER SYSTEM APURTENANCES		
8A.	Furnish and Install 8" Dia. SDR 35 PVC Gravity Sewer Pipe and Fittings, all depths of cover, per Linear Foot _____dollars and_____cents ($_____)	250 L.F.	$ _____
8B.	Furnish and Install 6" Dia. SDR 35 PVC Gravity Sewer Pipe and Fittings, all depths of cover, per Linear Foot _____dollars and_____cents ($_____)	280 L.F.	$ _____
8C.	Furnish and Install Sewer manhole Frame and cover, As specified, each _____dollars and_____cents ($_____)	2 EA.	$ _____
8D.	Furnish and Install 4' Dia. Standard Precast Sanitary Manholes, any Depth, As Specified, Each _____dollars and_____cents ($_____)	2 EA.	$ _____
8E.	Furnish and Install Sewer Service Cleanout Assembly, As Specified, each _____dollars and_____cents ($_____)	3 EA.	$ _____
		Subtotal for Page	$_____
		Total for Add Alternate 1	$_____

BID SUMMARY SHEET

BID TOTALS:

TOTAL BASE BID $_____
(Pages 00300-5 through 00300-11)

_____
(Amount in Words)

TOTAL ADD ALTERNATE 1 $_____
(Page 00300-12 through 00300-13)

_____
(Amount in Words)

TOTAL BASE BID + ADD ALTERNATE 1 $_____
(Pages 00300-5 through 00300-13)

_____
(Amount in Words)

Basis of Award shall be at the Owner's sole discretion.

SECTION 301

BID FORM MONTCLAIR AVENUE

To the City of Waltham, Massachusetts:

Regarding: **Montclair Ave Water Main Replacement**

The Owner reserves the right to reject any bid in the event that any bid item or items are obviously unbalanced or appear to the Owner to be so unbalanced as to affect or to be liable to affect adversely any interest of the Owner.

The Owner reserves the right to reject any or all bids if it deems it to be in its best interest to do so. The Owner reserves the right to award the Contract based on sufficiency of appropriated funds to complete the work.

The undersigned states that no officer, agent, or employees of the Owner directly or indirectly have a financial interest in this Bid.

The undersigned, as Contractor, declares as follows:

- The only parties interested in this Bid as Principals are named herein
- This Bid is made without collusion with any other person, firm, or corporation
- No officer, agent, or employee of the Owner is directly or indirectly interested in this Bid
- The Contractor has carefully examined the proposed Work and fully informed and satisfied himself as to the conditions there existing, the character and requirements of the proposed Work, the difficulties attendant upon its execution and the accuracy of all estimated quantities stated in this Bid, and has carefully read and examined the annexed proposed AGREEMENT and the Specifications and other Contract Documents therein referred to and knows and understands the terms and provisions thereof
- Understands that information relative to subsurface and other conditions, natural phenomena, existing pipes, and other structures (surface and/or subsurface) has been furnished only for his information and convenience without any warranty or guarantee, expressed or implied, that the subsurface and/or other conditions, natural phenomena, existing pipes, and other structures (surface and/or subsurface) actually encountered will be the same as those shown within the Contract Documents and agrees that the Contractor shall not use or be entitled to use any such information made available to him through Contract Documents or otherwise or obtained by him in his own examination of the site, as a basis of or ground for any claim against the Owner of the Engineer arising from or by reason of any variance which may exist between the aforesaid information made available to or acquired by him and the subsurface and/or other conditions, natural phenomena, existing pipes, and other structures (surface and/or subsurface) actually encountered during the construction work, and has made due allowance therefore in this BID
- The Contractor understands that the quantities of work tabulated in this Bid or indicated in the Specifications of other Contract Documents are only approximate and are subject to increase or decrease as deemed necessary by the Engineer

- The Contractor agrees that, if this BID is accepted will contract with the Owner, as provided in the copy of the Contract Documents deposited in the office of the Engineer, this BID from being part of said Contract Documents, and that the Contractor will perform all the work and furnish all the materials and equipment, and provide all labor, services, plant, machinery, apparatus, appliances, tools, supplies, and all other things required by the Contract Documents in the manner and within the time therein prescribes and according to the requirements of the Engineer as therein set forth, and that the Contractor will take in full payment therefore the lump sum or unit price applicable to each item of the Work as states in the schedule below

Contractors must bid on each Item.

Refer to Section Special Provisions for Measurement and Payment for Item Descriptions.

BASE SCOPE OF WORK BID FORM

The Base Bid include all the work of the Contractor, being all work covered by Items 120.1 through 999, inclusive.

Montclair Avenue Water Main Replacement

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
119.101	1	LS	RODENT CONTROL AT _____ per lump sum		
120.1	50*	CY	UNCLASSIFIED EXCAVATION AT _____ per cubic yard		
129	5300	SY	PAVEMENT MILLING AT _____ per square yard		
141.1	100	CY	TEST PIT FOR EXPLORATION AT _____ per cubic yard		
144	350*	CY	CLASS B ROCK EXCAVATION AT _____ per cubic yard		
151	350*	CY	GRAVEL BORROW AT _____ per cubic yard		
153	50*	CY	CONTROLLED DENSITY FILL AT _____ per cubic yard		
156	50*	CY	CRUSHED STONE AT _____ per cubic yard		
182.2	100*	FT	REMOVAL OF ASBESTOS AT _____ per each		
220	22	EA	DRAINAGE STRUCTURE ADJUSTED AT _____ per each		
220.2	80	VLF	DRAINAGE STRUCTURE REBUILT AT _____ per vertical linear foot		
220.7	13	EA	SANITARY STRUCTURE ADJUSTED AT _____ per each		
221.1	12	EA	FRAME GRATE (OR COVER)MUNICIPAL STANDARD AT _____ per each		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
238.12	50	FT	12 INCH DUCTILE IRON PIPE AT _____ per foot		
241.15	50	FT	15 INCH REINFORCED CONCRETE PIPE AT _____ per foot		
250.04	535	FT	4 INCH PVC SANITARY SEWER PIPE AT _____ per foot		
252.15	50	FY	15 INCH HDPE PIPE AT _____ per foot		
301.1	1	LS	4 INCH TEMP BYPASS WATER MAIN BASE BID WORK AT _____ per lump sum		
302.06	130	FT	6 INCH DUCTILE IRON WATER PIPE AT _____ per foot		
302.08	1040	FT	8 INCH DUCTILE IRON WATER PIPE AT _____ per foot		
302.12	350	FT	12 INCH DUCTILE IRON WATER PIPE AT _____ per foot		
302.16	75	FT	16 INCH DUCTILE IRON WATER PIPE AT _____ per foot		
309	6000	LB	DUCTILE IRON FITTINGS FOR WATER PIPE AT _____ per pound		
347.1	1020	FT	1 INCH COPPER TUBING TYPE K AT _____ per foot		
350.06	6	EA	6 INCH GATE AND GATE BOX AT _____ per each		
350.08	5	EA	8 INCH GATE AND GATE BOX AT _____ per each		
350.12	5	EA	12 INCH GATE AND GATE BOX AT _____ per each		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
356.16	3	EA	16 INCH GATE AND GATE BOX AT _____ per each		
358	20	EA	GATE BOX ADJUSTED AT _____ per each		
363.1	64	EA	1 INCH CORPORTAION COCK AT _____ per each		
371.06	1	EA	6 INCH COUPLING AT _____ per each		
371.08	4	EA	8 INCH COUPLING AT _____ per each		
371.16	5	EA	16 INCH COUPLING AT _____ per each		
376	6	EA	HYDRANT AT _____ per each		
381.01	64	EA	SERVICE BOX MUNICIPAL STANDARD AT _____ per each		
384	64	EA	CURB STOP AT _____ per each		
460	1650	TON	HOT MIX ASPHALT AT _____ per ton		
464	265	GAL	BITUMEN FOR TACK COAT AT _____ per gallon		
472	320	TON	HOT MIX ASPHALT FOR MISCELANEOUS WORK AT _____ per ton		
472.2	1250	SY	HOT MIX ASPHALT FOR PERMANENT PATCH (5”) AT _____ per square yard		
518	11	EA	CURB INLET CONCRETE AT _____ per each		
570.2	1400	FT	HOT MIX ASPHALT CURB TYPE 1, 2 OR 3 AT _____ per foot		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
580	150	FT	CURB REMOVED AND RESET AT _____ per foot		
697.1	14	EA	SILT SACK AT _____ per each		
701	75	SY	CEMENT CONCRETE SIDEWALK AT _____ per Square Yard		
702	150	SY	HOT MIX ASPHALT WALK SURFACE AT _____ per Square Yard		
703	400	SY	HOT MIX ASPHALT DRIVEWAY AT _____ per Square Yard		
751.2	650	SY	LOAM BORROW AND SEEDING AT _____ per square yard		
850.1	1	LS	TRAFFIC CONTROL BASE BID WORK AT _____ per lump sum		
999	2250	HR	POLICE DETAILS AT FORTY FIVE DOLLARS AND NO CENTS per hour	$45.00	$101,250.00
TOTAL BASE BID:					

Price written in: Words (Dollars and Cents) Figures

****Indeterminate quantities. These quantities are not guaranteed. Payment will be based on actual quantities constructed.****

Basis of Award: The basis of award shall be at the Owner's sole discretion.

Add. Alternate #1 – Montclair Avenue Water Main Replacement (Piedmont Ave to Trimount Ave)

Note: Items listed in the Add. Alternates below that are also included in the Base Bid above shall have the same unit bid prices in both the Base Bid and the Add. Alternates.

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
119.201	1	LS	RODENT CONTROL AT _____ per lump sum		
129	1300	SY	PAVEMENT MILLING AT _____ per square yard		
141.1	50*	CY	TEST PIT FOR EXPLORATION AT _____ per cubic yard		
182.2	50*	FT	REMOVAL OF ASBESTOS AT _____ per each		
220	4	EA	DRAINAGE STRUCTURE ADJUSTED AT _____ per each		
220.2	20	VLF	DRAINAGE STRUCTURE REBUILT AT _____ per vertical linear foot		
220.7	5	EA	SANITARY STRUCTURE ADJUSTED AT _____ per each		
222.1	4	EA	FRAME GRATE (OR COVER)MUNICIPAL STANDARD AT _____ per each		
250.04	20	FT	4 INCH PVC SANITARY SEWER PIPE AT _____ per foot		
252.15	50	FT	15 INCH HDPE PIPE AT _____ per foot		
301.2	1	LS	4 INCH TEMP BYPASS WATER MAIN ADD ALT WORK AT _____ per lump sum		
302.06	40	FT	6 INCH DUCTILE IRON WATER PIPE AT _____ per foot		
302.08	660	FT	8 INCH DUCTILE IRON WATER PIPE AT _____ per foot		
309	2000	LB	DUCTILE IRON FITTINGS FOR WATER PIPE AT _____ per pound		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
347.1	200	FT	1 INCH COPPER TUBING TYPE K AT _____ per foot		
350.06	2	EA	6 INCH GATE AND GATE BOX AT _____ per each		
350.08	2	EA	8 INCH GATE AND GATE BOX AT _____ per each		
358	10	EA	GATE BOX ADJUSTED AT _____ per each		
363.1	20	EA	1 INCH CORPORTAION COCK AT _____ per each		
371.06	1	EA	6 INCH COUPLING AT _____ per each		
376	2	EA	HYDRANT AT _____ per each		
381.01	20	EA	SERVICE BOX MUNICIPAL STANDARD AT _____ per each		
384	20	EA	CURB STOP AT _____ per each		
460	450	TON	HOT MIX ASPHALT AT _____ per ton		
464	65	GAL	BITUMEN FOR TACK COAT AT _____ per gallon		
472	80	TON	HOT MIX ASPHALT FOR MISCELANEOUS WORK AT _____ per ton		
472.2	450	SY	HOT MIX ASPHALT FOR PERMANENT PATCH (5”) AT _____ per square yard		
514	2	EA	CURB INLET CONCRETE AT _____ per each		
570.2	100	FT	HOT MIX ASPHALT CURB TYPE 1, 2 OR 3 AT _____ per foot		

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
580	30	FT	CURB REMOVED AND RESET AT _____ per foot		
697.1	3	EA	SILT SACK AT _____ per each		
701	25	SY	CEMENT CONCRETE SIDEWALK AT _____ per Square Yard		
702	100	SY	HOT MIX ASPHALT WALK SURFACE AT _____ per Square Yard		
703	250	SY	HOT MIX ASPHALT DRIVEWAY AT _____ per Square Yard		
751.2	400	SY	LOAM BORROW AND SEEDING AT _____ per square yard		
850.2	1	LS	TRAFFIC CONTROL ADDITIVE ALTERNATIVE AT _____ per lump sum		
999	500	HR	POLICE DETAILS AT FORTY FIVE DOLLARS AND NO CENTS per hour	$45.00	$22,500.00
TOTAL ADD ALTERNATE #1:					

Price written in: Words (Dollars and Cents) Figures

****Indeterminate quantities. These quantities are not guaranteed. Payment will be based on actual quantities constructed.****

Basis of Award: The basis of award shall be at the Owner's sole discretion.

The Contractor hereby agrees that he will not withdraw this BID within one hundred twenty (120) consecutive calendar days after the actual date of the opening of Bids and that, if the Owner shall accept this BID, the Contractor will duly execute and acknowledge the AGREEMENT and furnish, duly executed and acknowledge, the required CONTRACT BONDS within ten (10) calendar days after notification that the AGREEMENT and other Contract Documents are Ready for signature.

If this BID is accepted by the Owner, the undersigned agrees to substantially complete work provided to be done under the Contract within **180 calendar days** (water main) and final completion within **365 calendar days** (final paving), as stipulated in the AGREEMENT.

This Proposal must bear the written signature of the Contractor or that of his duly authorized agent. If the Contractor is a corporation or a partnership, the Bid must be signed by a duly authorized office of such corporation or by a Partner and the title of such officer must be stated. Satisfactory completion of the following data is an essential part of submission of this Proposal and is required. Bid must be embossed with corporate seal.

(SEAL)

_____ By:_____
(Name of Contractor) (Signature and title of authorized representative)

Date:_____

_____ _____
(Telephone Number) (Business Address)

_____ _____
(Fax Number) (City and State)

END OF SECTION 00300

SECTION 01000
GENERAL REQUIREMENTS

PART 1 GENERAL

PART 1 GENERAL

1.01 GENERAL

A. The Contractor shall conform to all general requirements as herein specified.

1.02 TRAFFIC CONTROL

A. For control of moderate traffic, the Contractor shall provide an adequate number of flagmen employed at his own expense.

B. Whenever and wherever, in the opinion of the Engineer, traffic is sufficiently congested or public safety is endangered, the Contractor, as required, shall furnish uniformed special officers to direct traffic and keep traffic off the highway area affected by his construction operations. Such officers shall be in addition to the watchmen required under other provisions of the Contract.

1.03 INTERFERENCE WITH/AND PROTECTION OF STREETS

A. The Contractor shall not close or obstruct any portion of a street, road, or private way without obtaining permits from the proper authorities. If any street or private way shall be rendered unsafe by the Contractor's operations, he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the Engineer.

B. Streets, roads, private ways, and walks not closed shall be maintained passable by the Contractor at his expense, and the Contractor shall assume full responsibility for the adequacy and safety of provisions made.

C. The Contractor shall, 24 hours in advance of closing any street, notify the police and fire departments in writing, with a copy to the Engineer. He shall cooperate with the police

department in the establishment of alternate routes and, at his own expense, shall provide adequate, plainly marked detour signs.

1.04 MAINTAINING STORMWATER AND SANITARY SEWER FLOWS

A. It is essential to the operation of the existing drainage system that there is no interruption in the flow of drainage. To this end, the Contractor shall provide, maintain, and operate all temporary facilities such as dams, pumping equipment, sewers, conduits and all other labor and equipment necessary to intercept the flow before it reaches the points where it would interfere with his work, carry it past his work, and return it to the system below his work.

1.05 HANDLING AND DISTRIBUTION

A. The Contractor shall handle, haul, and distribute all materials and all surplus materials on the different portions of the work, as necessary or required; shall provide suitable and adequate storage room for materials and equipment during the progress of the work, and be responsible for the protection, loss of, or damage to materials and equipment furnished by him, until the final completion and acceptance of the work.

B. Storage and demurrage charges by transportation companies and vendors shall be borne by the Contractor.

1.06 INSPECTION OF WORK AWAY FROM THE SITE

A. If work to be away from the construction site is to be inspected on behalf of the Owner during its fabrication, manufacture, testing, or before shipment, the contractor shall give notice to the Engineer of the place and time where such fabrication, manufacture, testing, or shipping is to be done. Such notice shall be in writing and delivered to the Engineer in ample time so that the necessary arrangements for the inspection can be made.

1.07 LINES, GRADES, AND MEASUREMENTS

A. Reference marks establishing the controlling grades are available from the Engineer. These reference marks shall be replaced at the Contractor’s expense if damaged or destroyed by construction operations.

B. The Contractor shall be responsible for detailed layout, stakeout and grade control required, and shall employ a registered land surveyor or registered professional engineer for this purpose. The Owner will provide engineering inspection.

C. Construction staking shall consist of construction layout and reference staking necessary for the proper control and satisfactory completion of all structures, grading, paving, drainage and all other appurtenances required for the completion of the Contract and acceptance of the work.

D. The Owner will furnish the Contractor such control points, bench marks and other data as may be necessary for the construction staking and layout by qualified engineering or land surveying personnel. It shall be the responsibility of the Contractor to verify all such data prior to construction.

E. Upon request of the Engineer, the Contractor shall furnish copies of all data used in setting and referencing all stakes and other layout markings used by the Contractor. The Contractor shall be responsible for the placement and for the accurate re-establishment of all baselines shown on the Plans, and for the replacement of existing survey points found on the Project and/or noted on the Plans. All brass survey pins in lead plugs and "PK" nails which are to be set or reset and are not to be set in stone bounds installed under this Contract, as noted on the Contract Drawings, are to be set or reset at no additional cost to the Authority. "PK" nails are to be galvanized, 1 ¼ inch minimum, with the letters "PK" on the head, separated by an indentation which marks the actual survey point, and shall be subject to the approval of the Engineer. All stakes, references and batterboards, including original, additional or replacements which may be required for the construction operations, shall be furnished, set and properly referenced by the Contractor. He shall be solely and completely responsible for the accuracy of the line and grade of all features of the work. Any errors or apparent discrepancies found in previous surveys, plans or in these Contract Documents shall be called to the Engineer's attention by the Contractor for correction or interpretation prior to proceeding with the work.

F. All staking shall be performed by qualified engineering or land surveying personnel, acceptable to the Engineer. These personnel shall perform the staking under the direct supervision of a registered land surveyor or registered professional engineer. All stakes used for control staking shall be of a quality meeting the approval of the Engineer.

G. When requested by the Engineer, the Contractor shall provide safe and convenient access to control points, batterboards and references. The Owner may make a check of the control of the work, as established by the Contractor, at any time as the work progresses. The Contractor will be informed of the results of these checks, but the Owner by so doing in no way relieves the Contractor of his responsibility for the accuracy of the layout work. The Contractor shall, at his expense, correct or replace, as required, any deficient layout and Construction work which is a result of inaccuracies in his taking operation or of his failure to report inaccuracies. If the Owner is required to make further studies, redesign, or both, all expenses incurred by the Owner due to such inaccuracies will be deducted from any monies due the Contractor.

H. The Contractor shall furnish all necessary personnel, engineering equipment and supplies, materials, and transportation incidental to the accurate and satisfactory completion of this work. There will be no direct payment for construction staking, or layout, but the cost thereof shall be considered as included in the bid unit prices or the Bid.

I. The Contractor shall verify dimensions and utility locations shown on the Contract Drawing and if any inconsistencies or discrepancies should be noted on the Contract Drawings, or between the Contract Drawings and actual field conditions, or between

the Contract Drawings and the Specifications, he shall immediately notify the Owner. The Contractor will be held responsible for any errors resulting from his failure to exercise the aforementioned precaution.

1.08 DIMENSIONS OF EXISTING STRUCTURES

A. Where the dimensions and locations of existing structures are of importance in the installation or connection of any part of the work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment which is dependent on the correctness of such information.

1.09 PIPE LOCATIONS

A. Exterior pipelines will be located substantially as indicated on the Contract Drawings, but the right is reserved to the Owner, acting through the Engineer, to make such modifications in location as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings, etc., are noted on the Contract Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

B. Small interior piping is indicated diagrammatically on the Contract Drawings, and the exact location is to be determined in the field. Piping shall be arranged in a neat, compact, and workmanlike manner, with a minimum of crossing and interlacing, so as not to interfere with equipment or access way, and, in general, without diagonal runs

1.10 PRECAUTIONS DURING ADVERSE WEATHER

A. During adverse weather and against the possibility thereof, the Contractor shall take all necessary precautions so that the work may be properly done and be satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building-paper shelters, or other suitable means.

B. During cold weather, materials shall be preheated, if required, and the materials and adjacent structure into which they are to be incorporated shall be made and kept sufficiently warm so that a proper bond will take place and a proper curing, aging or drying will result. Protected spaces shall be artificially heated by suitable means that will result in a moist or dry atmosphere according to the particular requirements of the work being protected. Ingredients for concrete and mortar shall be sufficiently heated so that the mixture will be warm throughout when used.

1.11 CUTTING AND PATCHING

A. The Contractor shall leave all chases or openings for the installation of his own or any other contractor's or subcontractor's work, or shall cut the same in existing work, and shall see that all sleeves or forms are properly set in ample time to prevent delays. He shall see that all such chases, openings, and sleeves are located accurately and are of

proper size and shape and shall consult with the Engineer and the contractors and subcontractors concerned in reference to this work.

B. In case of his failure to leave or cut all such openings or have all such sleeves provided and set in proper time, he shall cut them or set them afterwards at his own expense, but in so doing he shall confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the written consent of the Engineer.

C. The contractor shall carefully fit around, close up, repair, patch, and point around the work specified herein to the satisfaction of the Engineer.

D. All of this work shall be done by careful workmen competent to do such work and with the proper small hand tools. Power tools shall not be used except where, in the opinion of the Engineer, the type of tool proposed can be used without damage to any work or structures and without inconvenience or interference with the operation of any facilities. The Engineer's concurrence with the type of tools shall not in any way relieve or diminish the responsibility of the Contractor for such damage, inconvenience, or interference resulting from the use of such tools.

E. The Contractor shall not cut or alter the work of any subcontractor or any other contractor, nor permit any of his subcontractors to cut or alter the work of any other contractor or subcontractor, except with the written consent of the contractor or subcontractor whose work is to be cut or altered or with the written consent of the Engineer. All cutting and patching or repairing made necessary by the negligence, carelessness, or incompetence of the Contractor or any of his subcontractors shall be done by or at the expense of the Contractor and shall be the responsibility of the Contractor.

1.12 PROTECTION AGAINST ELECTROLYSIS

A. Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjoining surfaces so as to eliminate direct contact and any resultant electrolysis. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, non-metallic separators or washers, or other acceptable materials.

END OF SECTION

SECTION 01010
SUMMARY OF WORK

1. GENERAL SCOPE OF WORK

A. The Work under the Contract consists of:

1. Replacement of an existing 6" water main with approximately 320 linear feet of 8" cement lined ductile iron (CLDI) Class 56 water pipe and appurtenances, including replacement water services to the resident property line and replacement of valves and hydrants.

2. Installation of a temporary water system, temporarily paved at street crossings. Installation of temporary water services with buried or direct connection to existing water user services.

3. Removal, disposal and abandonment of existing water mains, water services and appurtenances.

4. Reclamation and paving including driveway aprons to Right-of-Way along a portion of Christopher Road.

B. In addition, the Work under the Contract includes:

1. Work outside the Project Site as called for in the Contract Documents and as required for the performance of the Work.

2. The restoration of any items damaged or destroyed by encroaching upon areas outside the Project Site.

3. Providing and restoring, where appropriate, all temporary facilities.

4. All Work either shown on the Drawings or included in the specifications unless specifically indicated as not to be done.

2. TIME OF COMPLETION

A. In accordance with Article 9 of the General Conditions, the Work shall start as stated in the Notice to Proceed and all items related to the pipe installation and paving shall be completed within 180 calendar days.

END OF SECTION

SECTION 01025

MEASUREMENTS AND PAYMENT

PART 1 GENERAL

1.01 GENERAL

A. The following section describes the measurement of and payment for the work to be completed under the respective items listed in the BID.

1.02 PAYMENT OF WORK

A. Payment shall be for the price set forth in the BID and is deemed full compensation for all materials, labor, tools, equipment and incidentals necessary to perform the work.

PART 2 CONTROL OF WORK

2.01 PIPE COVER

A. Pipe “cover” shall be defined as the vertical distance between the ground surface and the top of pipe.

2.02 DESIGN CHANGES

A. If changes are made in the design based on the Contract Drawings and Specifications as issued, and should such changes increase or decrease the amount of work to be done under the various Lump Sum Items on which the bid is based, adjustment will be made therefore as stipulated under the General Conditions of the Contract.

2.03 NORMAL LIMITS FOR EARTHWORK

A. The following limits establish the normal limits for all pay items except where additional work beyond these limits is indicated on the Contract Drawings. Except as specifically directed by the Engineer or indicated on the drawings, all work beyond these limits is the responsibility of the Contractor, and will not be considered a payment item.

B. Payment for excavation above or below normal grade shall only be made if such excavation is ordered in writing by the Engineer. Excavation done at the discretion of the Contractor will not be considered for payment.

2.04 NORMAL TRENCH LIMITS

A. Normal limits of excavation for pipe installation shall be as indicated in the tables for trench width and trench depth. Excavation above normal limits for pipe shall be defined as that excavation above the elevation corresponding to the bottom of the specified depth, and outside of the specified payment width. Excavation below normal limits shall be defined as all excavation below the elevation corresponding to the bottom of the specified depth. For excavations below the specified depth, the cost for the increased limits of excavation and backfilling shall be in addition to the cost of normal excavation and backfill limits and no deductions shall be made for the normal situation.

2.05 NORMAL TRENCH DEPTH

A. Pipe trench depth shall be defined from the ground elevation as determined by the Engineer prior to excavation. Depth of rock excavation shall be from the top of the rock formation encountered to the depth below the invert as noted below. A minimum clear space of 6-inch shall be provided between the rock and any part of the pipe. Trench depth in open cut and sheeted areas shall be from the original ground elevation to the depth below the pipe invert as noted in the table below, which defines the normal limits of trench excavation.

B.

Pipe Size	Depth Below Invert
W.S. up to 4-in	1.2 ft.
6-in to 16-in	1.2 ft.
18-in to 21-in	1.3 ft.
24-in to 30-in	1.4 ft.
36-in and 42-in	1.5 ft.
48-in and 54-in	1.6 ft.
66-in and 54-in	1.8 ft

2.06 NORMAL TRENCH WIDTHS

A. Pipe trench widths referred to herein are the distances separating the vertical planes between which the pipe is to be laid. In computing the amount of rock excavation in trenches, granular fill, concrete backfill, replacement of utility crossings or replacement of unsuitable excavated material ordered by the Engineer for payment under the respective Items of the Bid Form, the maximum limits of trench width shall be as follows:

a. For pipe up to 15 inches in diameter, allowable trench width at a plane 12 inches above pipe shall be no more than 36 inches. For pipe greater than 15 inches, the allowable width shall be equal to the pipe outside diameter plus 24 inches.

b. The trench payment widths up to 10 feet deep, extending from a plane 12 inches above the pipe to the grade surface shall be:

	Size	Width
1.	Service Pipe up to 4 inches	36 inches
2.	6 inches through 15 inches	48 inches
3.	18 inches through 21 inches	60 inches
4.	24 inches through 21 inches	66 inches
5.	27 inches through 30 inches	72 inches
6.	36 inches through 30 inches	84 inches

c. Additional width for deeper trench shall be limited to an increase of 1 foot for depths 10 feet to 15 feet and 2 feet for depths 15 feet to 20 feet.

	IN ROCK	
	0-12 ft.	Over 12 ft.
Pipe Size	Invert Depth	Invert Depth
0-24-in	5.0 ft.	7.0 ft.
Over 24-in	Nominal Dia. +3.0 ft.	Nominal Dia. +5.0 ft.

2.07 NORMAL STRUCTURE LIMITS

A. Normal limits of excavation for structures shall be defined as that area 12 inches below the base of the structure and within a vertical line offset 2 feet from footings or 4 feet from base slabs. Excavation above normal limits for structures shall be defined as that excavation above the elevation corresponding to 12 inches below the base, and outside of the aforementioned vertical offsets of the structure for which the excavation is being done. Excavation below normal limits shall be defined as that excavation below the elevation corresponding to 12 inches below the base of the structure for which the excavation is being done.

2.08 NORMAL ROADWAY EXCAVATION LIMIT

A. Normal limit for roadway excavation shall be defined as 16" below existing roadway pavement grade from edge of pavement to edge of pavement as shown on the typical cross-sections on the Contract Drawings.

2.09 NORMAL SIDEWALK/DRIVEWAY LIMITS

A. Normal limits for construction of the sidewalk/driveway shall be as defined as the bottom of the 8" gravel base and sides on the typical cross sections on the Contract Drawings.

PART 3 MEASUREMENT AND PAYMENT ITEMS

1. WATER PIPE AND APPURTENANCES

ITEM 1A & 1B: WATER MAINS

A. Measurement for payment under Items 1A and 1B shall be the length of the pipeline, sized 8" and 6" diameter measured in place and recorded by the Resident Engineer. Payment shall be by the linear foot basis, with no measured deductions made for fittings and valves.

B. Measurement of pipe used for cross connections and/or hydrant branches shall be made from the centerline of tees or tapping sleeves and valves and from the centerline of tee to centerline of hydrant. Payment shall be based on the linear foot basis with no deductions made for fittings and valves.

C. Prices bid under this Item for water pipe shall be full compensation for all labor, equipment, tools and materials necessary to complete the work as specified, which shall include all fittings, joint restraining gaskets, reducers, tees, bends, couplings, etc. and appurtenances (not paid for under other items), "mega lug" or equal restraints, temporary facilities, handling, storing and distribution of materials, excavation, segregating and stockpiling material suitable for backfill, backfill above trench grade including all bedding materials, placing sand blanket around new water pipe, 12" of roadway gravel, saw-cutting pavement, existing pavement removal and disposal, compacting trenches, dewatering, sheeting and shoring not ordered left in place, restoration, adjusting or supporting of existing utility pipes and conduits, removing and disposing or abandoning existing water mains and hydrants, capping existing water mains, and daily and final cleanup, flushing, hydrostatic testing, and chlorinating, water quality analyses, connections to existing water mains, and all other incidental work relative thereto, not specifically paid for under other Items and as specified and as shown on the plans.

D. Prices bid under this Item for water pipe shall include furnishing all labor, materials, tools and equipment to connect to the existing water main, which shall include shutting down existing water mains as necessary, including excavation, backfill, compaction,

dewatering, disposal of surplus or unsuitable materials, temporary sheeting or bracing as required, cutting and conditioning, or tapping of existing water main, sand blanket, 12" gravel road base, all fittings, and appurtenances (as previously stated) and assembly, cleanup and all other incidental work not specifically mentioned to satisfactorily complete this Item, including coordination with water users to shut down affected water service with 72-hour minimum notification and as specified and as shown on the plans.

E. The Contractor shall furnish and install all temporary watertight plugs, caps or blank flanges that may be required to properly protect the work and to test and chlorinate the mains. The Contractor shall also provide all necessary labor, tools, and materials required to dewater and permanently plug all abandoned valve boxes. Payment for furnishing and installing these items shall be made under the applicable pipe laying items listed under this Item, which shall also include all costs relative to flushing to remove silt and debris from the mains.

F. The Contractor shall be provided with water for flushing, testing and chlorinating water mains, at no cost, but only once for each section of pipe. Water required for additional flushing, testing and re-chlorination shall be billed to the Contractor at the prevailing rates of the Owner, (or water Utility having jurisdiction) and this sum of money shall be paid by the Contractor upon receipt of a bill from the Owner. The Owner may deduct such amounts of money from the Contractor's periodic estimates for payment.

G. Only seventy-five (75) percent of the price bid per linear foot of pipe shall be eligible for payment upon installation. The balance shall not be eligible for payment until the pipe has been successfully tested and chlorinated and is accepted by the Owner for incorporation into the existing system. The above percentages will apply before the specified retainage is withheld.

H. Pipe and other appurtenant water works materials delivered to the job site and properly stockpiled and protected, shall be eligible for payment upon written request by the Contractor. With each request for payment of stored materials, the Contractor shall submit an itemized and properly executed transfer of title form, made out to the owner. Payment shall be based upon seventy-five (75) percent of the total amount of each material invoice, as submitted to Contractor by materials supplier. All such pre-payments for materials, by the Owner, will later be deducted from the Contractor's Periodic Estimates for Payment. Prepayment for materials by the Owner shall not relieve the Contractor of responsibility for prompt payments to suppliers, and for successful protection of stored materials. The Owner may require copies of paid invoices as a prerequisite for payment.

I. Payment for furnishing and installing water mains of the various types and diameters listed shall be made at the unit prices bid under the applicable Item.

ITEM 1C & 1D: VALVES

A. Measurement for payment for furnishing and installing the mechanical joint ductile iron valves shall be the number of items counted in-place and recorded by the Engineer.

B. Payment for furnishing and installing the various types and sizes of valve listed or as shown on the contract drawings, shall be made at the unit prices bid under the particular Item.

C. The unit prices bid under this Item shall be full compensation for all labor equipment, tools and materials necessary to complete the work as specified, which shall include shutting down existing water mains as necessary, cutting and conditioning, or tapping of pipe, saw cutting existing pavement removal and disposal, joint accessories and restraints, jointing, assembly, support system, valve boxes, raising castings and covers to finished grade, excavation, backfill and compaction, and all other incidental work relative thereto.

ITEM 1E: HYDRANT

A. Measurement for payment for furnishing and installing a new hydrant shall be the numbers of items counted in place and recorded by the Engineer.

B. Payment for furnishing and installing a new hydrant, as listed in the proposal or as shown on the contract drawings shall be installed at the unit prices bid under Item 1E.

C. The unit price bid under each division of this Item shall be full compensation for all labor, equipment, tools and materials necessary to complete the work as specified, which shall include shutting down existing water mains as necessary, furnishing and installing, hydrant, hydrant extension if necessary, excavation, cutting pipe, installation and/or removal, transporting, transporting old hydrant to the Waltham DPW or disposal, stacking, repair, capping and restraining existing pipe, thrust blocks, saw cutting existing pavement removal and disposal, backfill and compaction, drainage well, factory painting to the City of Waltham paint color, and all other incidental work relative thereto.

ITEM 1F: DUCTILE IRON FITTINGS

A. Ductile Iron fittings, paid for under the associated pipe item, actually installed shall be measured by the pound, including the cement lining, based on the nominal weights of specific fittings tabulated in the AWWA Specifications or certified shipping weight slips furnished by the supplier to the Contractor. Mechanical joint glands, restraints, bolts, gaskets and accessories will not be included in the weight measurement, but are considered incidental to this item and the cost is to be included in the fitting weight.

B. Payment for furnishing and installing the various sizes and types of ductile iron fittings: hydrant extensions, bends, tees, solid sleeves, flexible couplings, and/or transition couplings, etc. listed here and not shown or called out on the contract drawings shall be

made at the price per pound in the bid. This price shall be full compensation for furnishing and installing the glands, gaskets, restraints, jointing, concrete thrust blocks, extensions and all work required for, incidental to the satisfactory completion of the Item for which payment is not provided under other items.

C. If additional ductile iron fittings are required that are not called out or shown on the drawings, the Contractor shall be compensated for the fitting by the unit price bid for this item.

D. The unit prices bid under this Item shall be full compensation for all labor, equipment, tools, and materials necessary to complete the work as specified, which shall include cutting and conditioning of pipe, fitting accessories, jointing, excavation, backfill and compaction, and all other incidental work relative thereto.

ITEMS 1G THROUGH 1I: COPPER TUBING WATER SERVICES AND APPURTENANCES

A. Payment for furnishing and installing 1" diameter, water service connections as directed by the Engineer shall be made at the unit prices bid under the applicable Items. These Items may be utilized for new water services or to replace existing services only as directed by the Engineer. No payment is to be made under this Item for replacement of existing water services damaged or removed by the contractor in the performance of other work under this Contract.

B. The unit prices bid under these Items shall be considered as fair compensation for all labor, equipment, tools and materials necessary to furnish and install a new water service within City property and to complete the work as specified, which shall include excavation, tapping water mains, assembling fittings, laying service pipe, connecting to existing services, saddles, tapping tees if required, couplings, adaptors and other appurtenant materials, dewatering, backfill and compaction, sand blanket backfill, 12" roadway gravel, saw cutting trenches, removal and disposal of pavement and surplus backfill, abandoning existing water services and removing existing corporations and installing plugs, 72-hour advance water customer notification, all other incidental work related thereto.

C. Method of Measurement: Payment for furnishing and installing water service connections shall be made as follows:

1. Payment for furnishing and installing 1" Type K Copper water tubing pipe per linear foot and all couplings shall be made at the unit price bid under Item 1G. Payment for removing and disposing of the existing water services shall be included in the unit price for furnishing and installing the pipe, item 1G and shall include coordination of shutting down existing water mains, if required, through prior notification of affected users no less than 72 hours before as necessary.

2. Payment for furnishing and installing each corporation cock shall be made at the unit price bid under Item 1H, shall include furnishing and installing each corporation cock and all required adaptors, couplings, saddles, tapping tees and

other accessory items to connect to the existing water main and all required work to wet tap the existing water main.

3. Payment for furnishing and installing each curb stop and street service box including extension rod shall be made at the unit price bid under Item 1I, shall include furnishing and installing each curb stop and all required reducers, adaptors, couplings and other accessory items to connect to the existing water service at the City property line beyond the back of the proposed sidewalk. Street service boxes shall be Erie service box with 18" stainless steel extension rod.

ITEMS 1J THROUGH 1N: TEMPORARY BYPASS PIPING & APPURTENANCES

A. Payments made for furnishing and installing 4", 2" and 1" diameter temporary bypass piping, temporary valves and hydrants and service connections as per contract shall be made at the unit prices bid under the applicable items.

B. Payment under these items shall include full compensation for furnishing and installing appropriate barricade and protection for installed water main bypass system including barrels and cones as necessary. No payment is to be made under these Items for replacement of temporary piping, valves, hydrants or service connections damaged or removed by the contractor in the performance of other work under this contract. No payment is to be made under these Items for replacement of temporary piping, valves or hydrants or service connections damaged on-site for the duration of this contract.

C. Payments under these Items shall be full compensation for the design and approval by the engineer. Refer to Section 02768.

1. Payment under Items 1J, 1K and 1L for the installation of bypass piping shall be per linear foot and shall include furnishing all pipe, fittings, valves, hoses, stone dust, crusher run material, barricades, disinfection and testing, dechlorination and all other materials necessary to install and activate the temporary bypass water system, complete. Payments made under Items 1J, 1K and 1L shall be full compensation for the for the maintenance and removal of all bypass 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.

2. Payment under item 1M shall include installation of temporary hydrants, per each, and shall include furnishing all temporary hydrants, fittings, valves, hoses, stone dust, crusher run material, barricades, disinfection and testing, dechlorination and all other materials necessary to install and activate the temporary hydrants for the bypass water system, complete.

3. Payment under item 1N shall include all labor, tools and equipment necessary to adequately temporarily serve and maintain each water customer with adequate domestic and fire service lines, per each service connection at

connection point, including the removal of meters if necessary. Pipe and fittings required for each service shall be included under the price of the bypass piping items. Payment under this item shall include the following:

a) Accurately locating water service lines and coordinating with water users for connection shutdowns required for temporary bypass and permanent water line connections.

b) Coordination with utility companies both Public and Private.

c) Prices bid under this Item for water pipe shall include furnishing all labor, materials, tools and equipment to connect temporary water services to water user services at the right of way. Work under this item shall include shutting down existing water pipes as necessary, including excavation, backfill, compaction, dewatering, disposal of surplus or unsuitable materials, temporary sheeting or bracing as required, cutting and connecting to existing pipe, fittings required or all materials and work required for tapping of existing water services, sand blanket, 12" gravel road base, all fittings, and appurtenances (as previously stated) and assembly, cleanup and all other incidental work not specifically mentioned to satisfactorily complete this Item, including coordination with water users to shut down affected water service with 72-hour minimum notification and as specified and as shown on the plans.

d) Removal of temporary connections upon completion and restore service to normal operating conditions.

4. EARTHWORK

ITEM 4A: UNCLASSIFIED EXCAVATION, GENERAL EXCAVATION AND TEST PIT EXCAVATION AND BACKFILL

A. Should the Engineer order test pit excavation, general excavation or unclassified excavation, the Contractor shall be paid therefore under this Item. Measurement for the quantity of excavation and backfill to be paid for shall be the number of cubic yards excavated and backfilled, in place, as ordered by the Engineer.

B. Payment shall constitute full compensation for the work of excavating, placing on-site or disposal of surplus or unsuitable materials, backfill and all work incidental thereto.

ITEM 4B: ROCK EXCAVATION, DISPOSAL AND BACKFILL

A. Measurement for the quantity of rock to be paid for under this Item shall be the number of cubic yards of rock, measured in place before excavation, within the limits of normal excavation as specified, unless rock excavation beyond such limits has been authorized by the Engineer, in which case measurements shall be made to the authorized limits.

B. Where rock is encountered, it shall be uncovered but not excavated until measurements have been made by the Engineer, unless in the opinion of the Engineer, satisfactory measurements can be made in some other manner.

C. Payment for rock excavation shall be full compensation for all labor, materials, and equipment necessary for rock excavation, disposal, and furnishing, placing and compacting acceptable backfill. The bidder should include in his bid under all items involving excavation, the cost of doing the entire excavation as earth. The unit price for rock excavation covers the difference between the cost of rock excavation and the cost of earth excavation.

ITEM 4C: GRAVEL BORROW FILL AND/OR GRAVEL BORROW REFILL OF UNSUITABLE MATERIAL

A. When additional gravel borrow fill (not already paid for under another item in this contract) is required or, in the opinion of the Engineer, the material above or below normal limits including tests pits is unsuitable for backfill, it shall be disposed of and replaced in such volumes within the lines of payment as the Engineer may order. This Item applies only to the use of borrow refill when stockpiles of excavated suitable backfill materials are insufficient in quantity.

B. All borrow refill shall be sand and gravel Type 3 material.

C. The quantity to be paid for shall be equal to the number of cubic yards of unsuitable material replaced with Type 3 sand or gravel borrow.

D. The unit price shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary for replacing of excavated material and furnishing, placing new fill material or placing and compacting sand and gravel in such excavations and furnishing.

ITEM 4D: FINE GRADING AND COMPACTING OF SUBGRADE AREAS

A. The square yard price for this Item shall constitute full compensation for the placement of on-site pavement sub-grade material (reclaim gravel) for the roadway, fine grading and compacting of the sub-grade areas prior to the placement of pavement. Also straight cut existing pavement.

B. The square yard price for this Item shall include furnishing all labor, materials, tools and equipment for the shaping, fine grading and compacting of the pavement sub-grade as shown on the Contract Drawings, as directed by the Engineer and as required to place the proposed base course pavement.

C. The square yard price shall also include the cost associated with dust control of the fine graded areas, through use of water and flake calcium chloride, as required and as specified in Section 01567 of the Contract Documents.

5. PAVEMENT

ITEM 5A: RECLAIM EXISTING PAVEMENT (RECLAIMED BASE COURSE)

A. Measurement for payment under this Item (Reclaimed Base Course) shall be the actual number of square yards of reclaimed base course, measured in place to the limits specified on the plans or as directed by the Engineer. Excess reclaimed material to be used before gravel borrow. No deduction shall be made for manhole covers, grates, or other surface structures.

B. Payment for this Item shall constitute full compensation for the reclaimed base course, complete in-place including scarifying, pulverizing, stockpiling and mixing the existing pavement, blending with the underlying material or gravel borrow, and spreading, rough grading and compacting the graded material. It shall also include the cost of labor, equipment, materials and all other work necessary to satisfactorily complete the work.

C. Payment for this Item shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary to saw cut pavement, lower existing, utility castings, utility valve boxes, frames and covers. This Item includes all costs associated with the preparation of the existing road for the reclamation. The unit price per square yard for reclaimed base course shall also include the restoration of all drainage and utility castings, utility valve boxes, frames and covers to the top of the proposed reclaimed base course (the surface upon which the bituminous concrete binder and top is to be placed).

D. Payment for this Item shall constitute full compensation for the removal and disposal of unsuitable subgrade and subbase material or surplus material associated with the pulverizing operation. The square yard price shall also include the cost associated with dust control, through use of water or flake calcium chloride, as required and as specified in Section 01567 of the Contract Documents. Excess reclaimed material shall become the property and responsibility of the Contractor.

E. Payment for this Item shall constitute full compensation for the completing all cuts and fills necessary to establish the proposed standard cross section and proposed centerline as shown on the contract drawings. Surplus reclaimed material shall be used to complete all filling operations. Surplus reclaimed material to be used before gravel borrow. See Section 02220

ITEM 5C: 3'' BASE COURSE PAVEMENT (MACHINE METHOD)

A. Measurement for payment under this Item shall be the actual number of tons of asphalt placed for permanent base course pavement, and maintained as shown on the drawings, as specified, and as directed by the Engineer.

B. Payments for this Item shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary to place the base course pavement, including construction of pavement end joints, saw cutting joints, tack coat along the edges,

minor adjustments to subbase material, raising all castings and gate boxes to binder grade and to maintain the permanent base course pavement as required by the Specifications.

C. The Contractor shall continuously maintain pavement, as specified, and repair the pavement at his own expense. No additional compensation shall be made for labor, materials, tools and equipment required for maintenance and/or repair of pavement.

ITEM 5D: 1-1/2" PERMANENT TOP COURSE PAVEMENT (MACHINE METHOD)

A. Measurement for payment under this Item shall be the actual number of tons of asphalt placed for permanent top course pavement, and maintained as shown on the drawings, as specified, and as directed by the Engineer.

B. Payment for this Item shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary to place the top course pavement, including all raising of castings and gate boxes to finished grade, sweeping and cleaning existing street, as required, including construction of pavement end joints, saw cutting joints, applying prime or tack coat by tank truck with heated spreader bar only, (no "tack wand or wagon accepted"), sanding and sealing all joints and to maintain the permanent top course pavement as required by the Specifications.

C. The Contractor shall continuously maintain pavement, as specified, and repair the final paving at his own expense. No additional compensation shall be made for labor, materials, tools and equipment required for maintenance and/or repair of pavement.

ITEM 5E: BITUMINOUS CONCRETE PAVEMENT (HANDWORK)

A. Measurement for payment under this Item shall be the actual number of tons of asphalt placed by hand work as shown on the Contract Drawings, as specified, or as directed by the Engineer.

B. Payment for this Item shall constitute full compensation for furnishing all labor, materials, tools and equipment necessary to place the bituminous pavement for driveways, berms, walkways, sidewalks, and miscellaneous areas, including sweeping and cleaning existing street, as required, and application of prime or tack coat, saw cutting and disposal of existing pavement, concrete, etc., raising castings, and to maintain the pavement as required by the Specifications.

D. The Contractor shall continuously maintain paving, as specified, and repair paving at his own expense, No additional compensation shall be made for labor, materials, tools and equipment required for maintenance and/or repair of pavement.

ITEMS 5F: 3" TEMPORARY TRENCH PAVEMENT

A. The quantity to be measured for payment under this Item shall be the actual number of linear feet of 3" depth trench pavement, placed in one compacted lift and maintained as shown on the Drawings, as specified, and as directed by the Engineer. Item shall be

for temporary trench pavement placed at all widths as required for permanent water main and water main bypass line.

B. The unit price for this Item shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary to place a compacted 3" bituminous concrete (dense binder) course trench pavement, removing cracked or broken pieces of existing pavement from the trench edges after utility installation, placement and adjustment of gravel base course, fine grading and compaction, prime or tack coat, raising of frames and covers to trench pavement grade and to maintain the trench pavement as required by the specifications.

C. The Contractor shall continuously maintain trench paving, as specified, and repair trench paving at his own expense. No additional compensation shall be made for labor, materials, tools and equipment required for maintenance and/or repair of trench pavement.

D. A minimum compacted pavement thickness of 3" inches of dense binder shall be used to pave trenches as directed by the engineer. This item shall be used to pave the utility trenches and shall include sanding and sealing after placement.

6. INCIDENTAL WORK

ITEM 6A: CONCRETE FOR ENCASEMENT, CRADLES AND MISCELLANEOUS WORK

A. Measurement for the quantity of encasement, pipe cradle or miscellaneous work to be paid for shall be the quantity of cubic yards for thrust blocks, encasement, pipe cradle, concrete dams, around street castings or miscellaneous work (not in front of curbs) furnished in place within the limits of normal excavation and to a depth as shown on the Contract Drawings, or as specified by the Engineer.

B. Payment of this Item shall constitute full compensation for furnishing and placing thrust blocks, pipe encasement, pipe cradle, concrete dams, around street castings and miscellaneous work not included under other items (not in front of curbs) as shown on the drawings, or as directed or specified. Concrete furnished and placed under other items shall not be included for payment under this Item.

ITEM 6B: UNIFORMED POLICE FOR TRAFFIC CONTROL

A. Payment for special assignments of personnel of the City Police Department will be made for the actual amount invoiced to Contractor by the Police Department including the department's administrative costs. The allowance established in the Bid Form is for bidding purposes only. The actual invoiced rates may differ from these established rates.

B. Payments made for this item are based on actual invoiced amounts which have been paid to the City Police Department by the Contractor. Paid invoices must be submitted by the Contractor for payment under this item.

ITEMS 6D: UNMARKED SERVICE PIPE REPAIR

A. Measurement for payment for repairing an unmarked existing drain service broken during the installation of the proposed water main or water service shall be the numbers of items counted in place and recorded by the Engineer.

B. Item 6D shall be for measurement and payment of repair of unmarked drain.

C. Payment for repairing existing sewer or drain service not shown on the contract drawings or unmarked in the field within the water trench limits which is broken during the installation of the proposed water main or water service, as specified or as shown on the contract drawings shall be installed at unit price bid under Item 6D.

D. The unit price bid under Item 6E shall be full compensation for all labor, equipment, tools and materials necessary to complete the work as specified, which shall include handling flows, furnishing and installing up to 12" inside diameter – SDR 35-PVC or HDPE replacement pipe matching the existing inside pipe diameter, adapters, couplings, bends, excavation, cutting pipe, dewatering, removal and disposal of broken service pipe, placement and adjustment of 12" gravel base course, transporting, repair, backfill and compaction, crushed stone cradle, sand blanket, and all other incidental work relative thereto.

E. The Contractor shall excavate back along and expose the existing drain service on either side of the proposed water main or water service trench to expose the unbroken pipe ends and cut away damaged pipe. Replacement pipe, bends and adapter couplings shall then be installed between the existing pipe ends as required for a watertight sewer or drain service repair.

F. Existing drain services shown on the contract drawings or pre-marked in the field within the water trench limits, which are either intentionally, or accidentally broken or damaged during the proposed water main or water service installation are not eligible for payment unless authorized by the Engineer.

G. The existing drain services are clay or concrete and require watertight adapter couplings for repair. "Fernco" style flexible rubber adapter couplings are acceptable as method of repair to adapt to existing pipe ends. Brick or cement collars will not be accepted as a method of repair to adapt to existing pipe ends.

ITEM 6F: REMODEL EXISTING MANHOLE OR CATCH BASIN STRUCTURE

A. The quantity to be measured for payment under this item shall be the number of vertical feet of existing manhole or catch basin structure removed and replaced or rebuilt, below 16" from existing grade, as specified, or as directed by the Engineer.

B. The unit price for this item shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary to remove and replace or rebuild an existing manhole or catch basin structure, including excavation and disposal of excess material,

brick masonry, backfilling and compacting, adjusting to 16" below existing grade, as required by the Contract Documents or as directed by the Engineer.

ITEM 6G: PAVED SIDEWALK

A. Measurement for payment under this Item shall be the actual number of square yards of bituminous concrete sidewalk, walkways and miscellaneous bituminous areas that are 3" minimum compacted depth paved, furnished and installed or replaced, and maintained as shown on the contract drawings within the limits, and as directed by the Engineer.

B. Payment for this Item shall constitute full compensation for furnishing all labor, materials, tools and equipment necessary to complete the work as specified, which shall include clearing and grubbing, saw cutting of existing pavement, excavation to gravel subgrade and disposal of existing bituminous concrete, cement concrete and brick pavement and topsoil and subsoil, excavating as necessary, furnishing and installing 8" gravel subbase, compacting gravel base course, fine grading, furnishing and installing of 3" minimum compacted bituminous concrete consisting of and 1 ½" binder course and 1 ½" top course, as specified, infrared treatment of joints between new and existing pavement, furnishing backfill and placing loam and seeding and establishing growth, dewatering, restoration, adjusting or supporting of existing utility pipes and conduits, adjusting of castings, gate boxes, etc. to the finished grade, daily and final cleanup, and all other incidental work relative thereto and not specifically paid for under other items of work and to maintain the sidewalk as required by the specifications.

C. The Contractor shall continuously maintain sidewalk and areas as specified, and repair any defective paving at his own expense. No additional compensation shall be made for labor, materials, tools and equipment required for maintenance and/or repair of sidewalk.

D. Excavation and backfill within normal limits shall be to the depth required to furnish and install the new compacted gravel base and bituminous concrete paving to the proposed grade.

E. The existing gravel base may be reused if determined by the engineer to be acceptable with no deductions. Additional gravel if required shall be added as necessary prior to placement of the bituminous paving at no additional cost.

F. Sidewalks at a minimum 3" bituminous concrete thickness shall be measured in square yards as the actual area between the back of curb or back of grass strip and back of sidewalk multiplied by the length of sidewalk.

ITEM 6H: LOAMING AND SEEDING OR MULCH FOR LANDSCAPING REPAIR

A. Measurement for payment under this Item shall be the actual number of square yards actually loamed and seeded or mulch placed at a 6” minimum depth within the limits indicated on the Contract Drawings or as directed by the Engineer.

B. Payment shall constitute full compensation for excavation and to subgrade for loam and disposing of excess subgrade material, furnishing and placing loam (min. 6'' of loam) and seed or mulch (min. 6”), grading, compacting and providing establishment of growth of grass as specified.

ITEM 6I: STRAW FILTER TUBES “WATTLES”

A. The quantity to be measured for payment under this Item shall be the actual number of linear feet of straw filter tubes “wattles” furnished and installed as shown on the Contract Drawings, as specified and as directed by the Engineer.

B. The unit price for this Item shall include full compensation for furnishing all labor, materials, tools and equipment necessary to furnish and install, maintain as specified, remove and dispose of wattles, complete, including earth excavation, backfill, fill, grading, disposal of materials, clearing and grubbing, site restoration and clean-up and all incidental work, not specifically mentioned, to satisfactorily complete this Item.

7. LUMP SUM ITEMS

GENERAL

A. The extent of utility relocations required for the completion of lump sum items are shown on the contract drawings. All work associated with support of utilities in conjunction with any of these lump sum items shall be included within the scope of the lump sum item.

ITEM 7A & E.: MOBILIZATION

A. The lump sum price for this Item shall constitute full compensation for furnishing at the project site, all men and equipment necessary to properly commence and complete the various sections of work described in the bid. Mobilization costs are those costs incurred in initiating the contract and providing for the above-mentioned equipment and labor to be operational at the site, exclusive of the cost of materials. For purposes of this contract, operational shall mean the substantial commencement of work. The lump sum price of this work shall not exceed five percent (5%) of the total bid amount. Bids not in compliance with the above may be considered unresponsive and may be rejected for that reason.

B. Mobilization may be considered as complete by the Engineer when the Contractor substantially commences work on the project with a full complement of men and equipment necessary to expeditiously perform and complete the required work in the opinion of the Engineer. The Engineer may authorize a percent (%) complete of this

Item for payment if all of the mobilization has not been accomplished. A breakdown of the lump sum price must be submitted to the Engineer.

C. The lump sum price for mobilization shall include coordinating a location for staging and storing stockpiled materials including private agreements and fees that may be associated. The City of Waltham is not responsible to provide or coordinate.

C. Payment for the lump sum price bid in the proposal for mobilization shall be full compensation for all costs and work involved under this Item.

ITEM 7B: MISCELLANEOUS WORK AND CLEAN-UP ITEMS

A. Measurement for payment for miscellaneous work and cleanup shall be on lump sum basis.

B. Payment of the lump sum price under the Item 7B of the Bid Form shall fully compensate the Contractor for labor, materials, equipment, and incidentals required to do all work specified below, and shown on the Drawings, and any other miscellaneous work obviously necessary to complete the Contract. Payment shall include but not be limited to supporting all existing utilities, modification to existing utilities, maintaining existing drainage flows, removal and resetting of fences, walls, landscape boulders, driveway edging etc. and the Contractor shall be responsible for site restoration and cleanup upon completion of the project and to comply with the provisions of Section 02995 of these specifications.

In addition, to allow the installation of the proposed water system, the Contractor shall do the following, which is paid for under Item 7B.

- The temporary and permanent relocation and protection of any trees, signs, benches, mailboxes, newspaper holders, trash barrels, post office boxes, planters, etc. located along the roadway and on the existing sidewalks prior to proposed construction activities.
- Coordinating a location for staging and storing stockpiled materials.
- Coordination with utility companies both Public and Private.
- Accurately locating water service lines and coordinating with water users for connection shutdowns required for temporary bypass and permanent water line connections not specifically included for payment under Item 1N.
- Furnish and install appropriate barricade and protection for installed water main bypass system including barrels and cones as necessary.
- Replace sidewalks and curbing disturbed during the installation of the proposed water system not specifically paid for under pavement or incidental work items.

- Protection of the trees and roots located adjacent to and within the limit of work.
- Protection and support of telephone poles located adjacent to and within the limit of work.
- All slope protection and erosion control measures including catch basin silt sacks, necessary to comply with the requirements of Section 02270 and as shown on contract documents, not specifically paid for under item 6I.
- All testing, disinfection and dechlorination of the proposed water system as specified in Section 02675 and all temporary caps and taps required.
- All permits as specified in Section 00821.
- All work to remove, dispose or abandonment of the existing water system on Christopher Road.
- All calcium chloride and water as required to control and maintain dust control on site.

C. The Engineer may authorize a percent (%) complete of this Item for payment if not all of the work has been accomplished. A breakdown of the lump sum price must be submitted to the Engineer at the start of work.

D. If the Owner chooses to accept Add Alternate #1, the Lump Sum payment for Item 7B included in the Base Bid shall be considered full compensation for Miscellaneous Work and Clean up by the Contractor as part of Add Alternate #1 as well.

ITEM 7C & F: TRAFFIC CONTROL SYSTEM FOR VEHICULAR AND PEDESTRIAN SAFETY

A. The lump sum for this Item shall constitute full compensation for the implementation of the traffic control system designed by a Massachusetts certified traffic engineer, complete as detailed in the Specifications. See Section 01570.

B. The lump sum price for this Item shall include furnishing all labor, materials, tools, and equipment to start up and implement the traffic control system including all signs, barriers, warning light, and any detour controls as specified and as deemed necessary by the City.

C. The Engineer may authorize a percent (%) complete of this Item for payment if not all of the work has been accomplished. A breakdown of the lump sum price must be submitted to the Engineer at the start of work.

ITEMS 7D & G: Rodent Control

A. The lump sum for this Item shall constitute full compensation for the implementation of Rodent Control, complete as detailed in the Specifications. See Section 01105.

B. The lump sum price stated in the Bid Schedule for Rodent Control shall be considered full compensation for furnishing all labor, supervision, materials, and equipment necessary to provide comprehensive and professional rodent control at all project locations. The Contractor shall be required to provide the services of a Massachusetts state licensed, experienced, rodent control person whose duties shall be to identify rodent activity or infestation resulting from the construction activity under this contract and to take approved and professionally acceptable remedial action, including development and implementation of an Integrated Pest Management (IPM) approach, baiting, elimination of sources of harborage and making recommendations that may be necessary in controlling and/or eliminating rodent activity, and other activities in accordance with Section 01105. The licensed person shall maintain a close liaison with the Owner and/or Engineer for the duration of construction. The rodent control person employed by the Contractor shall visit and inspect the site and implemented rodent control measures at least every 14 days and keep careful records of his/her activity and note the activity levels of rodents within the project area; these shall be transmitted through the Contractor to the Owner and/or Engineer.

C. The Engineer may authorize a percent (%) complete of this Item for payment if not all of the work has been accomplished. A breakdown of the lump sum price must be submitted to the Engineer at the start of work.

~~ITEMS 8A THROUGH 8E ARE ADD ALTERNATE 1~~

2. SEWER PIPE AND FITTINGS, SEWER SYSTEM APPURTENANCES

ITEM 8A & 8B: GRAVITY SEWER PIPE AND FITTINGS

A. The quantity of pipe to be paid for under these Items shall be based on the length of pipe installed, measured on a linear foot basis. Measurement for payment does not signify that the sewer line is accepted.

B. Measurement for length will be along the horizontal center line of pipe as installed including wyes, saddles, tee branches and bends from center to center of manholes excluding the length of manhole inverts. Connections to structures shall be measured to the inside face of the wall. Plugged pipe stubs in manholes shall be measured from end to end of the stub.

C. Payment for pipe shall be on the basis of the linear foot of pipe, and the type of pipe installed. The Contractor's attention is directed to the Technical Specifications that stipulate that all pipes between adjacent manholes shall be of the class required by the critical depth of cover between said manholes. The unit pipe prices shall include full compensation for furnishing the class of pipe required by the manhole-to-manhole profile regardless of depth of cover variations.

D. Payment shall constitute full compensation for furnishing and installing pipe of the type and size specified on the Bid Form (Item 8A-8B) for the respective quantities as above determined at the applicable bid price. Each unit price shall constitute full compensation for furnishing all labor, materials, fittings, tools, and equipment necessary for laying, jointing and testing the pipe, unless specified elsewhere, including earth excavation (except rock excavation), saw cutting of pavement, dewatering, removal and replacement or supporting of existing utility pipes and conduits, jetting which is required, compaction as specified, cleaning of lines by high pressure water (1200 psi min.), mandrilling and air testing lines, television inspections, portable trench box or temporary timber sheeting, disposal of surplus materials, backfilling, screened gravel cradle, dust control, removal and disposal of existing pipe, and all work incidental thereto not specifically paid for under other items. Cost for wyes, tees, saddles, adapter couplings (including connections to existing pipes at private property/side streets) shall be included in the unit price of the pipe (Item 8A-8B). Payment for pipe will be seventy five percent of amount installed until pipe has been tested and television inspection is completed.

E. Where excavated material is not suitable for backfill and excess stockpiled excavated material is not available in sufficinet quantities, payment for imported backfill shall be made under the applicable earthwork item.

ITEM 8C: FURNISH AND INSTALL SEWER MANHOLE FRAME AND COVER

A. The quantity to be measured for payment under this Item shall be the actual number of sewer manhole frame and covers furnished and installed as specified and shown on the contract drawings. See Detail Sheet.

B. The unit price shall constitute full compensation for furnishing all labor, materials, tools and equipment necessary to install the sewer manhole frame and cover, including excavation and disposal of the sewer manhole frame and cover at the Fairhaven BPW, backfilling and compacting, adjustment to grade, as required. Bituminous or cement concrete backfill if required will be paid for under associated item.

C. Sewer manhole frames and covers to be, models as manufactured by East Jordan Iron Works and Town Standards and as shown on the construction plans

ITEM 8D: 4’ DIAMETER PRECAST CONCRETE SANITARY MANHOLES

A. Measurement for payment under this item shall be the actual number of manholes of each classification, constructed as specified.

B. Payment for manholes shall include furnishing and installing manhole bases, concrete intermediate platforms as specified on plans, brickwork for inverts, and adjusting frames and covers to grade, walls and domes, complete.

C. Payment shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary for construction of the manholes including the walls, steps, watertight connections, sealant, damp proofing, bases, brick inverts or granite inverts, concrete collars, excavation, temporary sheeting, backfill, dewatering, compaction as specified, disposal of surplus material, screened gravel or crushed stone subbase, testing, connection of sewers into manhole base, removal and disposal of existing sewer manholes and all other work necessary for constructing a complete manhole. Payment shall also include the cost of resetting the frames and covers to accommodate final paving, and installation of stubs, knockouts and stoppers as indicated on the drawings.

ITEM 8E: SEWER SERVICE CLEANOUT ASSEMBLY

A. The unit price of the Item shall consitiute full compensation to furnish and install a sewer service cleanout assebly, including 4" though 6" diameter, schedule 35-PVC pipe, wye, bend, push on style cap to 4" below finished grade, adapter couplings and 12" diameter sewer casting and briskwork as shown on the dontract drawings and as specified. See section 02622 of these specifications.

B. The unit price shall include furnishing all labor, materials, tools and equipment to install a sewer cleanout assembly, including locating the existing sewer service at the sidewalk, excavation, backfill, compaction, dewatering, saw cutting trenches, removal and disposal of pavement and surplus backfill, disposal of surplus or unsuitable materials, crushed stone bedding, sand blanket backfill, temporary sheeting or bracing as required, cutting and conditioning existing sewer pipe, 12” gravel road base, all assembly, concrete encasement, raising of the sewer cleanout casting to finished grade, cleanup and all other incidental work not specifically mentioned to satisfactorily complete this item.

B. Sewer cleanout assembly shall consist of 4” through 6” reducing adapter coupling, 6” pipe, 6” wye, 6” bend, push on style 6” cap to 4” below finished grade and 12” diameter sewer casting placed on a section of 12” diameter pvc and encased in concrete.

C. The sewer cleanout casting is to be 12 ”diameter x 3” depths, Model#R812-000, stamped “SEWER” as manufactured by East Jordan iron Works or equal.

D. Sewer cleanout assembly is to be located and installed within the proposed concrete sidewalk at the existing sewer connection. A sewer casting shall be set to grade over the PVC cleanout when the concrete sidewalk is installed.

END OF SECTION

SECTION 01050

ABBREVIATIONS

PART 1 GENERAL
1.01 ABBREVIATIONS

PART 1 GENERAL
1.01 ABBREVIATIONS

A. Where any of the following abbreviations are used in the specification, they shall have the following meaning:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGA	American Gas Association
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
ANSI	American National Standard Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
OSHA	Occupational Safety and Health Administration
(USASI)	(formerly the United States of America Standard Institute)
USEPA	United States Environmental Protection Agency

END OF SECTION

SECTION 01105

RODENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies rodent control and general pest control requirements within project areas, and bordering areas as designated by the Owner and Engineer. This work is to be performed prior to demolition, excavation, and site preparation and throughout the Contract, so that rodents and other pests do not disperse from or infest the project area.

B. The Contractor shall develop and implement an Integrated Pest Management (IPM) approach. As part of that approach, the Contractor shall maintain a cooperative dialogue with appropriate agencies and management/representatives of neighboring properties.

C. The Contractor shall perform the rodent control tasks described in this Scope of Work and also respond to other pest control needs when directed by the Owner.

1.2 SUBMITTALS

A. Submit to the Engineer copies of pesticide applicator certifications and licenses within ten (10) days of the start of Rodent Control activities and ten (10) days prior to their issuance or renewal for the duration of this Contract.

B. After performing the survey described in Paragraph 3.2 below and before initiating baiting, submit to the Engineer a written description of proposed pest control procedures, indicating materials, quantities, methods, and time schedule. For all pesticides to be used, submit a copy of the pesticide manufacturer's EPA-approved pesticide label with application directions.

C. Submit to the Engineer documentation of pest control activities and results and follows:

1. Weekly - Submit data sheets with locations of sites treated, amounts and types of pesticide used, number and types of traps set, survey and inspection results, sanitation conditions, complaint calls investigated, and any problem that occurred.

2. Monthly - Submit a written summary that includes determinable results of

the IPM program and recommendations.

3. Quarterly - Submit a map that shows bait stations, manholes, and catch basins where rodent baits are being maintained.

1.3 QUALIFICATIONS

A. The Contractor shall perform this work at all times in accordance with the following minimum standards and as acceptable to the Owner and Engineer.

1. The Contractor and key personnel shall have experience with commercial and residential accounts and construction projects; have experience and technical training in vertebrate pest management and integrated pest management; have experience with various rodent control techniques, equipment, and strategies; have training and experience with insect control; and have knowledge of and experience with techniques to reduce non-target hazards.

2. The supervisor shall be licensed and certified by the Massachusetts Pesticide Bureau and certified in General Pest Control (category 41) and Vertebrate Pest Control (category 44). The supervisor shall have specific training and experience in vertebrate pest management, commercial rodent control, general pest control, and integrated pest management.

3. Applicators shall be licensed by the Massachusetts Pesticide Bureau and certified in General Pest Control (category 41). Applicators shall have specific training and experience in commercial rodent control and integrated pest management.

1.4 COORDINATION

A. Perform this Work in cooperation with the other Work performed under the Contract.

B. Initiate the work on or before field mobilization begins for the Contract and with adequate timing to achieve control before environmental disruptions. Provide a maintenance program until Contract is completed and all equipment and materials are removed.

C. Perform the Work according to the preliminary schedule described in this section and as accepted or revised by the Owner and Engineer. Estimated durations and start dates may be changed by the Owner or Engineer to suit changes in construction schedules and field conditions. The Work could potentially require performance any day of the week and any hour of the day or night, regardless of

weather.

D. Perform this work in such a manner that toxicant or other control tools do no pose a hazard to persons, domestic animals, or non-target wildlife.

1.5 PERMITS

A. Obtain and maintain in coordination with the Contractor appropriate permit(s) from city or state agencies for pest control activities associated with this Work.

B. Obtain and maintain in coordination with the Contractor all right of entry permits required for the performance of this Work. This includes all utilities and private properties to which entrance is required.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Furnish and use only pesticide formulations registered by the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Food and Agriculture, where appropriate according to label directions and as acceptable to the Engineer.

B. Furnish and use devices and supplies (e.g., traps and bait stations) to facilitate the management and effectiveness of the pest control program, where appropriate and as acceptable to the Engineer.

PART 3 - EXECUTION

3.1 MEETINGS

A. Before proceeding with the Work, all pest control personnel shall attend a Work Shop held by the Contractor and Engineer to discuss planned pest control methods and coordination.

B. The supervisor shall meet with the Contractor and Engineer weekly to discuss pest control activities.

3.2 SURVEY

A. Prior to baiting, survey the proposed construction area and accessible or observable bordering areas and record signs of rodent activity and sanitation conditions. Closely inspect all embankments, edge areas, and properties within and abutting the construction area. Maintain survey records in the manner

described in Paragraph 3.7 below.

B. Thoroughly inspect construction area and accessible or observable bordering areas and any nearby areas designated by the Owner or Engineer, for rodent activity and sanitation deficiencies weekly throughout the duration of this Contract and in accordance with the work schedule. Maintain inspection records in the manner described in Paragraph 3.7 below.

C. Plan the control program and allocate resources based on survey and inspection data and as acceptable to the Owner.

3.3 APPLICATION FOR RODENT CONTROL

A. Apply rodenticide in strict accordance with EPA-approved label directions and the Rules and Regulations of the Massachusetts Department of Food and Agriculture. Maintain records of all bait placements in the manner described in Paragraph 3.7 below.

B. Where appropriate, especially for surface placements of rodent baits, use properly secured and tamper-resistant bait stations consistent with EPA regulation. Individually number and properly identify all bait stations.

C. Surface Applications

1. Initial Surface Baiting

Rid the construction area of all detectable rodents before construction begins, or as acceptable to the Owner. Bait all observable rodent burrows. Install and secure bait stations at regular and appropriate intervals and locations, and document rodent activity (burrows, droppings, bait consumed, dead rodents). Replenish bait and shift bait stations as necessary to ensure complete control of rodent populations. Bait edge and accessible bordering areas as necessary to ensure that rodents will not be dispersed by construction activities and that rodents will not infest work areas.

2. Maintenance Surface Baiting

Establish a maintenance baiting program prior to mobilization by the Contractor, including construction areas and accessible bordering areas, as acceptable to the Owner. Check bait placements weekly. Use survey and baiting data to determine the most effective distribution of baiting locations and bait quantities. Shift and distribute bait and bait stations as appropriate to ensure continued control.

D. Subsurface Applications

1. General

For situations involving underground construction/demolition, utility relocation, or utility construction, and for other situations when determined necessary by the Owner or Engineer, initiate subsurface baiting and rid underground environments of all detectable rodents before construction begins. Assign an identifying number to each manhole and catch basin where bait is placed so that locations of bait placements can be identified and rodent activity (droppings, bait consumed, dead rats) can be documented. Conduct bait applications during off-peak traffic hours unless otherwise directed by the Engineer. Access manholes according to the requirements of appropriate agencies and utility companies. Coordinate the Work with appropriate municipal agencies and utility companies.

2. Initial Subsurface Baiting

Apply appropriate baits to control rodent populations in manholes and catch basins. This will involve suspending and securing bait using noncorrosive wire (e.g., 24 gauge plastic coated). Place bait in all accessible manholes and catch basins within the construction work area. In addition, bait an appropriate set of manholes and catch basins in the blocks bordering the work area and as acceptable to the Owner. Identify all baited manholes and catch basins with a standardized paint mark on the street and a numbered tag to be attached to the suspending wire. Approximately seven days after completion of the first baiting, check all manhole and catch basin baits and record estimates on the amount of bait consumed. Replenish or increase the amount of bait applied according to the amount consumed or as acceptable to the Owner and Engineer. Repeat this process again approximately fourteen days later and until there is little or no bait consumed. Check manholes and catch basins weekly when they repeatedly have 100 percent of the bait consumed.

3. Maintenance Subsurface Baiting

Prior to mobilization by the Contractor, establish a maintenance baiting program appropriate for the rodent infestation patterns identified during initial subsurface baiting. This program shall ensure continued control and shall be performed in a manner acceptable to the Owner and Engineer. Maintain bait in manholes and catch basins that have rodent activity and those that had activity during initial baitings. Check each bait according to rodent activity levels. This could range from weekly to approximately

every three months, depending upon the recent history of bait consumption. Use utility maps and baiting data to determine the most effective distribution of baiting locations and bait quantities. Shift and distribute baiting locations as necessary to ensure adequate interception points for controlling immigrating rodents.

E. Cleanup

1. Remove visible rodent carcasses and dispose of them daily consistent with the pesticide label directions and applicable codes, laws, and regulations.

2. Upon completion of any pest control operations at the site, remove remaining bait and dispose of it according to the pesticide label and applicable codes, laws, and regulations. Also remove all wires used for subsurface baiting and any bait stations or traps.

3.4 SANITATION

A. Prior to construction and throughout the duration of this Contract, identify and document harborage and food sources available to rodents on the construction site and in observable bordering areas. This includes any littering or improper or insufficient use of trash receptacles in construction areas. It also includes any bordering areas with sanitation conditions or structural deficiencies that violate City or State sanitation codes.

B. Maintain records of sanitation conditions in the manner described in Paragraph 3.7 below.

3.5 COMPLAINT CALLS

A. During construction, respond to pest-related complaints from the "adjacent" neighborhood (i.e. within 200 feet of the project limits) within 12 hours when directed by the Owner or Engineer. Inspect the particular premises and adjacent areas for sanitation and structural deficiencies and also signs of historic and recent pest activity. Provide sanitation and structural maintenance information to the property owner or manager. Use pesticides or traps as necessary and appropriate to resolve the complaint when there is a relationship between the pest infestation and construction activities, or when directed by the Owner or Engineer.

B. Maintain records of all complaints investigated, including location, contact person, inspection results, and actions taken. Document the relatedness of the pest infestation to construction activities.

3.6 GENERAL PEST CONTROL

A. When directed by the Owner or Engineer, the Contractor shall determine appropriate methods for any pest control task not specifically identified above and shall submit them in writing to the Owner and Engineer for approval in advance. Such pest control tasks would relate to unanticipated pest control needs within construction areas or adjacent areas. This could include control of insects or vertebrates other than rats and mice.

B. Maintain records of general pest control activities and results in the manner described in Paragraph 3.7 below.

3.7 RECORD KEEPING

A. Use standardized data sheets acceptable to the Owner and Engineer to maintain accurate records of date, placement, type, and amount of pesticides or other control tools (e.g., traps) applied. Similarly, maintain records of surveys, inspections, changes in pest activity, sanitation conditions, and complaint calls. Submit data in a format acceptable to the Owner and Engineer and as required under Paragraph 1.3 (C) above.

PART 4 – Compensation

Not Used

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 INTENT

A. The submittals consist of several classes applying to the execution of several or all of the individual Division 2 thru 16 Specifications.

B. Provisions of this section shall be binding on all applicable work performed under the other detailed specifications and payment for work performed under this section shall be apportioned against each of the payment items listed in the Bid, unless otherwise directed.

1.02 MATERIALS - SAMPLES - INSPECTION - REVIEW

A. Unless otherwise indicated on the drawings or specified, only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by the Contractor to be incorporated in the work shall be subject to the inspection and review by the Engineer. No material shall be processed for, fabricated for, or delivered to the work without prior review by the Engineer.

B. As soon as possible after the formal execution of the Contract Agreement, the Contractor shall submit to the Engineer, the names and addresses of the manufacturers and suppliers of all materials and equipment he proposes to incorporate into the work. Where such names have been directly specified in the Bid, or where substitutions have been made in compliance with the INSTRUCTION AND INFORMATION FOR BIDDERS, repetitive submission will not be necessary. When shop and working drawings are required as specified below, the names and addresses of the manufacturers and suppliers shall be submitted prior to the submittal of the drawings so that the Engineer may review the manufacturer and/or supplier as to his or their ability to furnish a product meeting the specifications, subject to final review of the particular material or equipment. As requested, the Contractor shall also submit data relating to the materials and equipment he proposes to incorporate into the work, in sufficient detail to enable the Engineer to identify the particular product in question and to form an opinion as to its conformity to the Contract requirements. Such data shall be submitted in a manner similar to that specified for shop and working drawings.

C. If the Engineer so requires, either prior to beginning or during the progress of the work, the Contractor shall submit samples of materials for such special tests as may be necessary to demonstrate that they conform to the specifications. Such samples, including concrete test cylinders, shall be furnished, taken, stored, packed, and shipped as directed, at the expense of the Contractor. Except as otherwise specified, tests shall be arranged and paid for in accordance with the General Conditions.

D. All samples shall be packed so as to reach their destination in good condition, and shall be labeled to indicate the material represented, the name of the building or work and location for which the materials is intended, and the name of the Contractor submitting the sample.

E. To ensure consideration of samples, the Contractor shall notify the Engineer in writing that the samples have been shipped and shall properly describe the sample using standard submittal forms supplied by the Engineer. In no case shall the letter of notification be enclosed with the samples.

F. The Contractor shall submit data and samples, or place his orders, sufficiently early to permit consideration, inspection, testing, and approval before the materials and equipment are needed for incorporation in the work. Delay resulting from his failure to do so shall not be used as the basis of a claim against the Owner or the Engineer.

G. In order to demonstrate the proficiency of workers, or to facilitate the choice among several textures, types, finishes, surfaces, etc., the Contractor shall, at his own expense, provide such samples of workmanship on wall, floor, finish, etc., as may be required.

H. When required, the contractor shall furnish to the Engineer triplicate sworn copies of manufacture's shop or mill tests (or reports from independent testing laboratories) relative to materials, equipment performance ratings, and concrete data.

I. After acceptance of the samples, data, etc., the materials and equipment used on the work shall correspond therewith.

1.03 SHOP AND WORKING DRAWINGS

A. The Contractor shall submit for review shop and working drawings six (6) copies unless otherwise specified) of all materials fabricated especially for this Contract, and of all other equipment and materials except for which such drawings are specifically exempted. Three copies will be returned to the Contractor. Additional copies of shop drawings required by the contractor shall be included in the original submission.

All shop drawings submittals shall be accompanied by a properly completed "Standard Shop Drawing Submittal Form" which will be furnished to the Contractor by the Engineer.

B. Such drawings shall show the principal dimensions, weight, structural and operating features, performance characteristics and wiring diagrams, space required, clearances, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the drawing. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for this Contract.

C. When so specified or if considered by the Engineer to be acceptable, manufacture's specifications, catalog data, descriptive matter, illustrations, etc., may be submitted for review in place of shop and working drawings. In such case the requirements shall be specified for shop and working drawings, insofar as applicable.

D. The Contractor shall be responsible for the prompt submission of all shop and working drawings so that there shall be no delay to the work due to the absence of such drawings.

E. No material shall be purchased for fabricated especially for this Contract until the required shop and working drawings have been submitted and reviewed as conforming to the Contract requirements. All materials and work involved in the construction shall then be as represented by said drawings.

F. Only drawings which have been checked and corrected by the fabricator should be submitted to the Contractor by his subcontractors and vendors. Prior to submitting drawings to the Engineer, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the drawings and specifications in all respects; that the electrical characteristics are correct; and that the dimensions of work submitted fit the available space. Any deviations from the Contract requirements shall be clearly noted on the shop drawings. The Contractor shall stamp each submittal with his firm's name, date, and approval, thereby representing that the above has been complied with. Shop drawings not so checked and stamped will be returned without being examined by the Engineer.

G. All shop drawings shall be properly identified and indicate the article number of the specifications or the drawing number which applies to the submitted item.

H. The Engineer's review of shop and working drawings will follow a general check made to ascertain conformance with the design concept and functional result of the project and compliance with the information given in the Contract Documents. The contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

I. The classification of Engineer's review shall be as follows:

Review Code	Action Code
No Exception Taken	-
Note Markings	Confirm
Rejected	Resubmit

1.04 RECORD OR AS-BUILT DRAWINGS

A. During the progress of the work, each major subcontractor shall keep on file one complete set of red line prints furnished by the Engineer on which shall be accurately and promptly noted, as the work progresses, changes, revisions and additions to the work. Wherever the work is installed otherwise than as shown on the contract Drawings said changes shall be noted. Corrections shall be made in red ink. The above prints upon completion of the work shall be submitted to the Engineer.

B. Before the Contractor is entitled to receive his final payment under this Contract, he shall submit to the Engineer for transmittal to the Owner the above complete set of annotated plans of his work performed by him indicating in particular the location of covered work, pipes, wires, ducts, etc. All trades must cooperate with the Contractor in preparation of this set of plans to facilitate its accuracy and completeness.

1.05 OPERATION AND MAINTENANCE INSTRUCTIONS

A. The Contractor shall thoroughly instruct the Owner's representative in the proper operation of all mechanical and electrical systems. Skilled personnel shall be retained as long as necessary for this purpose.

B. The Contractor shall submit to the Engineer three (3) typed sets, bound neatly in loose leaf binders, of all instructions for the installation, operation, care and maintenance of all equipment, fixtures and systems. Information shall indicate possible problems with equipment and suggested corrective action. The instructions shall include other information deemed necessary by the Engineers.

C. The Contractor shall furnish three (3) typed sets of instructions for lubricating each piece of equipment. Instructions shall state type of lubricant, where and how frequently lubrication is required.

D. The Contractor shall submit to the Engineer three (3) typed sets of instructions for the ordering and stocking of spare parts for all equipment. The lists shall include catalog numbers of parts and suggested supplier. Each set shall also include an itemized list of component parts that should be kept on hand with information where such parts can be purchased.

E. Such instructions and parts lists shall be annotated to indicate only the specific equipment furnished. References to other sizes and types or models or similar equipment shall be deleted or neatly lined out.

F. Such operating instructions and parts lists shall be delivered to the Engineer at the same time that the equipment to which they pertain is delivered to the site.

END OF SECTION

SECTION 01500

TEMPORARY PROVISIONS AND PROTECTION

OF UTILITIES AND PROPERTIES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor's attention is directed to the location of underground utilities in the proposed area of work.

B. The Contract Drawings indicate the approximate location in plan and profile of existing overhead and subsurface utilities in the vicinity of the work.

C. Whatever measures are necessary to protect these lines during the work shall be included in the Contract Unit Price for the various items involved.

D. In case of damage to utilities, the Contractor shall promptly notify the Owner and shall, if requested, furnish manpower under the Owner's direction in getting access to the utility. Pipes or other structures damaged by the operation of the Contractor may be repaired by the Owner, either the municipality or the utility company. The cost of such repairs shall be borne by the Contractor without compensation.

E. The locations of existing underground utilities are shown in an approximate way only. The Contractor shall determine the exact location of all existing utilities before commencing work. He agrees to be fully responsible for any and all damages which might be occasioned by his failure to exactly locate and preserve any and all underground utilities.

F. The work to be done under this Contract may necessitate changes in the properties of utility companies or the municipality hereinbefore listed. Immediately after executing the Contract, the Contractor shall confer with the owners of all utilities in order that relocations of mains or services may be made at times consistent with operations of this Contract.

G. The rims of all utility manholes and boxes shall be set to conform to the required grades and the Contractor shall see that all such setting or resetting is substantially and

accurately done in conformity with new grades, whether such setting or resetting is done by him or by companies owner or controlling same, and shall notify the Engineer of any negligence on the part of the owners of the utilities to perform their work promptly.

1.02 RELATED WORK SPECIFIED ELSEWHERE

SECTION 01300 - SUBMITTALS
SECTION 01570 - TRAFFIC CONTROL AND POLICING
DIVISION 2 - SITE WORK - As Appropriate

PART 2 EXECUTION OF WORK

2.01 COORDINATION WITH OTHERS

A. Before starting any work under this Contract, the Contractor shall submit a Schedule of Operations. The work schedule shall include a plan of his construction procedures and the safety measures he will use during the prosecution of the work.

B. The Contractor shall coordinate his work with the work to be done by the Public Utilities or other agencies, and he shall so schedule his operations as to cause the least interruption to the normal flow of traffic in existing roads.

C. The Contractor shall provide, place and erect all necessary barricades and warning signs and maintain adequate lights and illumination. He shall be held responsible for all damage to the work due to any failure of signs and barricades needed to protect the work from traffic, pedestrians or other causes.

D. The Contractor shall assume full charge of space for the storage of materials of all subcontractors and trucks, confining all apparatus, storage of materials and construction operations to the limits indicated by ordinance or permits. He shall allot space for the storage of materials of subcontractors, facilitate the progress of the work, prevent friction, and maintain order and tidiness throughout the project site. Storage areas within the project are limited. The Contractor may be required to obtain storage areas outside the project limits at his own expense. The Contractor shall enforce any instruction of the Owner or the Engineer regarding signs, advertising, fires, danger signals, barricades, smoking, etc.

E. Existing property markers shall be tied by the Contractor with respect to the construction and/or base line with such ties being given to the Resident Engineer. Such work shall be considered as part of the Contractor’s incidental work for which no payment will be received.

F. No extra payment shall be made for scheduling the work or for maintenance of traffic; the cost of which shall be included in the various bid items of the Bid.

G. The casting of all structures, which are required to be set or reset under the pertinent items of this contract or by others shall not be set complete in place to the established grade until after the bituminous concrete base course has been completed in place as directed.

H. The Contractor shall not proceed with surfacing operations without the specific written approval of the Engineer.

I. Wherever it is necessary to meet existing surface, the Contractor shall construct a foundation, base and surface to form a continuous smooth roadway.

J. The Contractor shall provide for the removal of all dirt spilled from his trucks on existing pavement over which it is hauled, or otherwise deposited thereon whenever, in the judgment of the Engineer, the accumulation is sufficient to cause the formation of mud or dust, or interfere with drainage or create a traffic hazard.

K. Private Property that is disturbed, outside of the construction limits, shall be repaired by the Contractor at his own expense. No area shall be used for storage without the permission of the Engineer, and the Contractor may be required to obtain storage areas outside the project limits at his own expense.

L. Particular care shall be taken to establish and maintain methods and procedures which will not create unnecessary or unusual hazards to public safety. The convenience of the general public along and adjacent to the highway shall be provided for in an adequate and satisfactory manner. Adequate access shall be maintained to all buildings in use. Signs are to be kept clean at all times, and legends shall be distinct and unmarred.

M. The Contractor shall place and erect the necessary detour signs as indicated on the Contract Drawings and under the related sections as specified, and shall maintain said signs for the duration of the project.

N. The Telephone Company and the Electric Company shall install and/or relocate poles and services as required. The Gas Company shall relocate its service as required. The Contractor shall schedule his operation so as to permit regulated public service corporations to remove and temporarily or permanently relocate their property which conflicts with respect to line and grade of any structure to be constructed under this Contract. All other structures which are owned by public service corporations and are within the limits of work shall be protected by the Contractor. Any public service corporation's property which require temporary supports shall be supported by the respective utilities during the period of construction.

O. 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 or his intention to commence operations affecting such utilities at least one (1) week in advance of the commencement of such operations that may affect their utilities and the Contractor shall at the same time file a copy of such notice with the Engineer.

P. The Contractor's attention is called to the completion date opening the road for traffic, which have been established with the intent to complete the project and make it available to the traveling public at the earliest possible date.

Q. For the purpose of observing work that affects their respective properties, inspectors for the municipality, public agencies and the utility companies shall be permitted access to the work, but all official orders and directives to the Contractor shall be issued by the Engineer.

2.02 PUBLIC SAFETY AND CONVENIENCE

A. Trenches shall not be excavated in traveled ways until all materials and equipment required for such work are at the site and available for immediate use. When work is not in progress, trenches in areas subject to public travel shall be covered with steel plates capable of safely sustaining a 20 ton truck load with impact. The work in each trench shall be practically continuous, with the placing of pipe, backfilling and patching of the surface closely following each preceding operation. Payment for steel plates will be included under the unit bid price per linear foot for each respective pipe item regardless of width of trench.

B. The Contractor's attention is directed to the AASHTO Guide on Occupational Safety of Highway Construction Projects, subpart N, 1926.550, relating to construction equipment clearances at overhead electric lines, which states in part "...the minimum clearance between the lines and any part of the crane or load must be at least 10 feet from lines rated 50 KV or below, and greater distances for higher voltage...". For the protection of personnel and equipment, the Contractor should be aware of this regulation especially during paving operations using large semi-trailer vehicles.

END OF SECTION

SECTION 01562

DUST CONTROL

PART 1 GENERAL

1.01 DUST CONTROL OPERATIONS

A. The Contractor shall perform dust control operations, in an approved manner, whenever necessary or when directed by the Engineer, even though all other work on the project shall be suspended. Dust controlling shall be generally accomplished by the use of water; however, the use of flake calcium chloride may be ordered when necessary to control dust nuisance.

1.02 REQUIREMENTS

A. The Contractor shall practice dust control to meet all air pollution standards as set forth by federal and state regulatory agencies.

END OF SECTION

SECTION 01567

POLLUTION CONTROL & ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This work shall consist of temporary and permanent control and restoration measures as hereinafter stated or ordered by the Engineer during the life of the Contract to control water pollution and erosion (through use of berms, dikes, dams, sediment basins, fiber mats, netting, gravel, mulches, grasses, slope drains and other erosion and pollution control devices or methods) and to limit disturbance and/or alteration of the natural environmental setting.

B. The temporary pollution control and environmental protection and restoration provisions contained herein shall be coordinated with detailed construction specifications elsewhere in the Contract to the extent practical to assure economical, effective and continuous pollution and erosion control, and environmental protection and restoration throughout the construction and post construction period.

C. Payment for this work shall be apportioned against each of the payment items listed in the Bid, unless otherwise specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. This is a general section and relates to any and all other sections wherein the work might result in pollution or environmental damage.

B. SECTION 01710 - CLEANING UP

PART 2 MATERIALS

2.01 POLLUTION AND EROSION CONTROL MATERIALS

A. Mulches may be hay, straw, fiber mats, netting, wood cellulose, corn or tobacco stalks, bark, corncobs, wood chips, or other suitable material acceptable to the Engineer and shall be reasonably clean and free of noxious weeds and deleterious materials.

B. Slope drains may be constructed of pipe, fiber mats, riprap, plastic sheets, or other material acceptable to the Engineer that will adequately control pollution.

C. Grass shall be quick growing species (such as rye grass, Italian rye grass, or cereal grasses) suitable to the area providing a temporary cover which will not later compete with grasses sown later for permanent cover.

D. Fertilizer and soil conditioners shall be a standard commercial grade acceptable to the Engineer.

E. Flake calcium chloride shall be used for dust control.

PART 3 EXECUTION

3.01 PRECONSTRUCTION CONFERENCE

A. At the preconstruction conference or prior to the start of the applicable construction, the Contractor shall submit to the Engineer for acceptance his schedules for accomplishment of temporary and permanent pollution and erosion control and environmental protection and restoration work, as are applicable for clearing and grubbing and general construction. The Contractor shall also submit for approval his proposed method of disposal of unsuitable material and restoration of disturbed land to its original (prior to construction) condition, either at the time of the pre-construction conference or prior to the starting of any work. No work shall be started until schedules and methods of operations have been approved by the Engineer.

3.02 PROCEDURAL DETAILS

A. The Engineer shall have the authority to limit the area of erodible earth exposed by construction and to direct the Contractor to provide immediate permanent or temporary pollution control and environmental protection measures to prevent contamination of adjacent streams or other watercourses, ponds, or other areas of water impoundment. Such work may involve the construction of temporary mulches, mats, seeding or other control devices or methods as required by the conduct of the work.

B. The Contractor shall be required to incorporate all permanent pollution control and environmental protection features into the project at the earliest practical time as outlined in his approved schedule. Temporary pollution control and environmental protection measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of

permanent pollution control or environmental protection features; or that are needed temporarily.

C. The Contractor shall undertake and comply with the following measures with respect to adverse environmental impacts, resulting from the operations listed below.

1. Clearing Grubbing - Disturbed areas shall be re-grassed at the direction of the Engineer.

2. Tree cutting in undeveloped cross-country or building site areas as designated by the Engineer - Trees within the temporary right-of-way, shall be cut only with the written approval of the property owner. Trees approved for cutting shall be marked with a 2-inch wide paint ring. The Contractor shall furnish the Engineer with sufficient spray paint and shall be present during all tree marking, and shall notify the appropriate property owner, the Owner, and the Engineer, concerning his availability for tree-marking at least ten (10) calendar days prior to the start of the applicable construction. Trees not approved for cutting shall be adequately protected against damage by methods approved by the Engineer. Cut or damaged trees not approved for cutting or outside of the total working right-of-way shall be replaced with trees of similar nature and maturity at the Contractor's expense. When directed, stumps of approved cut trees shall be removed and replaced with seedlings of a similar nature, 6-12 feet in height.

3. Access road construction - Riprap or sodding shall be used to prevent erosion.

4. Material Storage - Materials shall be stored only at approved locations. Petroleum products shall be stored away from wetland areas.

5. Excavation - The Contractor shall use care to contain wet fill where it is dumped. When material is stockpiled next to a trench, the side away from neighboring brooks, swamps, canals, etc., shall be utilized where space conform to the natural angle of repose of the soil. The Contractor shall promptly remove all sediment from brooks and swamp areas, if deposition cannot be avoided during construction. The Contractor shall promptly remove excess fill and regress the work area. Excess fill shall not be disposed of in wetlands, other than in areas defined on the drawings, or areas approved by commissions or authorities having jurisdiction.

6. Water handling - The Contractor shall be required to use crushed stone or plastic sluiceways leading to brooks to filter and pool pumped discharges.

7. Backfilling - The Contractor shall replace unsuitable material with suitable material. He shall also be responsible for surface repairs as required.

8. General - Trash receptacles shall be required on the job site. The Contractor shall perform preliminary clean-up operations as he completes segments of his work.

9. Spillings - Ground Spillings of oil or other petroleum products drained from equipment shall be strictly prohibited. The Contractor shall provide leak proof containers for receiving drained oil and shall properly dispose of such oil away from the site of the job.

3.03 DUST CONTROL OPERATIONS

A. The Contractor shall perform dust control operations, in an approved manner, whenever necessary or when directed by the Engineer, even though all other work on the project shall be suspended. Dust lying shall be generally accomplished by the use of water; however, the use of flake calcium chloride may be ordered when necessary to control dust nuisance.

B. The Contractor shall practice dust control to meet all air pollution standards as set forth by federal and state regulatory agencies.

3.04 ACCEPTANCE

A. Final inspection and acceptance in regard to cleanup, site restoration and pollution control measure areas shall be made in the presence of the Owner and/or commissions or authorities having jurisdiction. The Contractor shall notify the Owner in writing of readiness of the work for final inspection.

END OF SECTION

SECTION 01570

TRAFFIC CONTROL AND POLICING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall install construction traffic and pedestrian controls as specified herein and any additional construction and/or detour controls deemed necessary by the Engineer or the Contractor himself, or required by the Manual on Uniform Traffic Control Devices.

B. Where the roadway under construction is the only means of vehicular or pedestrian access to a particular area, the Contractor must provide continual access to that area for residents and emergency vehicles.

C. Work under these items shall conform to the relevant provisions of the Massachusetts "Standard Specifications for Highways and Bridges", latest edition, as amended and specified herein.

PART 2 MATERIALS

2.01 GENERAL

A. All signs, barricades, and drums shall have encapsulated lens and reflective sheeting in accordance with the Massachusetts "Standard Specifications for Highways and Bridges".

PART 3 EXECUTION OF WORK

3.01 SCHEDULE OF OPERATIONS

A. At a reasonable time in advance of the construction work, the Contractor shall submit to the Engineer for approval a traffic management plan, stamped by a Massachusetts Registered Professional Engineer, showing all construction and/or detour control

devices to be erected. All of the devices shall be moved after each phase of the project and after the project is completed.

3.02 LOCATION OF SIGNS

A. The detour signs and other control devices shall be located as specified herein.

B. The construction and/or detour signs as herein specified shall be removed and relocated after each phase of the project.

C. The Contractor shall notify the responsible heads of the Fire, Police, and Public Works Departments, before beginning each phase of the project.

D. All signs, barricades, makings and lighting devices shall conform to the Manual on Uniform Traffic Control Devices - latest edition.

E. The contractor shall submit a Traffic Control Management plan detailing types of signs, detours, and locations of signs for review by the City. The submitted traffic plan shall be stamped by a Massachusetts Registered Professional Engineer.

END OF SECTION

SECTION 01710
CLEANING UP

PART 1 GENERAL
1.01 SCOPE OF WORK

PART 1 GENERAL

1.01 SCOPE OF WORK

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

B. Where material or debris has washed or flowed into or been placed in watercourses, drains, catch basins, or elsewhere as a result of the Contractor's operations, such materials or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the ditches, channels, drains, etc., kept in a neat, clean and functioning condition.

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

D. The Contractor shall restore or replace, when and as directed, any public or private property damaged by his work, equipment, or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration, or as required in other divisions of this specification.

E. The Contractor shall thoroughly clean all materials and equipment installed by him and his subcontractors and on completion of the work shall deliver it undamaged and in a fresh and new appearing conditions. All mechanical equipment shall be left fully charged with lubricant and ready for operation.

F. Payment for cleanup and restoration shall be apportioned against each of the payment items listed in the BID, unless otherwise specified.

END OF SECTION

SECTION 02016

PRE/POST CONSTRUCTION SURVEY

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Work under this section consists of furnishing all labor, materials, equipment and supervision necessary to perform a pre/post construction survey of a designated "blasting area" or area where proposed excavations would influence the condition or alignment of existing structures or appurtenances. Such a study would involve a detailed, descriptive investigation with photographic support of, as minimum, all buildings within 300 feet of anticipated rock blasting or as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. DIVISION 2 - As Appropriate

PART 2 MATERIALS - NOT APPLICABLE

PART 3 EXECUTION OF WORK

3.01 INVESTIGATION CONDUCTED FOR INSURING AGENCIES

A. Adequate liability coverage shall be secured by the Contractor for himself, the Owner and the Engineer. Such coverage as applied to this section shall cover all damages resulting from seismic disturbances created by execution of the proposed project. In the event of damage to private property resulting from excavation or blasting operations, the Owner and the Engineer shall be held harmless.

B. Pre/post construction surveys shall be performed under the supervision of a professional engineer registered in Massachusetts and shall be documented with

photographs. The pre-construction study shall be conducted no more than four weeks prior to commencement of work in the designated area in order to be considered a valid representation of existing conditions.

3.02 EXAMINATION OF EXISTING STRUCTURES

A. Investigations of area structures shall be conducted with photographic support so as to exactly define the condition of their foundation and supporting columns. This established base shall be later used for comparison with post construction conditions. Deficient and failing structures shall be defined in detail.

B. Examination of bridges and other roadway structures shall also be conducted with regards to structural integrity, alignment, elevation and with regards to related structures.

3.03 SURVEY OF EXISTING UTILITIES

A. Examinations shall also be conducted with respect to area utilities. Alignments of utility poles and pipe lines shall be established wherever possible by photographic means. Elevations and conditions of drainage structures to be left-in-place shall also be examined if such information has not already been obtained by the Engineer.

3.04 POST CONSTRUCTION SURVEY

A. Upon completion of construction operations in a given area, the Contractor shall conduct a final inspection and survey so as to ascertain any damage or non-damage resulting from his operations. The survey shall be fully supported by photographic evidence, and any resulting damage shall be immediately reported to the Owner, the Engineer and the insurance agent for the Contractor.

END OF SECTION

SECTION 02100

SITE PREPARATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, tools, equipment, and service necessary to perform the following items of work which relate to the performance of the construction contract, in accordance with the contract drawings.

B. Work shall include:

1. Field engineering and grade control.
2. Modifications and/or abandoning or removal of existing utility structures and lines not paid for under other items.
3. Furnish and Install Erosion Control Barriers and remove barrier upon completion of project.
4. Sawcutting of pavement
5. Excavation of pavement and subbase and removal of surplus as specified under Section 02220.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. DIVISION 2 - SITE WORK - As Appropriate

PART 2 NOT APPLICABLE

PART 3 EXECUTION OF WORK

3.01 PROTECTION

A. Adequate protection measures shall be provided to protect workmen and passersby. Streets, roads, adjacent property, and existing utilities to remain shall be fully protected throughout the construction operations.

B. This item shall include any additional work required in crossing existing culverts, water courses, catch basins, drains, fire hydrants, gas, water and sewer lines and services, utility poles, and other utilities. Also included in this item is all work required to support existing utilities and structures including, but not limited to, the following: bracing, hand excavation and backfill (except concrete cradles), and any other work required for crossing the utility or obstruction, but included for payment in other items of this Specification.

C. Fences, trees, signs, traffic islands, guardrails, and utility poles in the vicinity of the work shall be protected from damage under this item. If damaged or removed, they shall be replaced in a condition equal to that existing before construction began.

3.02 PRELIMINARY SITE PREPARATION

A. Prior to any excavation the Engineer will furnish the following survey work: location of the benchmark(s) at the site and copies of survey notes. The Contractor shall furnish and set, at his own expense, all remaining stakes required for the construction operations and he shall be solely responsible for the accuracy of the line and grade of his work.

B. The Contractor shall be held responsible for the preservation of all stakes and marks placed by the Engineer. If any of such stakes or marks are disturbed or destroyed by the Contractor, he shall replace them at his expense.

3.03 EXPLOSIVES

A. Explosives will not be permitted.

3.04 CONSTRUCTION NEAR TREES

A. When excavation occurs around trees to remain, the tree roots shall not be cut. Excavation shall be accomplished by careful hand digging and without injury to the roots.

3.05 DISPOSAL

A. All disposal costs are the Contractor's expense.

B. Material to be removed shall be removed by the end of each day's work, as it accumulates. Should the Contractor elect to continue work beyond normal working hours, material to be removed shall not be allowed to accumulate for more than 36 hours.

C. Burning on site will not be permitted

END OF SECTION

SECTION 02110

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The provisions of this section apply to undeveloped or cross-country building site areas as designated by the Engineer. It is the intent of the Contract Documents that damage and/or alteration of existing terrain be minimized and confined to a limited area.

B. The Contractor shall clear and grub as shown on the plans, unless otherwise directed by the Engineer. Trees approved for cutting shall be marked by a 2 inch wide paint ring.

C. The Contractor shall not cut or injure any existing trees or other vegetation outside the limits of the areas of work, as indicated on the Contract Drawings, without written approval from the Engineer. Trees or group of trees to be left in place, inside the work limits, shall be protected from damage by barriers or other suitable means to be approved by the Engineer.

1.02 RELATED SPECIFIED ELSEWHERE

A. SECTION 02200 - EARTHWORK
SECTION 02270 - SLOPE PROTECTION & EROSION CONTROL

PART 2 MATERIALS - NOT APPLICABLE

PART 3 EXECUTION OF WORK

3.01 CLEARING

A. With the exception of those trees and other vegetation which the Engineer denotes for preservation by the Contractor, the Contractor shall cut or remove all trees, saplings, brush, and other vegetative matter such as snags, leaves, saw dust, bark, etc., and refuse. The ground shall be cleared to the width of the permanent easement unless otherwise directed by the Engineer.

B. Trees or group of trees designated to be left standing shall be trimmed of all dead branches 1 ½ inches in diameter or more. The trees shall be trimmed of live branches to height specified by the Engineer. All limbs which are to be trimmed must be neatly cut as close as possible to the tree trunk or a major branch; and all cuts more than one inch in diameter shall be painted by an approved tree wound paint.

C. Except where clearing is done by uprooting with machinery or where stumps are left longer to facilitate subsequent grubbing operation, trees, stumps, and stubs to be cleared shall be cut as close to the ground surface as practicable, with no more than 6 inches remaining above the ground surface in the case of small trees, and 12 inches in the case of large trees.

3.02 GRUBBING

A. In areas to be grubbed, the Contractor shall remove completely all stumps, remove to a depth of 18 inches all roots larger that 3 inches in diameter, and remove to a depth of 6 inches all roots larger than ½ inch in diameter. Such depths shall be measured from the existing ground surface or the proposed finished grade, whichever is the lower. Depressions resulting from grubbing shall be filled in with approved material and compacted to the height of the adjacent surface.

3.03 DISPOSAL

A. All material collected in the course of the clearing and grubbing, and not to remain shall become the property of the Contractor and shall be disposed of in a manner satisfactory to the Engineer. Disposal of the materials in the clearing and grubbing operations and shall not be left until the final cleanup period.

B. Burning shall not be allowed without a permit from the Fire Department and the approval of the Engineer. The Contractor will be responsible for compliance with all Federal, State and Local Laws regarding such burning. The site of the fire shall be picked out in advance by the Engineer. Burning shall be carried out in such a manner as to avoid all hazards which might cause damage to existing structures, construction in progress, trees, vegetation or other property not designed to be disposed of. All disposal by burning shall be under constant attention by the Contractor until the fire has burned out or has been properly extinguished.

C. Prior to depositing surplus material at any offsite location, the Contractor shall obtain a written agreement between himself and the owner of the property. The agreement shall state that the owner of the property gives permission for the Contractor to enter and deposit the material at no expense to the project Owner or the Engineer. A copy of the agreement shall be furnished to the Engineer.

D. Because of the disease-carrying characteristics of elm trees, the Contractor shall take special care to completely dispose of all elm trees or the limbs of elm trees removed, by burying under 12 inches of soil in approved areas. Where it is evident that removed timber carries Dutch Elm disease, then the timber shall be disposed of in accordance with applicable laws.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall make all excavation of normal depth in earth for sites, structures, roads, and trenches in whatever substance encountered, and shall place and compact backfill to the dimensions and levels shown on the plans or as required by the Engineer. The Contractor shall provide all labor, material, equipment, supervision and incidentals to execute the work in strict accordance with these specifications and applicable drawings. Work under this section includes, but is not necessarily limited to, stripping and stockpiling of suitable topsoil, excavation of all materials encountered, trenching, sheeting, shoring, dewatering, blasting, maintenance of excavation, backfill, fill, providing borrow, compaction, and grading. The Contractor shall do layout.

B. The Contractor is advised that lines and grades, as shown on plans and profiles, are subject to change. Although it is the intention to adhere to that which is shown on the plans, the Engineer reserves the right to make changes in lines and grades of utilities and locations of manholes when such changes may be necessary or advantageous.

C. The Contractor's particular attention is directed to the related sections of the specifications. Specific information is provided for stockpiling material on-site or off-site and disposal of unsuitable material. Special requirements applicable to excavation to remove soft material, site preparation settlement, and timing of construction are identified.

D. In open trenching on State, County, or local highways and railroad properties, the Contractor shall be governed by the conditions, restrictions and regulations made by the appropriate body. All such regulations shall be in addition to those set forth in these specifications.

E. Any excavation, dewatering, sheeting, and bracing shall be carried out in such a manner as to eliminate any possibility of undermining or disturbing the foundations of any existing structures or any work previously completed under this Contract, or as specified herein.

F. The Contractor shall fill or backfill all excavations as indicated on the Contract Drawings and as specified herein, but is advised that some of the excavated material may not be suitable as backfill material.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02224 - FILL AND BACKFILL MATERIALS
B. SECTION 02250 - COMPACTION CONTROL AND TESTING
C. SECTION 02575 - PAVING REPAIR AND REPLACEMENT

1.03 SITE INFORMATION

A. Existing grades and other site information shown on the applicable Contract Drawings are approximate and have been compiled by field surveys. The Owner does not guarantee that grades shown will not vary from the actual site conditions. The Contractor must make his own field investigations to determine all conditions affecting the work to be done and materials needed and make his bid in sole reliance thereon.

1.04 PROTECTION OF EXISTING CONDITIONS

A. General: Extreme care shall be exercised to avoid existing trees, shrubs, facilities, utilities, fences, and private property that are to remain and all necessary precautions taken to prelude damage to these items. Any damage to these items as a result of work performed by the Contractor shall be repaired by the Contractor at his own expense.

B. Utility agencies shall be contacted and advised of proposed work prior to the start of actual excavation. The Contractor shall obtain information from the proper sources and authorities concerning locations of all utilities within the scope of this work, in order that there will be no damage done to such utilities.

C. If and when encountered, utilities shall be supported and protected, and the Engineer shall be notified. Entrance, opportunity, and ample time shall be allowed for such measures as may be required for the continuance of utility services. Utilities to be abandoned within excavation areas shall be removed, plugged, or capped by the Contractor as directed by the Engineer. Permanent existing utilities near the excavation and/or construction work shall be properly protected during construction work, and any damage to such permanent utilities shall be repaired by the Contractor without expense to the Owner or Engineer.

D. All utility services shall be supported by suitable means so that the services shall not fail when tamping and settling occurs. No separate item is provided for service supports and the Contractor must cover supports in the unit prices bid for the roadway construction.

E. The Contractor shall not be compensated for any additional work involved whenever a utility or underground structure is so encountered within the work limits.

F. The Contractor shall not be compensated for any additional work involved if the utilities or underground structures cross the trench line transversely above or below the proposed work.

G. Rules and regulations governing the respective utilities shall be observed. Active utilities shall be adequately protected from damage, and shall not be removed or relocated except as indicated or directed.

H. All existing pipes, poles, wires, fences, curbing, and other structures which, in the opinion of the Engineer, must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from injury by the Contractor, and in case of injury, the Contractor shall notify the appropriate party so that proper steps may be taken to repair any and all damage done. The Contractor shall at his own expense replace, repair, or restore the affected facilities to their original condition or shall reimburse the owner of said facilities for such expenses as the owner may accrue. When the owners do not wish to make the repairs themselves, all damage shall be repaired by the Contractor, or, if not promptly done by him, the Engineer may have the repairs made at the expense of the Contractor.

I. Survey markers: Any existing property boundary markers, Town bounds, control points, and datum elevations markers or bench marks to be removed and replaced as shown on the Contract Drawings or directed by the Engineer shall be removed and replaced by the Contractor with all expenses for such replacement paid for by the Contractor.

J. The Contractor shall provide and maintain barricades, signs, lights, etc., required for the protection of personnel, materials and property. Barricades, etc., shall conform with all codes and regulations, and shall be lighted at night with lanterns, and reflectorized paint as directed or required for safety, and shall be removed upon completion of the Contract.

PART 2 MATERIALS - NOT APPLICABLE

PART 3 EXECUTION OF WORK

3.01 DESCRIPTION

A. The Contractor shall make excavations in such manner and to such width as will give suitable room for building the structures or for constructing the roadways but complying with the limits shown on the Contract Drawings. The Contractor shall furnish and place all sheeting, bracing, and supports; shall do all pumping and draining and any other work necessary for dewatering and shall render the bottom of the excavation firm and dry and in all respects acceptable.

B. In no case, except as provided for in Part 3.10 titled “Trench Limits”, shall the earth be plowed, scraped, or dug by machinery so near to the finished grade as to result in disturbance of material below said grade. The last of the material to be excavated shall be removed with pick and shovel just before placing pipe, masonry, or other structures.

C. All excavations shall be braced with steel sheeting or steel excavation boxes as specified in the related specifications or as shown on the Contract Drawings.

3.02 OPEN EXCAVATION

A. All excavation, except as otherwise specified or permitted, shall be open cut. The length of trench open at any one time will be controlled by the Engineer. The Contractor shall not have more than three hundred (300) feet of trench open at any one time during daylight hours.

3.03 SEPARATION OF SURFACE MATERIALS

A. From areas within which excavations are to be made, loam, topsoil, sand, and gravel shall be carefully removed and separately stored to be used again as directed; or, if the Contractor prefers not to separate materials, he shall furnish as directed and without additional compensation, clean backfill and loam and topsoil at least equal in quantity and quality to that excavated.

B. When excavations are to be made in paved surfaces, the Contractor shall machine cut the pavement along the proposed trench lines, with either a pneumatic hammer or mechanical saw in such a manner that the edges of the remaining pavement follow clean, trim, straight lines. If pavement is removed, it shall not be mixed with other excavated material, but shall be disposed of away from the site before the remainder of the excavation is made.

3.04 EXCAVATED MATERIAL

A. Excavated material shall be so placed as not to interfere with travel on the streets and driveways by the occupants of adjoining property, cause undesirable settlement, or obstruct free access to hydrants and gate valves. Access for emergency vehicles shall be maintained at all times. Excavated material shall not be deposited on private property until written consent of owner or owners thereof has been filed with Engineer. Onsite excavated material stockpiles shall be stored as directed by the Engineer. However, if it is impractical or unsafe to stack suitable, excavated, backfill material adjacent to the work, the material shall be hauled and stored at a location provided by the Contractor at no additional expense to the Owner. Excavated material shall not be deposited in brooks or streams. Excavation shall include the removal of unearthed wooden structures.

B. It is expressly understood that no excavated materials shall be removed from the site of work or disposed of by the Contractor except as directed or approved by the Engineer. All material designated by the Engineer to be removed from the site shall be immediately removed and legally disposed of according to Federal, State and Local codes and regulations. The Contractor will be required to clean any roads and streets of material that is spilled from his operation of hauling and disposing of unsuitable excavated material.

C. Suitable excavated material may be used for fill or backfill on other parts of the work.

D. Upon completion of the backfilling, the streets or property shall be cleaned, surplus material removed, and the surfaces restored to the condition in which they were before construction. All materials left over in public highways shall become the property of the Contractor. If the Contractor fails to promptly remove such surplus material, the Engineer may have the work done and charge the cost thereof
as money paid to the Contractor.

E. Material excavated from private property shall belong to the property owner or his representative, and shall be disposed of by the Contractor, as required by said property owner or representative, but the longest haul requested by the Owner shall in no case exceed 5 miles. If the Contractor fails to promptly remove such surplus material, the Engineer may have the same done and charge the cost thereof as money paid to the Contractor.

3.05 DRAINAGE

A. At all times during construction, the Contractor shall provide, place and maintain ample means and devices with which to intercept and/or remove promptly, and dispose properly all water entering trenches and other excavation, or the water may flow along or across the site of work; and keep said excavations dry until the structures, pipes, and

appurtenances to be built have been completed to such extent that they will not be damaged. At this time the Contractor shall remove such temporary means and devices.

B. Every precaution necessary to obtain watertight construction of all joints in pipe, manholes, wyes, and drop connections must be taken.

C. All ground water which may be found in trenches or excavations and any water which get may into them from any cause whatsoever shall be removed.

D. All water pumped or drained from the work shall be disposed of in a suitable manner, satisfactory to the Engineer, without undue interference with other work or damage to pavements, other surfaces, or property.

3.06 STRUCTURE EXCAVATION

A. The Contractor shall excavate to the elevations shown on the plans, or as directed by the Engineer. If the Contractor excavates below the elevations specified, he shall bring the excavation back to the proper elevation by backfilling with screened gravel (Type 6 material) and tamping in 6'' layers to provide a compact base. The backfill material must be approved by the Engineer before being placed. If the Engineer directs any changes in elevation or dimension of the structure excavations from that shown on the plans, the Contractor shall be paid for work performed under the appropriate bid item. Any increase in cost resulting from backfilling, or increasing the size of the excavation or foundations because of over excavation in depth, shall be borne by the Contractor. Cut slopes shall have a maximum slope of 2:1 if not braced. When excavation has reached specified dimensions, the Engineer shall be notified and he will determine if conditions are satisfactorily met before work is allowed to continue.

3.07 SLABS ON GRADE

A. Where slabs on undisturbed earth occur, all loams, organic or other undesirable materials shall be removed as required by the Engineer, and the area grubbed to a depth of at least six (6) inches below the finished sub-grade elevation or as indicated on the Contract Drawings. Where slabs on fill occur, the fill will also be compacted in accordance with the related section of the specifications.

3.08 TRENCH EXCAVATION

A. Excavation shall not commence in any section until the pavement covering the proposed excavation has been properly cut.

B. In general, trenches shall be excavated to such depth as will permit pipe to be laid at elevations, slopes or depths of cover as indicated on the Contract Drawings. Deeper trenches shall be provided where necessary on account of the conformation of the ground and to permit the alignment of the pipe without undue deflection of joints.

C. Trenches shall be excavated by hand or machinery to the width and depth indicated on the Contract Drawings and specified herein under Paragraph 3.10 “Trench Limits”. All

loose material shall be removed from the bottom of the trench so that the bottom of the trench will be in an undisturbed condition, and so as to provide a proper foundation for pipe bedding material.

D. Particular care shall be taken that no stone 6 inches or larger in any diameter protrudes more than 3 inches from the bottom or side of the trench. Suitable bell holes shall be made in the trench at joints as required.

E. At completion of a workday, all excavations shall be covered by backfilling to existing grade or plating to entirely cover the opening or completely enclosing with a 6 foot high temporary chain link fence.

F. In earth excavation in sections where bedding is excluded, the bottom of the trench shall be shaped so as to conform to the outside of the pipe, particular care being taken to recess the bottom of the trench in such a manner as to relieve the bell of all load.

3.09 TRENCH EXCAVATION IN FILL

A. If pipe is to be laid in embankments or other recently filled material which are more than 1 foot below the invert of the pipe, the fill material shall be placed and properly compacted to final grade or to a height of at least 3 feet above the top elevation of the pipe, whichever is the lesser, before laying pipe. Particular care shall be taken to ensure maximum consolidation of material under the pipe. The pipe trench shall then be excavated as though in undisturbed material.

3.10 TRENCH LIMITS

A. The limits of normal trench excavation shall be as shown on the Contract Drawings or specified herein. Trenches shall be excavated to the required depths, adding, however, to such depths the thickness of the pipe and, where applicable, the thickness of the bedding. The width of the trench at the bottom shall always be wide enough to make the joints properly. When, in the opinion of the Engineer, it is necessary to lay a concrete foundation, the excavation shall be made as shown on the details or as ordered by the Engineer.

B. Where the bottom of the trench, by mistake of the Contractor, has been taken out to a greater depth than above specified, it shall be refilled to the proper grade, using screened gravel material by the Contractor who shall receive no additional compensation whatever therefore. Refilling with earth to bring the bottom of the trench to the proper grade will not be permitted.

C. The Contractor shall at all time exercise care not to excavate outside the trench limiting lines as shown on the Contract Drawings unless otherwise authorized by the Engineer.

D. Bedding for pipe will be as detailed on the Contract Drawing and as specified in the related section of the specifications.

3.11 EARTH EXCAVATION BELOW NORMAL GRADE

A. If in the opinion of the Engineer, the material at or below the depth to which excavation for structures and pipes would normally be carried is unsuitable for foundation, it shall be removed to such widths and depths as directed and replaced with suitable material. Such work shall be paid for under appropriate items.

1. Roadway over-excavations shall be backfilled with compacted Type 3 material.

2. Trench over-excavation shall be minimum of 3 feet or as directed by the Engineer and shall be lined with a geotextile fabric.

3.12 EXCAVATION NEAR EXISTING STRUCTURES

A. Attention is directed to the fact that there are pipes, drains, and other utilities in certain locations. Some of these have been indicated on the Contract Drawings, and an attempt has been made to show all of the lines and services, but the completeness of accuracy of the information given is not guaranteed.

B. All pipes and other utility conduits shall be located on the ground with pipe finding equipment well ahead of the work at all times. All such locations shall be plainly marked by coded paint symbols on pavement or by marked stakes in the ground. All such location work shall be provided by the Contractor in cooperation with the appropriate utility to the satisfaction of the Engineer at no extra cost.

C. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools, as directed. Such manual excavation when incidental to normal excavation shall be done to the satisfaction of the Engineer at no extra cost.

3.13 RELOCATION AND REPLACEMENT OF EXISTING STRUCTURES

A. Whenever the Contractor encounters certain existing structures as described below and is so ordered in writing, he shall do the whole or such portions of the work as he may be directed, to change the location or, remove and later restore, or replace such structures, or to assist the Owner thereof in so doing. For all such work, the Contractor shall be paid under such items of work as may be applicable, otherwise as Extra Work.

B. In removing existing pipes or other structures, the Contractor shall use care to avoid damage to material, and the Engineer shall include for payment only those new materials which, in his judgment are necessary to replace those unavoidably damaged.

C. The structures to which the provisions of the preceding two paragraphs shall apply include pipes, wires, and other structures which (a) are not indicated on the Contract Drawings or otherwise provided for, (b) encroach upon or are encountered near and substantially parallel to the edge of the excavation, and (c) in the opinion of the Engineer will impede progress to such an extent that satisfactory construction cannot

proceed until they have been changed in location, removed (to be later restored), or replaced.

D. When fences interfere with the Contractor's operations, he shall remove and (unless otherwise specified) later restore them to at least as good condition as that in which they were found immediately before the work was begun. The restoration of fences shall be done as promptly as possible and not left until the end of the construction period.

3.14 CARE AND RESTORATION OF PROPERTY

A. Excavation machinery and cranes shall be of suitable type and be operated with care to prevent damage to trees not to be cut and overhanging branches and limbs.

B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. In case of cutting or unavoidable damage to branches, limbs, and trunks of trees, the cut or damaged portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C. Cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations shall be protected by suitable means or shall be dug up and temporarily replanted and maintained. After the construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is reestablished. If cultivated hedges, shrubs, and plants are injured so such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of kind and quality at least equal to the kind and quality existing at the start of the work.

D. On paved surfaces, the Contractor shall not use or operate tractors, bulldozers, or other power operated equipment, with treads or wheels of which are so shaped to cut or otherwise damage such surfaces. All surfaces which have been damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operation. Suitable materials and methods shall be used for such restoration.

E. The restoration of existing property or structures shall be done as promptly as practicable and shall not be left until the end of the construction period.

3.15 DUST CONTROL

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities so as to minimize the creation of dust. If the Engineer decides that it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish the material, load, deliver, and spread it as directed.

3.16 BACKFILLING - GENERAL

A. In general, and unless other material is indicated on the Contract Drawings or specified elsewhere, material used for backfilling trenches and excavations around structures shall be suitable material which was removed in the course of construction excavation. Backfilling shall not commence until the Engineer gives permission. Where the trench is in an area to be paved, or in an unpaved vehicular or pedestrian traveled way, or the shoulder of a paved roadway, a suitable pavement base shall be provided to a depth of at least that required in the related sections of the specifications.

B. Suitable backfill material shall be free from cinders, ashes, refuse, boulders, rocks, or stones greater than 6 inches in any dimension, unsuitable organic material, or other material which, in the opinion if the Engineer, is unsuitable.

C. Frozen material shall not be placed in the backfill, nor shall backfill be placed upon frozen material. Previously frozen material shall be removed, or shall be otherwise treated as required, before new backfill is placed.

3.17 BACKFILLING AROUND STRUCTURES

A. The Contractor shall not deposit backfill against structures until the structure has obtained sufficient strength to withstand the earth pressure placed upon it and in no case less than seven days, nor before carrying out and satisfactorily completing the tests specified in the related sections of the specifications. Compaction of backfill against concrete structures shall not be carried out by motorized equipment closer to the structure than the depth of the structure below grade. Such backfilling shall be carried up evenly on all walls of a structure simultaneously with maximum allowable variation of 2 feet in elevation at any point. Unequal soil pressures shall be avoided by depositing the material evenly around the structure.

B. In addition, where pipe is connected to the structure, the backfilling procedure shall be carried out as specified in “Backfilling in Open Trench”.

C. Measurement of fill material under this work will not include any filling made beyond a vertical plan of one foot outside the footings except as directed.

D. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of the day’s operations. Prior to terminating work for the day, the final layer of compacted fill shall be rolled or graded to eliminate ridges of soil left by compaction equipment. No fill shall be placed and compacted on snow, ice, or soil that was permitted to freeze prior to compaction.

3.18 BACKFILLING IN OPEN TRENCH

A. As soon as practical after pipe has been laid in accordance with the appropriate sections and the pipe joints have been properly made, the backfilling shall begin, and shall continue without delay. However, the trench shall be kept open long enough for the Engineer to locate existing utilities uncovered during excavation and to inspect pipe or structure conditions.

B. If a screened gravel or concrete envelope is not used, the selected material shall be (see Contract Drawings for additional or superseding information) free from large lumps and stones having any dimension greater than 2 inches, and shall be placed simultaneously on both sides of the pipe, so that there will be no tendency to displace the pipe alignment. In placing the material, care shall be taken that stones do not strike the pipe and geotextile fabric shall be installed to the limits shown on the Contract Drawings at the locations specified on the drawings or as directed by the Engineer.

C. A sand blanket (Type 2 material) shall be placed at the sides of the pipe up to the top of the pipe and shall be hand-placed and thoroughly compacted using approved hand-operated tampers. Backfilling shall be carried up evenly on both sides of the pipe.

D. Type 2 material shall be extended up to a level of 1 foot above the top of the pipe shall be placed in 6 inch layers, leveled along the length and width of the trench and thoroughly compacted with approved tampers.

E. The sand blanket (Type 2 material) may be omitted for cast iron, ductile iron and reinforced concrete pipe provided, however, that no stone large than 2 inches is in contact with the pipe.

F. The backfill in the remainder of the excavation above the top of the screened gravel or concrete envelope, if used, shall be Type 1, backfilled in approximately 12 inch layers and promptly compacted by mechanical tamping. Material used for backfilling to a point two feet over the pipe shall contain no stones larger than three inches in greatest dimension. Backfilling or tamping with trenching machines is prohibited.

G. Care shall be taken in the use of mechanical or other tampers not to injure or move the pipe or cause the pipe to be supported unevenly.

H. Large masses of backfilling material shall not be dropped into the trench in such a manner, in the opinion of the Engineer, as to endanger the pipe.

I. All backfilled trenches shall be thoroughly surface tamped with a tamping machine approved by the Engineer.

J. Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material.

K. No compacting shall be done when the material is too wet to be compacted properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compacting, or such other precautions shall be taken as may be necessary to obtain proper compacting.

3.19 MATERIAL FOR FILLING AND EMBANKMENTS

A. Approved selected materials available from the excavations and not required for backfill around pipes or under structures may be used for site preparation except as otherwise

specified. Material needed in addition to that available from construction operations shall be obtained from approved Type 1, 2, 3, or 4 sources.

B. All material, whether from the excavations or offsite, shall be such nature that after it has been placed and properly compacted in 12-inch layers, it will make a dense, stable fill. It shall not contain vegetation, roots, stones over 6 inches in diameter, or porous material.

3.20 GRADING

A. Grading, in preparation for placing of paved walks and drives and appurtenances, shall be preformed at all places to the lines, grades, and elevations as directed by the Engineer. All unsuitable material encountered, of whatever nature, shall be removed and disposed of as directed. During the process of grading, the sub-grade shall be maintained in such condition that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the prosecution or conditions or the work.

B. The right is reserved to make minor adjustments or revisions in lines or grades if found necessary as the work progresses or in order to obtain satisfactory construction.

C. All slopes cut during construction shall be uniformly redressed to the slope, cross-section and alignment existing prior to construction as indicated on the Contract Drawings or as directed by the Engineer.

END OF SECTION

SECTION 02220

RECLAMATION OF BASE COURSE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The work shall consist of scarifying and pulverizing the in place asphalt pavement and underlying material, mixing and/or blending the material, removing excess material necessary to provide a sufficient depth of reclaimed material and spreading and compacting the resultant mixture to the lines and grades shown on the plans or established by the Engineer.

B. Work under this Item shall conform to the relevant provisions of the Massachusetts Department of Public works “Standard Specifications for Highways and Bridges” (latest edition).

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02250 - COMPACTION CONTROL AND TESTING

PART 2 MATERIALS

2.01 SCARIFIED AND PULVERIZED MATERIAL

A. All scarified and pulverized material shall pass the 3 inch sieve. Materials for blending shall conform to the requirements of Gravel Borrow, Type b (M1.03.0) of the Massachusetts Department of Public Works Standard Specifications for Highways and Bridges.

PART 3 CONSTRUCTION METHODS

3.01 RECLAMATION OF BASE COURSE CONSTRUCTION METHODS

A. Prior to scarifying and pulverizing the existing pavement, the Contractor shall locate and protect existing drainage and utility structures and underground pipes, culverts, conduits and other appurtenances. If the upper sections of utilities are removed to facilitate scarifying and pulverizing the existing pavement, the remaining part of the

structure shall be immediately covered with a steel plate capable of withstanding a 36.5 ton truckload with impact.

B. The Contractor shall submit to the Engineer for approval a description of equipment and process to be used for scarifying and pulverizing the existing pavement. The pulverizing operation shall be controlled in such a manner that the resultant material will be free form excessive fine material (material passing the No. 200 sieve). The Engineer will determine the acceptable level of fine material.

C. The bituminous pavement and underlying material shall be scarified to depths shown on the plans or established by the Engineer and pulverized and mixed to produce a consistent homogeneous material, 100 percent passing the 3 inch sieve and without an excess of material passing the No. 200 sieve. If the Engineer directs, Gravel Borrow (Type b) shall be blended with the pulverized material in quantities established by the Engineer to produce a uniform blend suitable for use as base course only if excess suitable reclaim from other areas is not available.

D. Unsuitable material in the subgrade shall be removed to the lines and depths established by the Engineer and shall be included in the unit price for reclaim item. If excess suitable reclaimed base course material is available, it shall be used to replace unsuitable material without extra compensation. Any excess reclaimed material shall become the property and responsibility of the Contractor. If sufficient suitable reclaimed base course material is not available, then the unsuitable material shall be replaced with Gravel Borrow conforming to the requirements of Subsection M1.03.0, Type b.

E. Suitable material in the subgrade (material under reclaim) shall be removed to the lines and depths as shown on the contract drawings or as established by the Engineer and shall be included in the unit price of reclaim item.

F. The mixed and/or blended base course material shall be spread and compacted in accordance with the requirements of SECTION 02250 - COMPACTION CONTROL AND TESTING, to the widths, depths and crowns shown on the plans or established by the Engineer.

G. Procedure for completing cut operations where the removal of subgrade material is required shall be to windrow all reclaim material to the opposite side of the excavation. Excavate subgrade material to the proposed grade, then windrow back all reclaim material to the proposed grade of the reclaimed material. The cost associated with this work shall be paid for under the reclaim item.

H. Procedure for completing cut operations where the removal of subgrade material is not required shall be to remove surplus reclaimed material to the proposed grade of the reclaimed material and stockpile for later use or to place in fill areas as required. The cost associated with this work shall be paid for under the reclaim item.

I. Procedure for completing fill operations is to place suitable surplus excavated reclaimed material (from cut areas) to the proposed grade of the reclaimed material. If surplus

reclaimed material is unavailable then Gravel Borrow conforming to the requirements of Subsection M1.03.0, Type b shall be placed. The cost associated with this work shall be paid for under the reclaim item.

J. According to the proposed standard cross section as part of the contract drawings, the proposed reclaimed base course shall be a minimum 12” depth in all areas upon completion of the work.

END OF SECTION

SECTION 02221

ROCK EXCAVATING AND DISPOSAL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Work under this section consists of furnishing all labor, tools, equipment and supervision necessary to excavate rock, if encountered, to the lines and grades required to install the pipe as indicated on the Contract Drawings. The Contractor shall dispose of the excavated material for backfill in place of the excavated rock.

B. In general, rock in trench shall be excavated so as to be not less than 6 in. from the pipe after it has been laid. Before the pipe is laid, the trench shall be backfilled to the correct subgrade with thoroughly compacted, suitable material or when so specified or indicated on the drawings, it shall be backfilled with the same material as that required for bedding the pipe and will be furnished and placed at the expense of the Contractor.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. DIVISION 2 -SITE WORK

PART 2 MATERIALS - NOT APPLICABLE

PART 3 EXECUTION OF WORK

3.01 ROCK EXCAVATION - GENERAL

A. “Rock” shall be classified as a material that requires for excavation drilling, blasting, or breaking by means of power tools. Boulders and concrete structures one cubic yard or greater, however removed, are included within this definition of rock. When material is encountered with respect to which the Contractor may claim removal as rock excavation, such material shall be uncovered and exposed and the Engineer notified by the Contractor before proceeding with the excavation. The Contractor shall not

proceed with the excavation of the material to be re- moved as rock excavation until this material has been cross-sectioned and classified by the Engineer. Failure on the part of the Contractor to uncover such material, notify the Engineer, and allow time for cross sectioning the undisturbed surface of such material, will forfeit the Contractor's right of claim to any classification other than that allowed by the Engineer for the areas of work in which the deposits occur. Rock excavation shall be considered unsuitable backfill material and shall be used for ditch and slope protection or wasted off-site as directed by the Engineer.

3.02 ROCK BLASTING

A. If blasting is required and allowed, it shall be done in a safe manner by a licensed blaster, and the Contractor shall take all precautions necessary for the protection of persons and property. Extreme care shall be exercised in the handling and use of explosives. No blasting work shall be performed without permission from all governing authorities and the Engineer. Any blasting work approved as necessary shall be done in accordance with all applicable safety regulations including all State and local regulations. Ample warning shall be given for all blasts, and adequate means taken to prevent all persons from entering the blasting area. Experienced personnel shall do all blasting operations. The Contractor shall be entirely responsible for any blasting operations and the results therefrom. The Contractor at no additional expense to the Owner shall correct any damage caused by blasting.

B. Prior to conducting any blasting, the Contractor shall prepare, and submit to the Engineer for review, a description of the blasting procedures that the Contractor proposes to use on the various segments of the work. The Contractor shall measure vibration from blasting operations at all structures within 100 feet of a blast with a seismograph. The Contractor shall perform a series of test shots to ascertain the allowable load per delay. The Contractor shall adjust the maximum allowable particle velocity to site-specific requirements.

C. The Contractor shall perform a pre/post construction survey of existing structures, utilities, bridges, and roadways on both sides of the water main alignment where any structures are within 100 feet of the water main centerline.

D. The surveys shall be performed under the supervision of a Professional Engineer, registered in Massachusetts, and shall be documented with photographs.

E. Blasting and explosion coverage shall be obtained if there is a need for blasting under this Contract, and no blasting shall be performed until such insurance has been secured. Insurance amounts shall correspond with Contract general and supplemental conditions.

3.03 EXPLOSIVES

A. The Contractor shall keep explosives on the site only in such quantity as may be needed for the work underway and only during such time as they are being used. He shall notify the Engineer, in advance, of his intention to store and use explosives. Explosives shall be stored in a secure manner and separate from all tools. Caps or

detonators shall be safely stored at a point over 100 feet from the explosives. When the need for explosives has ended, all such materials remaining on the site shall be promptly removed from the premises.

B. In addition to observing all municipal ordinances and State and Federal laws relating to the transportation, storage, handling and use of explosives, the Contractor shall conform to any further regulations that the Engineer may think necessary to this project, including those of property owners through whose properties the proposed facilities pass. The licensed blaster shall at all times, have his license on the site and shall permit examination thereof by the Engineer or other officials having jurisdiction. Blasts shall be fired according to a schedule to be given to the Engineer.

C. All operations involving explosives shall be conducted by experienced personnel and only with all possible care to avoid injury to persons and property. Blasting shall be done only with such quantities and strengths of explosives, in such manner as will break the rock approximately to the intended lines and grades, and yet will leave the rock not to be excavated in an unshattered condition. Care shall be taken to avoid excessive cracking of the rock upon or against which any structure will be built, and to prevent injury to existing pipes or other structures and property above or below ground. Rock shall be well covered with rugs or mats, or both, where required. Sufficient warning shall be given to all persons in the vicinity of the work before a charge is exploded.

D. All blasting shall be completed within a distance of 50 ft. before any portion of a masonry structure is placed or any pipe is laid.

3.04 BLASTING RECORDS

A. The Contractor shall keep and submit daily to the Engineer an accurate record of each blast. The record shall show the general location of the blast, the depth and number of drill holes, the kind and quantity of explosive used, and other data required for a complete record.

3.05 EXCESS ROCK EXCAVATION

A. If rock is excavated beyond the limits of payment indicated on the plans, and not specified or authorized in writing by the Engineer, the excess excavation, whether resulting from over breakage or other causes, shall be backfilled, by and at the expense of the Contractor, as specified below in this section.

B. In pipe trenches, excess excavation below the elevation of the top of the bedding, cradle or envelope shall be filled with material of the same type, placed and compacted in the same manner, as specified for bedding, cradle, or envelope. Excess excavation, above said elevation shall be filled with suitable backfill material.

C. In excavations for structures, excess excavation in rock beneath foundations shall be filled with concrete that shall possess strength of 4,000 psi, or 3,000 psi, at the option of the Engineer. Under any foundation that over excavation has occurred, the entire area under the foundation shall be either all concrete or all backfill, but not both. Other excess excavation shall be filled with suitable backfill material.

3.06 SHATTERED ROCK

A. If the rock below normal depth is shattered due to drilling or blasting operations of the Contractor, and the Engineer considers such shattered rock to be unfit for foundations, the shattered rock shall be removed and the excavation shall be backfilled with concrete as required, except that in pipe trenches gravel fill may be used for backfill, if approved. All such removal and backfilling shall be done by and at the expense of the Contractor.

3.07 BACKFILLING ROCK EXCAVATIONS

A. Where rock has been excavated and the excavation is to be backfilled, the backfilling above normal depth shall be done as specified under the related specifications. If material suitable for backfilling is not available in sufficient quantity from other excavation, The Contractor at his own expense, shall furnish suitable material from outside sources.

END OF SECTION

SECTION 02224

FILL AND BACKFILL MATERIALS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, equipment, fill and backfill material and incidentals for site preparation and to meet finished contours as shown on the Contract Drawing. The use of the fill and backfill material is specified elsewhere. The Engineer may order the use of granular fill materials for purposes other than those specified in other sections, if in his opinion such use is advisable.

1.02 APPROVAL OF MATERIALS

A. The Contractor shall furnish the Engineer with representative samples and a gradation analysis of each type of soil. If the source of materials changes significantly or a different source is used, re-submittals and re-approvals must be made.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02200 - EARTHWORK
C. SECTION 02250 - COMPACTION CONTROL AND TESTING

PART 2 MATERIALS

2.01 TYPE 1 - COMMON BORROW

A. Common Borrow shall be a granular material obtained from approved on-site or off-site natural deposits and unprocessed except for the removal of unacceptable material and stones larger than six (6) inches. It shall not contain vegetation or roots. It shall be free from loam, clay, fine wood, trash, and other objectionable materials or harmful substances.

B. Common Borrow shall consist of a material satisfactory to the Engineer and not specified as gravel borrow, sand borrow, special borrow material or another particular kind of borrow. This material shall have the physical characteristics of soils designated as group A-1, A-2 - 4 or A-3, under AASHTO-M145. It shall have properties such that it may be readily spread and compacted for the formation of embankments.

2.02 TYPE 2 - SAND BORROW

A. Sand Borrow shall consist of clean, inert, hard, durable grains of quartz or other hard durable rock. It shall be free from clay, loam, vegetable or other objectionable matter.

B. Material for pipe cover, landscaping, or other uses as determined by the Engineer, shall be well graded as follows or as indicated on the Contract Drawings. The allowable amount of material passing a No. 200 sieve as determined by AASHTO-T11 shall not exceed 10 percent by weight.

Sieve Size	Percent by Weight Passing Through
$^3/_8$ inch	85 - 100
#16	50 - 85
#200	0 - 10

2.03 TYPE 3 - SAND AND GRAVEL

A. The sand and gravel material for foundation sub-grades or structural fills shall meet AASTHO-M145, for A-1-a, A-1-b, or A-3 soils. The mixture shall consist of clean hard durable particles or fragments. It shall be free from loam, organic or other objectionable matter.

B. Subgroup A-1-a includes those materials consisting predominantly of stone fragments or gravel, either with or without a well-graded binder of fine material and with 50% maximum passing the No. 10 sieve, 30% maximum passing the No. 40 sieve and 15% maximum passing the No. 200 sieve. The fraction passing the No. 40 shall have a maximum plasticity index of 6.

C. Subgroup A-1-b includes those materials consisting predominantly of course sand either with or without well-graded soil binder and with 50% maximum passing the No. 40 sieve and 25% maximum passing the No. 200 sieve. The fraction passing the No. 40 shall have a maximum plasticity of 6.

D. Group A-3 material shall be fine beach sand without silty or clay fines or with a very small amount of non-plastic silt. The group includes also stream deposited mixtures of poorly-graded fine sand and limited amounts of coarse sand and gravel; 51% minimum shall pass the No. 40 sieve, and 10% maximum shall pass the No. 200 sieve.

2.04 TYPE 4 - COARSE GRAVEL

A. The material shall consist of clean hard, inert, durable particles or fragments. It shall be free from clay, loam, vegetable or other objectionable matter. Materials that break up when alternately frozen and thawed or wetted and dried shall not be used.

B. Material for foundation under drainage, pavement subbase, or other uses as determined by the Engineer shall be well graded as follows:

SIEVE SIZE	PERCENTAGE BY WEIGHT PASSING
3 inch	100
1 ½ inch	70- 100
¾ inch	50- 85
#4	30- 60
#200	0-12 (based on fraction passing No. 4)

C. The processed material shall be stockpiled in such a manner to minimize segregation of particle sizes. All processed gravel shall come from approved stockpiles.

2.05 TYPE 5 - LOAM BORROW AND TOPSOIL

A. Material shall conform to related sections of the specifications.

2.06 TYPE 6 - SCREENED GRAVEL MATERIALS

A. The gravel shall generally conform to ASTM-C33 and shall consist of clean, hard, inert, durable particles or fragments. It shall be free from clay, loam, organic or other objectionable matter. Crushed rock of suitable size and grading may be used instead of screened gravel. The specifications which follow shall apply to whichever material is used.

B. Material for trench stone fill shall consist of sound angular stones; 50 to 70 percent of which shall weigh at least 500 pounds and the remainder shall weigh not less than 50 pounds each.

C. Material for trench bedding shall be well graded from ¾ inch to 2 inch.

D. Material for stabilizing trench base shall be well graded from ½ inch to 1 ½ inch.

E. Material for pipe bedding, landscaping, or other uses as determined by the Engineer, shall be well graded as follows:

SIEVE SIZE	PERCENT BY WEIGHT PASSING
1 inch	100
¾ inch	90 - 100
$^3/_8$ inch	20 - 55
#4	0 - 10
#8	0 - 5

2.07 TYPE 7 - CRUSHED STONE

A. The crushed stone shall consist of clean, hard, inert, durable particles or fragments. It shall be free from clay, loam, vegetable or other objectionable matter.

B. At least 50% of the material passing a one (1) inch sieve shall have a fractured face. The percent of wear of the crushed stone for pavement base coarse shall not exceed 50.

The stone sizes for the crushed stone shall be as follows:

SIEVE SIZE	PERCENT BY WEIGHT PASSING
1 ½ inch	100
1 ¼ inch	85 - 100
¾ inch	10 - 40
½ inch	0 - 8

C. The equipment for producing crushed stone shall be of adequate size and with sufficient adjustments to produce the required materials without unnecessary waste. The plant shall be capable of removing excess sand. The Engineer may order final screening of crushed stone if flat or elongated pieces are present in objectionable amounts.

PART 3 EXECUTION OF WORK

3.01 PLACING AND COMPACTING

A. The material shall be placed and compacted as specified in related specification sections.

END OF SECTION

SECTION 02226

SAND BLANKET

PART 1 GENERAL

1.01 CONTRACT DOCUMENTS

A. The general provisions of the Contract including General and Supplemental Conditions and General Requirements apply to the work specified in this section

1.02 DESCRIPTION OF WORK

A. The Contractor shall furnish, place and compact sand in trenches and elsewhere, as directed by the Engineer.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. DIVISION 2—As Appropriate

PART 2 MATERIALS

2.01 GRAVEL

A. The sand shall consist of clean, hard and durable particles or fragments of quartz on the durable rock. It shall be free from dirt, vegetable or other objectionable matter, an excess of soft, thick elongated, laminated or disintegrated pieces.

2.02 GRADATION

A. The sand shall be well graded in size so that 90 to 100 percent passes a ½ inch sieve and not more than 15 percent will pass a No. 200 sieve.

PART 3 EXECUTION OF WORK

3.01 PLACING AND COMPACTING

A. The material shall be placed and compacted as specified in SECTION 02250—COMPACTION CONTROL AND TESTING

END OF SECTION

SECTION 02250

COMPACTION CONTROL AND TESTING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials and equipment necessary to place and compact fill or backfill. The Contractor shall furnish all equipment necessary to collect soil samples.

B. Actual testing of soil samples with the exception of insitu-density determinations shall be done by an independent testing laboratory approved by the Owner. Insitu-density determinations shall be made by the Engineer or his representative. Copies of test results shall be furnished by the test laboratory directly to the Engineer.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02200 - EARTHWORK

B. SECTION 02224 - FILL AND BACKFILL MATERIALS

C. SECTION 02226 – SAND BLANKET

1.03 SUBMITTALS

A. Prior to commencement of filling and backfilling operation, the Contractor shall submit for approval a detailed list six (6) copies unless otherwise specified) of the types of compacting equipment to be utilized in the work, and the number of each.

PART 2 MATERIALS

2.01 TEST METHODS

A. Contractor shall provide heavy-duty sample bags for fill or backfill material to be tested. Soils shall be classified as in the in the related sections of the Specifications which include AASHTO specifications M145 Recommended Practice for Classification of Soils as Soil-Aggregate Mixtures for Highway Construction Purposes.

B. Soil samples shall be prepared for testing according to ASTM D42 Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.

C. Gradation testing shall be done according to ASTM D2216 Particle Size Analysis of Soils and ASTM D1140 test for Amount of Materials in Soils Finer than the No. 200 sieve.

D. Moisture content of soil shall be determined by ASTM D2216 Laboratory Determination of Moisture Content of Soil.

E. Liquid Limits and Plasticity Index shall be determined ASTM D423 Liquid Limit of Soils and ASTM D424 by Plastic Limit and Plasticity Index of Soils.

F. Maximum dry density for each type of fill shall be determined by ASTM D1557 Method D Moisture - Density Relations of Soils using 10-lb. Hammer and 18-in. Drop.

G. In-place field unit weight shall be determined by ASTM D- 1556 Density of Soil in Place by the Sand-Cone Method.

H. Maximum dry density at the discretion of the Engineer may be determined in accordance with ASTM D-2049 test for Relative Density of Cohesionless Soils.

PART 3 EXECUTION OF WORK

3.01 COMPACTION EQUIPMENT

A. No backfilling shall be done until the compacting equipment list has been submitted and approved as conforming to the Contract requirements. Sufficient compacting equipment shall be available at all times, thereafter while backfilling is being conducted.

B. Each layer of fill shall be inspected prior to compaction. All visible roots, vegetation, or debris shall be removed. Stones larger than 6 inches in diameter shall be removed. The water content of each layer shall be determined to be suitable for compaction or shall be brought to a suitable condition. Material incorporated in the fill which is not in satisfactory condition shall be subject to rejection and removal at the Contractor's expense. Placement of fill on frozen ground or placement of fill material which is frozen will not be permitted.

C. Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction. No compacting shall be done when the material is too wet, from either rain or too great an application of water, to compact it properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions shall be taken as may be necessary to obtain proper compaction.

D. Filling shall begin in the lowest section of the area. Fill shall be spread in layers as specified. The surface of each layer shall be approximately horizontal but will be provide with sufficient longitudinal and transverse slope to provide for runoff of surface water from every point. Filling shall be conducted so that no obstruction to drainage from other sections of the fill area is created at any time. Sumps, if any, shall be continuously maintained in effective operating condition.

E. Each layer of material shall be compacted by the use of only approved rollers or other approved means so as to secure a dense, stable, and thoroughly compacted mass. At such points as cannot be reached by mobile mechanical equipment, or where such equipment is not permitted, the materials shall be thoroughly compacted by the use of suitable power-driven tampers.

F. The compaction equipment shall be operated so as to make a minimum of three passes over each section of each layer of fill. Each successive pass shall overlap the adjacent pass by not less than 10%. Additional passes shall be made to obtain the required compaction, if necessary.

G. Compaction by water jetting or puddling will be allowed only if the Engineer deems the conditions suitable for this method. Wherever the material contains excessive amounts of clay or loam to prevent satisfactory drying, water-jetting shall not be used.

H. If the material is allowed to be compacted by water jetting or puddling, it shall be placed in uniform layers not exceeding 4 ft. deep. Each layer shall be thoroughly saturated throughout its full depth and at frequent intervals until all slumping ceases. For water jetting or puddling, the Contractor shall provide one or more jet pipes, each of sufficient length to reach the specified depth and not less than 1 ½ in. in diameter. The jet pipe shall be equipped with a quick-acting valve and sufficient fire hose to connect to a hydrant or pump having adequate pressure and capacity. A hydrant shall be utilized only upon approval of the local Water and/or Fire Departments. The Town requires that all water usage shall be metered. The Contractor shall obtain a meter for hydrant usage at the water department. There will be no additional charge for water used for the project.

3.02 COMPACTION REQUIREMENTS

A. Pipe Bedding: Bedding shall be Type 6 fill placed uniformly in 6 inch layers and compacted unless otherwise specified. Compaction shall be accomplished by 20 lb. hand tampers.

B. Pipe Sand Blanket: Material shall be Type 2 fill placed uniformly in 6 inch layers and compacted to 90% of maximum dry density of the sand. Compaction shall be accomplished by 20 lb. hand tampers.

C. Trench Cover: Material shall be Type 1, 2, 3 or 4 fill placed uniformly in 12 inch layers and compacted to 95% of maximum dry density for the type of material used. Compaction shall be accomplished by mechanical tampers. Compaction by water-jetting shall be in accordance with the related sections of the specifications.

D. Catch Basin and Manhole Base Bedding: Material shall be Type 6 fill placed uniformly in 6 inch layers and compacted. Compaction shall be accomplished by 20 lb. hand tampers or pneumatic tampers.

E. Structural Fill (foundation sub-grade, foundation under drainage, pavement sub-grade, pavement sub-base): Material for foundation sub-grade or pavement sub-grade shall be Type 3 fill. Structural fills shall be placed in 6 inch layers compacted to 95% maximum dry density for a given type of material. Compaction shall be by mechanical power driven vibratory compactors. Pavement sub-grade in cut areas shall be rolled and compacted to 95% density of the in situ material.

F. Fill around structures shall be Type 1, 2, 3, or 4 material placed in 6 inch layers and compacted to 95% maximum dry density. Compaction shall be accomplished by mechanical power driven vibratory compactors. Compaction of backfill against concrete structures shall not be carried out by motorized equipment closer to the structure than the depth of the structure below grade.

G. Non Structural Fill (Landscaping and other uses as designated by the Engineer): Material shall be Type 1, 2, 3 or 4 placed in 12'' layers and compacted to 45% maximum dry density for the given type of material used. Compaction shall be accomplished by mechanical power-driven vibratory compactors.

3.03 APPROVAL OF FILL OR BACKFILL MATERIAL

A. Before placing or compacting any on-site or borrow material, the Contractor shall submit a sample of the material for testing. No on-site material shall be placed until approved by the Engineer.

B. The Engineer may at any time require additional laboratory testing should he observe any changes in gradation of the material being placed. No additional fill shall be placed or compacted until the material has been approved. If the material does not meet the required gradation and Otterburg limits for a given type of fill, the Contractor shall remove it as his expense. The Contractor may use the material for other types of fill providing it meets the required gradation and properties of that type.

3.04 FREQUENCY OF COMPACTION TESTING

A. The Engineer may perform tests of the degree of compaction obtained, in any area he may select. Payment for performing tests will be made by the Owner. If test results are unsatisfactory, all costs involved in correcting deficiencies in compacted material including retesting, shall be borne by the Contractor. If improper compaction methods are used, the Owner shall have the right to discontinue payments from the Contractor for said payment item until the situation is corrected.

3.05 FAILED TESTS

A. If the percentage compaction at any point is found to be unacceptable, additional compaction with or without modification of the field moisture content as directed by the Engineer, shall be performed and a second moisture-density determination made. This procedure shall be repeated until satisfactory compaction is obtained. If after five (5) tests any fill or backfill material cannot be compacted to the required density it shall be removed and disposed of at the Contractor's expense.

END OF SECTION

SECTION 02270

SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This work shall consist of temporary and permanent control measures as shown on the Contract Drawings, as required, or as ordered by the Engineer throughout the construction and post-construction period to control erosion and sedimentation by the use of silt fences, sedimentation pools, check dams, filter fabric and other control devices. The erosion and sediment control features installed by the Contractor shall be satisfactorily maintained by the Contractor.

B. In the event that temporary erosion and sediment control measures are required due to the Contractor's negligence, carelessness or failure to install permanent controls as a part of the work scheduled, and such additional measures are ordered by the Engineer, the work shall be performed by the Contractor at his expense.

C. Repeated failures by the Contractor to control erosion (pollution/siltation) shall be cause for the Engineer to employ outside assistance or to use his own forces to provide the necessary corrective measures. The cost of such assistance plus Engineering costs will be charged to the Contractor and appropriate deductions made from the Contractor's monthly progress estimate.

D. The Contractor shall remove sediment from behind silt fences, check dams and from sedimentation pools as necessary or as directed by the Engineer.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 1300 - SUBMITTALS

B. DIVISION 2 - SITE WORK

PART 2 MATERIALS

2.01 SLOPE PROTECTION AND EROSION CONTROL

A. This work shall consist of the design, installation, maintenance and removal of temporary
erosion control measures such as mulching slope drains and grasses to control and/or prevent erosion around the construction site during construction. Mulches may be hay, straw, fiber mats, netting or other suitable material acceptable to the Engineer.

B. Slope drains may be constructed of pipe, fiber mats, or other material acceptable to the Engineer that adequately controls erosion.

C. Grass shall be a quick growing species (such as rye grass, Italian rye grass, or cereal grasses) suitable to the area providing a temporary cover which will not later compete with the grasses used later for permanent cover.

D. Fertilizer and soil conditioners shall be a standard commercial grade acceptable to the Engineer.

E. Hay bales shall be 36'' x 18'' x 24'', or larger, with two 1'' x 1'' x 48'' stakes, per bale, to secure the bale in place.

2.02 SEDIMENTATION POOLS

A. Sedimentation pools where used shall be constructed to a size and configuration and at locations as approved by the Engineer. The sedimentation pools shall be constructed and operational before excavation, embankment or drainage system construction in the area served by the pool is started. A series of haybales, in a rectangle secured with oak stakes (see attached detail), line with siltation fence, and shall be used to construct a siltation pool. The discharge hose from the trench shall discharge into the pool. Sedimentation pools shall be maintained during and after construction in good hydraulic condition such that function as intended. Pools shall be maintained and kept in operation by the Contractor for the duration of the project. Sediment and other deposits shall be removed when the depth of material reaches 12 inches, or as directed by the Engineer, to ensure satisfactory pool performance. The Contractor shall provide and maintain access to the pools for their maintenance. The pools shall be removed at the completion of the Contract or when directed by the Engineer. All disturbed areas shall be covered with 4 inches of plantable soil borrow and seeded in accordance with the provisions of these Specifications.

2.03 SILT FENCES

A. This work shall consist of the construction, maintenance and removal of temporary silt fences. The silt fences shall be placed at the location shown on the Contract Drawings or as directed by the Engineer. The silt fences shall be in place before construction in the area begins.

B. The snow fence should be set in place with a 6'' trench on the front side. The filter fabric will be laid loosely on the fence so as not to stretch the material. The panels shall be overlapped a minimum of 12 inches. Suitable tie wire shall be used to secure the cloth to the top of the fence. The bottom of the cloth should be buried in the trench to prevent water from flowing beneath the fence. Fence posts shall be wooden or metal posts set 1 ½ feet into the ground at 6' centers.

C. The filter fabric shall conform to the following requirements. The yarn shall consist by weight of at least 85 percent vinylidene chloride and shall contain stabilizers added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and/or heat exposure. After weaving, the cloth shall be calendered so that the filaments retain their relative positions with respect to each other. The cloth shall be free of defects or flaws which significantly affect its physical and/or filtering properties. It shall be woven in widths of at least 6 feet and in rolls of not less than 50 linear feet. The sheets of filter cloth shall be sewn together with polypropylene or polyvinylidene chloride at the point of manufacture to form sections not less than 24 feet wide. All edges of the cloth shall be salvaged. During shipment and storage, cloth shall be wrapped with a suitable material for protection against damage.

D. Should the Contractor desire to use an equal filter fabric sample of the proposed filter fabric shall be furnished 30 days prior to installation of the fabric. Samples, shipping, and cost of testing shall be at the Contractor's expense. A minimum of 5 square yards of cloth a minimum of 36 linear inches of seam, with at least one foot of cloth each side of the seam, shall be furnished for testing. Mill certificates, or affidavits from the manufacturer, shall accompany these samples, citing the trade name and producer of the cloth and certifying that the samples are representative of the material which will be installed on the project and that the cloth meets the requirements stated in this Specification. In addition, a certified copy of permeability and filtration tests from a qualified laboratory showing the performance of filter with various grain size soils and water, giving both particle retentions and permeability, shall be submitted at the request of the Engineer.

E. Filter fabric shall be handled and placed in accordance with the manufacturer's recommendations. When the fabric is joined by stitching it shall be stitched with a yarn of contrasting color. The size and composition of the yarn shall be as recommended by the fabric manufacturer. The stitches shall number 5 to 7 per inch of seam.

F. Should the fabric be damaged during placing, the torn or punctured section shall be repaired by placing a piece of fabric that is large enough to cover the damaged area and to meet the overlap requirement.

G. Damaged sections of the silt fences shall be repaired or replaced by the Contractor for the duration of their use. Sediment shall be removed as directed by the Engineer.

H. The silt fences shall be removed when adequate vegetative growth insures no further erosion of the slopes or when directed by the Engineer. The filter fabric may be cut at ground level.

I. All material, including the filter fabric and fence, become the property of the Contractor and shall be disposed of away from the site.

2.04 STONE LINED WATERWAYS

A. The Contractor shall provide all material, labor, and crushed stone for waterways, consisting of a protective covering of angular shaped stones laid on the waterway to insure protection of the waterway.

B. The waterway shall be placed to line and grade as shown on the plans or as directed by the Engineer on a prepared bed of crushed stone. Each stone for the waterway shall be carefully placed by hand, normal to the slope and firmly bedded thereon. Each stone shall weigh not less than 50 pounds nor more than 125 pounds and at least 75% of the volume shall consist of stones weighing not less than 75 pounds each. The remainder of the stones shall be so graded that when placed with the larger stones, the entire mass will be compacted with a minimum percentage of voids and a minimum thickness of 6 inches.

PART 3 EXECUTION OF WORK

3.01 PRECONSTRUCTION CONFERENCE

A. At the preconstruction conference or prior to the start of the applicable construction, the Contractor shall submit to the Engineer for acceptance, his plans and schedules for accomplishment of temporary and permanent slope protection and erosion control and restoration work, as are applicable for clearing and grubbing and general construction and disposal of unsuitable material and restoration of disturbed land to its original (prior to construction) condition. No work shall be started until schedules and methods of operations have been approved by the Engineer.

3.02 PROCEDURAL DETAILS

A. The Engineer shall have the authority to limit the area of erodible earth exposed by construction and to direct the Contractor to provide immediate permanent or temporary erosion control and slope protection measures to prevent sediment runoff to adjacent streams, ponds, or other areas of water impoundment. Such work may involve the construction of temporary mulches, mats, seeding or other control devices or methods as required by the conduct of the work or as directed by the Engineer.

B. The Contractor shall be required to incorporate all permanent erosion control measures into the project at the earliest practical time as outlined in the approved schedule. Temporary erosion control and slope protection measures will be used to correct conditions that develop during construction that were not foreseen during the design stage.

C. The Contractor shall undertake and comply with the following measures with respect to adverse environmental impacts, resulting from the operations listed below.

1. Clearing and Grubbing - Disturbed areas shall be re-grassed at the direction of the Engineer.

2. Access Road Construction - Riprap or sodding shall be used to prevent erosion.

3. Material Storage - Materials shall be stored only at approved locations. Petroleum products shall be stored away from wetland areas.

4. Excavation - The Contractor shall use care to contain wet fill where it is dumped. When material is stockpiled next to a trench, the side away from neighboring brooks, swamps, canals, etc., shall be utilized where space is available. Side slopes of stockpiled material shall conform to the natural angle of repose of the soil. The Contractor shall promptly remove all sediment from brooks and swamp areas, if deposition cannot be avoided during construction. The Contractor shall promptly remove excess fill and re-grass the work area. Excess fill shall not be disposed of in wetlands, other than in areas defined on the drawings, or areas approved by commissions or authorities having jurisdiction.

5. Water handling - The Contractor shall be required to use crushed stone or plastic sluiceways leading to brooks to filter pumped discharges.

6. Backfilling - The Contractor shall replace unsuitable material with properly suitable material. He shall also be responsible for surface repairs as required.

7. General - Trash receptacles shall be required on the job site. The Contractor shall perform preliminary clean-up operations as he completes segments of his work.

8. Spillings - Ground spilling of oil or other petroleum products drained from equipment shall be prohibited. The Contractor shall provide leakproof containers for receiving drained oil and shall properly dispose of such oil away from the site of the job.

3.03 ACCEPTANCE

A. Final inspection and acceptance in regard to cleanup, site restoration, erosion control and sloped protection measures shall be made in the presence of the Owner and/or commissions or authorities having jurisdiction. The Contractor shall notify the Owner in writing of the readiness of the work for final inspection.

END OF SECTION

SECTION 02380

SHEETING AND BRACING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall do all permanent and temporary work involved in the bracing of excavation through the use of steel sheet pilings, timber sheeting, shoring boxes, and steel plates or as shown on the Contract Drawings or as directed by the Engineer.

B. The Contractor shall take responsibility and shall furnish all parts, labor and materials for the placement and maintaining of sheeting, bracing or shoring of the sides of the excavation so as to prevent earth movements which would in any way diminish the width of excavation so as to interfere with proper construction, which would cause injury to persons in or about the work site, which would endanger adjacent structures, or which would delay the progress of work.

C. The Contractor shall engage a Professional Engineer, registered in the State of Massachusetts and possessing prior experience in this field to design all necessary sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design, and written certification of this shall be provided promptly by the Professional Engineer.

D. No sheeting, bracing or shoring operations shall commence until the Engineer has reviewed all descriptions, plans, sketches and time sequences and until the Engineer has given his approval of such items. The furnishing of such materials is only for review purposes and does not serve to relieve the Contractor of any part of his responsibility for the safety of the work or the successful completion of the work.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. DIVISION 2 - SITE WORK

1.03 SUBMITTALS

A. The Contractor shall submit to the Engineer in triplicate a detailed written description of the equipment and methods he proposes to use in the sheeting, bracing and shoring operations along with the computations and sketches of his Professional Engineer. This material shall be submitted to the Engineer at least fifteen (15) working days prior to the proposed start of work. In addition, the Contractor shall also supply the Engineer with an overall time schedule of the sheeting, bracing and shoring work.

PART 2 MATERIALS

2.01 STEEL SHEET PILING

A. Steel sheeting and associated bracing shall be of adequate weight for the use intended. The materials used for steel sheet piling shall conform to the requirements of ASTM-A328. Gauged sheeting shall not be acceptable for use where sheeting must be left in place.

2.02 TIMBER SHEET PILING

A. Timber Sheeting shall be composed of a 3 layer laminated timber with tongue and groove connecting edges. The toe of the sheeting shall be cut on a diagonal so that, in driving, the pile will be continuously wedged back against the previously driven pile. Timber sheet piling shall conform to the requirements of AASHTO M. 09. 01-1.

B. Timber Sheeting shall be sound, straight grained, free from shakes, loose knots, and other defects liable to impair its strength or durability.

2.03 STEEL SHORING BOXES

A. In areas where temporary sheeting is specified, steel shoring boxes may be utilized to protect the excavation from collapsing when approved by the Engineer.

B. The boxes shall be composed of sections, the number of which shall be dictated by the depth of excavation. The forward end of the box shall be equipped with cutting edges to facilitate the movement of the box along the trench bottom and shall be equipped with eyelets or hooks by which the excavator may pull the boxes along.

2.04 STEEL PLATES

A. Steel plates and associated bracing shall be of adequate weight for the use intended. The materials used for steel sheet piling shall conform to the requirements of ASTM-A328. Gauged plating shall not be acceptable for use where sheets must be left in place.

PART 3 EXECUTION OF WORK

3.01 GENERAL

A. Whenever possible, sheeting shall be driven ahead of the excavation to avoid loss of materials from behind the sheeting. If it is necessary to excavate below the sheeting, care shall be taken to avoid trimming behind the face along which the sheeting will be driven. Care shall be taken to prevent voids outside the sheeting, but if voids are formed, they shall be filled immediately and compacted.

B. The Engineer may direct that sheeting and bracing be cut off at any specified elevation, at least 3 feet below final grade.

C. In streets, the Contractor will generally be required to install the braced excavation from the existing ground surface.

3.02 INSTALLATION OF SHEETING AND PLATES

A. Sheet piles shall be driven in such a manner as to preserve interlocking between piles and so as to be vertical without any tendency to leaning.

B. If handling holes on sheets should extend below normal static groundwater elevation, they shall be welded or plugged so as to facilitate trench dewatering operations.

C. Splicing of steel piles shall not occur without the prior approval of the Engineer and spliced sections shall not be driven until inspection of the welded splice has been conducted by the Engineer.

D. Bracing of the sheeting shall follow the designs of the Contractor's Professional Engineer and be subject to additional bracing if directed by the Engineer.

3.03 EXCAVATION UTILIZING SHORING BOXES

A. The use of shoring boxes is an acceptable measure of excavation protection; however, special attention should be made to ensure that the boxes are set stable in the excavation, that when it is pulled along the trench the box remains on line and that the proper grade and depth is maintained.

B. When other utilities or cross-connections are encountered within the excavation, the use of the shoring box may be somewhat limited and may necessitate the use of other sheeting or bracing measures as needed or as directed by the Engineer.

3.04 SHEETING AND PLATES LEFT-IN-PLACE

A. When indicated in the Contract Documents, or as directed by the Engineer, sheeting and/or bracing shall be left-in-place and properly backfilled.

B. The Engineer may direct the Contractor at any time in writing, to have sheeting, bracing, left in place to be embedded in backfill or concrete for the purpose of preventing subsequent injury to structures or property.

3.05 EXTRACTION OF SHEETING AND PLATES

A. All sheeting and bracing not to be left in place shall be carefully removed in such a manner as to not endanger the construction, other structures, utilities or property. All Voids left or caused by withdrawal of sheeting shall be refilled immediately with sand by ramming with tools especially adapted to that purpose, by watering, or by other means as may be approved.

END OF SECTION

SECTION 02401

DEWATERING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment, appurtenant material and equipment, and incidentals required to design, install, operate and remove a temporary dewatering system to prevent surface and groundwater from entering any excavations required as per this Contract. The dewatering system installed shall lower the groundwater and prevent surface water intrusion to provide a firm, dry excavation with a stable bottom and sidewalls capable of supporting structures, pipes and backfill.

B. The Contractor shall retain the services of a Professional Geotechnical Engineer, registered in the State of Massachusetts and experienced in dewatering systems, to design the dewatering system to be used during construction. A copy of the proposed dewatering system including plans and calculations shall be submitted to the Engineer for review at least two weeks prior to commencing any work. All drawings and calculations shall bear the stamp and signature of the Registered Professional Geotechnical Engineer. The Registered Professional Geotechnical Engineer shall monitor the installation of the dewatering system and visit the site periodically during the construction period.

C. The dewatering system shall include the installation of one or a combination of the following dewatering methods as necessary: sumps and ditches, horizontal drainage systems, cofferdam dewatering, well method, well point method, cutoff methods and other methods as designated by the Contractor's Geotechnical Engineer and approved by the Engineer.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. DIVISION 2 - SITE WORK

1.03 DESIGN AND PERFORMANCE REQUIREMENTS

A. The bottom of all excavations shall be dry and firm. All excavation, construction, backfilling and compaction shall be conducted “in-the-dry” unless hydraulic compaction measures are dictated by the Engineer.

B. The following measures shall be met in all areas where predrainage of the existing water table is required prior to construction operations.

1. No excavation below the elevation of the groundwater level existing at the time of construction will be allowed until this groundwater level has been lowered to, and maintained at, an elevation at least 2 feet below the bottom of excavation.

2. The dewatering system shall maintain the groundwater level at least 2 feet below the bottom of excavation until sufficient backfill has been placed to prevent flotation of any structures or pipelines.

3. The Contractor and his Professional Geotechnical Engineer shall be responsible for insuring that dewatering measures and well points are so installed and situated as to provide sufficient dewatering of the work area and abutting soil stratum.

4. The design of well points of other dewatering units shall be such that removal of fines during pumping is minimized.

5. A single stage well point system with the header at ground surface will not be adequate to lower the water level to the required depths.

C. Safe working conditions shall be ensured by whatever dewatering measures deemed necessary, including the use of chemical and soil stabilization.

D. During the course of construction if alterations or re-design of the dewatering system is necessitated, the Contractor’s Professional Geotechnical Engineer shall submit plans and calculations, stamped and signed, indicating such alterations and changes. The Contractor shall bear all costs of the Geotechnical Engineer any modifications.

E. Dewatering measures shall be so designed as to prevent the removal of any lines during pumping or excessive subsidence about the construction site. Discharged groundwater shall be properly detained, settled, filtered, or otherwise treated to prevent contamination, and to prevent contamination of nearby waterways.

1.04 SUBSURFACE CONDITIONS

A. Test borings and groundwater observation wells installed along the excavation route by the Owner or Engineer shall be made available to the Contractor for his use.

B. The Contractor shall also consider groundwater level fluctuations due to the season, precipitation, or other factors.

C. The Contractor shall be responsible for obtaining all additional and supplementary information he deems necessary for the design of the dewatering system.

PART 2 MATERIALS

2.01 SUBMITTALS

A. The Contractor shall submit to the Engineer for approval a plan showing a typical dewatering method to be used during the construction. The plans shall be submitted to the Engineer four weeks prior to beginning the work. Plans shall show location of a given method and the materials to the used for a given installation. Submittal shall include a description of each piece of equipment to be used for the dewatering operation.

PART 3 EXECUTION OF WORK

3.01 GENERAL

A. The Contractor shall conduct all dewatering operations in a manner, which will protect existing structures, pipelines and utilities from undermining of their bearing soils or disturbance to soil supporting, overlying or adjacent to structures. The Contractor shall be solely responsible for damage to properties, buildings, structures, utilities, pavements, sidewalks or pipelines resulting from his dewatering and surface water control operation.

B. The Contractor shall control all surface and groundwater so that dry, firm, undisturbed bearing soils exist in the trench or pit during all stages of excavation, construction and backfilling. Softening and instability due to the presence of seepage of water shall not be allowed to occur.

C. The Contractor shall maintain surface and groundwater control until backfilling is completed so as not to cause shifting of pipe due to flotation and buoyant forces.

3.02 CONCRETE STRUCTURES

A. The Contractor shall construct concrete cutoff dams to prevent the unnatural flow of groundwater through the backfilled trenches as detailed on the Contract Drawings. Intervals between the dams shall not exceed 300 feet. At least one dam shall be constructed between manholes.

B. The Contractor shall not permit water to rise above concrete or brick masonry within 24 hours after being placed, nor shall moving water be allowed to rise over any masonry for 96 hours. In no event shall water be permitted to rise to set up unequal pressures in structures until the concrete or mortar has set at least 24 hours.

3.03 SURFACE WATER CONTROL

A. The Contractor shall control surface water inflow through the construction of dikes, ditches, pumps or any other control method required to prevent the flow of any surface water into any excavation.

3.04 INSTALLATION OF DEWATERING SYSTEM

A. The Contractor shall install the dewatering system, and shall show to operate to the Engineer's satisfaction, prior to the excavation of any trench or pit. The system shall be shown to maintain the groundwater level as specified or modified to provide the required level as directed by the Engineer. Provisions shall be made to have standby pumps and generators available at all times.

3.05 OBSERVATION WELLS

A. The Contractor shall install observation wells along the trench centerline in all areas requiring predrainage. There shall be an operating observation well located within 50 ft. of the working edge of the excavation. The Contractor shall install all observation wells to a minimum bottom of the excavation. Observation wells shall consist of a screened or slotted well point and a riser pipe shall be fitted with a threaded watertight cap. Additional observation wells may be required as instructed by the Engineer in areas where a sand stratum underlies a clay layer located at or below the bottom of the excavation.

B. The Contractor shall make water level readings in the observation wells twice daily, and submit a copy to the Engineer on a daily basis. The Engineer shall be permitted to make independent readings as he requires.

3.06 SITE RESTORATION

A. Upon completion of the excavation work and approval of the Engineer, the Contractor shall restore the area to its pre-construction condition. All equipment, materials and accessories shall be removed and shall become the property of the Contractor. Observation wells shall be filled with sand upon completion of the Contract or as directed by the Engineer.

B. Any areas requiring repaving shall be repaved in accordance with related sections of the specifications.

END OF SECTION

SECTION 02575

PAVING AND ROAD CONSTRUCTION

PART 1 GENERAL

1.01 CONTRACT DOCUMENTS

A. The general provisions of the Contract, including General and Supplemental Conditions and General Requirements, apply to the work specified in this section.

B. The Contractor shall be responsible for maintaining all pavements and sidewalks placed as part of the Contract, in a safe and satisfactory condition until the project is accepted as complete. For any pavement or sidewalk area damaged, the Contractor shall remove entire pavement structure in damaged area and replace it as directed by the Engineer.

C. Should the application of the wearing surface be delayed for any reason including bad weather, the Contractor shall provide and maintain the base in acceptable condition until the new pavement is place.

D. During construction, all existing pavement, not to be removed, shall be protected by the Contractor. Any pavement damaged shall be removed and replaced by the Contractor at the Contractor's expense.

1.02 DESCRIPTION OF WORK

A. Work under this section consists of furnishing all materials, labor, tools, equipment and supervision necessary to restore existing or construct new pavement sub-grades, subbase, HMA binder courses, tack coats and HMA surface courses for roadways and all curbs, sidewalks, driveways, and parking areas.

B. The materials and construction methods used for this work shall conform to the Massachusetts Highway Department, "Standard Specifications for Highways and Bridges", 1988 Edition, and subsequent revisions and addenda.

C. All temporary construction roads, ditches, and drainage facilities shall be removed and the site restored before completion of the project.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02200 - EARTHWORK

B. SECTION 02224 - FILL AND BACKFILL MATERIALS

C. DIVISION 2 - SITE WORK -As Appropriate

D. DIVISION 3 - CONCRETE - As Appropriate

PART 2 MATERIALS

2.01 GENERAL CRITERIA

A. The Contractor shall be responsible for obtaining any permits and meeting State requirements for all work within State highways.

2.02 SUBGRADE

A. Sub-grade shall be either Type1, 2, 3 & 4 materials in accordance with related specifications.

2.03 SUBBASE

A. Sub-base shall be Type 6 screened gravel material in accordance with related specifications or reclaimed material.

2.04 TRENCH PAVEMENT – IF REQUIRED

A. Trench pavement shall be a HMA intermediate dense binder.

2.05 HOT MIX ASPHALT (HMA) INTERMEDIATE COURSE DENSE BINDER - PERMANENT PAVEMENT

A. Dense binder course shall be the first layer of bitumen and aggregate mixture overlying the screened gravel sub-base.

B. Dense binder course shall be HMA Intermediate Dense Binder Course as given in the Massachusetts Highway Department Standard Specifications for Highways and Bridges.

2.06 HOT MIX ASPHALT (HMA) SURFACE COURSE – STANDARD TOP -PERMANENT PAVEMENT

A. Surface course shall be HMA Surface Standard Top Course Pavement as given in the Massachusetts Highway Department Standard Specifications for Highways and Bridges.

2.07 SIDEWALKS, DRIVEWAYS AND CURBS

A. HMA for driveways, sidewalks and curbs (Cape Cod berms) shall be in accordance with the appropriate section in the Massachusetts Highway Department Standard Specifications for Highways and Bridges or as noted on the design plans.

2.08 PAVEMENT EXCAVATION - COLD PLANER (MILLING)

A. This work consists of removing pavement by cold planer in designated areas. The cold planer must be equipped with an elevating device capable of loading directly into dump trucks while operative. It shall have all necessary safety devices.

B. Milling shall be done to a depth of 1 ½ inches.

C. Excavation shall be in accordance with MHD Specifications 120.66.

D. The contractor shall dispose of the material cold planed at his expense.

PART 3 EXECUTION OF WORK

3.01 HOT MIX ASPHALT (HMA) PAVING - GENERAL

A. All mixtures delivered to the job site shall be accompanied by a Certificate of Compliance. Deliveries not accompanied by a certificate will not be used in the work.

B. Construction methods shall conform to the requirements of the Massachusetts Highway Department Standard Specifications for Highways and Bridges, including the following:

1. Mixtures delivered to the job site shall not possess signs of segregation of ingredients or surface crust.

2. The temperatures of the mixture when delivered to the spreader will be a minimum of 250 F.

3. Mixtures shall be placed only upon approved surfaces that are clean from foreign material and are dry; and when weather conditions are suitable. No mixture shall be placed when the weather is foggy or rainy, provided, however, that the Engineer may permit, in the case of sudden rain, the placing of mixture then in transit from the plant, if laid at the proper temperature and if the roadbed is free from pools of water. Such permission shall in no way relax the requirements for the quality of the pavement and smoothness of the surface. Paving materials shall not be placed upon a frozen base or when ambient air or surface temperature is less than 40 degrees Fahrenheit or when wind conditions are such that rapid cooling will prevent satisfactory compaction.

4. Wherever possible material shall be compacted using steel-wheeled rollers.

5. In areas not accessible to a roller, compaction shall be accomplished by using mechanical compactors or hand tampers, approved by the Engineer.

6. All material place shall receive final compaction before nightfall of the day placed, unless artificial light, satisfactory to the Engineer, is provided.

7. The density of completed paving shall not be less than 95% of the density obtained from laboratory compaction of a mixture composed of the same materials in like proportions.

8. The Engineer may require the Contractor to remove and replace at his own expense, any work deemed defective based on sampling and testing for composition and density, or faulty procedures.

3.02 CARE AND RESTORATION OF PROPERTY

A. All streets, sidewalks, gutters, driveways and curbs that have been damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operations.

B. Suitable materials and methods shall be used for restoration of curbs and other types of gutters, driveways and sidewalks.

C. Materials and method of all restoration work shall be subject to approval by the Engineer.

D. All frames, grates, covers, street boxes, manhole rings and other castings removed or damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operations.

E. All frames, grates, covers, street boxes, manhole rings and other castings within the limits of new paving shall be reset by the Contractor such that they are flush with the new surface.

3.03 PREPARATION OF SUBGRADE IN CUT AREAS

A. After excavation to the proposed sub-grade elevation the insitu material is determined by the Engineer to be unsuitable, the Contractor shall excavate an additional 1-foot and backfill with Type 3 sand and gravel compacted to 95% of maximum dry density. Changes in the depths and limits of excavations or fills shall be an appropriate bid adjustment item.

B. The Contractor shall remove loam and topsoil, loose vegetable matter, stumps, large roots, etc., from areas upon which subbase and pavement material will be placed. The subgrade shall be shaped as indicated on the Contract Drawings and shall be compacted to 95% of maximum dry density.

3.04 PREPARATION OF SUBGRADE IN FILL AREAS

A. The Contractor shall remove loam and topsoil, loose vegetable matter, stumps, large roots, etc., from areas upon which embankments will be built or material will be placed for grading.

B. After the area has been stripped and grubbed as herein specified, Type 1, 2, 3 and 4 materials or reclaimed material shall be placed thereon and built up in successive layers until it has reached the required elevation.

C. Layers shall not exceed 6 inches in thickness before compaction. The layers shall be slightly convex toward the center. Layers shall be compacted to 95% of the maximum dry density of the particular material used.

3.05 PREPARATION OF SUBBASE

A. Subbase material shall conform to Type 6 Screened Gravel or reclaimed material as described in the related sections of the specifications.

B. Screened gravel subbase for either permanent paving shall be a minimum of 12 inches in thickness.

3.06 TRENCH PAVEMENT

A. Trench paving shall be the depth as specified, or as directed by the Engineer.

B. Prior to placing trench pavement, trenches shall have been backfilled in accordance with related sections of the specifications. The top of the trench shall be backfilled with the specified gravel subbase materials, spread and compacted as specified herein.

C. Prior to placing trench pavement, the backfilled trenches shall be excavated and compacted to proper depth. The edges of the existing pavement, previously cut for the trenching operations, shall be retrimmed a minimum of 1 foot back along clean, straight, undamaged lines, on each side, as directed by the Engineer, and the gravel base course shall be recompacted to form a satisfactory, stable foundation.

D. Prior to the placing of trench pavement, the cut edges of existing pavement shall be swept clean and painted with a prime or tack coat of compatible asphalt materials.

E. Trench pavement shall be furnished, placed and compacted, as specified, to such widths necessary to meet undisturbed existing pavement. The completed pavement shall match the grade and shape of the adjoining existing surfaces.

F. The Contractor shall continuously maintain trench pavement in good repair, flush with existing pavement, at his own expense. Should soft, damaged or broken areas develop, such areas shall be removed immediately and be replaced with new, properly compacted materials.

3.07 PERMANENT PAVEMENT

A. Permanent top course paving is to be placed after at least 90 days has elapsed from the installation of the binder course paving for required compaction to have occurred as determined by the Engineer.

B. Prior to permanent top course paving, the Contractor shall make all final repairs to the previously installed binder course, and raise or cause to be raised, all existing, manhole, catch basin, valve box, curb box, and utility covers, etc., to conform to the final pavement grade. All loose or damaged material on the binder course pavement shall be removed and a leveling course may be installed, as hereinbefore specified. Leveling course shall also be installed at depths and locations, as directed by the Engineer, to fill existing holes and depressions, or to improve roadway crowns. Leveling course quantities used for permanent paving shall be included for compensation under the paving item.

C. All surfaces to receive permanent paving shall be dry and thoroughly cleaned of foreign or loose material; a compatible prime or tack coat shall be applied to the rate of 0.05 to 0.15 gallons per square yard of pavement, depending upon the condition of the existing surface. All castings and edge stones will be protected from the tack coat.

D. Prior to the installation of the final top pavement, the binder shall be swept of all debris. A uniform layer of bituminous asphalt emulsion (tack) shall be spread with approved equipment. To achieve the minimum spreading rates for the tack, a tanker truck will be required with spreader bar for uniformity. Slips will be required stating the volume (gallons) of tack spread and the engineer shall verify the spreading rate prior to placement of the final top pavement. A tack wand or wagon will not be acceptable for application of the tack.

3.08 MAINTENANCE OF PAVING

A. The Contractor shall maintain pavement placed under this Contract until the expiration of the one-year guarantee period and shall promptly fill with similar material all depressions and holes that may occur to keep the pavement in a safe and satisfactory condition for traffic.

3.09 SIDEWALKS, DRIVEWAY AND CURB CONSTRUCTION AND RECONSTRUCTION

A. All granite curbs, cement concrete sidewalks, and driveways damaged during construction will be reconstructed to their original condition after construction is completed. Granite curbing to be reset shall be removed and reset to proper grade and alignment in accordance with the construction methods of Section 701 of the Massachusetts Highway Department Standard Specifications for Highways and Bridges.

B. Curbing to be reset shall be carefully removed and stored. The Contractor shall replace any edging damaged or lost due to his negligence. The base upon which the edging is to be set shall be compacted to a firm even surface. Joints shall be pointed with mortar and the exposed portion finished with a jointer. Granite curb inlets shall be set in full mortar beds.

END OF SECTION

SECTION 02601

MANHOLES, COVERS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Construct manholes, covers, frames, brick masonry, inverts and apply waterproofing in conformance with the dimensions, elevations, and locations shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere (when applicable):
   1. Final sewer testing is specified in this Division.
   2. Pipe, excavation, backfill, paving and dewatering are specified in the appropriate Sections in this Division.

1.2 QUALITY ASSURANCE

A. Precast Manhole Base, Barrel and Top Sections:
   1. Conform to ASTM C478-97 except as modified herein, and on the Drawings.
   2. Average strength of 4,000 psi at 28 days.
   3. The precast concrete structure shall be sized to resist floatation. A factor of safety of 1.15 shall be used against flotation based on weights of empty structure and soil directly over footing extensions.
   3. Testing:
      a. Determine concrete strength by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the bases, barrels and tops.
      b. Have tests conducted at the manufacturer's plant or at a testing laboratory approved by the Engineer.
      c. Have not less than 2 tests made for each 100 vertical feet of precast manhole sections.

B. Frames and Covers:
   1. Acceptable Manufacturers:
      a. East Jordan Iron Works
      b. General Foundries Inc.
      c. Or equivalent.

C. Masonry:
   1. Brick: Shall comply with the ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for Grade SS, hard brick.
   2. Cement: ASTM C-150.
   3. Hydrated Lime: ASTM C-207
   4. Sand: ASTM C144

D. Waterproofing:
   1. Acceptable Manufacturers:
      a. Karnak #220 AF Fibered Emulsion Dampproofing, Karnak Corp., Clark, NJ.
      b. PPS 922 Superseal, International Precast Supply.
      c. Or approved equal.

1.3 SUBMITTALS TO THE ARCHITECT/ENGINEER

A. Submit shop drawings and manufacturer's literature in conformance with Section 01340 and the Standard General Conditions of the Construction Contract.

B. Precast Manhole Sections: Submit test results and receive approval from the Engineer prior to delivery to the site.

C. Submit structural design calculations demonstrating the structural integrity of all precast concrete units for the intended use and a buoyancy analysis with a factor of safety against flotation of 1.15 with the assumptions of the ground water table at finished grade and the precast concrete tank empty. Calculations and Drawings shall be prepared and stamped by a Professional Engineer registered in the State of Massachusetts.

PART 2 - PRODUCTS

2.1 PRECAST MANHOLE SECTIONS

A. Dimensions, shall be as shown on the Drawings:
   1. Base & Riser Sections:
      a. Diameter: As shown on the Drawings.
      b. Length: As required.
      c. Wall Thickness: Not less than 5 inches.
      d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
   2. Tops:
      a. Diameter: Eccentric cone type, 24**]** inches I.D. at top, 48 inches I.D. at bottom unless otherwise shown on the Drawings.
      b. Length: 4 feet.
      c. Wall thickness: Not less than 5 inches at the base, tapering to not less than 8 inches at the top.
      d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
      e. Exterior face of cone sections shall not flare out beyond the vertical.
   3. Flat Slab Tops:
      a. Location: Where shallow installations do not permit the use of a cone-type top and where indicated on the Drawings.
      b. Slab thickness: Not less than 6 inches.
      c. Constructed to support an HS-20-wheel loading.

B. Openings:
   1. Provide openings in the risers to receive pipes entering the manhole.
   2. Make openings at the manufacturing plant.
   3. Size: To provide a uniform annular space between the outside wall of pipe and riser.
   4. Location: To permit setting of the entering pipes at the correct elevations.
   5. Openings shall have a flexible watertight union between pipe and the manhole base.
      a. Cast into the manhole base and sized to the type of pipe being used.
      b. Type of flexible joint being used shall be approved by the Engineer. Install materials according to the Manufacturer's instructions.

6. Acceptable Manufacturers:
    a. Lock Joint Flexible Manhole Sleeve made by Interpace Corporation.
    b. Kor N Seal made by National Pollution Control System, Inc.
    c. Press Wedge II made by Press-Seal Gasket Corporation.
    d. A-Lok Manhole Pipe Seal made by A-Loc Corporation.
    e. Or equivalent.

C. Joints:
1. Joint gaskets to be flexible self-seating butyl rubber joint sealant installed according to manufacturer's recommendations. Install a double row of joint sealants for every manhole joint. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer.
   Acceptable Materials:
    a. Kent-Seal No. 2
    b. Ram-Nek
    c. Or equivalent.
2. Joints between precast sections shall conform to related standards and manufacturer's instructions.

D. Waterproofing:
1. The exterior surface of all manholes shall be given two coats of waterproofing material at an application rate as recommended by the manufacturer.
2. The coating shall be applied after the manholes have cured adequately and can be applied by brush or spray in accordance with the manufacturer's written instruction.
3. Sufficient time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.

E. Frost Protective Wrapping:
1. The frost protective wrap shall be constructed of an ultraviolet resistant polyethylene material and shall be a minimum thickness of 6 mils.

2.2 FRAMES AND COVERS

A. Standard Units:
1. Made of cast iron conforming to ASTM A48-76, Class 30 minimum.
2. Have machined bearing surfaces to prevent rocking.
3. Castings shall be smooth with no sharp edges.
4. Constructed to support an HS-20-wheel loading.
5. Dimensions and Style shall conform to the Drawings, Standard castings differing in non-essential details are subject to approval by the Engineer:
    a. Covers -solid with “SEWER” in 3-inch letters diamond pattern.
    b. Frame - 24-inch diameter clear opening, with flange bracing ribs.
6. Minimum weight of frame and cover shall be 370 lbs.

B. Water Tight Units:
1. Same features as above for Standard Units, with 22-inch diameter minimum clear opening.
2. Sealing features:
    a. Inner lid held by a bronze tightening bolt in a locking bar.
    b. Neoprene gasket
    c. Water tight pick hole.
3. Minimum weight of frame and cover shall be 510 lbs.

2.3 MASONRY

A. Brick:
   1. Sound, hard, uniformly burned, regular and uniform in shape and size, compact texture, and satisfactory to the Engineer.
   2. Immediately remove rejected brick from the work.

B. Mortar:
   1. Composition (by volume):
      a. 1 part Portland cement.
      b. 1/2-part hydrated lime.
      c. 4-1/2 parts sand.
   2. The proportion of cement to lime may vary from 1:1/4 for hard brick to 1:3/4 for softer brick, but in no case shall the volume of sand exceed 3 times the sum of the volume of cement and lime.

C. Cement shall be Type II Portland cement.

D. Hydrated lime shall be Type S.

E. Sand:
   1. Shall consist of inert natural sand.
   2. Grading:

Sieve	Percent Passing
No. 4	100
No. 8	95-100
No. 16	70-100
No. 30	40-75
No. 50	10-35
No. 100	2-15
No. 200	0-5

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Precast Manhole Sections:
   1. Perform jointing in accordance with manufacturer's recommendations and as approved by the Engineer.
   2. Install riser sections and tops level and plumb.
   3. Make all joints watertight.
   4. When necessary, cut openings carefully to prevent damage to barrel sections and tops. Replace damaged manhole sections and tops at no additional cost to the Owner.

B. Drop Manholes:
   1. The difference in elevation between the invert of the inlet pipe and outlet pipe is to be either less than 6-inches (which does not require a drop manhole) or more than 24-inches (which does require a drop manhole).
   2. Where difference in elevation between the invert of the inlet pipe to the invert of the outlet pipe exceeds 24 inches, construct a drop manhole as shown on the Drawings or as directed by the Engineer.

C. Adjust to Grade:
   1. Adjust tops of manholes to grade with brick masonry.
   2. Concrete rings are not acceptable for adjusting to grade.

D. Pipe Connections to Manholes: Connect pipes to manholes with joint design and materials approved by the Engineer.

E. Invert Channels:
   1. After manhole and all pipes entering or exiting the manhole have been installed, construct the invert channels and shelf.
   2. Channels to be smooth and semicircular in shape conforming to the inside of the adjacent sewer section.
   3. Make changes in direction of flow with smooth curves having a radius as large as permitted by the size of the manhole.
   4. Stop the pipes at the inside face of the manhole where changes of direction occur.
   5. Form invert channels and shelf with brick.
   6. The maximum change in elevation from the invert of the inlet pipe to the invert of the outlet pipe is 6-inches. Shape invert to make smooth transition in vertical grade.
   7. Slope the floor of the manhole (shelf) to the flow channel, as shown on the Drawings.

F. Masonry:
   1. Laying Brick:
      a. Use only clean bricks in brickwork for manholes.
      b. Moisten the brick by suitable means until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
      c. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and thoroughly bond as directed.
      d. Construct all joints in a neat workmanlike manner. Construct the brick surfaces inside the manholes so they are smooth with no mortar extending beyond the bricks and no voids in the joints. Maximum mortar joints shall be 1/2 inch.
      e. Outside faces of brick masonry shall be plastered with mortar from ¼-inch to 3/8-inch thick.
      f. Completed brickwork shall be watertight.
   2. Curing:
      a. Protect brick masonry from drying too rapidly by using burlaps which are kept moist, or by other approved means.
      b. Protect brick masonry from the weather and frost as required.

G. Frames and Covers:
   1. Set all frames in a full bed of mortar, true to grade and concentric with the manhole opening.
   2. Completely fill all voids beneath the bottom flange to make a watertight fit.
   3. Place a ring of mortar at least one-inch-thick around the outside of the bottom flange, extending to the outer edge of the manhole all around its circumference.
   4. Clean the frame seats before setting the covers in place.

H. Plugging and Patching:
   1. Fill all exterior cavities with non-shrink grout and with bituminous waterproofing once the concrete and mortar has set.
   2. Touch up damaged water proofing.

I. Cleaning:
   1. Thoroughly clean manholes, steps, frames and covers of all debris and foreign matter.

J. Bedding and Backfilling:
   1. Bedding of manholes shall be 6 inches of 3/4" screened stone.
   2. Backfill a minimum of 18 inches all around manhole with gravel borrow.

K. Frost Protective Wrap:
   1. The Contractor shall comply with the manufacturer's instructions for the particular conditions of installations in each case.
   2. Clean each manhole exterior of all dirt and remove any sharp protrusions.
   3. Apply two (2) 6-inch wide vertical strips of bituminous waterproofing material and/or duct tape from the top to bottom of the manhole per layer.
   4. Prior to installing pipe through each manhole or valve pit, wrap each manhole to the maximum depth of frost penetration, but not less than 5 feet below grade, with four (4) layers of the polyethylene material by beginning the wrap at the adhesive strip and proceeding around the manhole, valve pit, etc., continuously by overlapping the adhesive strip by 24 inches on the final layer. Cut the polyethylene wrap in areas where piping exits the manhole. The size of the cut is to be equivalent to the pipes outside diameter.
   5. Tuck and pleat the polyethylene wrap at the top of each manhole in a continuous manner, minimizing the size of each fold. Extend the polyethylene wrap past the top of the manhole frame and temporarily tuck the remainder inside the frame, until final backfill and paving.
   6. In paved areas, cut the polyethylene wrap flush with the manhole rim after the pavement is in place.
   7. In unpaved areas, pull the polyethylene wrap together, and tie around frame with galvanized wire.
   8. Protect the installed frost barrier from harmful weather exposures and from possible physical abuses, where possible by prompt installation of concealing work or, where that is not possible, by temporary covering or enclosure.
   9. Backfill around the manhole/frost barrier with material as outlined in Section 02200 - Earthwork.

3.2 MANHOLE TESTING

A. General:
   1. Perform either a vacuum test on all manholes.
   2. All testing must be performed in the presence of the Engineer.
   3. Suitably plug all pipes entering each manhole and brace plugs to prevent blow out.

B. Vacuum Test:
   1. The manhole shall be tested by a vacuum test after assembly of the manhole, connection piping and backfilling. Vacuum testing to be conducted prior to construction of invert channels.
   2. Plug all lifting holes completely with non-shrink grout.
   3. Properly tighten all boot clamps and brace all plugs to prevent them from being sucked into the manhole.
   4. Install the testing equipment according to the manufacturer's instructions.

5. A vacuum of 10 inches of Hg shall be drawn on the manhole and the loss of 1 inch of Hg vacuum timed. The manhole shall be considered to have passed the test if the time for the loss of 1 inch of Hg vacuum is:
    a. Not less than 2 minutes for manholes less than 10-feet deep.
    b. Not less than 2.5 minutes for manholes 10 to 15-feet deep.
    c. Not less than 3 minutes for manholes more than 15-feet deep.
6. If the manhole fails the initial test, the Contractor shall locate the leak(s) and make repairs. The manhole shall be retested until a satisfactory test result is obtained.

C. Manhole Repairs:
1. Correct leakage by reconstruction, replacement of gaskets and/or other methods as approved by the Engineer.
2. The use of lead-wool or expanding mortar will not be permitted.

D. After the manholes have been backfilled and prior to final acceptance, any signs of leaks or weeping visible inside the manholes shall be repaired and the manhole made watertight.

END OF SECTION

SECTION 02615

DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish and install ductile iron pipe, fittings, and appurtenant materials as shown on the Contract Drawings and specified herein.

B. The cement lined ductile iron pipe used for water pipe shall be Thickness Class 56, all else as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02641 – PIPING SPECIALTIES

B. SECTION 02200 – EARTHWORK

1.03 SUBMITTALS

A. Submit to the Engineer six (6) sets of shop drawings detailing the type and class of materials to be furnished. The Contractor shall not purchase the pipe prior to the Engineer's approval of the shop drawings.

PART 2 MATERIALS

2.01 DUCTILE IRON PIPE & FITTINGS

A. The Ductile Iron pipe shall be designed in accordance with AWWA C150 and shall be manufactured in accordance with AWWA C151. The Ductile Iron pipe shall conform to the ANSI A21.50, A21.51 Specifications for Ductile Iron Pipe. The grade of iron, from which pipe is made, shall be 60-42-10, having 60,000 psi minimum tensile strength, 42,000 psi minimum tensile strength, 42,000 psi minimum yield strength, and 10% minimum elongation.

PIPE SIZE	Thickness (inches)	Thickness Class	Rated Working Pressure
6''	0.43	56	350
8''	0.45	56	350
10''	0.47	56	350
12''	0.49	56	350
16''	0.52	56	350

B. Pipe fittings (if required) shall conform in all respects to ANSI 21.10 and 21.11 (AWWA C110 and C111) and shall be mechanical joint. Compact fittings 3 inches through 16 inches shall conform to ANSI/AWWA C153/A21.53 and shall be mechanical joint. Compact fittings larger than 16 inches shall not be used.

C. Pipe shall be of the push-on type, unless specified, mechanical joint or flanged as shown on the Contract Drawings.

D. All pipe and fittings shall be furnished with a cement lining on the inside of the pipe. The lining shall be twice the thickness as specified in ANSI A21.4 (AWWA C104). Cement lining shall be double thickness. The cement lining shall be given a seal coat of asphalt material. Asphalt seal coat shall not impart taste or odor, or toxic or carcinogenic compounds to the water contained therein. Asphalt seal coat shall be a product acceptable to the U.S. E.P.A. for use in potable water and shall be so listed in the most current E.P.A. summary of approved products. The asphalt seal coat shall be applied and cured in strict conformance with the coating manufacturer's cautions and instructions. The seal coat shall be applied by the pipe manufacturer or supplier, under controlled factory conditions and field application is strictly prohibited.

E. All ductile iron pipes for buried service shall be furnished with a minimum of 1 mil thick bituminous coating on the outside of the pipe.

F. Fittings shall be ductile iron, with mechanical joint ends. All fittings shall be cement lined and coated inside and out, as specified hereinbefore for ductile iron pipe.

G. All fittings shall be Class 350 and all fittings shall conform to the weights and dimensions shown in the latest edition of the CIPRA Handbook of Ductile Iron Pipe and Cast Iron Pipe.

H. Where required, flanged fittings shall be furnished and installed. Fittings shall be ductile iron as specified or as shown, and shall have Class 125 drilled flanges and shall conform in every respect to the applicable requirements of AWWA C115 and ANSI B16.1.

I. Joint accessories shall consist of high strength ductile iron glands, rubber gaskets, tee head or hex head bolts and nuts. Nuts and bolts shall be made of low alloy steel or stainless steel as required, where corrosive soils and/or saltwater conditions exist. Bolts and setscrews shall be torqued in accordance with the manufacturer's recommendations.

2.02 PUSH-ON JOINTS

A. Push-on joints shall meet all the requirements of ANSI A21.11 and shall consist of a single continuous, molded, rubber ring gasket; a bell socket cast integrally with the pipe or fitting; and a plain end. The configuration shall be such that when the plain end is inserted into the pipefitting socket, the gasket shall be compressed radially to form a positive seal. The gasket and annular space shall be so designed and shaped that the gasket is locked in place after the plain end is inserted into the fitting socket.

B. Push-on joints shall have the same pressure rating as the pipe or fitting of which they are a part.

C. Gaskets for push-on joints shall be vulcanized natural or synthetic rubber. All gaskets shall be free of porous areas, foreign material and visible defects.

2.03 MECHANICAL JOINTS

A. Mechanical joints shall meet all the requirements of ANSI A21.11 and consist of a bell socket cast integrally with the pipe or fitting and provided with an exterior flange having bolt holes and a socket with annular recess; a plain end; a continuous molded, rubber ring gasket and; a follower with boltholes, tee head bolts and hexagonal nuts.

B. Mechanical joints shall have the same pressure rating as the pipe or fitting of which they are a part.

C. Glands for mechanical joints shall be cast or ductile iron and be stamped with the manufacturer's identification, nominal size and material type. Glands shall receive a bituminous coating at the shop.

D. Rubber gaskets for mechanical joints shall be natural or synthetic vulcanized rubber, free of porous areas, foreign materials and visible defects.

2.04 FLANGED JOINTS

A. Flanged joints shall meet all the requirements of ANSI A21.15 and ANSI A21.10 and shall consist of two threaded flanges; flange gasket and; bolts with square or hexagonal shaped heads and hexagonal nuts.

B. Threaded flanges shall be individually fitted and machine tightened on the threaded pipe by manufacturer. Threaded flanges shall not be installed in the field. Flange faces shall be machined.

C. Pipe furnished with flanges at each end shall have the bolt holes aligned.

D. Flange gaskets shall be ring or full face rubber and be 1/8 inch thick.

2.05 PIPE MARKING

A. The weight, class or nominal thickness and casting period shall be shown on each piece of pipe. The manufacturer's mark, year of fabrication and the letters "DI" or the word "Ductile" shall be cast or stamped on in letters and numerals not less than ½ inch in height.

PART 3 EXECUTION OF WORK

3.01 HANDLING AND CUTTING PIPE

A. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe or lining, scratching or marring machined surfaces and abrasion of the pipe coating or lining.

B. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack.

3.02 INSTALLING PUSH-ON JOINT PIPE AND FITTINGS

A. Prior to assembling, the bell and plain end shall be cleaned of all foreign matter. Push-on joints shall be made up by first inserting the gasket into the groove of the bell and applying a thin film of special non-toxic gasket lubricant, supplied by the pipe manufacturer, uniformly over the inner surface of the gasket that will be in contact with the spigot end of the pipe. The end of the plain pipe shall be chamfered to facilitate

assembly. The end shall be inserted into the gasket and then forced passed it until it seats against the bottom of the socket. Bedding and backfill requirements shall be as shown on the Contract drawings.

3.03 DEFLECTION OF PIPE

A. When laying ductile iron pipe, the deflection at the joints shall not exceed 5 degrees or 12 inches for a 16-foot length of pipe.

3.04 INSTALLING MECHANICAL JOINT PIPE AND FITTINGS

A. Prior to assembling mechanical joints the bell and plain end shall be cleaned of all foreign matter and then brushed with non-toxic gasket lubricant supplied by the pipe manufacturer. With the follower gland and gasket on the plain end, seat the plain end into the bell and press the gasket evenly and firmly into the bell. Move the follower gland into position for bolting, insert all nuts and bolts, and make finger tight. The follower gland shall be tightened evenly using a torque wrench on opposite bolts until all are made up. Bedding and backfill requirements shall be as shown on the Contract drawings. All nuts and bolts shall be given a bituminous coating after bolts are tightened. All fittings shall be rodded to the other fittings or a restraining gland placed on the pipe.

3.05 REMOVE/ ABANDON EXISTING WATER, SEWER OR DRAIN PIPE

A. All existing sewer and drain pipe and appurtenances to be replaced shall be physically removed and disposed of by the Contractor unless otherwise directed by the Engineer.

B. Sections of existing sewer and drain pipe that are permitted to be abandoned in-place by the Engineer shall have open ends plugged with concrete or brick and mortar to prevent the entrance of soil into the pipe after backfilling.

END OF SECTION

SECTION 02622

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, tools, equipment, materials, and services necessary to lay, join and test all PVC pipe and fittings, and appurtenant materials as shown on the Contract Drawings and as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02200 - EARTHWORK

B. SECTION 02224 - FILL & BACKFILL

PART 2 MATERIALS

2.01 PVC - PRESSURE PIPE

A. The PVC pressure pipe shall be Class 150 or DR18 unless otherwise specified and conform to ANSI/AWWA C-900 standard for PVC Pressure Pipe. PVC pipe shall meet the criteria of ASTM D-2241 "Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)". PVC Class 150 Pipe shall be manufactured to dimensions of standard Cast Iron Pipe outside diameters instead of dimensioning according to Iron Pipe Standards (I.P.S.). PVC pipe

(SDR-18) shall meet all requirement of Uni-Bell Standard Uni-B-2-72. Class 150 pipe & couplings shall meet the following requirements:

PHYSICAL PROPERTY	REQUIREMENT	TEST METHOD
90 second Minimum Burst Pressure	755 PSI	ASTM D-1599
Sustained Pressure	500 PSI	ASTM D-1598 ASTM D-2241
Impact	100 Ft. - lbs.	ASTM D-2244
Hydrostatic Integrity	Non-Failure	ANSI/AWWA C 900-81 Section 3.1.1
Flattening	Non-Failure	ASTM D-2412
Extrusion Quality	Non-Failure	ASTM D-2152
Coupling Pressure Seal	Non-Failure of Seal	ASTM D-3139

2.02 PVC PIPE - GRAVITY SEWER

A. PVC gravity sewer 8" through 15" shall be SDR 35 unless otherwise specified and shall conform to ASTM D3034 Standard for PVC pipe. PVC gravity Sewer pipe 18" through 27" shall be Type 1 heavy wall unless otherwise specified and shall conform to ASTM F679-80 standard for PVC pipe. The PVC pipe shall be supplied in lengths of 13 or 20 feet.

B. Except as indicated differently on the Contract Drawings or in the specifications or where specifically directed by the Engineer, gravity sewer pipe shall be furnished with standard integral bell and spigot ends and elastomeric gasket joint.

C. PVC gravity sewer tees, wyes and tee wyes to be used for service connections shall be PVC SDR 35 fittings with ring tite joints. All fittings shall be capped.

2.03 PUSH-ON JOINTS

A. Push-on joints shall consist of 1) a single continuous, molded, rubber, ring gasket, 2) a bell socket cast integrally with the pipe or fitting and 3) a pipe or fitting plain end. The configuration shall be such that when the plain end is inserted into the pipe fitting socket the gasket shall compressed radially to form a positive seal. The gasket and annular space shall be so designed and shaped that the gasket is locked in place after the plain end is inserted into the fitting socket.

B. Push-on joints shall have the same pressure rating as the pipe or fitting of which they are a part.

C. Gaskets for push-on joints shall be vulcanized natural or synthetic rubber. All gaskets shall be free of porous areas, foreign material and visible defects.

2.04 PVC BELL (INTEGRALLY CAST)

A. The bell shall consist of an integral wall section with locked-in, solid cross section elastomeric ring which meets the requirements of ASTM F-477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C-900.

2.05 SOLVENT WELD JOINTS

A. Where solvent weld joints are required they shall be made with solvent supplied by the pipe manufacturer's specifications or with ASTM Recommended Practice D2855. The dry fit of joints shall be snug; pipe and fittings which afford loose fits will be rejected by the Engineer. The use of multiple layers of filler solvent to overcome a loose fit will not be permitted. Solvent cements shall conform to ASTM D-2564.

2.06 PIPE MARKINGS

A. Pipe and couplings shall bear identification markings that will remain legible during normal handling, storage, installation and during the life of the pipe. Markings shall have been applied to the pipe and couplings in a manner which will not reduce strength or durability or otherwise damage the pipe.

B. Markings for pressure pipe shall be applied at intervals of not more than 5 Feet and shall include the following: nominal size and OD base, "PVC", dimension-ratio number, AWWA pressure class, AWWA designation number for AWWA C-900, manufacturer's name or trademark and production record code, and mark or seal of pipe testing agency.

PART 3 EXECUTION OF WORK

3.01 HANDLING AND CUTTING PIPE

A. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring its surfaces and ends.

B. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be at least 12 inches from the visible limits of the crack.

D. All cutting of PVC pipe is to be square. The pipe to be cut shall be marked around its entire circumference prior to cutting.

E. Using a factory finished beveled end as a guide to determine the angle and length of the taper, the end of a freshly cut pipe shall be beveled similarly.

3.02 PIPE BEDDING

A. Pipe bedding and foundation design shall be as specified in related sections.

3.03 INSTALLATION OF PIPE

A. Standard laying lengths shall be 20 feet for pressure pipe with 85% of the total footage of pipe being full lengths and the remaining 15% being furnished as random lengths. Random lengths shall not be less than 10 feet long. Standard laying lengths for gravity sewer shall be 13 feet.

B. Prior to assembling, the bell and plain end shall be cleaned of all foreign matter. Push-on joints shall be made up by first inserting the gasket into the groove of the bell and applying a thin film of special non-toxic gasket lubricant, supplied by the pipe manufacturer, uniformly over the inner surface of the gasket which will be in contact with the spigot end of the pipe. The end of the plain pipe shall be chamfered to facilitate assembly. The end shall be inserted into the gasket and then forced passed it until it seats against the bottom of the socket.

C. Pipe shall be installed in such a manner that will ensure that external loads will not subsequently cause a deflection of greater than 5% in the vertical cross-section dimension.

D. For PVC pressure pipe horizontal deflection from joint to joint shall be limited to 12 inches for PVC pipe sizes 6 inches to 12 inches based on 16 foot length.

E. The bedding of the pipe shall conform to the trench detail as shown on the Contract Drawings. Installation precautions are also given in ASTM D 2774.

F. Cleanouts shall be installed where shown on the Contract Drawings and at convenient points in long runs of pipe.

G. Installed pipe shall rest flat and straight on the bedding at all locations without bridging or binding. Backfill shall be carefully placed to avoid damage to the pipe. The pipe shall be placed to the grades shown on Contract Drawings.

H. Only laborers competent in laying plastic pipe and suitable equipment shall be employed. Pipe and fittings shall be handled with care so as to prevent scratching or other damage to the materials. All joints shall be properly cleaned and free of foreign matter. The installation instructions of the manufacturer shall be strictly followed with the exception that the pipe bedding shall be as shown on the Contract Drawings.

I. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, hammer, or other unyielding object. When each pipe has been properly bedded, enough of the backfill material shall be placed and compacted between the pipe and the sides of the trench to hold the pipe in correct alignment.

J. Before a joint is made, the pipe shall be checked to insure that a close joint with the next adjoining pipe has been maintained and that inverts are matched and form to the required grade.

K. The Contractor shall take all necessary precautions to prevent flotation of the pipe from trench flooding. At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary water-tight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

L. Any defective pipe or fitting found in the line shall be removed and replaced without cost to the Owner. All pipes and fittings shall be kept clean of all dirt and debris before being laid, and shall be kept clean until acceptance.

3.04 PIPE ENCASEMENT

A. Concrete encasement of the PVC Pipe shall be conducted as specified herein or as shown on the Contract Drawings. Concrete requirements for such encasement shall be specified in related sections.

3.05 SEWER REPLACEMENT

A. The Contractor shall take the necessary precautions to support and protect existing sewer pipes from being damaged during construction of new the water main.

B. Sewer pipes that are shown on the contract drawings or located in the field and are damaged by the Contractor shall be replaced with PVC pipe at the Contractor's expense.

C. Should the Engineer feel that PVC is insufficient for use as a replacement pipe, based on field conditions, a different pipe material such as ductile iron pipe may be specified as directed by the Engineer.

D. The size of the replacement pipe shall closely approximate the size of the existing section to be replaced, allowing a watertight joint to be made while maintaining the existing pipe slope.

E. Joints between the existing pipe and replacement pipe shall be made with suitable watertight sleeve or couplings.

F. Joints shall not be backfilled until approved for water-tightness by the Engineer.

END OF SECTION

SECTION 02641

WATER PIPING SPECIALTIES

PART 1 GENERAL

1.01 DESCRIPTION

A. Work Included:

Furnish all labor, materials, equipment and incidentals required to install all gate valves, tapping sleeves, valves, couplings, hydrants, and appurtenances, complete as shown on the Drawings and/or as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02615 - DUCTILE IRON PIPE AND FITTINGS

1.03 APPROVAL OF MATERIAL

A. Submit to the Engineer within ten days after execution of the Contract a list of materials to be furnished, the name of the suppliers and the date of delivery of materials to the job site.

B. Contractor shall provide to Engineer a sworn affidavit upon receipt upon receipt of valves that they comply with all applicable provisions of the reference standards and the other provisions of these specifications including the coating requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete for Thrusts Blocks

1. Concrete for thrust blocks shall have a minimum compressive strength of 3,000 psi and shall conform to the contract drawings.

B. Gate Valves

1. All gate valves shall be manufactured in full compliance with the content and intent of this specification. Gate valves shall be in accordance with AWWA Designations C111, C509 and C550.

2. Gate valves shall be municipal standard as manufactured by: Mueller Co., Inc., as specified by the City of Waltham.

3. Gate valves shall be iron body, resilient wedge type with 8 mil epoxy coating inside and out, with two inch operating nut. Valves shall have mechanical joint hubs. Gate valves shall conform in every respect to AWWA C509. Valves shall be designed for 200 psi working and 300 psi test pressure. Valves shall open right as specified by the City of Waltham.

4. Valves shall also conform to the specifications of the AWWA as to size of stem, pitch of thread, etc. The gasket seating area shall be fully machined to fixed dimensions and tolerances as per AWWA specifications. All valves shall be provided with "O" rings. The design of the valve is under pressure in a fully open position. Cartridge O-ring type gate valves, if accepted, shall be furnished with a spare cartridge for each valve furnished.

C. Valve Boxes

1. Valve boxes shall be provided for each buried valve. They shall be cast iron, of heavy pattern, sliding adjustable type and provided with cast cover. The bottom of the lower section shall enclose the stuffing box and operating nut of the valve. Boxes shall have barrel of not less than 5 ¼-inch diameter and be of the sliding adjustable type with a lap of least 6 inches when in the most extended position. Covers shall have the word "WATER" cast into them.

2. Valve boxes shall be provided for each gate valve installed for buried service. Valves shall open right as specified by the City of Waltham.
Direction arrows shall be on the valve covers.

3. Valve boxes and covers shall be by the same manufacturer and shall be manufactured in North America only.

4. Valve boxes shall be centered over the operating nut of the valve and set to be flush at final pavement or finished grade.

5. Valve boxes shall be of good quality cast iron free from all defects in material and workmanship and shall be coated with coal-tar pitch enamel or other approved coating.

D. Butterfly Valves

Butterfly Valves and operators shall conform to the requirements of AWWA C504 and with the specific requirements and exceptions to AWWA C504 which follow:

1. Manual operator shall be submersible, worn gear type (Philadelphia Gear or equal) rack and pinion traveling nut type on lead screw type suitable for buried service.

2. All operators shall have positive adjustable stops to prevent over-traveling of the disc in the open or closed positions.

3. Operators shall be equipped with two inch square operating nuts, fully gasketed and lubricated for buried service.

4. Gearing shall be totally enclosed, air tight and permanently sealed.

5. Valves up to and including 12 inch diameter shall have a rated working pressure of 200 psi. Valves larger than 12 inch shall have a rated working pressure of 150 psi.

6. The exterior of all valves shall be coated with a minimum of three applications of an approved bituminous solution over a rust free casting prior to shipment. Body rings shall be free of bitumen or defect.

7. Valve interiors shall have a 100 percent solid heat cured or fusion bonded epoxy coating system in accordance with AWWA C550.

8. The location and arrangement of the operator shall be as shown on the plans. The operator shall be designed to hold the valve disc on any intermediate position between fully opened and fully closed without creeping or fluttering. It shall be furnished with a device such as an input shaft lock device to hold the valve in a fixed position for an extended period of time. Valve operating mechanism shall be capable of transmitting sufficient torque to open and close each valve under the most adverse operating conditions. In addition, valves and their operators shall be satisfactory for application involving valve

operation after long periods of inactivity. Valve operation shall be through a precision made, high quality, totally enclosed, factory greased and sealed worn gear reducer. Primary gearing shall consist of self-locking worm gear constructed of high tensile bronze and a worm polished or travelling nut designed according to AWWA specification C-504-74, Section 11.3. The valve operator shall be so sized that a maximum input force will be necessary to develop the required operating torque. When additional gearing is required to reduce the input force to the operator, it shall consist of a combination of helical or spur gearing in the first or input stage with a self-locking worm gear unit as described above in the final or output stage. The gearing of the valve operating mechanism shall be such that the operating nut shall turn clockwise to open the valve. All gear operators shall be designed to transmit twice the required torque without permanent damage to the gear teeth. The valve shaft at the connection to the operator, shall have built-in adjustable mechanical stops to prevent over-travel of the disc. These stops shall be fully enclosed and integral with the worm gear housing. Each operator shall be equipped with a large mechanical position indicator which is positively coupled to the valve shaft. The manual operators shall contain a 2 inch square operating nut.

9. Operators shall be watertight for buried service with extension shafts in enclosed, sealed housing and valve boxes at grade.

10. Butterfly valves shall be manufactured by Mueller Co., Inc., as specified by the City of Waltham.

E. Solid Sleeve and “Dresser” Couplings

1. Solid Sleeve and “Dresser” couplings shall be mechanical joint with ductile iron glands.

2. Ductile iron “Dressers” shall conform to AWWA Specification C-110. Solid sleeves, plugs and caps shall also be ductile iron and conform to AWWA Specification C-110.

3. Coupling and bolts shall receive two coats of bituminous paint - Inertol No. 66 Special Heavy - after installation.

F. Insertion Valve

1. Insertion valves shall be first quality, free from all imperfections and defects. The sleeve shall be made of ASTM A-36 steel, epoxy coated to 10-12 mils.

2. Insertion valves shall be QuikValve as manufactured by Romac Industries of Seattle, Washington or approved equal.

G Tapping Sleeves and Valves

1. Tapping sleeves and valves shall conform to AWWA specifications for tapping sleeves and valves. Tapping sleeves shall be mechanical joint, two part castings, flanged on the vertical centerline, and come complete with all joint accessories. The surface area of each flange shall be thoroughly machined, and the sleeve flanges shall be fitted with lead gaskets. Each gasket shall cover the entire surface area of each joint for the full length of the sleeve. Bolts used to assemble the sleeves shall pass directly through each flange and through each gasket. Bolts shall be properly spaced to insure uniform gasket pressure and compression.

2. Sleeve outlets shall have counterbored flanges to insure proper centering of the tapping valve. All tapping valves shall be flanged by mechanical joint as specified by the Owner. Tapping valves shall conform with the aforementioned specifications for gate valves.

4. Tapping sleeves and valves shall be manufactured by Mueller Co., Inc., as specified by the City of Waltham.

H. Copper Water Services

1. Piping for buried water services shall be continuous Type K annealed seamless copper water tubing conforming to ASTM B88 Standard Specification for Seamless Copper Water Tube. Tubing size shall match existing service size unless otherwise indicated.

2. Service Boxes: The cast iron service box shall be the Buffalo-type extension curb box.

3. Service boxes shall be tar coated and adjustable to accommodate bury depths from five feet to six feet.

4. Required Brass Goods shall include Corporation Cocks, Curb Stops, Misc. Couplings and Fittings shall be lead free. Casting shall be sufficiently heavy to meet all service conditions without springing or leaking and be clean and free from roughness both inside and out. Waterways shall be smooth, full size and free from obstruction. All threads shall be cut sharp, clean and true.

5. Nuts shall be of commercial bronze containing not less than 89 percent copper and finished on both sides to true faces. Adjusting nuts shall also come to a true facing against the bottom of the bronze washer and proper adjustment shall be made to assure easy turning and freedom from leakage. Adjusting nuts shall be properly locked to avoid change in position in operation.

6. Curbstops and corporations shall be ball type no bleeding and have lockdown style nuts, "Pack Joint" or equal.

7. All corporation and curb cocks shall be subjected to a sustained hydraulic pressure of 200 pounds and tested in both the open and closed position.

8. All brass goods shall be individually wrapped to protect threads during shipment.

9. The inlet of corporation cocks shall have AWWA taper thread (CC) connections and the outlet shall have compression connections.

10. The inlet and outlet of curb cocks shall have compression connections.

11. Corporations shall open right as specified by the City of Waltham, and as manufactured by Mueller Co., Inc., as specified by the City of Waltham.

12. Curbstops shall open right as specified by the City of Waltham, and as manufactured by Mueller Co., Inc., as specified by the City of Waltham.

I. Water Service Boxes

1. Service Boxes: The cast iron service box shall be the Buffalo type.

2. Service boxes shall be tar coated and adjustable to accommodate bury depths from five feet to six feet.

J. Hydrants

1. Hydrants shall be American Darling B-62-B-5 Fire Hydrant. Owner has standardized on American Darling. No substitution will be allowed.

2. Hydrants shall have a 6 inch mechanical joint inlet, 5 ¼ inch valve opening and shall open right or clockwise. The hydrant barrel shall have two 2 ½ inch hose outlets and one 4 ½ inch pumper outlet with National Standard Threads. Operating nuts shall be standard pentagon. Hydrants shall be supplied with drain port plugs capable of being installed in the field during construction. The plugs shall be supplied not installed. Hydrant barrel extensions shall be repainted in the field to the City's standards prior to acceptance.

3. The hydrant main valve shall be designed to remain closed in the event of a break in the hydrant above or near grade level.

4. Crushed stone for use as drainage material for hydrant assemblies shall conform to the requirements of Part 2.07 of Section 02224, "Materials."

5. A hydrant assembly shall consist of a hydrant anchoring tee of the appropriate size, a thrust block, a gate valve with a valve box, a hydrant and generally one full length of pipe. All joints shall be mechanical with retainer glands.

6. Where a hydrant assembly is to be disconnected from the existing main and reconnected to the new main, the Contractor shall cut the existing pipe at a sufficient distance from the hydrant to allow for the connection of the new pipe to the existing using a flexible coupling. The flexible coupling shall be municipal standard as manufactured by: Dresser, Inc., Rockwell, Inc., or Smith-Blair, Inc.

5. Hydrants shall be thoroughly cleaned and given two shop or field coats of paint in accordance with AWWA C502 and the instructions of the paint manufacturer.

6. Paint color shall be the standard “Waltham Colors” hydrant colors, black and yellow, as specified by the Owner. The barrel of all hydrants shall be painted yellow, the spindle, bonnet and nozzle caps shall be painted black in accordance with the Owner's standards.

4. If the hydrants are delivered with the Owner’s standard color, they shall be given one matching field coat of an alkyd gloss enamel. If the hydrants are not delivered with the Owner’s standard color, they shall be given two coats of an alkyd gloss enamel.

5. Hydrant paint shall be as manufactured by Sherwin-Williams, Cleveland, OH; Tnemec Company, Inc., Kansas City, MO; or Minnesota Mining and Manufacturing Co. (3M), St. Paul, MN; or approved equal.

K. Pipe Insulation

1. The insulation shall be flame retardant, extruded polystyrene, wired on with No. 18 copper wire on 150 mm centers. The covering shall be an aluminum jacket 0.4 mm thick min., with lock-on type joints and a polycraft moisture barrier secured in place by 12.5 mm stainless steel strapping on 450 mm centers. The joint shall be sealed with Miracle Adhesive FO 400 Sealer; Foster Foamseal 30-45; Cad-a-Seal 745 or equal.

2. The Contractor shall furnish the insulation manufacturer with the exact dimensions of the pipe to be insulated, together with the type of couplings and specials to be used.

3. The insulation material shall be cut to fit the pipe so as to give a continuous thickness. The insulation shall then be wired on with No. 18 copper wire on 150 mm centers. All joints shall be sealed, and with 75 mm overlaps will be secured in place by 12.5 mm stainless steel strapping of 450 mm centers. All fittings, valves and flanges shall be insulated with the same materials securely held in place. All jacket overlaps shall be sealed and waterproofed with a sealant as noted above, or equal. The work shall be accomplished to the satisfaction of the Owner and the Engineer

INSULATION THICKNESS		**WATER OR SEWER MAIN DIAMETER**	
XX = MM		**YY = DIAMETER**	
02	50 mm	04	4 NPS
03	75 mm	06	6 NPS
04	100 mm	08	8 NPS
05	125 mm	10	10 NPS
		12	12 NPS
		14	14 NPS
		16	16 NPS
		18	18 NPS
		20	20 NPS
		24	24 NPS
		30	30 NPS
		36	36 NPS
		42	42 NPS
		48	48 NPS
		54	54 NPS
		60	60 NPS

PART 3 EXECUTION

3.01 INSPECTION

A. All pipe, fittings, couplings, valves, hydrants and accessories shall be carefully inspected by the Contractor for defects before installation, and all defective, unsound or damaged materials shall be rejected. The Owner shall make such additional inspections it deems necessary, and the Contractor shall furnish all necessary assistance for such inspections.

B. No pipe joints shall be covered in any way until the joints have been inspected.

C. Operating parts shall be operated several times to demonstrate proper operation and adjustment.

3.02 PREPARATION

A. Proper implements, tools and facilities satisfactory to the Owner shall be provided by the Contractor for the proper and satisfactory execution of the Work.

B. The interior of pipe, fittings, couplings, valves and hydrants shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations.

C. The trench bottom and bedding shall be shaped and compacted to give substantially uniform unyielding circumferential support to the lower quarter of pipe and valves along their entire length. Bell holes shall be excavated so that, after placement, only the barrel of the pipe receives bearing pressure from the trench bottom and bedding.

D. Pipe, pipe fittings, couplings, valves, hydrants and accessories shall be handled, stored, installed, jointed and protected by the Contractor in strict accordance with the written recommendations of the manufacturer of the materials.

3.01 INSTALLATION

A. Buried valves and boxes shall be set with the stem vertical and box vertically centered over operating nut. Valves shall be set on a firm foundation and supported and anchored as shown on the Drawings. Selected excavated material shall be placed and tamped under and at the sides of the valve. Valve box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade.

B. All bolts and nuts shall be heavily coated with two coats of bituminous paint comparable to Interol No. 66 Special Heavy.

C. Pipe upon which a tapping sleeve is to be installed shall be thoroughly cleaned of all foreign matter with scraping tools and wire brushed, a minimum of six (6) inches each side of the sleeve. Sleeve bolts shall be alternately tightened from the extreme end on one side to the extreme of the opposite side with approved torque wrenches until all are securely tightened. Take care to ensure that the tapping machine is kept in leveled horizontal position and securely supported so as not to transmit any additional weight to the tapping valve.

D. Service Connections: Connect all services to the new main as directed by the Owner, the Engineer and as specified herein. Services shall be connected after the new main has been tested, chlorinated and approved for service and the work shall result in a minimum disruption of service to the consumer. Make only “wet taps” into the new mains and install corporation cocks, copper tubing, new curb stops, new service boxes, fittings, etc., and make all joints water tight. Services shall be installed to the limits as

shown on the contract drawings or as directed by the Engineer. The Contractor shall connect the new copper tubing to the existing service pipe using an approved coupling approximately 12 inches from the new curb stop on the building side of the stop. Where transfers are being made and the existing service is lead or iron, the service shall be replaced to the limit of the City's right of way. All services shall be installed with 5 feet cover unless otherwise directed by the Engineer. Where existing curb boxes are to remain and found to be below grade, the Contractor shall raise the upper section to grade. If the upper section cannot be raised, the Contractor shall remove the existing cover, install the new extension on the existing upper section and install a new cover.

E. Water mains shall be tapped in accordance with the manufacturer's latest published recommendations, i.e., depth of tap, number of threads exposed, allowable sizes, etc., and the Contractor shall adhere strictly to these recommendations. The Contractor shall be held responsible for all subsequent leaks or failure of the taps for one year from the date of final acceptance of the project and he shall make all necessary repairs that may be required during this period.

END OF SECTION

SECTION 02647

CONNECTIONS TO EXISTING WATER MAINS

PART 1 GENERAL

1.01 DESCRIPTION

A. Work Included:

This section covers connections to the existing water mains, complete. The Contractor shall furnish all pipe, fittings, valves, tapping machines, if required, and appurtenances. The Contractor shall do all excavation and backfill as required.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02615 - DUCTILE IRON PIPE AND FITTINGS

B. SECTION 02641 – PIPING SPECIALTIES

PART 2 MATERIALS: NOT APPLICABLE

PART 3 EXECUTION

3.01 CONTRACTOR OPERATIONS

A. The Contractor shall make all connections to the existing mains as indicated on the drawings and as herein specified.

B. The Contractor shall develop a program for the construction and putting into service of the new work subject to the approval of the Engineer. All work involving cutting into and connecting to the existing work shall be planned so as to interfere with operation of the existing facilities for the shortest period possible time and when demands on the system best permit such interference eve to the extent of working outside of normal working hours to meet these requirements.

C. The Contractor shall have all possible preparatory work done prior to making the connection and shall provide all labor, tools, material and equipment required to do the work in one continuous operation.

D. The Contractor shall have no claim for additional compensation, by reason of delay or inconvenience, for adapting his operations to the needs of the Owner's water supply. No damages shall be claimed by the Contractor for delays in dewatering pipelines nor shall any damages be claimed because of water leaking through closed valves after dewatering is completed.

E. Under no circumstances shall any customers be without water for a period of more than four (4) hours without prior approval of the Owner. Should it appear that any customer will be without water for more than four (4) hours, the Contractor shall install temporary water service where directed by the Engineer.

F. Existing pipeline that is not to be abandoned but is damaged by the Contractor during the work shall be replaced by him at his own expense in a manner approved by the Engineer.

3.02 TAPPING CONNECTION TO EXISTING MAINS:

A. Tapping connections to the existing mains, where indicated on the drawings, shall be made with service pressure in the main, using tapping sleeves and valves and a suitable tapping machine.

B. Other connections to existing mains shall be made with the main out of service, unless otherwise directed by the Engineer. Such connections will not require tapping sleeves and valves but connections as indicated on the drawings.

END OF SECTION

SECTION 02675

WATER DISTRIBUTION SYSTEM, DISINFECTION AND TESTING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall have a third party perform ALL testing, including testing of the temporary main. The Contractor shall furnish all the necessary equipment and labor for pressure testing and disinfecting the potable water distribution mains shown on the Contract Drawings in accordance with AWWA C600 Specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

02615 - DUCTILE IRON PIPE AND FITTINGS
02641 - PIPING SPECIALTIES

PART 2 MATERIAL

2.01 MANIFOLDS

A. Each permanent blow-off testing and chlorinating water mains shall consist of a 1 inch corporation service or road box as required. Temporary blow-offs shall consist of a 1 inch corporation and tubing and shall be included for payment under the price of the pipe.

B. A manifold shall be provided to connect the existing system and the new water main. Each manifold shall consist of two (2) ¾ inch gate valves, one (1) 5/8 inch

by ¾ inch water meter. Type K copper tubing ¾ inch shall be used and the new main connected to the existing system by either tapping into the pipes or utilizing hydrants.

C. A pumping unit or proportionate feeder that delivers a hypochlorite solution to the isolated water main shall be provided. The unit used shall not enable the solution to flow back into the existing system.

PART 3 EXECUTION OF WORK

3.01 FLUSHING POTABLE WATER LINES

A. Prior to testing and disinfecting water lines, the Contractor shall thoroughly flush all water lines with potable water. Potable water shall be supplied by the Owner. The Contractor shall furnish all equipment necessary including ancillary pumping equipment, taps, temporary piping, etc., to provide a minimum of 2.5 FPS scouring velocity in the mains being flushed for a duration of at least 15 minutes.

B. The Contractor shall have a third party perform ALL testing, including testing of the temporary main. The Contractor with the assistance of the D.P.W. shall fill water mains as slowly as practicable so as not to cause dirty water and serious pressure drops within the existing system.

C. Air shall be vented from the mains during the filling process and temporary or permanent blow-offs shall be made on the mains where directed.

D. After the water mains have been filled, controlling gate valves shall be closed and the new mains kept isolated from the existing system. The Engineer may direct that a manifold be installed connecting the existing system and the new water mains, in order to maintain static system pressure within the new system for at least 72 hors. Each manifold shall contain double check valves to prevent water from the newly installed water main from backing up into the existing system through the manifold, as previously described in Section 2.01.

E. Water mains shall be filled at least 3 days before testing to allow for absorption.

3.02 TESTING

A. The Contractor shall have a third party perform ALL testing, including testing of the temporary main.

B. Testing and chlorinating of the pipelines shall closely follow pipe laying work. Pipelines shall be tested approximately every 2000 feet, or distances slightly greater or less, as approved by the Engineer, unless otherwise noted, as the pipeline is installed. Should the pipelines fail to be tested and chlorinated as

specified, the pipe laying work shall be suspended until the testing and chlorinating is done.

C. The completed pipelines shall be pressure tested in the presence of the Engineer. The City of Waltham requires a pressure test which consists of applying a constant hydrostatic pressure of 200 pounds per square inch for 2 hours. This test shall be conducted for two continuous 15 minute periods. After the first 15 minute period, the pressure in the mains shall be dropped to the normal working pressure of the system, and then build back up to the required test pressure.

D. The leakage test may be conducted independently of the pressure test. The allowable liquid lost shall not exceed the amount shown on the following table. The leakage test shall be conducted for one hour per mile of pipe but not less than ½ hour per test. The leakage shall be recorded to one-tenth of a gallon accuracy by means of a test meter or wher allowed by the Engineer permission will be given to measure the drawdown in the test barrel. If the leakage is more than that specified above or in the table that follows, leak or leaks shall be located and the necessary repairs made so that the leakage will not exceed the amount specified. The Contractor shall employ qualified personnel throughout the test procedure. All records and charts shall become the property of the Owner.

NOMINAL PIPE DIAMETER (INCHES)

AVG TEST PRESSURE (PSI)	6	8	10	12	16	20	24
Ductile, Gray Cast Iron and PVC Mains Allowable Leakage per 1000 ft.							
250	0.71	0.95	1.19	1.42	1.90	2.37	2.85
200	0.64	0.85	1.06	1.28	1.70	2.12	2.55
150	0.55	0.74	0.92	1.10	1.47	1.84	2.21
100	0.45	0.60	0.75	0.90	1.20	1.50	1.80

*Leakage allowable based on gallons per hour per 1000 feet of Main.

E. The contractor shall at his own expense make any taps and furnish all necessary caps, plugs, etc., as required in conjunction with testing a portion of the main between gate valves. He shall also furnish a test pump, gauges, and any other equipment required in conjunction with carrying on the hydrostatic tests. He shall at all times protect the new water mains and the existing water mains against the entrance of polluting material.

3.03 DISINFECTION

A. Before being placed in service, all new water pipe-lines shall be chlorinated in accordance with AWWA C900, “Standard Procedure for Disinfecting Water Mains”. The procedure shall be discussed with the Engineer before doing the work and shall be approved.

B. The location of the chlorination and sampling points will be determined by the Engineer in the field. Taps for chlorination and sampling shall be uncovered and backfilled by the Contractor as required.

C. The general procedure for chlorination shall be the first to flush all dirty or discolored water from the lines, and then introduce chlorine in approved dosages through a tap at one end, while water is being withdrawn at the other end of the line. The chlorine solution shall remain in the pipeline for about 24 hours.

D. Following the chlorination period, all treated water shall be flushed from the lines at their extremities, and replaced with water from the distribution system. Bacteriological sampling and analysis of the replacement water shall then be taken by an independent third party in full accordance with the AWWA Manual C601. The Contractor will be required to rechlorinate, if necessary, and the line shall not be placed in service until the requirements of the State Public Health Department are met.

E. Upon completion of disinfection, the water main shall be dechlorinated per this specification section 3.04 and thoroughly flushed with potable water supplied by the Owner until the chlorine concentration within the main is less than 0.5 ppm.

F. The Contractor shall engage the services of an independent testing laboratory, certified to perform the necessary testing, to obtain samples from the disinfected main and perform bacteriological tests. The results of the bacteriological tests shall be compared with the maximum contaminate levels set forth in the Primary Drinking Water Standards. Where these levels are exceeded the disinfection process shall be repeated as directed by the Engineer.

G. The water shall be tested bacteriologically for coliform group bacteria and heterotrophic plate count. A minimum of one (1) sample location shall be used per 2,000 linear feet. On all new piping there will be at a minimum sampling locations at each end of the new pipe segment. Additional testing locations may be determined by the Engineer at no additional cost to the Owner. Testing must be done by a Massachusetts State Certified Laboratory and the results of all tests must be submitted to the Waltham Water & Sewer Division. The Contractor shall be solely responsible for all costs associated by the aforesaid test(s).

H⌽ There will be a total of two (2) rounds of sampling for each section of main tested. The first round of samples shall be taken after the 24 hour disinfection period. The second round of samples shall be taken at least 24 hours after the first round of samples. During each round of sampling, two (2) separate samples shall be drawn from each sample location and sent for laboratory analysis. In the event a sample obtained fails laboratory analysis the Contractor must restart the testing process. The cost for all additional testing shall be borne solely by the Contractor.

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3.05 ACCEPTANCE

A. The Owner reserves the right to accept the water mains in sections after the satisfactory tests have been made and approved and to make full use of any part or parts of the system.

B. The Contractor shall be held responsible, for one (1) year from the date the entire contract has been accepted by the Engineer and the Owner, to rectify any leaks, errors, or other poor workmanship which may be discovered and shall make any necessary repairs, alternations or adjustments as may be required to properly complete the work, as directed by the Engineer.

END OF SECTION

SECTION 02753

TELEVISION INSPECTION OF SEWERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish all necessary labor, materials, supervision and equipment to satisfactorily inspect gravity sewer lines and sewer service pipes as required by the Contract Documents by means of a closed circuit television (CCTV) system.

B. Related Work Specified Elsewhere: Sewer line cleaning and sewer flow control are specified in the appropriate sections in this Division.

1.2 QUALITY ASSURANCE

A. CCTV work shall be completed and delivered per the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) standards. Operators of CCTV equipment shall be NASSCO PACP certified.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. The cameras shall be designed and constructed for sewer line inspection work. The mechanical design of the lens shall allow it to turn and rotate 360 degrees to provide a close up view of sewer pipe walls and sewer service pipes. The camera shall be designed to maintain proper orientation of the picture while the lens is turning and rotating.

B. The cameras shall be operative in 100% humidity conditions.

C. The lighting for the cameras shall be suitable to allow a clear picture of service pipes and the entire periphery of the mainline sewer pipe, such that joints, root intrusions, cracks, offset joints, deposits, etc. can be seen and identified by the Engineer.

D. The lens focus and rotational capabilities and the light intensity will be remotely controlled from an above ground television "studio".

E. The cameras shall produce a continuous, full color picture with a quality acceptable to the Engineer.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Flow Control:

1. A minimum of 75% of the periphery of the sewer line shall be visible at all times.
2. The Engineer may require that the line be plugged so that the entire periphery can be inspected. For details on sewer flow control, see Section 02751.

B. Operation:

1. Perform inspection of sewer lines after lines have been suitably cleaned.
2. When inspecting newly constructed sewer lines, introduce water into the sewer lines to be tested from the upstream manhole prior to the television inspection, but no more than 24 hours in advance of the inspection.
3. Lines will be suitably isolated from the remainder of the sewer line as required.

4. Move the cameras through the line in either direction at a moderate rate, not to exceed 30 feet per minute, as recommended by NASSCO.
5. The Engineer may require Contractor to pull cameras back to get a second view of a section of the pipe.
6. Use manual winches, power winches, television cable reel powered rewinds, high-pressure hose and reels on jet-cleaning trucks, or a flexible pole, to move the camera through the sewer.
7. If, during the inspection operation, the camera will not pass through the entire pipe section, the Contractor shall set up the equipment so that the inspection can be performed from the opposite manhole on the pipe segment.
8. The screen monitor and winch operators shall be in full communication at all times.
9. Remove all wires, screens, sand bags, etc. used in the television inspection process from the sewers at the completion of inspection of each sewer section.

C. Measurement:
1. Measurement for location of defects, service connections, etc., shall be accurate to two tenths (0.2) of a foot over the length of the section being inspected.

D. Records:
1. Printed records shall be provided, reflecting location of defects, service connections, etc., and shall be recorded per PACP standards and stored to a NASSCO-certified digital reporting software:
   a. Keep records and supply to the Engineer when the work has been completed.
   b. Show the exact location in relation to adjacent manholes, of each infiltration point discovered by the television camera.
   c. Show locations of laterals, unusual conditions, roots, break-in storm sewer connections, collapsed sections, presence of scale and corrosion, and other discernible features.
2. Inventory the houses and apparent empty lots bordering each section of sewer line that is inspected and compare results to the number and location of house services found during the inspection. Log inconsistencies and report them to the Engineer.
3. Video / Photographs:
   a. Two copies of the video shall be provided in DVD format, downloaded or output from a NASSCO certified software: one copy to the Engineer and one copy to the Owner.
   b. The video shall be digitally recorded, indexed by pipe section (labeled by manhole number or other means acceptable to Engineer) and allow for printing of still photographs.
   c. Photographs shall be printed at Engineer's request and shall be identified on the back as follows:
      Date_____; Section: MH#_____ to MH#_____
      Diameter of Sewer _____; Distance from MH#_____ is _____LF
      Description of item photographed _____
      _____
4. Provide owner with access database of CCTV videos on a portable hard drive.

END OF SECTION

SECTION 02755

FINAL SEWER TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Final sewer testing work includes the performance of testing and inspecting each and every length of sewer pipe, pipe joints and each item of appurtenant construction.
2. Perform testing at a time acceptable to the Engineer, which may be during the construction operations, after completion of a substantial and convenient section of the work, or after the completion of all pipe laying operations.
3. Provide all labor, pumps, pipe, connections, gages, measuring devices and all other necessary apparatus to conduct tests.

B. Related Work Specified Elsewhere (When Applicable):

1. Excavation, backfill, dewatering, pipe, pipe fittings and manholes are specified in the appropriate Sections in this Division and/or Division 15.
2. Manhole testing is specified in Section 02601 - Manholes, Covers and Frames.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:

1. All sewers, manholes, and appurtenant work, in order to be eligible for acceptance by the Engineer, shall be subjected to tests that will determine the degree of watertightness and horizontal and vertical alignment.
2. Thoroughly clean and/or flush all sewer lines to be tested, in a manner and to the extent acceptable to the Engineer, prior to initiating test procedures.
3. Perform all tests and inspections in the presence of the Engineer and the plumbing or building inspector in accordance with the requirements of the local and state plumbing codes.
4. Perform testing by test patterns determined by or acceptable to the Engineer.
5. Remedial Work:
   a. Perform all work necessary to correct deficiencies discovered as a result of testing and/or inspections.
   b. Completely retest all portions of the original construction on which remedial work has been performed.
   c. Perform all remedial work and retesting in a manner and at a time acceptable to by the Engineer at no additional cost to the Owner.

B. Line Acceptance Tests (Gravity sewers with no active service connections):
   1. Test all gravity sewer lines with no active service connections for leakage by conducting a low pressure air test.
   2. Equipment:
      a. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
      b. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
      c. All air used shall pass through a single central panel.
      d. Connect 3 individual hoses:
         (1) From the control panel to the pneumatic plugs for inflation.
         (2) From the control panel to the sealed sewer line for introducing the low pressure air.
         (3) From the sealed sewer line to the control panel for continually monitoring the air pressure rise in the sealed line.
   3. Testing Pneumatic Plugs:
      a. Seal test all pneumatic plugs prior to using them in the actual test.
      b. Lay one length of pipe on the ground and seal both ends with the pneumatic plugs to be tested.
      c. Pressurize the sealed pipe to 5 psig.
      d. The pneumatic plugs are acceptable if they remain in place without bracing.
   4. Testing Sewer Pipeline:
      a. After the sewer pipe has been cleaned and the pneumatic plugs checked, place the plugs in the sewer line at each manhole and inflate them.
      b. Introduce low pressure air into the sealed sewer pipeline until the air pressure reaches 4 psig greater than the average groundwater pressure.
      c. Allow a minimum of 2 minutes for the air pressure to stabilize to a minimum of 3.5 psig greater than the groundwater pressure. Groundwater is assumed to be at ground surface unless the Contractor can prove by otherwise by test pitting.
      d. After the stabilization period, disconnect the air hose from the control panel to the air supply.
      e. The pipeline will be acceptable if the pressure decrease is not greater than l/2 psig in the time stated in the following table for the length of pipe being tested:

	Time (Min.) for Length of Pipe			
Pipe Diameter (inches)	0-100 ft	101-200 ft	201-300 ft	301-400 ft
4	2.0	2.0	2.0	2.0
6	3.0	3.0	3.0	3.0
8	4.0	4.0	4.0	5.0
10	5.0	5.0	6.0	8.0
12	5.5	5.5	8.5	11.5
15	7.0	8.5	13.0	17.0
18	8.5	12.0	19.0	25.0
21	10.0	17.5	26.0	35.0

5. Test Results:
    a. If the installation fails the low pressure air test, determine the source of leakage.
    b. Repair or replace all defective materials and/or workmanship and repeat low pressure air test at no additional cost to the Owner.

C. Line Acceptance Tests (Gravity sewers with active services):
1. Test all new gravity sewer lines with active services by conducting a low-pressure air test on all joints using a packer after all services have been connected or capped at the property line and all trenches backfilled but before the surface course of permanent pavement is installed.
2. Equipment:
    a. Closed-circuit television system.
    b. Testing devices (packer):
        (1) Capable of isolating individual joints by creating a sealed void space around the joint being tested.
        (2) Constructed such that low pressure air can be admitted into the void area.
        (3) Shall contain a pressure gauge accurate to one tenth (0.1) psi in-line with the feed line to monitor the void pressure.
        (4) Capable of performing in sewer lines where flows do not exceed 1/4 of the pipe diameter without resorting to any method of flow control.
3. Testing Sewer Pipeline Joints:
    a. Test all joints except those with visible infiltration.
    b. Procedure:
        (1) Pull television camera through sewer line in front of the packer.
        (2) Position the packer on each joint to be tested.
        (3) Inflate the sleeves on each end of the packer.
        (4) Apply four (4.0) psi pressure above the existing hydrostatic pressure on the outside of the joint to the void area created around the inside perimeter of the joint.
        (5) Shut off the supply of air once the pressure has stabilized at the required amount.
        (6) Monitor the void pressure for thirty (30) seconds.
        (7) Repair the joint if the pressure drops more than one half (1/2) psi in the thirty (30) seconds.
    c. Water or chemical pressure testing may be used in lieu of air testing subject to review and approval by the Engineer.
    d. Re-clean and re-inspect all lines not approved by the Engineer at no additional cost to the Owner.
    e. Repairing of Joints:
        (1) When a joint fails the pressure test, excavate and repair the failed joint. Repairing joints with chemical grout will not be permitted.
    f. The Engineer may request checking of the testing equipment for accuracy.
        (1) Perform standard air test on a clean continuous section of pipe.
        (2) Repair the equipment if the void pressure drops.
    g. Testing Operation Inspection:
        (1) Reset each joint, as specified herein, prior to acceptance and final payment for joint testing. Retest all joints that fail until the test requirements are met.
    h. The contractor will supply a black and white photograph of every joint that fails the pressure test.

D. Alignment Tests (Gravity Sewers):
   1. Perform tests for the correctness of horizontal and vertical alignment on each and every length of gravity sewer pipeline between manholes.
   2. Alignment tests to be conducted after all pipe has been installed and backfilled.
   3. The observation test shall be conducted after all upstream work has been completed and the pipeline cleaned of debris.
   4. Notify the Engineer at least 24 hours in advance of the proposed observation testing.
   5. Introduce water into the sewer lines to be tested from the upstream manhole prior to the observation test but no more than 24 hours in advance of the test.
   6. Beam a source of light, acceptable to the Engineer, through the pipeline from both ends and the Engineer will directly observe the light in the downstream, and/or upstream manhole of each test section.
   7. The length of pipe between manholes, diameter of pipe and amount of light observed in the manhole at the end of each pipe section will determine acceptance of the alignment test by the Engineer.
   8. The amount of vertical and horizontal deflection shall not be greater than the ASTM allowance and (manufacturer's recommendations) for the pipe being tested.
   9. No standing water shall be allowed. The presence of standing water shall be cause for rejection of that pipe (including manhole) section.
   10. Improper alignment will be corrected by re-excavation and resetting of pipe at no additional cost to the Owner.

E. Pipe Deflection: (Gravity Sewers)
   1. Pipe provided under this specification shall be installed so there is no more than a maximum deflection of 5.0 percent. Such deflection shall be computed by multiplying the amount of deflection (normal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.
   2. The Contractor shall wait a minimum of 30 days after completion of a section of sewer, including placement and compaction of backfill, before measuring 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.
   3. 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.

F. Television Inspection Tests (Gravity Sanitary Sewers and Storm Drains)
   1. Where television inspection testing is required, test procedures shall be in compliance with the requirements outlined in Specification Section 02753.
   2. No standing water shall be allowed. The presence of standing water may be cause for rejection of that pipe.
   3. Any standing water, detectable leaks, improper joints or any other unacceptable feature detected by the television inspection will be corrected by re-excavation and resetting pipe at no additional cost to the Owner.

G. Inspection of Appurtenant Installations:
   1. Completely inspect, at a time determined by the Engineer, all manholes and inlets to ascertain their compliance with the Drawings and Specifications.
   2. Provide access to each manhole and inlet and check the following characteristics:
      a. Shape and finish of invert channels,
      b. Watertightness and finish of masonry structures,
      c. Location, type, and attachment of stops,
      d. Elevation and attachment of frames, covers, and openings,

e. Pattern and machining of covers, and
f. Drop connection arrangements.

H. Manhole Leakage Testing:
1. Specified in the "Manholes, Covers and Frames" Section in Division 2.

END OF SECTION

SECTION 02768

TEMPORARY BYPASS PIPING WITH SERVICE CONNECTIONS

PART 1 GENERAL

1.01 DESCRIPTION

A. For each section of water main pipe to be removed and replaced, shall provide temporary bypass piping to allow for installation of new water main and shall cut or open the pipes by bypass piping, shall repair all opened pipes; and shall do all other work as necessary to set up temporary bypass piping with service connections in full accord with the Specifications.

B. Related work:

1. Documents affecting work of this Section Include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
2. Section 01500 Temporary Provisions & Protection of Utilities & Properties
3. Section 02224 Fill & Backfill Materials

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workman who are thoroughly trained and experienced in installing bypass piping systems who are completely familiar with the

specific requirements and methods needed for proper performance of the work of this Section.

B. The Contractor shall conduct all work in a first-class workmanlike manner, and he/she shall use reasonable and appropriate care and skill in the performance of the work under this section.

1.03 BYPASS PIPING PLAN SUBMITTAL

A. Proposed plans for laying all of the bypass piping shall be submitted to the Engineer for approval at the pre-construction meeting. The Engineer shall make the final decision as to the routing of all bypass lines, before any bypass is laid.

1. All existing services fed by the main that is out of service must be located by the Contractor and must be fed by the bypass pipe.

2. Three (3) copies of the proposed bypass plans shall be submitted to the Engineer.

3. All bypass pipe and service connections shall be bubble-tight at all times. No leakage shall be acceptable.

4. All bypass pipes which crosses the sidewalks, driveway entrances, parking lot entrances, intersection or extends around the radius of an intersecting street shall be installed below the surface grade.

PART 2 PRODUCTS

2.01 TEMPORARY BYPASS PIPE WITH SERVICE CONNECTION

A. Shall be of the highest quality, and shall be fully adequate to withstand the pressures and all conditions of use.

B. The pipe and other materials shall provide adequate water-tightness, and care shall be exercised throughout the installation of the temporary pipe and making up of all temporary connections to avoid any possible pollution of any mains or services, or contamination of the temporary bypass pipe itself.

C. The Contractor shall chlorinate and flush, prior to placing pipeline into services, all temporary pipe and hose to prevent contamination.

D. The temporary pipe will be activated only after negative bacteriological results are obtained.

E. Connections shall be made to the existing services at the right of way line. The contractor shall excavate to the service, cut and connect to the existing service(s).

2.02 MATERIALS

A. Provide other materials not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Resident Engineer.

PART 3 EXECUTION

3.01 CUTTING OR OPENING PIPES

A. The Contractor shall open the pipe at each end of the section to be replaced and at other locations which may be necessary to permit satisfactory removal and replacement of the water main.

B. Every effort must be made to prevent foreign material from entering lines adjacent to the work.

C. Open ends of pipe shall be temporarily sealed with mechanical caps or plugs at all times when not being worked on.

D. Openings in the pipes shall be made by burning out existing service, the Contractor shall install adequate blocking to prevent motion of the closed gate valves during the time the pipe is open.

E. At openings adjacent to sections under pressure or in service, the Contractor shall install adequate blocking to prevent motion of the closed gate valves during the time the pipe is open.

3.02 REPAIRING PIPES

A. The Contractor shall make water-tight all openings made in the pipe lines.

3.03 SERVICES, LATERALS AND BRANCHES

A. Contractor shall plug, and subsequently remove plugs and debris from such services, laterals, hydrant branches, etc.

B. All side lines, services, hydrant connections, etc., must be back-flushed immediately after reconnection to new water main, and then the main flushed before it is put back into service, or as the Owner directs.

3.04 CHLORINATION AND DECHLORINATION OF TEMPORARY PIPING AND SERVICES

A. Upon completion of temporary piping and service hose set up operations and after the work has been approved by the Owner, chlorinate the section in accordance with the AWWA Manual C601, “AWWA Standard for Disinfecting Water Mains”.

B. All materials, equipment, labor and chlorine shall be furnished by the Contractor.

C. The entire procedure of chlorinating the pipes shall be discussed in advance of the time the work is to be done, and the methods employed shall be fully satisfactory to the Owner.

D. The disinfection shall be accomplished by pumping a chlorine solution into the pipe at a dose concentration of 25 mg/l.

E. After the twenty four (24) hour retainer period, the chlorinated water shall be dechlorinated per AWWA C655-09 Field Dechlorination, and flushed from the main until the chlorine concentration in the water leaving the main is not higher than in the system or less than 1 mg/l.

F. After final flushing and before the water main is placed in service, a sample or samples shall be collected from the end of the line and tested for bacteriologic quality and shall show the absence of coliform organisms. In the case of extremely long mains, samples shall be collected along the length of the line as well as the end of the line. The Contractor is responsible to have samples collected and tested by an independent third party.

G. If the initial disinfection fails to produce satisfactory results, the procedure shall be repeated at the Contractor's expense until satisfactory results have been obtained.

H. Special procedures may be outlined by the Resident Engineer where the above-outlined method is not practicable. The entire procedure of chlorinating the mains shall be such as to prevent flows of water from a section exposed to possible contamination to a section of pipe which has been completed and chlorinated. Should such water from a contaminated section be allowed to enter a previously chlorinated section as a result of the Contractor's negligence or through necessity caused by failure of the Contractor to properly schedule his work, the section or sections of pipe thus affected shall be re-chlorinated at the Contractor's own expense. Any temporary connection to the mains or other facilities required to accomplish the chlorination as just described shall be at the Contractor's expense. Any temporary connections shall be properly abandoned, as determined by the Resident Engineer at the Contractor's expense.

3.05 TEMPORARY BYPASS PIPE WITH SERVICES

A. GENERAL

1. Contractor shall furnish, install, maintain and remove bypass pipes of the size directed to satisfactorily service all dwelling, shops and trailers serviced by the mains to be lined, whether occupied at the time or not.

2. The bypass pipes shall be fed at connection points above or below ground and shall be connected thereto by the Contractor or as specified by the Owner.

3. Such portions shall be marked on the Contract plans but the Owner reserves the right to make additions of deletions as the situation warrants in field conditions.

4. Without additional compensation, Contractor shall also furnish, install, maintain and remove service hoses or pipe, of approved size, to service all consumers from gated connections on said bypass pipe.

B. INSTALLATION

1. The temporary bypass pipe shall be laid in locations satisfactory to the Owner where it will cause the least obstruction, and is less likely to be damaged.

2. Contractor will be required to cover clamps and bolts used to connect the bypass arrangement.

3. Cover material will be pavement, sand bags or any other material acceptable to or specified by the Owner.

4. At street crossings, driveways, entrances to parking lots a narrow trench shall be cut in the paving and the temporary pipe placed just below the surface at an 18" depth with temporary surfacing above it, or other satisfactory arrangements shall be made.

5. The location, method placing, materials employed and the sanitary precautions shall be fully satisfactory to the Resident Engineer.

3.07 CLEANING UP

A. Contractor shall exercise responsible precautions to prevent contamination of the pipe line. At the conclusion of the pipe replacement work prior to reconnection to existing main, remove all debris from the pipe line, leaving it clean and ready for use to the satisfaction of the Owner.

B. During the course of the work, keep the site of the operations in as clean and neat a condition as possible.

C. Satisfactorily repair or restore any driveways, walks, culverts, pipes, fences, walls, poles, posts, curbs or other property damaged by the installation, maintenance, operation and removal of temporary piping and shall leave them in condition equal to that which existed at the beginning of this Contract.

D. Removal and Cleaning Up

1. At the conclusion of the use of temporary bypass pipes and service hoses, they shall be removed and hauled away by the Contractor and any connections which have previously been interrupted shall be completely restored by him in full

compliance with e precautions which are required to prevent the possibility of contamination.

2. Contractor shall also remove and haul away any surplus material, broken pavement, lumber, equipment and any other refuse remaining from the temporary piping operations.

END OF SECTION

SECTION 02910

ESTABLISHMENT OF GROWTH

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, and equipment necessary to do all loaming and seeding and planting, as indicated on the Contract Drawings and as herein specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 01300 – SUBMITTALS
B. DIVISION 2 – SITE WORK

PART 2 MATERIALS

2.01 LOAM BORROW

A. Loam borrow shall consist of a fertile, friable, natural topsoil typical of the locality, without admixture of subsoil, refuse or other foreign materials, and shall be obtained from a well-drained site. It shall be such a mixture of sand, silt and clay particles as to exhibit sandy and clayey properties in and about equal proportions. It shall be reasonably free of stumps, roots, heavy or stiff clay, stones larger than 1 inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other litter.

B. Prior to stripping, the loam shall have demonstrated by the occurrence upon it of healthy crops, grass or other vegetative growth that it is reasonably well drained and that it does not contain toxic amounts of either acid or alkaline elements.

2.02 TOPSOIL

A. Topsoil shall consist of fertile, friable, natural topsoil, reasonably free of stumps, roots, stiff clay, stones larger than 1'' diameter, noxious weeds, sticks, brush or other litter.

B. Prior to stripping the topsoil from the construction project, it shall have demonstrated by the occurrence upon it of healthy crops, grass or other vegetative growth, that it is reasonably well drained and capable of supporting plant growth. Material classified as topsoil can only be obtained within the project limits.

2.03 LIMESTONE

A. Limestone shall consist of pulverized limestone obtained by grinding either calcareous or dolomitic limestone so that 95% of the material will pass a no. 20 sieve and at least 50 % of the material will pass a No. 100 sieve. The limestone shall have a neutralizing value satisfactory to the Engineer.

2.04 FERTILIZER

A. Fertilizer shall be complete starter fertilizer, at least 70 percent of the nitrogen of which is derived from natural organic sources of ureaform. It shall contain the following percentages by weight:

Nitrogen 15% Phosphorous 15% Potash 15%

Fertilizer shall be delivered mixed as specified above, in standard size, unopened containers showing weight, analysis, and names of manufacturers. They shall be stored in a weatherproof storage place in such a manner that the fertilizer will be kept dry and its effectiveness shall not be impaired. Fertilizer shall be applied at a rate of 800 pounds per acre.

2.05 GRASS SEED

A. Grass seed shall be of the previous year's crop and in no case shall the weed seed content exceed 1 percent by weight. The grass seed shall conform to the requirements of the following tables:

	Proportion	Germination Minimum	Purity Minimum
-Baron Kentucky Bluegrass	50%	85	98
-Creeping Red Fescue	20%	85	98
-Yorktown Rye	15%	90	98
-Jamestown Fescue	15%	90	98

B. The mix shall be Loft Seed Company – Turf Supreme or approved equal.

2.06 TREE PAINT

A. The paint furnished under this specification shall be suitable for application by brushing on sawed, cut or bruised surfaces of living trees, for the purpose of disinfection and protection of these surfaces.

B. The new materials from which this paint is manufactured shall be as follows:

1) Asphalt: Shall conform to the requirements of AASHTO-M 18, Grade A.

2) Creosote: Shall be a distillate of coal-gas tar or coke-oven tar.

3) Fibrous magnesium silicate pigment: not less than 97% passing through #325 screen.

Composition:

Asphalt	40-70%
Creosote	20-30%
Fibrous Magnesium Silicate	10-15%
Volatile Thinner	0-15%

C. The proportions of the various ingredients shall be chosen within the above limits to yield a paint of medium brushing consistency.

2.07 GENERAL PLANTING AND NURSERY STOCK

A. Materials to be used in this work shall conform to “The American Standards of Nursery Stock” as sponsored by the American Association of Nurserymen, Inc. These standards shall determine all requirements of acceptable shrub and seeding nursery stock.

B. All plants shall be packed so as to arrive at the delivery point in good growing conditions.

C. Delivery of plants and seedlings shall be made to site, only according to the Contractor’s ability to handle and properly care for them.

D. All nursery stock shall be grown at nurseries in the northern area of the United States.

E. All nursery stock shall conform to the “American Standards for Nursery Stock” as sponsored by the American Association of Nurserymen, Inc., U.S. Patent Office A60.1-1969.

F. All plants shall be fully representative of their normal species or varieties unless otherwise specified. All plants must have a good, healthy, well-formed upper growth; a fibrous compact root system; and must be free from disease, injurious insects, mechanical wounds either fresh or healed, broken branches, decay or any other defect; and shall be legible tagged with their proper names.

G. All plant materials shall be dug with reasonable care and skill immediately previous to shipment. Special precautions shall be taken to avoid any unnecessary injury to or removal of fibrous roots. Each species or variety shall be handled and packed in the approved manner for that particular plant, having regard to the soil and climactic condition at the time and place of digging, transit and delivery, and to the time that will be consumed in transit. All precautions that are customary in good trade practice shall be taken to insure the arrival of the plants at the site of the project in good condition for successful growth.

H. The roots of bare rooted material shall be carefully protected with wet straw, moss or other suitable material which will insure the arrival of the plants at the site of the work in good condition.

I. The sizes of these trees shall be as called for on the plans and measurements shall be made by calipering at a point 12 inches above the collar.

J. Non-flowering trees shall have been transplanted 3 times, the last transplanting within 2 years. With the exception of Ulmus Americana, they shall have a single straight leader not cut back. They shall have symmetrical development of strong, healthy branches beginning 5 feet to 6 feet from the ground; and below this point, the trunk shall be clean for street trees, although park trees will be permitted to branch lower.

K. Flowering trees shall have been transplanted twice, the last transplanting within 2 years. The trunk shall be clean and straight up to the first branch, which shall be about 4 feet from the ground where directed. Flowering trees shall be balled and burlapped and kept moist for delivery.

L. Deciduous shrubs shall be fully representative of their species and variety. They shall have been transplanted twice; the last transplanting within 2 years. They shall have 4 to 6 branches coming from the roots, and shall have a well-branched root system and shall be a good weight for the height specified.

M. Evergreen shrubs shall have been transplanted 3 times, the last transplanting within 2 years. They shall have a good colored top growth and shall be balled and burlapped and kept moist for delivery. Pyramidal type evergreen trees shall have a spread equal to ¾ of their height.

N. Evergreen shrubs shall have been transplanted twice and shall be of the size indicated on the plans and, except where noted, each clump shall have not less than 4 stems. Plants shall be balled and burlapped and kept moist for delivery.

PART 3 EXECUTION OF WORK

3.01 PLACING LOAM OR TOPSOIL

A. The loam or the topsoil obtained from stacked piles shall be hauled, deposited and spread to the directed depths on the areas shown on the plans or designated by the Engineer. The loam or topsoil shall be spread to a depth of not less than 4 in. All grass and weed growth on the areas designated to be loamed, shall be cut to a maximum height of 2 inches before the loam is placed thereon. After the loam or topsoil has been spread, it shall be carefully prepared by spading or harrowing, and lumps, large stones, brush, roots, stumps, litter and other foreign material shall be removed from the loamed, topsoil or processed planting materials areas and disposed satisfactorily.

B. The compaction shall be equivalent to that produced by a hand roller weighing from 75 to 100 pounds per foot of width. The compaction may be obtained by rolling, dragging or any method that produces satisfactory results. All degressions caused by settlement or rolling shall be filled with additional materials and the surfaces shall be regraded and rolled until it presents a reasonably smooth and even finish and is up to the required grade.

C. During hauling operations, the roadway surface shall be kept clean and any loam or other dirt which may be brought upon the surface shall be removed promptly and thoroughly before it becomes compacted by traffic. If necessary, the wheels of all vehicles used for hauling shall be cleaned frequently and kept clean to avoid bringing any dirt upon the surface. The Contractor shall take all reasonable precautions to avoid injury to existing or planted growth.

3.02 TOPSOIL REHANDLED AND SPREAD

A. Topsoil which is obtained on the site, from piles of topsoil previously excavated and stacked and designated as topsoil to be re-handled and spread, shall be used as required, and as directed by the Engineer, on areas to be seeded. The topsoil must be approved before it is spread and the Contractor will be required, without compensation, to take corrective action as directed, in order to make the topsoil suitable for its intended use.

B. The Contractor is required to adjust the acidity by the addition of limestone as determined by testing as required and to apply the fertilizer as required.

3.03 PREPARATION OF AREAS ON WHICH LOAM OR TOPSOIL ARE TO BE PLACED

A. The area upon which the above materials are to be placed shall be raked, harrowed or dragged to form a reasonably smooth surface, all stones larger than 2 inches, undesirable growth over 2 inches and debris shall be removed from the area and disposed of by the Contractor outside the location.

B. When directed by the Engineer, additional suitable material shall be spread as required to repair gullies or depressions. The labor, equipment and materials necessary to place, compact and grade the additional material shall be paid for under the respective item from which the material is obtained.

C. The Contractor shall not proceed with the work of seeding until permission of the Engineer has been obtained.

D. Before the application of limestone, fertilizer and seed, the Contractor shall harrow or roto-till to a depth of 3 inches, when directed, all areas where loam or topsoil has been placed under a previous contract. When loam borrow is placed, or topsoil is re-handled and spread; and they are paid for under the respective items of a contract, they will not require harrowing or rototilling.

E. The Contractor shall remove all debris and stones having any dimensions greater than 2 inches before the application of limestone, fertilizer and seed.

3.04 SURFACE DRAINAGE AND SEASONAL LIMITS

A. The Contractor shall provide and maintain uniform grades, slopes, crowns and ditches on all excavations and fills to insure satisfactory drainage at all times during the construction period.

B. The Contractor shall be responsible for protecting adjacent properties, completed work and work in progress from siltation and mud. Finished grades and surfaces for all work under this heading shall shed water to catch basins as per drawings.

C. No fill material or topsoil shall be placed, spread or rolled during unfavorable weather conditions such as interruption by heavy rains. Fill operations shall not be resumed until approved by the Engineer.

3.05 ROUGH FINISHED GRADE

A. Grading shall be accomplished as necessary to bring topsoil and sand surfaces to grades shown on the drawings or to prepare the subgrade to receive paving or construction as specified or shown on drawings.

B. After completion of pavements and structures, surfaces of earth mounds and planting areas shall be rough finished graded and shaped by blading, dragging or other means. Surfaces shall be uniform and smooth, true to slopes and grades. Soils in plating areas shall be graded level with the edge of headerboards, pavement or walks. Particular attention shall be given to surface drainage around sump catch basins.

C. The rough finished surface of the grading plane at any point shall not vary more than 0.10 feet above or below the grade indicated on the drawings.

D. Upon completion of earthwork, the Contractor shall remove all surplus construction materials, earth and debris resulting from his work so that the entire job site is left in a neat and orderly condition.

3.06 APPLICATION OF LIMESTONE

A. Limestone may be applied in dry form or hydraulically. Limestone where necessary shall be spread and thoroughly incorporated in the layer of loam or topsoil to adjust the acidity of the loam or topsoil. The rate of application of the limestone will vary up to a maximum of 1 pound per square yard depending on the results of laboratory tests performed by an independent professional testing laboratory acceptable to the Engineer, at the Contractor's own expense. The limestone shall be thoroughly incorporated into the layer of loam or topsoil and the upper 1-inch of the underlying subsoil by harrowing or other methods satisfactory to the Engineer so as to provide a layer of thoroughly mixed material for the seedbed.

3.07 APPLICATION OF FERTILIZER FOR GRASS

A. Fertilizer may be applied in dry form or hydraulically. After the application in dry form or hydraulically and after the application of limestone, if found necessary, on the seed bed, starter fertilizer shall be spread on the top layer of loam or topsoil at the rate of 800 pounds per acre and worked into the seed bed. The full depth of loam or topsoil shall then be spaded or harrowed and graded to the required cross-section.

3.08 SEEDING GRASS

A. After the loamed or topsoil areas have been prepared and treated as before described, grass seed conforming to the respective formulas before specified shall be carefully sown thereon at the rate of approximately 175 pounds per acre. Seeding shall be done in two directions at right angles to each other. Seeding on level areas and on slopes up to and including 4:1 slopes shall be done by means of an approved seeder that will seed and roll in one operation. On shoulders and other narrow areas, the seeding may be done longitudinally in one application.

3.09 SEEDING GRASS BY SPRAY MACHINE

A. The spray machine will be restricted for use only on slopes steeper than 4:1. The application of limestone as necessary, fertilizer and grass seed may be accomplished in one operation by the use of limestone as necessary, fertilizer and grass seed may be accomplished in one operation by the use of an approved spraying machine. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The spraying equipment shall be so designed that when the solution is sprayed over an area the resulting deposits of limestone, fertilizer and grass seed shall be equal in quantity to those quantities specified before.

B. A certified statement shall be furnished, prior to start of work, to the Engineer by the Contractor as to the number of pounds of limestone, fertilizer, and grass seed, per 100 gal. of water.

C. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above. If the results of the spray operation are unsatisfactory, the Contractor will be required to abandon this method and to apply the limestone, fertilizer and seed as before specified.

3.10 CARE DURING CONSTRUCTION

A. The Contractor shall be responsible for the watering of all seeded and grassed areas which shall be kept moist. The Engineer’s decision will prevail in the event a dispute develops with the Contractor as to whether or not the seeded and grassed areas are moist. Seeded areas on which growth has started shall be watered to a minimum depth of 2 inches to assure continuing growth. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment to apply one complete coverage to the seeded areas in an 8 hour period.

B. If necessary, suitable signs and barricades of brush or other materials shall be placed to protect the seeded areas. After the grass has appeared, all areas and parts of areas which fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas shall be seeded repeatedly until all areas are covered with a satisfactory growth of grass.

C. The Contractor shall care for all of the seeded areas until the work has been physically accepted, without compensation in addition to the amount regularly to be paid under this item as hereinafter provided. Care shall include all regrading, refertilizing, reseeding and mowing which may be necessary.

D. Prior to the acceptance of the project the Contractor will be responsible for mowing the grass when necessary on all flat or rolling slopes from level to and including 4 to 1 slopes to a height of 3 inches when the grass has attained a height of eight inches. The grass on all slopes steeper than 4 to 1 shall be cut when necessary to a height of 3 inches at such a time as a stable turf has been established in the Engineer's judgement.

3.11 REFERTILIZATION AND APPLICATION OF FERTILIZER

A. This work shall be done in April, May, August or September. No permission will be granted to re-fertilize in months other than herein prescribed. Areas recently seeded shall be re-fertilized only after one season of growth of two months duration.

B. The fertilizer shall have a composition of 10-10-10 and be applied at a rate of 500 pounds per acre. In addition, organic fertilizer derived from any commercial source shall be applied at the rate of 135 pounds of N per acre. Seed as before specified shall be included with the fertilizer at a rate of 10 pounds per acre.

3.12 PREPARATION FOR MULCHING

A. The areas upon which mulch is to be spread shall be prepared by raking, harrowing or dragging to form a reasonably smooth surface. All stones larger than 2'', undesirable growth over 2' in height and all debris shall be removed from the area and disposed by the Contractor in a satisfactory manner. The disposal area shall be outside the location limits of the project, when required by the Engineer and shall be responsibility of the Contractor.

B. When required by the Engineer, the Contractor shall spread, compact and grade additional acceptable material to repair gullies or depressions. Such additional material shall be obtained from suitable excavation or furnished by the Contractor.

3.13 PLACING MULCH

A. Hay mulch shall be loosely spread to a uniform depth over all areas designated on the plans, at the rate of 4 ½ tons per acre. Hay mulch may be applied by mechanical apparatus, if in the judgement of the Engineer the apparatus spreads the mulch uniformly and forms a suitable mat to control slope erosion. The apparatus shall be

capable of spreading at least 80% of the hay or straw in lengths of 6'' or more, otherwise it shall be spread by hand.

B. Wood chip mulch and aged pine bark mulch shall be loosely spread to uniform depth over all acres designated on the plans, at the rate of 390 cubic yards per acre (approximately 3'' in depth), or as otherwise directed.

C. Wood chip mulch and aged pine bark mulch may be applied by mechanical means, except that if the equipment breaks the mulch into small pieces or changes its desired texture, as determined by the Engineer, it shall be spread by hand.

END OF SECTION

SECTION 02995

MISCELLANEOUS WORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment, and incidentals necessary to complete the miscellaneous work under this Section and as noted on the contract drawings.

B. When applicable, the Contractor shall perform the work in accordance with other sections of this Specification. When no applicable Specification exists, the Contractor shall perform the work in accordance with the best modern practice and/or as directed by the Engineer.

C. The work of this Section includes, but is not limited to, any incidental work not specifically identified elsewhere.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. DIVISION 1 THROUGH 16 - As Appropriate

PART 2 MATERIALS

2.01 GENERAL

A. The Contractor shall furnish all materials necessary to remove, replace, and restore the site or structures sufficiently and to the satisfaction of the Engineer.

B. The materials provided by the Contractor shall meet all requirements as specified herein, of the applicable specification, or to the satisfaction of the Engineer.

C. All material not furnished, in the opinion of the Engineer, in accordance with the Contract Drawings and Specifications shall be removed immediately. Suitable material, which is satisfactory, shall be furnished at no additional compensation to the Contractor.

PART 3 EXECUTION OF WORK

3.01 INCIDENTAL WORK

A. The Contractor shall do all incidental work including all work listed under the miscellaneous work item 7B in section 01025 of the contract documents and not otherwise specified, but obviously necessary to the proper completion of the Contract as specified on the Contract Drawings.

3.02 RESTORATION OF CROSS COUNTRY AREAS

A. The Contractor shall furnish all labor, materials, and equipment to restore all areas disturbed by his operations. The ground surface shall be loamed and seeded as specified in related sections. It shall be maintained as required until the site has been restored to the original condition.

3.03 PRECAUTIONS UNDER ELECTRIC LINES

A. The bidders' attention is directed to the AASHTO Guide on Occupational Safety and the section on Highway Contraction Projects, Subpart N, 1926.550 relating to construction equipment clearances at overhead electric lines. This guide states, "...the minimum clearance between the lines and any part of the crane or load must be at least 10 feet from lines rated 50 kV or below, and greater distances for higher voltage..."

B. For the protection of personnel and equipment, the Contractor should be aware of this regulation especially during paving operations using large semi-trailer vehicles.

3.04 PUBLIC SAFETY

A. The Contractor shall furnish all labor, materials, tools, and equipment to provide public safety to vehicular and pedestrian traffic in the vicinity of the construction work. This includes all signs, barriers, warning lights, and any other controls deemed necessary by the Engineer.

END OF SECTION

SECTION 04100

MORTAR

PART 1 GENERAL

1.01 CONTRACT DOCUMENTS

A. The general provisions of the Contract, including General and Supplemental Conditions and General Requirements apply to the work specified in this section.

1.02 DESCTRIPTION OF WORK

A. The Contractor shall provide all necessary labor, tools, materials, and equipment as required for performing all operations relating to the placement of mortar as indicated on the Contract Drawings and as specified herein.

1.03 RELATED WORK SPECIFIED ELASEWHERE

A. SECTION 01300—SUBMITTALS

B. SECTION 04200—UNIT MASONRY

PART 2 MATERIALS

2.01 MORTAR MATERIALS

A. Portland cement shall conform to all the requirements of ASTM Designation C-150, Type I or II.

B. Hydrated lime shall conform to all the requirements of ASTM Designation C-207, Type “S.”

C. Masonry cement shall conform to all the requirements of ASTM Specification C-91, Type II, and with the approval of the Engineer may be used in place of cement and lime mortar. Masonry cement shall be Louisville Cement Company brixment, Lehigh Masonry Cement, or equal. Any lime contained in masonry cement shall be Type “S” only.

D. Sand shall be clean, hard siliceous, siliceous, in accordance with ASTM Specifications C-144, free from loam, silt or other impurities, composed of grains of varying sizes within the following limits:

	Percent Passing	
Sieve Size	Natural Sand	Manufactured Sand
No. 4	100	100
No. 8	95-100	95-100
No. 16	70-100	70-100
No. 30	40-75	40-75
No. 50	10-35	20-40
No. 100	2-15	10-25
No. 200		0-10

E. Mortar specimens made with sand shall have compressive strength at 28 days of not less than 90 percent of the compressive strength of specimens made with Ottawa sand.

F. Water shall be fresh, clean, and free from acids, alkali, sewage, organic materials, and other deleterious substances.

G. Water repellants and other admixtures shall be used only where specified or with written approval of the Engineer. When used they shall be the product of a manufacturer who can demonstrate successful usage of his product for a period of not less than 3 years prior to being offered for the work and shall be used in strict accordance with the printed directions of the manufacturer.

H. Coloring Pigments, if required, shall be alkali-resistant, non-staining, non-fading pigments, manufactured specifically for mortar coloring, subject to approval of the Engineer.

I. Unless otherwise specified, or required by building codes, mortar shall conform to ASTM C-270, Type “N”, composed, by volume of one part Portland cement, ½ to 1 ¼ part hydrated lime, with sand not less than 2 ¼ nor more than 3 times the sum of volumes of cement and lime used. Alternate—1 part approved masonry cement, 2 ¼ to 3 parts sand.

J. Where specifically shown or noted, or where required by building codes for the indicated construction mortar shall conform to ASTM C-270, Type “S”, composed by volume of one part Portland cement, ¼ to ½ part hydrated lime, with sand not less than 2 ¼ nor more than 3 times the sum of the volumes of cement and lime used. Alternate—1/2 part Portland cement, one part masonry cement; 3 ½ to 4 ½ parts sand.

K. Fire wall mortar for fire walls shall be 3 parts sand, one part Portland cement, and 15 percent lime by cement volume, conforming to Underwriters Laboratories, Inc., requirements.

L. Tuck pointing or prehydrated mortar of the same composition as the laying mortar shall be used as follows. Mix dry materials thoroughly; remix, adding only enough water to produce a damp workable mix which will retain shape when pressed into a ball; after one to two hours, add water as required for proper point consistency.

M. Colored mortar shall be used only if required and will be specified under the specific wall construction elsewhere herein.

PART 3 EXECUTION

3.01 MIXING

A. Mortar materials shall be measured by weight or by volume and the methods of measurement shall be such that the proportions can be controlled with an error not over 2 percent. One bag of Portland cement weighing not less than 94 pounds shall be considered as one cubic foot. Mortar shall be mixed in a mechanical batch mixer, not less than 3 minutes after all the materials are in the mixer. Hand mixing will be permitted for small batches provided the quantities of materials and water are accurately controlled and that the method of mixing is approved by the Engineer. Hand mixing for small batches shall be continued until the mortar is completely and uniformly mixed. Mortar shall be used within 30 minutes after it leaves the mixer and no retempering of mortar in which the cement has begun to set will be allowed.

SECTION 04200

MASONRY WORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment and incidentals for performing all operations required for the masonry work as indicated on the Contract Drawings, as specified hereinafter, and as evidently necessary to complete the work.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 01300 – SUBMITTALS

B. SECTION 02728 – MODIFICATION AND CONNECTIONS TO EXISTING STRUCTURES

C. SECTION 03300 – CAST-IN-PLACE CONCRETE

D. SECTION 03400 – PRECAST CONCRETE STRUCTURES AND MANHOLES

PART 2 MATERIALS

2.01 GENERAL

A. All concrete shall be site-mixed or ready-mixed as produced by a plant acceptable to the Engineer. Class A and Class B concrete shall be used as indicated by contract drawings or specified herein.

2.02 PORTLAND CEMENT

A. Portland cement shall be Type II and shall conform to ASTM Standard Specifications for Portland Cement, Designation C150-77.

B. All cement shall be American made Portland Cement from a reputable manufacturer. Cement shall be supplied from one mill through the construction phase and shall be of uniform color.

C. Cement shall be free from water-soluble salts or alkalies which may cause efflorescence on exposed surfaces. Cement shall be free from all lumps and from all partially or wholly set cement.

D. High-early-strength cement may be used only with the permission of the Engineer, but no additional payment will be made to the Contractor for the use thereof. Such cement shall meet all specification of Type III cement.

E. All cement used by the Contractor shall be subject to testing to determine compliance to specifications. The test methods shall conform to appropriate ASTM methods and specifications; however, the place, time, frequency and method of sampling shall be determined by the Engineer as applicable to site conditions and construction progress.

2.03 ADMIXTURES

A. Admixtures acceptable to the Engineer shall be added to the concrete as shown by the Contract Drawings or specified herein so as to create air-entrained concrete.

B. If admixtures are added to the concrete in solution form, the quantity of solution shall be considered in the computation of the water – cement ratio.

C. Admixtures causing the accelerated setting of cement in concrete shall not be used in any class of concrete.

D. The use of admixtures to concrete other than concrete exposed to the elements will not be permitted without the written consent of the Engineer.

E. Combinations of types of cements, admixtures and concrete shall be clean, fresh and free from injurious materials such as oil, acid, alkali, organic matter or deleterious materials. Testing of water shall be in accordance with AASHO T26.

2.04 WATER

A. Water use in the mixture of cements, admixtures and concrete shall be clean, fresh and free from injurious materials such as oil, acid, alkali, organic matter or deleterious materials. Testing of water shall be in accordance with AASHO T26.

Water quality shall be within the following guidelines:

pH	3.0 – 11.7
Total Solids	
Organic	.01 % (Max)
Inorganic	.10 % (Max)
Sulphate	.05 % (Max)

2.05 AGGREGATE

A. Fine Aggregate –

Fine aggregate for cement mortar shall be well graded and conform to the following sieve analysis:

Sieve Size	% Passing
3/8 ''	100
# 4	95 – 100
# 16	55 – 80
# 50	10 – 25
# 100	2 – 8
# 200	0 – 2

B. Coarse Aggregates

Course Aggregate for cement concrete shall consist of crushed rock or screened gravel and shall be composed essentially of clean, hard, strong and impermeable particles, resistant to wear and frost and free from deleterious amounts of organic matter, loam, clay, salts, mica and soft, thin, elongated, laminated or disintegrated stone, and it shall be inert to water and cement. Coarse aggregate shall consist of well graded gravel and crushed stone conforming to the ASTM Standard Specifications for Concrete Aggregates, Designation C33-77, and then conforming to the following detailed requirements.

NOMINAL SIZE

SIEVE SIZE	1 ½ inches	¾ inches	3/8 inches
1 ½ inch	90 –100		
¾ inch	35 – 60	90 –100	
½ inch	--	--	90 – 100
3/8 inch	10 – 25	20 – 50	30 – 70
# 4	0 - 5	0 - 10	0 – 15
# 8		0 - 5	0 - 5

2.06 MORTAR MATERIALS

A. Portland cement shall conform to all the requirements of ASTM Designation C-150, Type II.

B. Hydrated lime shall conform to all the requirements of ASTM Designation C-207,Type "S".

C. Masonry cement shall conform to all the requirements of ASTM Specification C-91, Type II, and with the approval of the Engineer may be used in place of cement and lime mortar. Masonry cement shall be Louisville Cement Company brixment, Lehigh Masonry Cement, or equal. Any lime contained in masonry cement shall be Type "S' only.

D. Sand shall be clean, hard siliceous, in accordance with ASTM Specification C-144, free from loam, silt or other impurities, composed of grains of varying sizes within the following limits:

PERCENT PASSING

Sieve Size	Natural Sand	Manufactured Sand
No. 4	100	100
No. 8	95 – 100	95 – 100
No. 16	70 – 100	70 – 100
No. 30	40 – 75	40 – 75
No. 50	10 – 35	20 – 40
No. 100	2 – 15	10 – 25
No. 200	--	0 – 10

E. Mortar specimens made with sand shall have compressive strength at 28 days of not less than 90 percent of the compressive strength of specimens made with Ottawa sand.

F. Water repellents and other admixtures shall be used only where specified or with written approval of the Engineer. When used, they shall be the product of a manufacturer who can demonstrate successful usage of his product for a period of not

less than 3 years prior to being offered for the work and shall be sued in strict accordance with the printed directions of the manufacturer.

2.07 BRICK

A. Clay brick shall conform to the requirements of AASHO-M91 with the following exceptions:

1. The size of brick furnished shall be 8 inches long by 3 ¾ inches wide by 2 ¼ inches deep.

2. The average absorption of 5 representative samples shall not exceed 15 % and the absorption of any individual sample shall not exceed 17 ½ %.

3. The average compressive strength of 5 representative samples shall not be less than 3000 pounds per square inch and the compressive strength of any individual sample shall not be less than 2500 pounds per square inch.

B. All bricks shall be good, sound, hard and uniformly burned. Under burned or salmon bricks shall not be acceptable. Broken or cracked bricks or bricks which are not regular and uniform in shape and size or otherwise unsatisfactory to the Engineer shall not be accepted. Bricks which are unsatisfactory to the Engineer shall be rejected and immediately removed from the site of the work by the Contractor and replaced with bricks satisfactory to the Engineer all at no additional compensation to the Contractor.

1. Bricks for the channels and shelves shall conform to ASTM C32 Grade specifications for Grade SS, Sewer Brick, except that the mean of five tests for absorption shall not exceed 8 percent and no individual brick exceed 11 percent.

2. Bricks for building up and leveling manhole and catch basin frames shall conform to ASTM C62.

C. The Contractor shall furnish the Engineer with the Manufacturer's Certification that units supplied meet all AASHO and ASTM specifications. Verification by additional testing shall be conducted by the Contractor at no additional cost as deemed necessary by the Engineer.

PART 3 EXECUTION OF WORK

3.01 MIXING

A. Mortar materials shall be measured by weight or by volume and the methods of measurement shall be such that the proportions can be controlled with an error not over 2 percent. One bag of Portland cement weighing not less than 94 pounds shall be considered as one cubic foot. Mortar shall be mixed in a mechanical batch mixer, not less than 3 minutes after all the materials are in the mixer. Hand mixing will be

permitted for small batches provided the quantities of materials and water are accurately controlled and that the method of mixing is approved by the Engineer. Hand mixing for small batches shall be continued until the mortar is completely and uniformly mixed. Mortar shall be used within 30 minutes after it leaves the mixer and no retampering of mortar in which the cement has begun to set will be allowed.

3.02 TRIMMING AND CLEANING

A. Masonry shall be cleaned with trisodium phosphate and detergent, ½ cup of each to each gallon of water. Before cleaning, all dirt, excess loose mortar shall be scraped or brushed off and masonry saturated on with stiff brushes as required and rinsed off thoroughly with clean water until all mortar, dirt and cleaning solution are removed.

B. As the cleaning progresses, all joints shall be examined for cracks, holes and imperfect pointing. Defective joints shall be cut out and repaired by tuck pointing.

END OF SECTION

SPECIAL PROVISIONS

MONTCLAIR AVE WATER MAIN REPLACEMENT

CITY OF WALTHAM ENGINEERING DEPARTMENT

SCOPE OF WORK

The work to be done under this Contract consists of the installation of approx. 1700 feet 8" and 350 feet of 12" CLDI water on Montclair Ave and Trimount Ave in Waltham.

The work to be performed will include excavation, installation of new water main in the same trench as the existing water main, replacing existing water services, hydrants, installation of valves, and related appurtenances, hot mix asphalt patching of streets and sidewalks, resetting of curb, pavement milling and paving with hot mix asphalt, and other incidental work as required.

Work under this Contract shall be paid for at the Contract unit bid prices, which shall constitute full compensation for all material, labor, equipment, etc., required to satisfactorily complete the work.

All work under this Contract shall be done in conformance with the Massachusetts Highway Department *Standard Specifications for Highways and Bridges* dated 1988, the *Supplemental Specifications* dated July 1, 2015, and the *Interim Supplemental Specifications*; the *2015 Construction Standard Details,* the *1990 Standard Drawings for Signs and Supports*; the *2009 Manual on Uniform Traffic Control Devices (MUTCD)* with *Massachusetts Amendments* and the *Standard Municipal Traffic Code*; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; the latest edition of *American Standard for Nursery Stock*; the latest edition of the American Water Works Association Standards, the Plans and these Special Provisions

WORK SCHEDULE

Work on this project is restricted by City Ordinance to a seven (7) hour day between the hours of 7:00am and 5:00pm. Work week is restricted to a five (5) day week Monday through Friday, with the Contractor and all subcontractors working on the same shift. No work shall be done on this Contract on Saturday's, Sunday's, or holidays without the prior written approval by the City. Weekly work schedules shall be delivered to the Engineer no later than noon on the Friday before the following work week.

No work shall be performed on the entire length of any street or roadway listed below during the hours of 7:00am to 9:00am and 4:00pm to 6:00pm. Also no construction vehicles shall be parked waiting to perform work during these hours. In case of emergency, exceptions to this rule can be made by the Consolidated Public Works Director or their designee. Any non-emergency work would be reviewed on a case-by-case basis and approval may be issued by the Consolidated Public Works Director or his/her designee. Street or roadways restricted are as follows: Bacon St., Bear Hill Rd., Beaver St., High St., Lexington St., Linden St., Main St., Maple St., Moody St., Newton St., Pine St., Prospect St., River St., Second Ave., Smith St., South St., Stow St., Totten

Pond Rd., Trapelo Rd., Waverley Oaks Rd., Weston St., Winter St., and Wyman St.

CHANGES IN SCOPE

The City of Waltham reserves the right to increase or reduce the amount of this Contract. Any changes in scope may involve adding work on the streets listed above or on streets yet to be identified, or deleting all or some of the work on a specific street or portion of a street. Changes in scope may be ordered at any time up to project acceptance at the Contract unit bid prices.

DEFINITIONS

Except for specific reference to Department Standards and Operations, the usage of the term Engineer shall mean the Waltham City Engineer or his/her duly authorized Agent.

RESPONSIBILITY FOR DAMAGE CLAIMS

The Contractor shall indemnify, defend and save harmless the Municipality and all of its or their offices, agents and employees against all suits, claims or liability of every name and nature, for or on account of any injuries to persons or damage to property arising out of or inconsequence of the acts of the Contractor in the performance of the work covered by the Contract or failure to comply with the terms and conditions of said Contract, whether by themselves or his/her employees or Subcontractors, but only in respect of such injuries or damages sustained during the performance and prior to the completion and acceptance of the work covered by the Contract.

The Contractor will be held responsible for any and all claims for damage to underground structures such as, but not restricted to, water or gas mains, pipes, conduits, manholes or catch basins, due to his/her operation or to the operations of any of his/her Subcontractors.

COOPERATION BY CONTRACTOR

Attention is directed to the provisions relating to rights of public corporations and municipal departments to enter the site of the improvement and alter, replace, and/or install facilities at such times when the Contractor will be prosecuting other required work contiguous thereto.

INSPECTION OF WORK

The Contractor is advised that the Waltham City Engineer will be provided with a schedule of operations and will at various times during the construction of the project be on-site to inspect procedures and give directions. For the purpose of observing work that affects their respective properties, inspectors for public agencies and utility companies shall be permitted access to the work, but all official orders and directives to the Contractor will be issued by the Waltham City Engineer or his/her duly authorized agent.

NOTICE TO OWNERS OF UTILITIES AND PUBLIC SERVICE DEPARTMENTS:

Written notice shall be given by the Contractor to all public service corporations or officials owning or having charge of Public or Private Utilities and Departments of his/her intentions to commence operations affecting such utilities and Departments at least one (1) week in advance of the start of such operations and the Contractor shall at the same time file a copy of said notice with the Engineer.

The names of the principal City Departments and Utilities which may be affected will be provided to the Contractor at the pre-construction meeting.

The Contractor shall notify "Massachusetts DIG SAFE" and procure a DIG SAFE number 72 hours prior to disturbing existing ground in any way.
DIG SAFE Call Center – PHONE - 811.

The City of Waltham is not a part of "DIG SAFE." The Contractor must request Water, Sewer, and Drain utility markings from the City Water & Sewer Department at least 72 hours prior to disturbing existing ground in any way.

Before the Contractor begins any work on operations which might result in damage to utility pipes or structures the Contractor shall verify the locations of existing overhead and subsurface utilities in the vicinity of the work with the listed Departments and Utility Companies and conduct his/her operations so as to avoid any damage to them.

PROTECTION OF EXISTING UTILITIES AND STRUCTURES

Excavation and backfill operations shall be carried out in a manner that will prevent cave-in of excavations or the undermining, damage or disturbing of existing utilities and structures or of new work.

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

Any damage due to excavation, backfilling or settlement of the backfill, or injury to persons or damage to property occurring as a result of such damage, shall be the responsibility of the Contractor. All costs to repair such damage, in a manner satisfactory to the Owner, shall be borne by the Contractor at no additional expense to the Owner.

Where existing subsurface utilities or other facilities adjacent to or crossing through the excavation require temporary support or protection, such temporary support or protection shall be satisfactorily provided by the Contractor at no additional expense to the Owner. All necessary measures shall be taken by the Contractor to prevent lateral movement or settlement of existing facilities or of work in progress.

The plans indicate the approximate location of existing overhead and subsurface utilities in the vicinity of the work and the bidders are advised to verify this information, as its accuracy and completeness are not guaranteed by the Owner or Engineer.

PROTECTION OF UTILITIES AND PROPERTIES

The Contractor's attention is directed to the location of underground utilities in the existing and proposed roadways.

The Contract Drawings indicate the approximate location in plan of existing overhead and subsurface utilities in the vicinity of the work. Whatever measures are necessary to protect these lines during the work shall be included in the Contract unit price for the various items involved.

In case of damage to utilities, the Contractor shall promptly notify the Owner and shall, if requested, furnish manpower under the Owner's direction in getting access to the utility. Pipes or other structures damaged by the operation of the Contractor may be repaired by the Owner, the municipality, or the utility company. The cost of such repairs shall be borne by the Contractor without compensation therefore.

The work to be done under this Contract may necessitate changes in the properties of utility companies or the municipality hereinbefore listed. Immediately after executing the Contract, the Contractor shall confer with the owners of all utilities in order that relocations of mains or services may be made at times consistent with operations of the Contract.

PROVISIONS FOR TRAVEL AND PROSECUTION OF THE WORK

Prior to commencement of work, the Contractor shall be responsible for obtaining all necessary construction permits. Permits will include, but are not necessarily limited to, a NPDES Notice of Intent from the Environmental Protection Agency (including the preparation of a Storm Water Pollution Prevention Plan) and a Street Opening / Trench Permit from the Consolidated Public Works.

Access shall be maintained for all abutters so that they may use the driveways and approaches adjacent to their properties. Pedestrian access to abutting property and access for emergency vehicles shall be provided at all times.

All construction equipment, material and debris shall be removed from the traveled way at the end of each working day and shall be stored in such manner as not to interfere with the flow of driveway traffic or pedestrians.

The Contractor shall coordinate his/her work with the work to be done by other Contractors on the site, public utilities or other agencies, and he/she shall so schedule his/her operations as to cause the least interruption to the normal flow of all traffic types. Reasonable facilities shall be provided by the Contractor for the safe and convenient passage of pedestrians and vehicles through and within the project area.

Particular care shall be taken to establish and maintain methods and procedures which will not create unnecessary or unusual hazards to public safety. The placement of necessary devices will be for daily work periods and shall be removed after the completion of work operations. Signs having messages that are irrelevant to normal traffic conditions shall be removed or properly covered at the end of each work period. Signs are to be kept clean at all times and legends shall be distinctive and unmarred.

TEMPORARY BYPASS WATER MAIN PLAN

The Contractor shall prepare and submit a Temporary Bypass Water Main Plan for approval by the Engineer. The Temporary Bypass Water Main Plan shall be designed and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. The Plan shall include layout of bypass piping, temporary service lines to all customers, specified bypass pipe diameter to be used in each location, location of temporary valves, and the type and location of temporary fire hydrants.

TRAFFIC MANAGEMENT PLAN

The Contractor shall prepare and submit a traffic management plan to the Engineer for review and approval by the Engineer and the Waltham Police Department Traffic Safety Officer. The Traffic Management Plan shall be prepared for all streets in the Contract, unless specifically directed otherwise by the Engineer. The Traffic Management Plan shall contain information on proposed detour routes if requested, location and type of detour and warning signs, barricades and other safety and traffic control means and devices to ensure a safe, orderly flow of vehicular and pedestrian traffic.
All temporary and permanent signs, traffic control devices, and pavement markings shall conform to the latest relevant sections of the Manual on Uniform Traffic Control Devices (MUTCD), and the Massachusetts Standard Specifications for Highways and Bridges.

The Traffic Management plan shall be submitted for review at least fourteen (14) days prior to any work being performed on the project roadways. No work would be allowed until the Traffic Management Plan is approved by the City and implemented by the Contractor.

Temporary pavement markings and other traffic control devices shall be provided in accordance with the Contractor's Traffic Management Plan and as directed by the Engineer.

Temporary traffic control devices shall include the provision of variable message sign boards to supplement other traffic control measures as directed by the Engineer. The cost of preparing the traffic management plan and providing and maintaining temporary traffic control devices shall be borne by the Contractor.

TRAFFIC POLICE DETAILS

Payment shall be made at the stated allowance in the Bid Form. The Police Department will bill the Contractor directly and the Contractor shall pay the Police Department bills within a ten day working period for uniform police officers provided on the job site. The billing shall include a weekly statement outlining the days worked, hours worked, location of the work, and rate for all officers providing service during that billing period.

The Contractor will be paid by the Owner for bills paid to the Police Department. The Contractor shall submit paid bills from the Police Department, stamped and signed as paid, to the Engineer, with the Contractor's Application for Payment.

Uniformed officers required for purposes other than public safety and / or control of traffic shall not be eligible for payment. Details billed to the Contractor due to cancellation of work will not be eligible for payment.

If uniformed policemen are required for traffic control, as determined by the Owner, the Contractor shall arrange for the police detail by contacting the Police Department at least 24 hours in advance of the time the detail will be required. The Contractor will be responsible for coordinating with the Police Department when details are required.

RAILROAD FLAGGING SERVICE

If any of the work required to be done by the Contractor may obstruct the tracks of a railroad or in any way endanger the operation of its trains, and the services of a flagger or flaggers or other railroad employees are required by the Chief Engineer of the railroad company and personnel are assigned by that Chief Engineer for the protection of the property and traffic of the Railroad against hazards, the cost of all such flagging services will be paid by the Contractor to their employers, subject to the rules and regulations of the railroad company. The Contractor shall provide to the City proof of payment to the Railroad for the cost of the flaggers required. The City shall reimburse the Contractor for the flaggers under item 999.2 Railroad Flagging. The City shall not pay any administrative charges associated with the costs of flaggers charged by the railroad nor shall the Department pay charges for debit accounts if such accounts are required by the railroad.

METHOD OR SEQUENCE OF CONSTRUCTION

The Contractor shall obtain approval for his/her proposed method and sequence of construction, including procedures for maintaining traffic, from the City Engineer or his/her duly authorized agent, prior to performing the work. The Contractor is responsible for filling out and submitting to the Engineer the one page checklist included at the end of this section prior to commencing a new segment or phase of work. The checklist describes the type of work to be done and identifies a series of notifications and preliminary steps that are to be addressed prior to commencing a new segment or phase of work.

OSHA REQUIREMENTS

The work to be performed under this Contract by the General Contractor and any and all subcontractors is to be performed in compliance with the Occupational Safety and Health Act of 1970, including any and all amendments thereto.

PRECAUTIONS UNDER ELECTRIC LINES

The bidders attention is directed to the AASHTO Guide on Occupational Safety on Highway Construction Projects, Subpart N, 1926.550, relating to construction equipment clearances at overhead electric lines, which states in part "... the minimum clearance between the lines and any part of the crane or load must be at least 10 feet from lines rated 50 KV or below, and greater distances for high voltage ...".

For the protection of personnel and equipment, the Contractor should be aware of this regulation especially during paving operations using large semi-trailer vehicles.

OVERLOADED TRUCKS

Materials delivered to the project in motor vehicles or semi-trailer units that exceed the legal maximum gross weight allowed for the particular class as specified in section 19a of chapter 90 of the general laws of Massachusetts will not be accepted.

PUBLIC SAFETY AND CONVENIENCE

Trenches shall not be excavated in traveled ways until all materials and equipment required for such work are at the site and available for immediate use. When work is not in progress, trenches in areas subject to public travel shall be covered with steel plates capable of safely sustaining a 36.5-ton truckload with impact without additional compensation. The work in each trench shall be practically continuous, with the placing of pipe, backfilling, and paving of the roadway surfaces closely following each preceding operation. Payment for steel plates will be included under the unit bid price per linear foot for the respective pipe or conduit item, regardless of width of trench.

The Contractor shall take every measure necessary for the protection of personnel and property.

The Contractor shall at all times, until written acceptance of the physical work by the Owner, be responsible for the protection of the work and shall take all precautions for preventing injuries to persons or damage to property on or about the project.

BARRICADES AND WARNING SIGNS

All automotive equipment not protected by traffic cones or flares that is working on the project in areas open to traffic shall have one amber flashing or strobe warning light mounted on the cab roof or on the highest practical point of the machinery. These lights shall be in operation whenever the equipment is working or traveling in the project work area at a speed less than 25 M.P.H. Flashers must be visible to both oncoming and overtaking vehicular traffic and shall have a light source of 32 minimum candlepower and a flashing frequency of 50-60 times per minute.

All personnel who are working in areas open to traffic shall wear MHD approved safety vests.

All vehicles except passenger cars which are assigned to the project which operate at speeds of 25 MPH or less shall have an official SLOW MOVING VEHICLE emblem displayed in accordance with the provisions of Section 7 of Chapter 90 of the General Laws as amended by Chapter 684 of the Acts of 1970.

STEEL PLATES IN CONSTRUCTION ZONES

At the end of each working day where trenches in areas of public travel are covered with steel plates, each edge of such plates shall be either beveled or protected by a slope of 2-feet horizontally to 1-inch vertically. Temporary bituminous concrete patching material shall be used to construct the ramps. The cost of necessary patching materials and their

maintenance and removal will be considered incidental to the item involved with no separate payment.

DISPOSAL OF SURPLUS EXCAVATED MATERIALS

All surplus excavated material not required or suitable for reuse on the project, or otherwise not wanted by the City, shall become the property of the Contractor and removed and disposed of outside and away from the limits of the project at no additional cost to the City in accordance with all local rules and the approval of local governmental authorities having jurisdiction over the disposal of such materials. Any excess material that the City decides to keep shall be transported to and stored at a location within City to be identified by the Engineer. Loading, transporting, and unloading shall be done by the Contractor without additional compensation.

Payment for this work shall be included in the unit price under the applicable item from which the material was obtained.

PROMPT PAYMENT AND RELEASE OF RETAINAGE TO SUBCONTRACTORS

The Contractor agrees to pay each subcontractor under this Contract for satisfactory performance of subcontract work not later than 10 business days from the receipt of each payment the Contractor receives from the City. Failure to comply with this requirement may result in the withholding of payment to the Contractor until such time as all payment due under this provision has been received by the subcontractor(s) and/or referral to the Prequalification Committee for action which may affect the Contractor's prequalification status.

ARCHITECTURAL ACCESS BOARD TOLERANCES

The Contractor is hereby notified that they are ultimately responsible for constructing all project elements in strict compliance with the current AAB/ADA/PROWAG rules, regulations, standards and guidelines (Rules and Regulations).

All construction elements in this project associated with sidewalks, walkways, wheelchair ramps and curb cuts are controlled by 521CMR - Rules and Regulations of the Architectural Access Board (AAB) and the Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG)

The Rules and Regulations specify maximum slopes and minimum dimensions required for construction acceptance. There is no tolerance allowed for slopes greater than the maximum slope nor for dimensions less than the minimum dimensions.

Contractors shall establish grade elevations at all wheel chair ramp locations, and shall set transition lengths according to the appropriate table in the Construction Standards (or to the details shown on the plans).

All wheelchair ramp joints and transition sections which define grade changes shall be formed, staked and checked prior to placing cement concrete. All grade changes are to be made at joints.

DEBRIS IN DRAINAGE AND SEWER STRUCTURES

The Contractor shall exercise care when conducting his/her operations so that the debris does not enter any structures. All structures and pipes shall be kept clean and operable. All costs of debris removals, damages due to back-ups, and cleaning by others due to operations of the Contractor shall be borne by the Contractor.

PROCEDURES FOR SHOP DRAWING SUBMITTALS

The following procedure shall be followed when making shop drawing submittals for this project:

1. The Contractor shall submit four (4) sets of drawings directly to the Engineer for preliminary review.
2. The Engineer will send a written reply, returning two (2) sets to the Contractor within seven (7) working days of receipt of the drawings.
3. If the Engineer's reply indicates rejection or advises corrections or additions to the drawings, steps 1 and 2 are repeated until the Engineer indicates that approval will be given.
4. The Contractor shall then submit four (4) sets of drawings to the Engineer for approval and distribution by the Engineer per the standard operating procedures of the Department.
5. The Contractor shall take care that every separate document in each set of every submittal shall carry the following identifying information:

    Information Required

    a. Project No.
    b. Identifying Item Number from proposal, if applicable
    c. Locations where material is proposed to be used, if applicable
    d. Name of submitting Contractor
    e. Personal signature and title of an official of the Contractor authorized to make shop drawings submittals
    f. Date of signature or submittal

The Contractor shall not receive payment for nor will he/she be allowed to install any item or materials which require shop drawing approval unless and until he/she receives shop drawing approval for that item.

Within 15 days after receipt of an approved shop drawing for any item, the Contractor shall provide the Engineer written proof that he/she has ordered such approved materials required on the subject Contract and a written confirmation on such order and delivery schedule from the manufacturer of the item. This delivery schedule shall be appropriate for timely completion of this project.

SAWCUTS

Sawcuts shall be made in existing pavements to provide a neat, square edge at limits of excavation and to provide a clean joint where new pavement and sidewalks are to match existing. Sawcuts shall also be made where shown on the Contract Drawings, or

otherwise directed by the Engineer. Sawcuts shall be made to the depth directed and shall be clean and even. All cuts shall be made using an approved power driven saw. All sawcuts shall be considered incidental and compensation will be included in the Contract bid prices for the related work items.

CONCRETE COLLARS

Concrete collars, as per the standard construction details, shall be placed around drainage and sewer and telephone structures, water service boxes, and utility boxes that are located in pavement areas as directed by the Engineer. High early strength concrete shall be used if required by the Engineer. Concrete used for collars shall not be measured for payment. Compensation shall be included in the Contract bid price for the respective items.

ASPHALT JOINTS

Tack coat and sand shall be applied to all joints composed of hot mix asphalt immediately after paving, or as required by the Engineer. Tack coat and sand, when applied to joints as described, shall be considered incidental and compensation shall be included in the Contract bid price for the respective hot mix asphalt items.

DEWATERING

Where excavations become inundated with water, whether from groundwater or surface runoff, the Contractor shall be responsible for dewatering the excavation prior to installing structures and/or pipes and backfill. Dewatering activities shall be performed in accordance with the details shown on the plans. Locations of materials and methods used for dewatering shall be approved by the Engineer prior to use. Costs associated with dewatering activities shall be considered incidental to the overall project, and no additional compensation shall be made.

PROTECTION OF EXISTING TREES

Trees and shrubs that are not designated on the plans, or by the Engineer, to be cut, removed, destroyed or trimmed shall be saved from harm and injury. The Contractor shall provide measures to prevent any harm and injury caused during construction operations.

DISTURBANCE OF EXISTING BOUNDS

Where existing bounds are disturbed by the Contractor's activities, they shall be reset by a Registered Land Surveyor at the Contractor's expense. Where the existing bounds conflict with the proposed construction, removal and resetting of the bounds shall be paid for under Item 711 - Bound Removed and Reset.

A certification by the Registered Land Surveyor performing the work shall be made and submitted to the Engineer for all bounds reset.

MATERIALS TESTING

All materials used in the construction of the project shall be subject to inspection, examination, or testing, by a certified materials testing laboratory as determined necessary by the Engineer.

RECORD DRAWINGS (AS-BUILT) DOCUMENTS

At the conclusion of construction and prior to final payment the Contractor shall submit ties to all curb stops, bends, valves and other water appurtenances installed as well as invert elevations for all drainage or sewer structures installed or altered as part of the Work under this Contract. Copies of legible and detailed field notes or marked up design plans shall be provided to the Engineer.

ITEM 120.1 UNCLASSIFIED EXCAVATION CUBIC YARD

The work to be done hereunder consists of removing and disposing of materials in accordance with the relevant provisions of Section 120 as amended and supplemented by the following: all materials obstructing the execution of other required work as shown on the plans and/or as directed except those materials for which payment is made as part of other items of this Contract.

The Contractor's attention is directed to the fact that materials shall be disposed of in accordance with the provisions written hereinbefore under the heading "Disposal of Surplus Excavated Materials".

Materials encountered in the excavation may include but are not necessarily limited to, earth, bituminous or cement concrete pavements and curb, Class A Rock, ledge, masonry, pipe, timber, cobblestones, stone pavers, cinders, trees and stumps, and other materials from previous constructions.

Where, in the opinion of the Engineer, the present roadway foundation is of suitable material, it shall only be excavated to a depth determined by the Engineer. Should unsatisfactory subgrade material be encountered, the Engineer may direct that excavation be carried to satisfactory material and the area be backfilled with gravel borrow, or other material, as directed by the Engineer. Payment for gravel borrow, if used, will be made under Item 151, Gravel Borrow.

Any work done or materials used for backfilling in excess of the depth authorized shall be at the Contractor's expense and will not be paid for under the Contract items involved.

The accepted quantity of Unclassified Excavation will be paid for at the Contract unit price per cubic yard under Item 120.1, Unclassified Excavation.

ITEM 129. PAVEMENT MILLING SQUARE YARD

This work to be performed under this Item shall conform to the relevant provisions of Section 120, supplemented by the following:

The adjusting of all drainage, utility, and municipality structures, gate boxes, and service boxes within the limits of areas to be cold planed and overlaid shall be done at the direction of the engineer. Payment for the adjustment of castings work is to be made at the unit bid price for the respective items.

Excavated material resulting from the milling operation shall be disposed of by the Contractor in accordance with the requirements of “DISPOSAL OF SURPLUS EXCAVATED MATERIALS”, payment for which is to be included in the unit bid price for Item 129.

The accepted quantity of Pavement Milling will be paid for at the Contract unit price per

square yard under Item 129.

ITEM 141.1. TEST FOR EXPLORATION CUBIC YARD

Excavate test pits, as shown on the plan or at the direction of the Engineer, to locate underground utilities or structures in advance of the construction. Backfill test pits immediately after their purpose has been satisfied and restore and maintain the surface in a manner satisfactory to the Engineer.

Payment for test pits will be based on the material removed which will be paid for at the Contract unit price per cubic yard. No additional compensation shall be made for the test pits not directed by the Engineer, or shown on the plan but is carried out at the discretion of the Contractor to benefit the installation.

The work to be performed under this Item shall conform to the relevant provisions of Section 140, amended or supplemented as follows:
The work to be performed under this Item consists of all work required to excavate test pits, as required, and as approved by the Engineer, to locate structures and utilities within the proposed work area. Also included is work required to backfill test pits with excavated material and compacting.

Work required to place and compact backfill to replace unsuitable material in test pits shall be paid for under Item 151, Gravel Borrow. Gravel borrow for pavement subbase will be paid under the same item.

Test pit for exploration shall be measured in accordance with Section 140 of the Standard Specifications.

Payment for test pit for excavation shall be at the contract unit price per cubic yard, which shall Be full compensation for all labor, material, tools and equipment necessary or incidental to complete the work including patching the test pit with Hot Mix Asphalt.

ITEM 144. CLASS B ROCK EXCAVATION CUBIC YARD

The work to be performed under this Item shall conform to the relevant provisions of Section 140 and the following:

The Contractor's attention is directed to the fact that materials shall be disposed of in accordance with the provisions written hereinbefore under the heading "Disposal of Surplus Excavated Materials".

Where, encountered in the construction of water, sewer and drain pipes and structures the removal and satisfactory disposal of all ledge and boulders greater than 1 cubic yard shall be measured and paid for under item 144. The removal shall be by blasting or power tools such as a hoe ram or jack hammer. Removal operations shall be so prosecuted that no damage will be caused to the adjacent structures.

Payment for Class B Rock Excavation will be based on the material removed within the pay limits as shown on the plans, which will be paid for at the Contract unit price per cubic yard. Payment shall include all necessary labor, materials, and equipment required to satisfactorily complete the work, including excavation, removal and disposal of rock (ledge) within the same trench. No additional compensation shall be made for the rock excavated outside of the pay limits or not directed by the Engineer, or shown on the plan but is carried out at the discretion of the Contractor to benefit the installation.

ITEM 151. GRAVEL BORROW CUBIC YARD

Refer to the Massachusetts Highway Department Standard Specifications for Highways and Bridges dated 1988, the Supplemental Specifications dated July 1, 2015, and the Interim Supplemental Specifications; the 2015 Construction Standard Details.

ITEM 153. CONTROLLED DENSITY FILL CUBIC YARD

The work to be performed under this Item shall conform to the relevant provisions of Section 150 and the following:

Excavatable Controlled Density Fill (CDF) shall be used as backfill material in trenches, abandoned structures or other locations if required by the Engineer. Materials shall meet the requirements specified in the following subsection of Division III, Materials: Controlled Density Fill, Type 2E M4.08.0.

Controlled Density Fill shall be placed in a manner such that no damage will occur to utility lines, pipes or structures. The material shall be placed so that no voids are left upon completion of the backfilling process.

Controlled Density Fill shall be measured in place by the cubic yard. Payment for Controlled Density Fill will be paid for at the Contract unit price per cubic yard. No additional compensation shall be made for material placed beyond the limits of excavation as shown in the plans or as determined by the Engineer.

ITEM 156. CRUSHED STONE CUBIC YARD

Refer to the Massachusetts Highway Department Standard Specifications for Highways and Bridges dated 1988, the Supplemental Specifications dated July 1, 2015, and the Interim Supplemental Specifications; the 2015 Construction Standard Details.

ITEM 182.2 REMOVAL OF ASBESTOS CEMENT PIPE FEET

This section specifies the requirements for handling and removal of asbestos containing material. The Contractor must perform all asbestos handling and removal work in accordance with these specifications and the following additional requirements.

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA) including but not limited to:

29 CFR 1910 Section 1001 and 29 CFR 1926 Section 58 Occupational exposure to Asbestos, Tremolite, Anthophyllite and Actinolite, Final Rule
29 CFR 1910 Section 134 Respiration Protection
29 CFR 1926 Construction Industry
29 CFR 1910 Section 2 Access to Employee Exposure and Medical Records
29 CFR 1910 Section 1200 Hazard Communication
29 CFR 1910 Section 145 Specifications for Accident Prevention Signs and Tags

U.S. Environmental Protection Agency, (EPA) including but not limited to:

40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no.134, July 12, 1985 p.28530 - 28540 Asbestos Abatement Projects Rule
40 CFR 61 Subpart A Regulation for Asbestos
40 CFR 61 Subpart M (Revised Subpart B) National Emission Standard for Asbestos
U.S. Department of Transportation 49 CFR 172 and 173

Massachusetts Department of Labor and Industries Regulations, (DLI) including but not limited to:

453 CMR 6.00 Removal, Containment and Encapsulation of Asbestos

Massachusetts Department of Environmental Protection (DEP) including but not limited to (supplementing subsection 7.01):
310 CMR 7.00, Section 7.09 Odor and Dust, Section 7.10 Noise, Section 7.15 Air Pollution Control Regulations Massachusetts Department Of Transportation Highway Division Project No. 605353.

310 CMR 18.00 and 19.00 Solid Waste Regulations

Massachusetts Division of Industrial Safety 45 CMR 10.00

Local Requirements including but not limited to those of Health Departments and Fire Departments.

Wherever there is a conflict or overlap of the above references, the most stringent provision shall apply.

All asbestos material shall be removed and properly disposed of by a Contractor or subcontractor with a current Massachusetts Abatement Contractors License issued by the Department of Labor and Industries. Work shall be supervised by a competent person as required by OSHA in 29 CFR 1926 to ensure regulatory compliance. This person must have completed a course at an EPA Training Center or equivalent course in asbestos abatement procedures, have had a minimum of four years on-the-job training and meet

any additional requirements set forth in 29 CFR 1926 for a Competent Person. This person must also be certified by the Commonwealth as an Asbestos Abatement Supervisor and Asbestos Abatement Project Designer as required by 453 CMR 6.00.

Asbestos removal work shall be coordinated with all other work under the Contract and shall be completed prior to performing any activities which could disturb the asbestos material or produce airborne asbestos fibers.
Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride will be implemented as required to control dusting during trenching and excavation. Alternatively, intrusive activities may be reduced or curtailed under high wind or heavy rain conditions, which in the opinion of the HASP may pose a safety hazard to the workers.

NOTIFICATION AND PERMITS
The Contractor shall prepare a formal pre-notification form at least ten (10) days prior to the start of asbestos removal work. This form must be submitted to the appropriate Regional Office of the Massachusetts Department of Environmental Protection and to the U.S. Environmental Protection Agency Region I Air and Hazardous Material Division. A copy of the submitted forms must be provided to the Engineer and kept at the work site.

The Contractor shall also obtain and pay all other applicable asbestos waste transportation and disposal permits, licenses and fees.

STANDARD OPERATING PROCEDURES
The standard operating procedure shall ensure the following:

1. Proper site security including posting of warning signs and restricting access to prevent unauthorized entry into the work spaces.
2. Proper protective clothing and respiratory protection prior to entering the work spaces.
3. Safe work practices including provisions for communications; exclusion of eating, drinking, smoking, or use of procedures or equipment that would in any way reduce the effectiveness of respiratory protection or other engineering controls.
4. Proper exit practices from the work space though the showering and decontamination facilities.
5. Removing asbestos containing material in ways that minimize release of fibers.
6. Packing, labeling, loading, transporting and disposing of contaminated material in a way that minimizes or prevents exposure and contamination.
7. Emergency evacuation of personnel, for medical or safety (fire and smoke) so that exposure will be minimized.
8. Safety from accidents in the work space, especially from electrical shocks, slippery surfaces and entanglements in loose hoses and equipment.
9. Provisions for effective supervision and OSHA - specified personnel air monitoring for exposure during work.

REQUIRED SUBMITTALS

The Contractor shall submit to the Engineer the following listed items at least ten (10) calendar days prior to the start of asbestos work. No asbestos removal work activities shall commence until these items are reviewed by the Engineer, unless otherwise waived. Submittals shall be clearly labeled and in sufficient detail to enable the Engineer to form an opinion as to its conformity to the specifications.

1. Name, experience and DLI certification of proposed Supervisors and Foreman responsible for asbestos work.
2. Summary of workforce by disciplines and a notarized statement documenting that all proposed workers, by name, have received all required medical exams and have been properly trained and certified for asbestos removal work, respirator use and appropriate Massachusetts DLI, EPA and OSHA standards. Massachusetts
3. Notarized statement that workers are physically fit and able to wear and use the type of respiratory protection proposed for the project. Notarized certification signed by an officer of the abatement contracting firm that exposure measurements, medical surveillance and worker training records are being kept in conformance with 29 CFR 1926.
4. Written plan of action and standard operating procedures to include: location and layout of decontamination areas; sequencing of asbestos work; detailed schedule of work activities by date and interface with other project activities which affect work performance; methods used to assure safety and security; worker protection and exposure monitoring; contingency and emergency evacuation procedures; detailed description of methods to be employed to control pollution; waste handling procedures.
5. Written respiratory protection program specifying level of protection intended for each operation required by the project and details of daily inspection and maintenance elements.
6. Copies of the U.S. EPA, State and local asbestos removal pre-notification forms. If applicable, lists and copies of all permits, licenses, or manifests which will be applied for and used.
7. Name, location and applicable approval certificates for primary and secondary landfill for disposal of asbestos-containing or asbestos contaminated waste. Name, address and licenses number(s) of hauler permitted to transport waste. (Submit copies of completed manifests upon disposal).

The Contractor must provide copies of daily inspection and record logs upon request of the Engineer, at any time during project. This information will include but is not limited to work area entry data, respirator inspections and maintenance, HEPA-exhaust inspections and maintenance and other work applicable activities or reports of accidents or unusual events.

Asbestos Cement Pipe removal shall be measured in linear feet. Payment for Asbestos Cement Pipe removal will be paid for at the Contract unit price per linear feet. No additional compensation shall be made for material removed beyond the limits excavation as shown in the plans or as determined by the Engineer.

ITEM 220	**DRAINAGE STRUCTURE ADJUSTED**	**EACH**
ITEM 220.2	**DRAINAGE STURCTURE REBUILT**	**VLF**
ITEM 220.7	**SANITARY STRUCTURE ADJUSTED**	**EACH**

The work to be performed under this Item shall conform to the relevant provisions of Section 220, supplemented by the following:

Structures to be adjusted shall be identified by the Contractor and approved by the Engineer prior to commencing with the work. Castings that are damaged due to the actions of the Contractor shall be replaced with new castings at his own expense. Structures that are adjusted will be paid for at the unit price per each, regardless of the number of times that structure is to be adjusted to a temporary or final grade. Payment for structures to be adjusted shall include modifications to the structure in line and/or grade of up to 3 feet. Adjustment of double inlet catch basins shall be counted as one unit.

If the Engineer determines that any castings require replacement, the Contractor shall install new castings as required under Items 221.1. If new castings are to be installed, payment for adjustment of the new castings shall be included under the item for the new casting.

Existing frames and grates or covers identified to be replaced shall be transported to the Public Works maintenance yard located at 169 Lexington St and stockpiled in a location identified by the engineer at no additional cost. Any frames and grates or covers determined by the Engineer to be of no further value to the City shall become the property of the Contractor and be disposed of off the project site by the Contractor without additional compensation.

Limits of drainage structures to be rebuilt shall be pre-approved by the Engineer. When in the judgment of the Engineer the masonry shows deterioration the structure shall be re-built in accordance with the provisions of Section 220.6.

Payment for the adjustment of structures shall include payment for all necessary labor, materials, and equipment required to satisfactorily complete the work, including removing and stacking existing castings to be replaced if required by the Engineer, initial setting of the new castings, adjustments to temporary grades, and adjustments to the final grade.

Drainage Structure Rebuilt will be measured by the vertical lineal foot, complete in place and will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment and incidental costs required to complete the work including

removal of deteriorated portions of the structure, brick, block and mortar as required to rebuild the structure.

ITEM 221.1 FRAME AND COVER - MUNICIPAL STANDARD EACH

The work to be performed under these Items shall conform to the relevant provisions of Sections 201 and 220, supplemented by the following:

Frames, grates and covers shall be LeBaron Foundry, Neenah Foundry or approved equivalent. The following model numbers refer to LeBaron products:

Frame and Cover for Drain and Sewer Manhole – LK 110A
Frames and Grates for Catch Basins and Gutter Inlets – LF 248.

Manhole covers shall have a diamond pattern; pick holes and the appropriate word "DRAIN" or "SEWER" cast in 3-inch letters to match the corresponding utility. Where 36" frames and covers are required, they shall be provided and installed at no additional cost. Casting frames shall be set in a full mortar bed with bricks, a maximum of 8 inches thick. All castings shall be set in a full concrete collar, conforming to Standard Detail 202.9.0.

Existing frames and grates or covers identified to be replaced shall be transported to a location Waltham identified by the Engineer at no additional cost. Any frames and grates or covers determined by the Engineer to be of no further value to the City shall become the property of the Contractor and be disposed of off the project site by the Contractor without additional compensation.

Frames and grates (or covers) - municipal standard will be measured for payment per each, complete in place and will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work including initial setting of the new casting, adjustments to temporary grades, and adjustments to the final grade.

ITEM 238.12 12 INCH DUCTILE IRON PIPE FOOT

The work to be done under this Item shall conform to the relevant provisions of Section 230 and the following:

Pipes shall be installed on a firm bedding of crushed stone if required by the Engineer. Extra depth excavation for installation of the crushed stone and the crushed stone itself shall be included in the payment for the drainage pipe being installed.

The removal of existing pipes within the same trench, excavation, backfill, the connection to existing or proposed drainage structures or pipes, crushed stone, the plugging of old pipes or holes in drainage structures, and the cutting of the ends of pipe to conform to the slopes of embankments shall be considered as incidental work under this Item at no additional compensation.

Limits of drainage structures to be rebuilt shall be pre-approved by the Engineer. When in the judgment of the Engineer the masonry shows deterioration the structure shall be re-built in accordance with the provisions of Section 220.6.
Payment for the 12 inch ductile iron pipe shall be made at the Contract unit price per foot, which price shall be full compensation for the removal and disposal of existing pipe (excluding Asbestos Cement) and appurtenances encountered during construction, cutting and plugging the existing pipe, and furnishing all materials, preparation and installation, including all excavation, backfilling and compaction, pipe bedding, testing, buried pipe identification tape, 12" of gravel roadway subbase, and for all labor, equipment, tools and incidentals necessary to complete the item. Crushed Stone used to replace unsuitable bottom material for water main bedding shall be paid for under Item 156.

ITEM 241.15 15 INCH REINFORCED CONCRETE PIPE FOOT

The work to be done under this Item shall conform to the relevant provisions of Section 230 and the following:

Pipes shall be installed on a firm bedding of crushed stone if required by the Engineer. Extra depth excavation for installation of the crushed stone and the crushed stone itself shall be included in the payment for the drainage pipe being installed.

The removal of existing pipes within the same trench, excavation, backfill, the connection to existing or proposed drainage structures or pipes, crushed stone, the plugging of old pipes or holes in drainage structures, and the cutting of the ends of pipe to conform to the slopes of embankments shall be considered as incidental work under this Item at no additional compensation.

Measurement and payment for 15 Inch Reinforced Concrete Pipe shall be at the contract unit price per foot, which shall be full compensation for all labor, material, tools and equipment necessary or incidental to complete the work.

Payment for the 15 inch reinforced concrete pipe shall be made at the Contract unit price per foot, which price shall be full compensation for the removal and disposal of existing pipe (excluding Asbestos Cement) and appurtenances encountered during construction, cutting and plugging the existing pipe, and furnishing all materials, preparation and installation, including all excavation, backfilling and compaction, pipe bedding, testing, buried pipe identification tape, 12" of gravel roadway subbase, and for all labor, equipment, tools and incidentals necessary to complete the item. Crushed Stone used to replace unsuitable bottom material for pipe bedding shall be paid for under Item 156.

ITEM 250.04 4 INCH POLYVINYL CHLORIDE SANITARY SEWER PIPE FOOT

The work to be done under this Item shall conform to the relevant provisions of Sections 201, 230 and the following:

The Contractor shall furnish, lay, join and test all gravity sewer pipe and appurtenant materials and equipment as indicated on the drawings and as specified herein.

1.0 MATERIALS

SANITARY SEWER PIPE

Gravity sanitary sewer pipe and fittings shall be SDR 35 (standard dimension ratio) Polyvinyl Chloride (PVC) gravity sewer pipe conforming to current ASTM standards. Joints shall be elastomeric gasket joints, providing a watertight seal, conforming to ASTM D3212 (Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals).

2.0 EXECUTION OF WORK

2.1 SEWER BYPASS

Prior to starting any sewer work, the Contractor shall submit to for approval a written sewer bypass plan indicating the proposed method of controlling and managing flows in the existing sewer during construction. Temporary service shut downs for individual residences shall only occur during normal working hours, with service restored at the end of each work day, and the work shall be scheduled so that temporary shut downs will not be required for more than one day per service.

2.2 LINES AND GRADES

A. Pipes shall be laid to the lines and grades shown on the drawings or as directed by the Engineer. The grade shown on the profile is that of the invert of the pipe. The work shall conform to this grade. A variation of one-eighth (1/8) inch or more from the true invert grade on gravity sewers laid on grades above one percent will be deemed sufficient reason to cause the work to be rejected. Work so rejected shall be corrected by the Contractor at his/her own expense.

B. The Contractor will establish the location of the pipe, manholes and other appurtenances, prior to construction for verification by the Engineer. The Engineer will establish bench marks along the route of the pipeline at convenient intervals for the use of the Contractor and for his/her own reference in checking the pipe and manhole inverts and other elevations throughout the project.

C. The grade and alignment of the pipe may be maintained, with the approval of the Engineer, by the use of laser beams if the Contractor can demonstrate that he/she possesses sufficient equipment and employs with sufficient experience, to utilize such method.

D. The Contractor shall furnish all labor, material, surveying equipment and tools to establish and maintain all lines and grades from basic control points furnished by the Engineer.

2.3 FOUNDATIONS

A. All pipes to be laid in open trench excavation shall be bedded and uniformly supported over their full length on foundations of the types specified and shown on the drawings. Flat-bottomed trenches shall be excavated and dewatered prior to preparing the specified bedding. All work shall be performed in a dry trench.

B. All pipe shall be supported on a stable soil foundation. The trench shall be excavated to a depth 6'' minimum below the bottom of the pipe. Crushed stone bedding shall be furnished and placed in the trench for its full width to uniformly support the pipe at the required line and grade. Suitable recesses shall be provided in the bedding to permit adequate clearance for bells, couplings, or similar projections. The bedding shall extend upward around the pipe barrel to a height of 12” above the pipe. Bedding material shall be spread in 6 inch layers, and each layer shall be compacted with twenty pound hand tampers or pneumatic tampers until the required total depth of bedding has been built up.

C. Where unstable soil conditions are encountered, the pipe shall be supported on a special foundation. The foundation shall be installed where a suitable supporting soil or rock stratum occurs at a depth greater than 6''minimum. The trench shall be excavated to the depth necessary to reach the suitable supporting stratum. The trench bottom and walls shall be covered with a geotextile fabric. Crushed stone shall then be furnished as bedding and placed in the trench for its full width. The bedding shall be spread in 6 inch layers, and each layer shall be compacted with twenty pound hand or pneumatic tampers. The bedding shall carry vertically from the supporting stratum up to an elevation 12'' minimum above the top of the pipe. The special foundation shall extend for a minimum of 5'-0'' beyond poor subgrade conditions.

D. Where required by the Engineer, check dams within the trench shall be constructed with an impervious soil material to prevent migration of groundwater around the sewer pipe along the backfilled trench. Check dams shall extend the width of the trench to undisturbed earth for a length of 3 feet along the pipe line, and shall extend to the top of the crushed stone bedding material, one foot above the pipe.

E. Manhole structures shall be installed on a firm bedding of 12” crushed stone. Extra depth excavation for installation of the crushed stone and the crushed stone itself shall be included in the payment for the structure being installed.

2.4 INSPECTION OF PIPE BEFORE INSTALLATION

A. All pipes and fittings shall be carefully inspected in the field before placing the trench. Cracked, broken, warped, out-of-round or otherwise defective pipe, fittings as determined by the Contractor or Engineer, shall be pulled and not installed. Such rejected pipe shall be pulled and not installed. Such rejected pipe shall then be removed from the job site by the Contractor at his/her own expense.

2.5 INSTALLATION OF PIPE AND FITTINGS

A. After the trench has been brought to the proper grade, as hereinbefore specified, the pipe shall be laid. Unless otherwise approved by the Engineer in writing, pipe laying shall be done only in the presence of the Engineer. The Contractor shall give ample notice of his/her schedule for pipe laying operations to the Engineer.

B. All pipe and fittings shall be carefully lowered into the trench with ropes, slings and proper equipment. Pipe cracked or otherwise damaged during or following installation shall be marked by the Contractor or Engineer and removed from the site as required.

C. Pipes shall be laid true to the grades shown on the drawings. Blocking will not be permitted except where the pipe is to be encased in concrete. Any pipe that has its grades or joints disturbed after laying shall be taken up and relayed. The interior and ends of all pipe shall be thoroughly cleaned during laying operations by means of plugs or other approved methods. Under no circumstances shall pipe be laid in water and no pipe shall be laid when trench conditions or the weather is unsuitable for such work except by permission of the Engineer.

D. Sanitary sewer cleanouts shall be installed at the property line to within 4-inches below the final grade and shall be capped with a cast iron ring and cover, fitted over the plugged PVC riser to provide protection from damage and allow future access for cleaning and inspection.

2.6 INSPECTION

A. Each section of installed sewer lines shall be visually inspected by the Engineer prior to final testing. The pipe shall be true to both line and grade, shall contain no broken pipe, shall show no leaks, shall show neither obstructions nor the projection of connecting pipes into the main pipe, and shall contain no debris or other deposits which will in any way reduce the full cross-section area of the pipe.

B. Any section of sewer pipe which does not comply with these inspection criteria, as determined by the Engineer, shall be promptly corrected, replaced or repaired by the Contractor at his/her own expense. Methods used for the correction shall be approved by the Engineer.

3.0 TESTING

4.0 MEASUREMENT AND PAYMENT

SANITARY SEWER PIPE

PVC sanitary sewer pipe will be measured in feet, from end of pipe to end of pipe installed including fittings, and paid for at the Contract unit bid price per foot of the respective pipe item. Payment shall include all necessary labor, materials, and equipment required to

satisfactorily complete the work, including excavation, removal and disposal of existing pipes within the same trench, crushed stone bedding, geotextile fabric where required, trench check dams, the connection to existing or proposed sanitary sewer structures or pipes, fittings, backfill, 12” of gravel roadway subbase, and testing.

Chimneys will be paid for under the respective pipe diameter item per vertical foot of chimney no separate payment will be made for polyethylene pipe, fittings, concrete, sand or other materials required to satisfactorily install the chimney to the specifications and detail drawings.

There will be no additional payment for cutting and plugging existing sanitary sewer lines as shown on the Contract Drawings.

Rock excavation when encountered in the trenching operation shall be paid for under Item 144.

ITEM 252.15 15 HIGH DENSITY POLYETHYLENE PIPE FOOT

The work to be done under this Item shall conform to the relevant provisions of Section 230 and the following:

Pipes shall be installed on a firm bedding of crushed stone if required by the Engineer. Extra depth excavation for installation of the crushed stone and the crushed stone itself shall be included in the payment for the drainage pipe being installed.

The removal of existing pipes within the same trench, excavation, backfill, the connection to existing or proposed drainage structures or pipes, crushed stone, the plugging of old pipes or holes in drainage structures, and the cutting of the ends of pipe to conform to the slopes of embankments shall be considered as incidental work under this Item at no additional compensation.

Payment for the 15 High Density Polyethylene Pipe shall be made at the Contract unit price per foot, which price shall be full compensation for the removal and disposal of existing pipe (excluding Asbestos Cement) and appurtenances encountered during construction, cutting and plugging the existing pipe, and furnishing all materials, preparation and installation, including all excavation, backfilling and compaction, pipe bedding, testing, buried pipe identification tape, 12” of gravel roadway subbase, and for all labor, equipment, tools and incidentals necessary to complete the item. Crushed Stone used to replace unsuitable bottom material for pipe bedding shall be paid for under Item 156.

ITEM 301.1 TEMPORARY WATER MAIN BYPASS (BASE BID) LUMP SUM
ITEM 301.2 TEMPORARY WATER MAIN BYPASS (ADD ALT) LUMP SUM

The work to be done under these Items shall conform to the relevant provisions of Section 301 and the following:

The work to be performed under these items shall include furnishing all equipment, materials, labor and other materials required to install and maintain temporary water service for all sections of the water system which may be temporarily out of service due to construction. Temporary water service is anticipated to be needed for the entire neighborhood to maintain water service until the new main is in operation.

Compensation for the preparation and submittal of Temporary Bypass Plan to the Engineer for approval, including addressing Engineer's comments and resubmittals shall be considered included in the Lump Sum payment under the respective item.

1.0 MATERIALS

1.1 GENERAL

A. The temporary service pipe, temporary hydrants and all other connecting materials shall be of the best quality materials and shall be capable of withstanding the required pressures and all other conditions of use. The temporary by-pass water main shall be a minimum size of four (4) inches unless otherwise approved by the Fire Department.

1.2 TEMPORARY BY-PASS WATER MAINS

A. The temporary by-pass water main, herein referred to as temporary service pipe, shall be steel water pipe with steel or victaulic couplings and all other necessary appurtenances. Certain types of plastic pipe may be used if approved by the Engineer prior to construction. Submittals to the Engineer will be required for approval of any plastic piping.

B. Pressure reducing valves shall be used in all areas as required.\

1.3 TEMPORARY HOUSE SERVICE CONNECTIONS

A. Temporary house service hose connections shall be standard industry 3/4-inch hard rubber hose capable of withstanding the usual water system pressures. No plastic or soft rubber hose shall be allowed. Polyvinyl chloride (PVC) pipe is not acceptable for temporary house service pipe.

1.4 EMERGENCY FIRE CONNECTIONS

A. Valves for emergency fire connections shall be installed and maintained on the 4-inch temporary water main where existing hydrants are taken out of service. At location shown

in the plan or at locations directed by the engineer, a 4-inch temporary fire hydrant shall be provided which has a 2 ½ -inch standard fire connection set in a horizontal position. Contractor shall supply Waltham Fire Department with ten wrenches or tools needed to operate temporary fire connections.

2.0 EXECUTION OF WORK

2.1 GENERAL

A. The work of providing suitable safety precautions to prevent any interruptions of water service during the period of temporary water service shall be the responsibility of the Contractor.

B. Before starting any work that will affect service to any customers, the Contractor shall notify the Owner and affected customers at least 48 hours in advance.

C. The Water and Sewer Division and the Contractor shall shut off curb stops and valves to individual services after the Contractor has installed all temporary services to the satisfaction of the Owner and prior to starting any work which will affect existing water service.

2.2 TEMPORARY BY-PASS WATER MAIN

A. The Contractor shall furnish, install, maintain and remove the by-pass piping to adequately supply potable water to all consumers currently supplied by the existing water main. Whether it is being installed, in service, or being removed, the amount of temporary service pipe kept on the job shall be the minimum that will allow the work to continue at a reasonable rate.

B. The by-pass piping shall be connected to the existing hydrants. The Contractor shall do all the work necessary to place the by-pass pipe in operation including all required connections and appurtenances. Gate valves and pressure reducing valves shall be provided at the connections to all existing hydrants.

C. Temporary service pipe construction shall not be installed without prior approval of the Engineer. The Engineer shall work with the Contractor on the field layout of all temporary water service pipe.

D. The Contractor shall do all the necessary excavating for any connections of the temporary service pipes to existing live water mains and make all such connections as shown on the Drawings or as directed by the Engineer in the field. The Contractor shall also furnish, install, maintain, connect, disconnect and remove individual temporary service lines to all water customers.

E. Generally, the temporary service pipe shall be laid in the gutters or off the road at the back of sidewalks or beyond the edges of the existing pavement. At street intersections,

driveways, walkaways and other locations when crossing the road, the temporary service pipe shall be buried and temp patched as shown on the plans and details. Hot mix asphalt shall be used to cover all temporary service pipe at all street crossings. No cold patch, gravel, crushed stone, or stone dust shall be used for trench surfacing unless previously approved by the Engineer in writing.

2.3 VALVES

A. All service pipe shall be suitably valved at designated places which meet with the approval of the Engineer. Individual shutoff valves shall be provided at each temporary house service or building connection. Line valves shall be located no further than one block or 1,000 feet apart, whichever is less. Suitable valved emergency fire connections shall be installed and maintained on the four-inch temporary water main adjacent to each existing fire hydrant which is scheduled to be out of service.

2.4 PROTECTION

A. The pipe and all other connections shall provide adequate water tightness and be free from excessive leaks. Care shall be exercised during the installation of the temporary pipe and especially during the connection to all house services such that pollution of all water mains and house services is prevented and contamination of the by-pass pipe itself is avoided.

2.5 DISINFECTION

For Disinfection of Temporary Water Main Bypass refer to the Specification for Item 302 Ductile Iron Water Pipe under Disinfection and Flushing.

Pipe disinfection shall be performed in accordance with AWWA C651 – Disinfecting Water Mains.

2.6 MAINTENANCE

A. The Contractor shall be responsible for the maintenance of the temporary by-pass pipe at all times especially after the end of the normal work day, any non-work day, and on all weekends and holidays without exception. He shall be responsible for the immediate correction of any interruption of service caused by any vandalism, physical damage or other condition and shall provide a plan suitable to the Engineer and Water Superintendent for immediate corrective action in writing. This plan shall include the name, address and telephone number of the principle personal and an alternate to be contacted after normal working hours in the event any temporary service interruption occurs. Such information shall be given to the Town Engineer, Water Superintendent, Fire Chief, and Police Dispatch Personnel. It shall be current at all times.

B. If service interruption occurs and the designated personnel or the Contractor cannot be reached for any reason, or if they fail to respond to the emergency situation, then any

costs associated with other personnel responding to remedy the situation shall be back-charged to the Contractor and deducted from any monies due him. In no case will any home or facility (building) be without adequate water supply at the end of any work day, weekend or holiday.

C. The Contractor shall maintain the temporary service pipe crossings at all streets with hot mix asphalt as required.

3.0 MEASUREMENT AND PAYMENT

Item 301.1 and 301.2 Temporary Water Main Bypass will be measured and paid for as lump sums. Payment shall include all necessary labor, materials, and equipment required to satisfactorily complete the work including pipe, fittings, appurtenances used for testing including corporations and copper or plastic tubing, valves, temporary water services, excavation, backfill, disinfection, flushing, laboratory testing of water samples, maintenance of the system, removal of the system at completion of the work, and all other equipment and materials considered incidental to the satisfactory completion of the Item.

Compensation for the preparation and submittal of Temporary Bypass Plan to the Engineer for approval, including addressing Engineer's comments and resubmittals shall be considered included in the Lump Sum payment under the respective item.

Temporary hot mix asphalt used to create asphalt pad where the temporary service pipe crosses streets shall be included in the lump sum bid price for the respective Temporary Water Main Bypass item.

After completion of the waterline work and removal of the bypass water main, the asphalt pads at cross streets and driveways shall be removed and the surfaces restored to its original condition. If the removal of the asphalt pad causes damage to the streets or driveways the surface shall be permanently patched with hot mix asphalt. No additional payment shall be award for this item.

At the Engineer's discretion, temporary patching with hot mix asphalt may be used in locations where subsequent roadway paving will occur after completion of the water main work. In this case, temporary patching will be measured and paid for under Item 472.1 Hot Mix Asphalt for Patching.

ITEM 302.06	**6 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET)**	**FOOT**
ITEM 302.08	**8 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET)**	**FOOT**
ITEM 302.12	**12 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET)**	**FOOT**
ITEM 302.16	**16 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET)**	**FOOT**
ITEM 309	**DUCTILE IRON FITTINGS FOR WATER PIPE**	**POUND**

Under these items, the Contractor shall furnish, lay, joint, test and disinfect all water pipe and fittings, as indicated on the Contract Drawings and in accordance with the relevant provisions of Section 140 and Section 300 of the Standard Specifications, the American Water Works Association Standards, and in accordance with the current practice and standards of the Waltham Water & Sewer Division.

The Contractor shall be responsible for notifying the Waltham Water & Sewer Division and the Engineer of service shutdown 48 hours prior to the actual shutdown. The shutdown of the water services will be performed only by personnel of the Waltham Water & Sewer Division. Valves, hydrants, corporations and curb stops will be operated by the Waltham Water & Sewer Division personnel only.

No water main or service supplying any home, place of business or fire hydrant shall be shut down for more than four hours unless an approved temporary means of supply is provided. Such temporary provisions will be considered as being for the convenience of the Contractor and as much will not be measured for direct payment.

The Contractor will be responsible to flyer affected areas prior to planned water service interruption 48 hours in advance. In the event of an emergency shutdown during and after normal hours of operation the Contractor shall contact Waltham Water & Sewer Division 781-314-3855 immediately to affect shutdown. During normal hours of operation Contractor will make every attempt to notify the abutters affected by the emergency water service interruption with sensitive receptors such as schools, day care providers, restaurants and businesses receiving priority status in notification.

Data relative to existing water mains, services, etc. shown on the plans has been compiled from plans and field information but such data is not guaranteed as to exact location or elevation.

Lines and Grades

Piping shall be installed at the locations indicated on the Contract Drawings and as designated in these Specifications. Unless otherwise shown or stated, the minimum total finished cover over the top of the barrel of all installed pipe shall be 5 feet. Where pipe is installed at less than the required cover, the Contractor shall furnish and install insulation as directed by the Engineer.

All excavation necessary for the pipe installation shall be included in the cost of the pipe. The location of the pipe is to be marked with an identification tape buried 2 feet below finished grade. The tape shall be 6 inches in width by 0.004 inches in thickness and shall read "Caution - Water Line Buried Below".

Pipe Foundations and Backfilling

All pipes, fittings and appurtenances to be laid in open trench excavations shall be bedded in and uniformly supported over its full length as shown on the Contract Drawings.

Backfill to an elevation 12 inches over the top of the pipe shall be a sand blanket placed in layers not to exceed 6 inches. The sand shall conform to Section M1.04.0 Type A for sand borrow. The sand blanket may be omitted, and suitable excess excavated material used for backfilling over the pipe, provided that no stone larger than 2 inches is in contact with the water pipe. The sand blanket shall be considered incidental to the water pipe items.

Unsuitable trench backfill material shall be replaced with suitable excess excavated material. Gravel borrow or another material approved by the Engineer shall be used for backfill if suitable excess material is not available.

Inspection of Pipe Before Installation

All pipe, fittings and appurtenances shall be carefully inspected in the field by the Engineer before lowering into the trench. All pieces found to be defective as determined by the Engineer, shall be pulled out and not installed. Such rejected pipe shall be clearly tagged in such a manner as not to deface or damage it, and the pipe shall be removed from the job site.

Installation of Pipe and Fittings

The Contractor shall maintain at least 10 feet horizontally from any existing or proposed sewer pipe. If this separation is not attainable, then the elevation of the crown of the sewer shall be at least 18 inches below the invert of the water line.

All pipe and fittings shall be carefully handled by equipment of sufficient capacity and proper design to avoid damage to the pipe and fittings. No defective pipe or fittings shall be laid or placed in the trench. Any piece discovered to be defective after having been laid shall be removed and replaced by a sound and satisfactory piece at the expense of the Contractor.

Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.

Pipe and fittings shall be laid accurately to the lines and grade indicated on the drawings or as required. Care shall be taken to ensure alignment both horizontally and vertically, and to give buried pipe a firm bearing along its entire length. Pipes shall not be laid in water, nor shall water be allowed to flow through them. The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench.

Backfilling of the pipe trench shall be done as specified under Section 300 of the Standard Specifications.

Connection to Other Facilities

The water pipe shall be connected to existing or new structures and/or piping by the Contractor as shown on the Contract Drawings. Test pits shall be dug as directed by the Engineer to verify the size and the type of existing pipe where connections are to be made. The Contractor shall furnish and install all such fittings and appurtenances as are necessary to make the connections shown whether all such fittings are detailed or not. Couplings, where required, shall be of a type equal to HYMAX® by Krausz; Smith Blair, Style 441; Dresser, Style 253 or equal approved by the Water Superintendent. Couplings shall be provided with plain, Grade 27 rubber gaskets and with black, steel, track-head bolts and nuts.

All fittings relative to the water pipe shall be paid for under Item 309. All concrete for thrust blocks shall be considered incidental to the pipe and fitting items. The other means of restraint (method of restraining may either be of an interlocking type or mechanical joint with retainer and as specified by the Waltham Water & Sewer Division) shall be installed in addition to or in lieu of thrust blocks as directed by the Water Superintendent. Pipe anchors shall be used when and as directed.

Laying Pipe and Fittings

Gasket type joints shall be made up by first inserting the gasket into the groove of the bell and applying a thin film of special non-toxic gasket lubricant uniformly over the inner surface of the gasket which will be in contact with the spigot end of the pipe. The end of the plain pipe shall be chamfered to facilitate assembly. The end shall be inserted into the gasket and then forced passed it until it seats against the bottom of the socket. A metal feeler shall then be used to make certain the gasket is properly located.

A minimum of two brass wedges shall be installed per pipe joint and fitting to maintain conductivity and facilitate locating pipe in the future. Restrained type joints shall be used where straight pipe joints are deflected to bend pipe line on a curve. The method of restraining may either be of an interlocking type or mechanical joint with retainer gland as specified by the Waltham Water & Sewer Division.

Reaction or thrust blocks of concrete shall be constructed at all tees, plugs and bends, as directed or as detailed on the drawings. 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. Joints must be protected by felt roofing paper prior to placing concrete. Method of restraint may be either locking joint or mechanical restraint as approved by the Water Superintendent.

Hydrant connections are to be restrained for the full length of the pipe from the main to the hydrant.

Ductile Iron Pipe and Fittings

All material shall be new, conform to the current standards of the Waltham Water & Sewer Division and be approved by them.

All ductile iron pipe shall be designed in accordance with AWWA C150 and shall be manufactured in accordance with AWWA C151.

The ductile iron pipe shall be **Thickness Class 56** cement lined seal coated and conform to the ANSI A21.50, A21.51 Specification for Ductile Iron Pipe. Pipe joints and gaskets shall be of the push-on joint type in accordance with ANSI A21.11 and shall conform to AWWA C111.

Ductile iron fittings shall be Thickness Class 56, Pressure Class 350, cement lined, and shall meet the requirements of AWWA C153, ANSI A21.4 and A21.10. All fittings are required to be equipped with mechanical joints and retainer glands. Mechanical joint fittings in sizes 6 inches through 24 inches shall be ductile iron compact fittings.
Gaskets, glands, nuts, bolts and accessories shall conform to AWWA C111 or C153 as appropriate. Gaskets shall be of plain tipped rubber, suitable for exposure to the liquid within the pipe. Glands shall be ductile or cast iron. Bolts and nuts shall be high strength alloy.

Hydrant tees shall be anchor type and have line bells conforming to the requirements of the main pipe. The branch shall have a plain end with an integral gland and rotating mechanical joint gland to provide a restrained connection.

Pipe and fittings shall be furnished with approved joint restraining appurtenances as specified herein, or as indicated on the drawings, to keep the piping from pulling apart under pressure.

Flexible Couplings:

The Contractor shall use solid sleeve coupling fittings for joining pipe. With the approval of the Engineer, sleeve-type flexible couplings may be substituted.

All sleeve-type couplings and accessories shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed.
Couplings shall be cast or ductile iron and shall be provided with gaskets of a composition suitable for exposure to the liquid within the pipe.

Joint Restraints:

Where indicated or necessary to prevent joints or sleeve couplings from pulling apart under pressure, anchoring and joint restraint methods shall be utilized. Methods shall be restrained joint systems. The number of joints to be restrained shall be as shown on the construction plans or provided by the Engineer.

Restrained joint system for standard mechanical joint or push on joint pipe shall be Megalug™ by EBAA Iron Sales Inc.; 1400 Series by Ford; StarGrip 3000 Series by Star Pipe Products; or approved equal. Methods that rely on the use of friction clamps and/or retainer glands with set screws alone are not acceptable.

Concrete thrust blocks may only be used for 6-inch, 8-inch, 10-inch, or 12-inch pipe where use of a joint restraint system is not feasible. Use of concrete thrust blocks shall be installed with the minimum bearing area (in square feet) against undisturbed material in accordance with the following:

Size of Main	90° Bends, Tees, Caps and Plugs	45° Bends and Wyes	22½° Bends	11¼ ° Bends
6 & 8 in	5	4	2	2
10 & 12 in	12	9	5	2

Tie rods may only be used for 6-inch, 8-inch, 10-inch, or l2-inch pipe where use of a joint restraint system is not feasible. Bolts shall have adequate length to allow nuts on both sides of the gland. Tie bolts shall have the same diameter as the tie rods and be in accordance with the following:

Pipe Size	Tie Rod	
	Number	Diameter
6	2	½”
8	2	¾”
10	2	¾”
12	4	¾”

Lining Coating

The inside of ductile iron pipe and fittings shall be given a cement lining and bituminous seal coat in accordance with AWWA C104/ANSI A21.4. Cement lining shall be double the thickness that is specified in AWWA C104.

The outside of ductile iron pipe and fittings shall be coated with bituminous varnish as required by AWWA C104/ANSI A21.4.

Machined surfaces shall be cleaned and coated with a suitable rust preventive coating at the shop immediately after being machined.

Handling and Cutting Pipe

The Contractor's attention is directed to the fact that the cement lining is comparatively brittle. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe or lining, scratching or marring machined surfaces, and abrasion of the pipe coating or lining.

Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

If any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved by the Engineer, may be cut off before the pipe is laid so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack. The cracked portion shall not be included as part of the measurement for payment under this section.

Temporary Plugs

At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

Deflection of Pipe

In laying ductile iron pipe, the following deflections, based upon a 20 foot length of pipe, shall not be exceeded.

Nominal Size of Pipe (inch)	Gasket Type Jacket Deflection (inch)
6 to 12	12
16 to 24	10

Field Testing

The testing shall conform to AWWA Standard C600, and all equipment shall be approved by the Waltham Water & Sewer Division. The water pipe shall be given pressure and leakage tests in sections of approved length. For these tests, the Contractor shall furnish a water measuring device and a pressure gage. The Contractor shall also furnish and install suitable temporary testing plugs or caps for the pipeline; all necessary pressure pumping equipment, pipe connections, and other similar equipment; and all labor required; all without additional compensation. Compensation for testing shall be included in the unit price for pipe and fittings. The meter and gage shall be installed by the Contractor in such a manner that all water entering the section under test will be measured and the pressure in the section indicated, and equipment shall be kept in use during both tests.

The scheduling of pressure and leakage tests shall be as approved by the Engineer.

Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If air release assemblies are not available at high points for releasing air, the Contractor shall make the necessary excavations and do the necessary backfilling and shall make the necessary taps at such points and install corporation stops. Corporation stops shall be capped with brass or bronze caps upon completion of the test and left in place.

The pressure and leakage tests shall be as specified in Section 301.60 L of the 1988 Standard Specifications for Highways and Bridges and the American Water Works Association Standard C600, Section 4.1. The test pressure shall be 200psi, the test duration shall be 2 hours.

The lengths of joint to be used in determining the allowable leakage shall be based on the nominal diameter of the pipe.

If the section shall fail to pass the pressure test, the leakage test, or both, the Contractor shall do everything necessary to locate, uncover, even to the extent of uncovering the entire section, and repair or replace the defective pipe, fitting, or joint, all at no additional cost to the owner and without extension of time for completion of the work.

A report containing calculations and documentation pertaining to the pressure and leakage testing shall be submitted to the Waltham Water & Sewer Division

If, in the judgment of the Engineer, it is impracticable to follow the foregoing procedure exactly for any reason, modification in the procedures shall be made as required or approved, but in any event the Contractor shall be responsible for the ultimate tightness of the line within the above leakage requirements.

The Owner, at its own expense, may test the water pipe independent of or in place of the Contractor's test. The Owner, or its agent, shall schedule such test so as to minimize any delay to the Contractor. The Contractor is notified that this test may cause delay in his/her work and he/she shall not receive reimbursement for costs incurred during a reasonable delay. Should any section of pipe fail, the Contractor shall have no claim for any expenses incurred during the delay required to schedule and complete a new test.

Insulation: Direct Buried Pipe

Insulation shall be cellular glass type. The insulation shall be a cellular glass product that is made specifically for thermal insulation of piping and is compatible with the piping material. Insulation shall be a minimum of 2 inches thick, unless otherwise shown on the drawings.

Insulation shall be composed of all glass sealed cells having no binders or fillers. The completed product shall be rigid and impermeable, with an ultimate compressive strength of at least 90 psi. The thermal conductivity of the cellular glass shall be no higher than 0.29 BTU-in.1hr e ft2 CII OF @ 75°F and 0.28 BTU-in.1hr iii ft2 CII OF @ 50°F.
The cellular glass insulation shall comply with all requirements of ASTM C552. The cellular glass shall be fabricated in half sections whenever possible.

Bands for securing the insulation to the pipe shall be 0.5 inches wide by 0.020 inches thick made of stainless steel.

The jacketing for the insulation shall be one of the following methods:

1. A 125 mil (3mm) thick, heat sealed high polymer asphaltic membrane with an integral glass scrim and integral 1 mil (.02mm) aluminum foil and a thin Mylar film on the surface, equal to Pittwrap Jacketing as manufactured by Pittsburgh Coming or equal.

2. Mastic - asphalt cutback mastic, equal to Pittcote 300 Finish, as manufactured by Pittsburgh Coming or equal.
3. Reinforcing fabric - an open mesh polyester fabric with a 6 x 5.5 mesh/inch configuration, equal to PC Fabric 79, as manufactured by Pittsburgh Coming or equal.

The insulation shall be "Foamglass" with jacketing as manufactured by Pittsburgh Coming Corporation, Pittsburgh, P A, or an approved equal. A minimum of 6" layer of fine sand shall surround the insulated pipe before rock free backfill is used in the trench.

The Foamglass and jacketing shall be installed per the manufacturer instructions included in the approved shop drawings.

Tees, valves, and bends shall be covered with form fitting factory made sections.

Cellular glass shall not be applied to the piping until the piping has been wiped clean and supported so that there is adequate space to apply the full thickness of insulation and the covering completely around the pipe. The Contractor must obtain the Engineer's approval before the installation begins.

Cellular glass insulation and jacketing shall be applied in accordance with the manufacturers installation procedures included in the approved shop drawings.

There shall be at least three 0.50-inch wide stainless steel bands secured around each joint and these bands shall be placed not over 9 inches on center on straight sections of pipe. Tees, valves, and bends shall be covered with form fitting factory made sections.

All testing of the piping system, such as hydrostatic, x-ray or other such testing, shall be accomplished prior to application of insulation.

Disinfection and Flushing

After a section of the main has been pressure tested and found acceptable, it shall be flushed free of all heavily treated water by the Contractor. After completion of the flushing operation, the Contractor shall disinfect the water mains with a solution consisting of 50 ppm of chlorine in accordance with the AWWA C651 Specifications for Disinfecting Water Mains. The preferable point of chlorine application shall be at the source of the water for the section being sterilized. The chlorine solution shall be fed into the pipe through a corporation stop, using a hypo chlorinator. This work shall be done with the attendance of a representative of the Waltham Water & Sewer Division.

The water shall be tested bacteriologically for coliform group bacteria and heterotrophic plate count. A minimum of one (1) sample location shall be used per 2,000 linear feet. On all new piping there will be at a minimum sampling locations at each end of the new pipe segment. Additional testing locations may be determined by the Engineer at no additional cost to the Owner. Testing must be done by a Massachusetts State Certified Laboratory and the results of all tests must be submitted to the Waltham Water & Sewer Division. The Contractor shall be solely responsible for all costs associated by the aforesaid test(s).

There will be a total of two (2) rounds of sampling for each section of main tested. The first round of samples shall be taken after the 24 hour disinfection period. The second round of samples shall be taken at least 24 hours after the first round of samples. During each round of sampling, two (2) separate samples shall be drawn from each sample location and sent for laboratory analysis. In the event a sample obtained fails laboratory analysis the Contractor must restart the testing process. The cost for all additional testing shall be borne solely by the Contractor.

The contact period for the disinfection shall be at least 24 hours and a longer period will be required if tests of residual chlorine show it to be necessary for proper disinfection. All valves and hydrants shall be operated during treatment to insure their thorough contact with the disinfecting solution.

Following chlorination, the mains shall be flushed again to remove any evidence of contamination, as determined by the bacteriological analysis. The quality of water shall remain acceptable for at least two days after the flushing.

A report containing amounts of water flushed, amounts of chlorine used and chlorine residuals after the test period must be submitted to the Waltham Water & Sewer Division. If the initial treatment fails to produce the desired result, the chlorination procedure must be repeated.

For this work, the Contractor shall furnish all equipment, materials, and labor required.

Water pipe shall be measured in feet, in place, along the axis of the pipe, excluding, however, the length occupied by new iron fittings and gate valves. Where two pipes join, measurement will be made to the intersection of the axis, excluding the length occupied by new ductile iron fittings.

New ductile iron fittings including socket clamps and tie rods shall 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 least weight.

Payment for ductile iron pipe shall be made at the Contract unit price per foot for water main of the size shown, which price shall be full compensation for the removal and disposal of existing water pipe (excluding Asbestos Cement) and appurtenances encountered during construction, cutting and plugging the existing water pipe, and furnishing all materials, preparation and installation, including all excavation, backfilling and compaction, pipe bedding, testing and disinfecting, appurtenances used for testing purposes including corporations and copper or plastic tubing, brass caps and wedges, buried pipe identification tape, cement lining, 12” of gravel roadway subbase, and for all labor, equipment, tools and incidentals necessary to complete the Item. Crushed stone used to replace unsuitable bottom material for water main bedding shall be paid for under Item 156.

Payment for new ductile iron fittings shall be made at the Contract unit price per pound of fitting installed and accepted, which price shall be full compensation for furnishing all materials, and for all labor, equipment, tools and incidentals necessary to complete the Item, including all excavation, backfilling and compaction, pipe bedding and sand blanket, testing and disinfecting.

Rock excavation when encountered in the trenching operation shall be paid for under Item 144.

The cost of the sand blanket over the water main shall be considered incidental to the cost of the ductile iron water pipe.

The cost of furnishing and installing concrete for thrust blocks shall be incidental to the pipe and fitting items

ITEM 347.1 1 INCH COPPER TUBING TYPE K FOOT

The Contractor shall install new water services and remove and dispose of existing water services as directed and in accordance with the relevant provisions of Section 140 and Section 300 of the Standard Specifications, amended and/or supplemented as follows:

Services shall be replaced with new 1 inch tubing up to the property line.

The depth of the service trench shall be at least 5 feet below the established finished grade and not more than 2.5 feet wide. All excavation, bedding and backfilling shall be included in the cost of the pipe.

Care shall be exercised to prevent dirt and other foreign matter from entering pipe and fittings. Corporation stops shall be left open (turned on) when the trench is backfilled.

The length of furnished and installed service pipe shall be measured beginning at the center of the corporation stop key. No deductions in length shall be made for curb stops or unions.to be paid for shall be measured by the foot, laid by the Contractor.

Payment shall be made at the Contract unit price per foot for furnishing and laying the service pipe complete in place and accepted by the Engineer. The prices shall include excavation, removing and disposing of existing services and unsuitable material from trenches, laying and connecting the new service, providing a three part union needed to connect the new service to the existing, fittings, goosenecks, bends, adapters, sand for bedding and backfill, 12” of gravel roadway subbase, and compactions.

Gravel borrow required to replace unsuitable backfill material as deemed by the Engineer shall be paid for under Item 151.

ITEM 350.6	**6 INCH GATE AND BOX**	**EACH**
ITEM 350.8	**8 INCH GATE AND BOX**	**EACH**
ITEM 350.12	**12 INCH GATE AND BOX**	**EACH**
ITEM 356.16	**16 INCH GATE AND BOX**	**EACH**

Under these Items, the Contractor shall furnish and install new valves, valve boxes and appurtenant materials and equipment, all as indicated on the drawings and as herein specified. Valves shall be applicable for a design working pressure of 250 psi.

Valves shall be equipped with mechanical joint ends and mechanical joint restraints as specified for Items 309 unless otherwise specified by the Water Superintendent. All internal and external surfaces must be epoxy coated, and the seal between the stem and bonnet must be composed of a cartridge.

Butterfly valves (16 inch and larger) for buried service shall conform to AWWA C504, except as hereinafter provided. Butterfly valves shall be rated for class 150b and both valve operators shall be especially designed for services buried in ground and be totally enclosed type. The unit shall be permanently lubricated with grease or oil. A standard AWWA 2-inch square operating nut shall be provided on the input shaft. Valves shall open to the right (clockwise)

Gate Valves shall be Resilient seat, wedge type gate valves shall be manufactured to meet all applicable requirements of AWWA C509 or AWWA C515. All valves shall be bubble-tight at 200 psi water working pressure, tested in both directions.

Valve bodies shall be of cast or ductile iron and shall have non-rising threaded bronze stems acting through a bronze stem nut. Opening nuts shall be 2 inches square and shall open right, clockwise. All buried valves shall have mechanical joint ends.

Valve wedges shall be of ductile iron with resilient seating surfaces permanently bonded to the wedges in strict accordance with ASTM D429 or attached to the face of the wedges with stainless steel screws. Each valve shall have a smooth, unobstructed water way free from sediment pockets.

Valves shall have low friction, torque-reduction thrust bearings. All O-rings and gaskets shall be removable without taking the valves out of service.

An NSF 61-approved epoxy coating, which is safe for potable water, shall be applied to exterior and interior valve surfaces.

Valves for horizontal applications shall have Delrin wedge covers, and be specifically designed for horizontal installation.

Resilient seat gate valves shall be as manufactured by Mueller Co., Decatur, IL; or approved equal.

Post indicating valve assemblies shall have a post and indicator as an integral part of the resilient seated gate valve assembly. The unit shall be provided with a detachable crank which OPENS the valve in a clockwise (RIGHT) direction. Shafts shall be Type 304 stainless steel. Post indicators and valves shall be UL listed, FM approved. Post indicators and valves shall be as manufactured by Mueller Co.; or approved equal."

Valve Boxes And Extensions:

Valve boxes shall be manufactured in North America. The minimum outside diameter of the boxes shall be 5¼ -inches and the lengths shall be as necessary to suit the ground elevation and the depth of each valve operator, regardless of the depth of cover.

When there is more than 6 feet of cover, valve operators shall have non-rising extension stems which raise the operating nut to a depth of approximately 4 feet below grade. The extension stem shall have a centering support ring at the upper end. The lower socket shall be tapped with a set screw into the valve nut to prevent the extension stem from lifting off the valve nut.

Each valve shall be provided with a box which has a close fitting cover and is substantially dirt-tight. Covers shall provide minimum overlap of 6 inches. The top of the cover shall be flush with the top of the box rim. The word "WATER" shall be cast in the top of the cover.

Valve boxes shall be of cast iron and of the adjustable sliding, heavy pattern type. They shall be so designed and constructed as to prevent direct transmission of traffic loads to the pipe or valve. The upper or sliding section of the box shall be provided with a flange on the top of the section (not on the bottom) having sufficient bearing area to prevent undue settlement. The lower section of the box shall be designed to enclose the operating nut and stuffing box of the valve and to rest on the backfill. The boxes shall be adjustable through at least 6 inches vertically without reduction of lap between sections to less than 8 inches.

Valve boxes shall be set plumb, flush with the ground or paved surface, and centered directly over the operating nut of the valves. Earth fill shall be carefully tamped around the valve boxes to a distance of 4 feet on all sides of the boxes or to the undisturbed trench face, if less than 4 feet.

Valves shall be operational and accessible at all times during construction and warranty period. The Contractor shall verify proper operation of all valves in the presence of the Engineer and/or Owner following completion of the project and prior to the acceptance of substantial completion.

Payment for gates and gate boxes shall be made at the Contract unit price for each unit installed which price shall be full compensation for furnishing all material, including excavation and backfilling, valve box and cover, and for preparation and installation, removal of existing valves and pipes, setting valve box to final grade, labor, equipment, tools, and incidentals necessary to complete these items.

ITEM 358 GATE BOX ADJUSTED EACH

The work to be done under these Items shall conform to the relevant provisions of Section 301 and the following:

Gate boxes, including service boxes, to be adjusted shall be identified by the Contractor and approved by the Engineer prior commencing with the work. Gate boxes and service boxes that are adjusted will be paid for at the unit price per each, regardless of the number of times that structure is to be adjusted to a temporary or final grade.

Service boxes and gate boxes are to be kept accessible during the construction period

for use in an emergency. Any existing boxes which are broken, damaged, or cannot be adjusted, shall be excavated to the depth of the existing gate valve and removed. The replacement box shall be set plumb at the same location. Gravel borrow backfill will be used and shall be thoroughly compacted with a power tamper. Adjustment to final grade shall be done just prior to placing the final pavement course or sidewalk material. Any castings determined by the Engineer to be of no further value to the Owner shall become the property of the Contractor and be disposed of off the project site by the Contractor without additional compensation.

Payment for the adjustment of gate boxes shall be at the contract unit price per each, complete in place, which price shall be full compensation for all necessary labor, materials, and equipment required to satisfactorily complete the work, including adjustments to temporary grades and adjustments to the final grade.

Work under this item will only be accepted if the water crew is able to operate the valve after the box has been replaced and/or reset.

ITEM 363.1 1 INCH CORPORATION COCK EACH

Under these items the Contractor shall furnish and install corporation cocks on all service lines as shown on the Plans and in accordance with the Relevant Provisions of Section 140 and Section 300 amended as follows.

Corporation cocks shall be of bronze, made from castings, the materials of which conform to ANSI/ASTM Standard Specification B61-76 or B62-76, latest issue.

Couplings shall be of bronze, made from castings, the material of which conforms to ANSI/ASTM Standard Specification B61-76 or B62-76, latest issue.

Each cock shall be individually tested under a hydrostatic head of 250 psi and a statement of the manufacturer shall be supplied to the Engineer prior to installation certifying that each stop supplied has been found to be watertight prior to leaving the factory.

Each corporation cock shall have a solid plug which freely operates and has a full, round, smooth, reamed waterway. Cocks shall have plugs hand ground into the body of the fittings. Cocks shall be opened by turning right, clockwise, and shall be marked on the fitting accordingly.

Corporation cocks shall be screwed firmly into the water mains. They shall be placed with the key upward and the inlet ends projecting at least 1/8 inch beyond the inside face of the main, unless otherwise permitted by the Engineer. All corporation cocks shall be easy turning, non-binding, open right and turned on before the trench is backfilled around them, so as to allow examination of connections for leaks.

All joints between cocks, fittings and service pipe shall be made watertight.

All corporation cocks for 1 inch service pipe shall be heavy pattern, solid plug, easy turning and meet the standards of the Water & Sewer Division. The inlet shall be an AWWA (CC) thread. The outlet shall be male iron pipe thread, one size larger than the inlet.

New services and services to be reconnected shall be joined to the water mains by means of a corporation stop inserted into a new tap in the main. The main, where service connections are necessary, shall be tapped by means of a tapping machine manufactured for that purpose and furnished by the Contractor. The tap and drill of the tapping machine must be kept sharp. The taps generally shall be so located that the corporation stops, when inserted in a tap, will be at or above the horizontal diameter of the pipe and the service pipe must have a cover of at least 4 feet at all points. Any additional service pipe needed for the connection to the water mains shall be paid for under the appropriate service pipe item.

Payment shall be made at the contract unit price per each for furnishing and installing corporation cocks and such payment shall include connecting services to the new water mains; all drilling and tapping of the new mains; furnishing and installing new corporation stops, clamps, and couplings where required to connect the new services to the new corporation stops; all at locations directed on the Plans, or as required by the Engineer. Also included in these items is the abandoning of the existing corporation stops.

ITEM 371.06	**6 INCH COUPLING**	**EACH**
ITEM 371.08	**8 INCH COUPLING**	**EACH**
ITEM 371.12	**12 INCH COUPLING**	**EACH**
ITEM 371.16	**16 INCH COUPLING**	**EACH**

Couplings shall only be allowed when connecting standard outside diameter pipe to oversize or pit cast pipe. HYMAX® by Krausz; Smith Blair, Style 441; Dresser, Style 253 or equal approved by the Water Superintendent. Couplings shall be provided with plain, Grade 27 rubber gaskets and with black, steel, track-head bolts and nuts. There shall be zero gaps between proposed water mains and existing water mains within proposed couplings.

Payment for couplings shall be made at the Contract unit price for the size unit installed which price shall be full compensation for furnishing all material, including excavation and backfilling, and for preparation and installation, labor, equipment, tools, and incidentals necessary to complete this item.

ITEM 376	**HYDRANT**	**EACH**

The Contractor shall furnish, install, and test fire hydrants and appurtenant materials and equipment all as indicated on the drawings and as herein specified.

Hydrants shall conform to the requirements of AWWAC502. The hydrant shall be of the anti-freeze and compression type. They shall be equipped with a 5-1/4-inch main valve and 6-inch mechanical joint inlet. Hydrants shall open right (clockwise). Valves shall open

right (clockwise).

Hydrants shall have one 4-1/2-inch pumper and two 2-1/2-inch hose connections. Threads shall be NST. Hydrant operating and nozzle cap nuts shall be of pentagonal shape and measure one and one half inches from flat to point. The height of the nut shall not be less than one inch.

All internal operating parts including main valve, main valve seat, drain valve mechanism, operating rod, etc., shall be removable without excavating.

Main valve seats shall be made of brass or bronze, and shall screw into a seat ring or sub-seat, which shall also be made of brass or bronze. Hydrants shall be traffic models with frangible bolts or breakaway couplings. Details of hydrant design shall meet the requirements of the Owner.

For purposes of standardization, hydrants shall be dry barrel American-Darling model B-62.

Depth of earth cover over the main line shall be normally 5 feet. All hydrants shall meet the requirements of the Waltham Water & Sewer Division.

Pressure ratings must not be less than 350 psi. Hydrant connections are to be restrained for the full length of the pipe from the main to the hydrant. All hydrants shall be painted to conform to the Waltham Water & Sewer Division Standards.

Hydrants shall be set plumb. The hydrant connecting pipe shall have at least the same depth of cover as the distribution main. The hydrants shall be bedded on a firm foundation set upon a slab of stone or concrete not less than 4 inches thick and 15 inches square. The side of the hydrant opposite the pipe connection shall be firmly wedged against the vertical face of the trench with a concrete thrust block, which is considered incidental to the item, as indicated on the drawings. Not less than 4 cubic feet of crushed stone shall be placed around the base of each hydrant to 6 inches above the drain holes.

Broken stone shall be placed around the base of the hydrant at the location of the drain hole, and backfill around the hydrant shall be thoroughly compacted to the grade line in a satisfactory manner.

Hydrants shall have the interiors cleaned of all foreign matter before installation, and shall be inspected in both the open and closed positions.

The body of the hydrant shall be of sufficient length to allow the hydrant to be set at the proper elevation, as shown on the drawings or as directed by the Engineer. Extensions shall be furnished and installed at the Contractor's expense, when required for greater depths.

The length of the hydrant barrel shall be such that when installed with the proper depth of cover on the branch pipeline, the hydrant will be set with the normal ground line of the

barrel within 3 inches of the actual finished ground surface.

In the work of removing hydrants which are to be replaced with new hydrants, 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 casting carefully removed. Any materials damaged during this work due to the Contractor's negligence shall be replaced by the Contractor at no additional cost to the owner. The removed hydrant shall be delivered by the Contractor to the Waltham Water & Sewer Division. If the Owner decides not to keep the hydrants the removal and disposal of the units will become the responsibility of the Contractor at no additional cost to the Owner

Payment for this item will be at the Contract unit price per each, which price shall include full compensation for furnishing all labor, materials, tools, and equipment necessary and for furnishing, installing and/or setting hydrants as specified including testing, excavation, crushed stone, backfilling, filter fabric, disposal of surplus material, connection to existing, tie rods, connection couplings, restraining glands, megalugs and extension sections, concrete thrust blocks, and all other work necessary for a complete hydrant.

ITEM 381.01 SERVICE BOX MUNICIPAL STANDARD EACH

The work to be done under this Item shall conform to the relevant provisions of Section 300 of the Standard Specifications amended and supplemented as follows:

The Contractor shall furnish and install new service boxes as indicated on the Contract Drawings or as directed by the Engineer.

For purposes of standardization, service boxes on ¾" & 1" curb stops shall be standard 1" Erie style having an extra heavy cover with brass pentagon plug and 36" rod. 4 ½' to 5 ½' bury only. Service boxes on 1 ½" & 2" curb stops shall be standard 4" Buffalo sliding style having a brass pentagon cover nut with proper footpiece for curbstop valve 4 ½' to 5 ½' bury.

The new service boxes shall meet the requirements of the Water & Sewer Division and be the extendable type. The cover shall be counter sunk with a brass pentagonal plug that features a course "rope" thread to enable quick and easy removal.

The existing service boxes shall be removed and delivered to the Water & Sewer Division. If the Owner decides not to keep the castings the removal and disposal of the units will become the responsibility of the Contractor at no additional cost to the Owner.

Payment for the above shall be at the contract unit price per each, which price shall include full compensation for furnishing all labor, materials, tools and equipment necessary to complete the work and for furnishing and installing service boxes. Also included under this item is the removal and disposal of existing curb stops.

ITEM 384 **CURB STOP** **EACH**

The work to be done under this Item shall conform to the relevant provisions of Section 300 of the Standard Specifications amended and supplemented as follows:

The Contractor shall furnish and install new curb stops as indicated on the Contract Drawings or as directed by the Engineer.

The existing curb stops shall be removed and disposed of by the Contractor. The new curb stops shall meet the requirements of the Waltham Water & Sewer Division. The curb stop shall have a quarter turn stop with check, solid tee head and no waste. Curb stops with plugged wastes will not be accepted. Curb stops shall open right (clockwise).
Payment for the above shall be at the contract unit price per each, which price shall include full compensation for furnishing all labor, materials, tools and equipment necessary to complete the work and for furnishing and installing curb stops. Also included under this item is the removal and disposal of existing curb stops.

If required by the Engineer, new service boxes shall be provided by the Water & Sewer Division.

The cost of resetting existing service boxes on new curb stops shall be considered incidental to the cost the curb stop.

ITEM 460 **HOT MIX ASPHALT** **TON**

The work to be done under this Item shall conform to all the relevant provisions of Section 460 and the following:

Item 460 Hot Mix Asphalt, shall conform to the requirements of Section 560.00 of the current Edition of the "Standard Specifications for Highways and Bridges," Commonwealth of Massachusetts, Department of Public Works, including any addenda or amendments thereto. The City of Waltham has the option of requesting a modified state top when deemed necessary.

Bituminous concrete shall be spread at a temperature of not less than 225 degrees Fahrenheit and all initial rolling or tamping shall be performed when the temperature of the mixture is such that the sum of the air temperature plus the temperature of the mixture is between 300 and 375 degrees Fahrenheit. All mixtures shall be placed only when the atmospheric temperature is above 40 degrees Fahrenheit.

Bituminous concrete for wearing surfaces and base courses shall be spread in individual layers and compacted to the required lines, grades and cross section.

Rolling shall commence at the lower edges and shall progress toward the highest portion. Under no circumstances shall the center be rolled first. Each completed surface shall be thoroughly compacted, smooth and free from ruts, humps, depressions, or irregularities. Where new bituminous meets existing bituminous surfaces, an emulsifying agent shall be

applied to seal the joint. A sand overcoat shall then be applied over the emulsifying agent.

All bituminous used for roadway and sidewalk bases and surfaces will be paid for on the basis of weight and shall be measured by tickets delivered with each load. The tickets shall be signed by a certified weigher and shall be countersigned by the OWNER. The tickets shall clearly show the total, tare, and net weights. Loads represented by tickets not showing the weights as specified above will not be accepted for payment. Only bituminous concrete placed at the required depth and within the limits specified by the OWNER will be accepted for payment.

PAYMENT: Payment for bituminous concrete shall be made for the number of tons as determined above at the Contract unit price for ITEMS 460 as set forth in the Bid. Said price and payment shall be full compensation for all fine grading and compaction, for furnishing, spreading and compacting bituminous concrete, emulsifying and sanding of all joints, and for furnishing all tools, labor, materials, equipment, and all else incidental thereto.

ITEM 464 BITUMEN FOR TACK COAT GALLON

The work to be done under this Item shall conform to all the relevant provisions of Section 400 and the following:

A tack coat of asphalt emulsion, grade RS-1 shall be uniformly applied to existing or new pavement surfaces prior to placing pavement courses as specified below. The existing surface shall be swept clean of all foreign matter and loose material using a mechanical sweeper and shall be dry before the tack coat is applied.

A pressure distributor shall be used to apply the tack coat. The tack distributor system shall be equipped with the following to control and monitor the application:

- System for heating the asphalt emulsion uniformly to specified temperature.
- Thermometer for measuring the asphalt emulsion temperature.
- Adjustable full circulation spray bar.
- Positive controls including tachometer, pressure gauge, and volume measuring device.

Tack Application Requirements.
The tack coat material shall be applied by a pressure distributor. All nozzles on the distributor shall be open and functioning. All nozzles shall be turned at the same angle to the spray bar. Proper nozzle angle shall be as determined by the manufacturer of the distributor spray bar. The spray bar shall be adjusted so that it is at the proper height above the pavement surface to provide a double overlap spray for a uniform coverage of the pavement surface. A double lap application requires that the nozzle spray patterns overlap one another such that every portion of the pavement receives spray from exactly two nozzles.

When an HMA pavement course is placed on an existing tight smooth pavement surface,

a tack coat shall be applied at the rate of 1/20 gal/sy. All existing surfaces subjected to milling shall receive a tack coat at the rate of 1/15 gal/sy. Tack coat shall be applied to cover approximately 90% of the pavement surface.

Any new HMA pavement course that has been open to traffic, or that was placed 30 days prior to placement of the subsequent pavement course, shall receive a tack coat at an application rate of 1/20 gal/s.y.

When the surface of a new HMA pavement course is in a condition which in the Engineer's judgment is unsatisfactory for the direct placement of the subsequent pavement course, a tack coat shall be applied at the applicable rate specified above for the particular pavement surface condition.

In addition to the requirements above, all vertical surfaces of cuts for patches, curbs, edging, utilities, and drainage structures shall receive a thorough tack coat application immediately prior to placing each HMA pavement course.

Tack Inspection.
The asphalt emulsion temperature and application rate shall be periodically measured. If the temperature or application rate is determined to not be in conformance with the specification requirements above, the Contractor shall make appropriate adjustments to the tack application operations.

METHOD OF MEASUREMENT
Item 464., Bitumen for Tack Coat, will be measured by the square yard and the quantity to be measured shall be the actual number of gallons of bitumen for tack coat applied to the as required by the Engineer. Bitumen for Tack Coat, will be paid for at the Contract unit price per gallon which shall be include full payment for all labor, materials, equipment, fuel and incidentals to properly complete the work to the satisfaction of the Engineer.

ITEM 472 HOT MIX ASPHALT FOR MISCELANEOUS WORK TON

The work to be done under this Item shall conform to all the relevant provisions of Section 472 and the following:

Where this work is performed within existing roadways, a gravel subbase of 12" compacted depth shall be installed flush with the bottom of the pavement. In place of the gravel subbase, excess reclaimed pavement borrow material may be used.

All areas that are to be patched as described above shall be marked out in the field after the milling operation and approved by the Engineer prior to excavation.

Payment for Hot Mix Asphalt for Miscellaneous Work shall be at the contract unit price per square yard, complete in place, which price shall be full compensation for sawcutting, excavating, installation of the gravel base, compacting, grading, paving and all labor,

equipment and materials necessary to complete the work.

ITEM 472.2 HOT MIX ASPHALT FOR PERMANENT PATCH (5") SQUARE YARD

The work to be done under this Item shall conform to all the relevant provisions of Section 472 and the following:

Item 472.2 Hot Mix Asphalt For Permanent Patch (5") shall consist of making roadway pavement repair patches on City roads. The areas for patching shall be identified by the Engineer. Areas to be patched shall be saw cut and the pavement removed, a gravel base of 12" compacted depth shall be installed and compacted hot mix asphalt shall be installed to be flush with the top of the adjacent roadway surface.

The bituminous concrete surface shall be laid in two courses to a depth after rolling of 5 inches. The binder course shall be 2.5 inches thick and parallel to the proposed grade of the finished surface. The top course shall be 2.5 inches in thickness after rolling and flush with the adjacent pavement surface.

In place of the 12" gravel base, excess reclaimed pavement borrow material may be used at no additional cost.

All areas that are to be patched as described above shall be marked out in the field and approved by the Engineer prior to excavation.
Payment for Item 472.2 shall be at the Contract unit price per square yard, complete in place, which price shall be full compensation for sawcutting, excavating, installation of the gravel base, compacting, grading, paving and all labor, equipment and materials necessary to complete the work.

ITEM 518 CONCRETE CURB INLET EACH

GENERAL
Work under these items shall conform to relevant provisions of Section 500 of the Standard Specifications and the following:

The work shall consist of furnishing and installing concrete curb inlets conforming to lines, grades, dimensions and details shown on the Plans. Care must be taken when handling and placement of curb. Any damaged curb inlet shall be replaced by the Contractor at his/her own expense.

Item 518, Concrete Curb Inlet – Straight- Municipal Standard, will be measured per each complete in place, and will be paid for at the contract unit price each, which price shall include all labor, tools, equipment, materials, transportation, and incidental work required to install the curb inlet complete in place, to the satisfaction of the Engineer.

ITEM 570.2 HOT MIX ASPHALT CURB TYPE 1, 2 OR 3 FOOT

The work to be done under these Items shall conform to the relevant provisions of Sections 501, 580, and the following:

Hot mix asphalt curb shall be constructed in accordance with the details shown in the plans, where required by the Engineer, and shall be measured per linear foot. Where noted on the plans, and at the Engineer's direction, hot mix asphalt berm shall be used in place of curb at no additional cost.

The work under this item shall include sawcutting the existing pavements, excavation, installation of gravel and binder course HMA berm foundation, and the installation of top course pavement patch. Removal and disposal of existing bituminous shall be considered incidental to the installation of new curbing, and no separate payment will be made.

Payment for Item 570.2 will be made at the contract unit bid price per foot of HMA curb and/or HMA curb, complete in place, which price shall be full compensation for all labor, equipment and materials necessary to satisfactorily complete the work.

ITEM 580 CURB REMOVED AND RESET FOOT

The work to be done under these Items shall conform to the relevant provisions of Sections 501, 580, and the following:

The work under these items shall include saw cutting existing pavements, excavation, gravel foundation and backfilling, curbing, and cement concrete, as shown on the details. Removal and disposal of existing bituminous or concrete curbing shall be considered incidental to the installation of new curbing, and no separate payment will be made.

All new curb and edging will be paid for under Items 506 whether or not the pieces are curved or straight, no distinction made for curved pieces for payment purposes. Resetting of existing edging, curb inlet stones, splayed end transition stones, and wheelchair ramp transition stones shall be included under Item 580 – Curb Removed and Reset, and no additional payment will be made for the resetting of these curb stones.

All work requiring chamfering or cutting of curb or edging shall be considered incidental and shall be included in the unit bid price of the respective item. All existing curb or edging determined suitable for reuse on the project which is not reset at its present location shall be removed and stacked by the Contractor at a designated location within the City for further reuse on the project at such location or locations as directed by the Engineer. Costs of transporting and stacking all such curb or edging to be re-used on the project shall be included in the Contract bid price for Item 580 – Curb Removed and Reset as applicable.

All existing curb or edging that is not to be re-used on the project shall be transported to a location within City to be identified by the Engineer at no additional cost to the City. Any

curb determined by the Engineer to be unsuitable for further reuse shall become the property of the Contractor and be disposed of off the project site by the Contractor without additional compensation.

New or existing curb stones may be used for wheelchair ramp transition curbs. Curbs shall be cut in such a way so that a flush joint is formed where the transition curb meets the adjacent curb at all locations. The length of the transition is to be in accordance with the Massachusetts Architectural Access Board's requirements.
Splayed end transition stones shall be used at vertical curb to sloped edging transitions and shall be as detailed on the plans.

Payment for the above items shall be at the Contract unit price per linear foot, complete in place, which price shall be full compensation for curbing, cutting and chamfering of curb as required, excavation, gravel for foundation and backfill, installation, concrete, and all labor, equipment and materials necessary to complete the work.

ITEM 697.1 SILT SACK EA

The work to be done under this Item shall conform to the relevant provisions of Sections 670, 767, and the following:

During construction and until disturbed soils are stabilized, sediment control silt sacks shall be installed in catch basins located in areas subject to stormwater runoff from disturbed areas, and where required by the Engineer. Silt sacks shall be installed in accordance with the details shown on the plans and this special provision.

Silt sacks shall be manufactured from a specially designed woven polypropylene geotextile and sewn by a double needle machine, using a high strength nylon thread. Silt sacks shall be manufactured to fit the opening of the catch basin and shall have integral straps or handles to facilitate lifting and emptying the sack. Silt sacks shall also have a marking or other visual means of indicating when the sack should be emptied.

Where the catch basin to be protected has an adjacent curb inlet, the silt sack shall also have an integral foam block insert that will fit into the curb inlet opening to prevent runoff from bypassing the silt sack. The cost of these foam blocks is to be included in the unit cost of the silt sack, no separate payment will be made.

Silt Sack will be measured per each catch basin that has a silt sack installed. Payment for silt sacks will be made at the Contract unit bid price per each, complete and in place, which price shall be full compensation for all labor, equipment and materials necessary to install, inspect, maintain, clean, reinstall, and remove the silt sack until disturbed areas have been stabilized, or until otherwise determined by the Engineer.

ITEM 701	**CEMENT CONCRETE SIDEWALK**	**SQUARE YARD**
ITEM 702	**HOT MIX ASPHALT WALK SURFACE**	**SQUARE YARD**
ITEM 703	**HOT MIX ASPHALT DRIVEWAY**	**SQUARE YARD**

The work to be done under this Item shall conform to the relevant provisions of Section 701 and the following:

In meeting existing sidewalks and driveways in the above areas, the Contractor shall saw cut by mechanical means using an approved power driven saw a neat straight line to permit the new work to blend satisfactorily with contiguous existing surfaces.

The work under these items shall include saw cutting existing pavements, excavation, fine grading and compacting, placing an 8" gravel foundation, and installing the cement concrete, or hot mix asphalt. Wire mesh reinforcement shall be used in construction of cement concrete sidewalks and wheelchair ramps as detailed in the plans

Where the existing subbase material is deemed suitable by the Engineer, it may be left in place and re-used. Reclaimed pavement borrow material may be substituted for gravel borrow for sidewalk foundations, where directed by the Engineer, however no additional payment will be made for this substitution.

Payment for work under these items shall be made at the unit Contract price per square yard of cement concrete sidewalk, HMA walk surface, and HMA driveways, and shall be full compensation for all necessary labor, equipment, and materials required to satisfactorily complete the work including saw cutting, excavation, gravel borrow, and fine grading.

ITEM 751.2	**LOAM BORROW AND SEEDING**	**SQUARE YARD**

The work to be done under this Item shall conform to the relevant provisions of Sections 751, 765, and the following:

The work under this item shall include placing a minimum of 6" of loam borrow and seeding disturbed areas beyond the edge of pavement and behind curbs and sidewalks, as directed by the Engineer.
Payment will be made at the Contract unit price per square yard of loam placed and seeded, and will include all necessary labor, equipment, and materials to satisfactorily complete the work including loam borrow, limestone, grass seed, and fertilizer.

ITEM 850.1	**TRAFFIC CONTROL**	**LUMP SUM**
ITEM 850.2	**TRAFFIC CONTROL**	**LUMP SUM**

The work to be done under this Item shall conform to the relevant provisions of Sections 751, 765, and the following:

The work to be done under this Item shall conform to the relevant provisions of Sections

800, 824, 828, 840, 850 and the following:

The Contractor shall furnish, illuminate, and maintain such signs as directed or as necessary for the safe and/or regulation convenience of traffic; shall provide, erect and maintain barricades, warning lights, etc. as needed or as directed to keep people and vehicles from equipment, obstacles, etc; and take such other reasonable means and precautions as the Engineer or the Owner may direct or as may be needed to prevent damage or injury to persons, vehicles, or other property, and to minimize the inconvenience and danger to the public by his/her occupancy of the street or highway or other areas of work. He/she shall arrange his/her operations and the spaces occupied by him/her, so far as possible, to provide access to property along the street, particularly driveways and entrances, to fire hydrants, manholes, gate boxes, etc., of other utilities. Whenever any equipment obstructs traffic in or to any public street, private driveway or property entrance, the Contractor shall take such means as may be necessary to maintain traffic and access so far as the requirements of this article are applicable, they shall also apply to work in private ways and public and private lands other than streets and highways. The Contractor shall confine his/her occupancy of public or traveled ways to the smallest spaces compatible with efficient performance of the work contemplated by the Contract, and particularly to such limits as may be set out in Drawings or Specifications.

ITEM 999 POLICE DETAILS HOUR

Refer to page SP-5 of these specifications along with the Massachusetts Highway Department Standard Specifications for Highways and Bridges dated 1988, the Supplemental Specifications dated July 1, 2015, and the Interim Supplemental Specifications; the 2015 Construction Standard Details.

ITEM 119.101	**RODENT CONTROL - BASE BID**	**LUMP SUM**
ITEM 119.201	**RODENT CONTROL - ADD ALT. #1**	**LUMP SUM**

This section specifies rodent control and general pest control requirements within project areas, and bordering areas as designated by the Owner and Engineer. This work is to be performed prior to demolition, excavation, and site preparation and throughout the Contract, so that rodents and other pests do not disperse from or infest the project area.

The Contractor shall develop and implement an Integrated Pest Management (IPM) approach. As part of that approach, the Contractor shall maintain a cooperative dialogue with appropriate agencies and management/representatives of neighboring properties.

The Contractor shall perform the rodent control tasks described in this Scope of Work and also respond to other pest control needs when directed by the Owner.

Submit to the Engineer copies of pesticide applicator certifications and licenses within ten (10) days of the start of Rodent Control activities and ten (10) days prior to their issuance or renewal for the duration of this Contract.

After performing the survey described below and before initiating baiting, submit to the Engineer a written description of proposed pest control procedures, indicating materials, quantities, methods, and time schedule. For all pesticides to be used, submit a copy of the pesticide manufacturer's EPA-approved pesticide label with application directions.

Submit to the Engineer documentation of pest control activities and results and follows:

1. Weekly - Submit data sheets with locations of sites treated, amounts and types of pesticide used, number and types of traps set, survey and inspection results, sanitation conditions, complaint calls investigated, and any problem that occurred.

2. Monthly - Submit a written summary that includes determinable results of the IPM program and recommendations.

3. Quarterly - Submit a map that shows bait stations, manholes, and catch basins where rodent baits are being maintained.

The Contractor shall perform this work at all times in accordance with the following minimum standards and as acceptable to the Owner and Engineer. The Contractor and key personnel shall have experience with commercial and residential accounts and construction projects; have experience and technical training in vertebrate pest management and integrated pest management; have experience with various rodent control techniques, equipment, and strategies; have training and experience with insect control; and have knowledge of and experience with techniques to reduce non-target hazards. The supervisor shall be licensed and certified by the Massachusetts Pesticide Bureau and certified in General Pest Control (category 41) and Vertebrate Pest Control (category 44). The supervisor shall have specific training and experience in vertebrate pest management, commercial rodent control, general pest control, and integrated pest management. Applicators shall be licensed by the Massachusetts Pesticide Bureau and certified in General Pest Control (category 41). Applicators shall have specific training and experience in commercial rodent control and integrated pest management.

Perform this Work in cooperation with the other Work performed under the Contract. Initiate the work on or before field mobilization begins for the Contract and with adequate timing to achieve control before environmental disruptions. Provide a maintenance program until Contract is completed and all equipment and materials are removed. Perform the Work according to the preliminary schedule described in this section and as accepted or revised by the Owner and Engineer. Estimated durations and start dates may be changed by the Owner or Engineer to suit changes in construction schedules and field conditions. The Work could potentially require performance any day of the week and any hour of the day or night, regardless of weather. Perform this work in such a manner that toxicant or other control tools do no pose a hazard to persons, domestic animals, or non-target wildlife.

Obtain and maintain in coordination with the Contractor appropriate permit(s) from city or state agencies for pest control activities associated with this Work. Obtain and maintain in coordination with the Contractor all right of entry permits required for the performance of this Work. This includes all utilities and private properties to which entrance is required.

Furnish and use only pesticide formulations registered by the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Food and Agriculture, where appropriate according to label directions and as acceptable to the Engineer. Furnish and use devices and supplies (e.g., traps and bait stations) to facilitate the management and effectiveness of the pest control program, where appropriate and as acceptable to the Engineer.

Before proceeding with the Work, all pest control personnel shall attend a Work Shop held by the Contractor and Engineer to discuss planned pest control methods and coordination. The supervisor shall meet with the Contractor and Engineer weekly to discuss pest control activities.

Prior to baiting, survey the proposed construction area and accessible or observable bordering areas and record signs of rodent activity and sanitation conditions. Closely inspect all embankments, edge areas, and properties within and abutting the construction area. Maintain survey records in the manner described below. Thoroughly inspect construction area and accessible or observable bordering areas and any nearby areas designated by the Owner or Engineer, for rodent activity and sanitation deficiencies weekly throughout the duration of this Contract and in accordance with the work schedule. Maintain inspection records in the manner described below. Plan the control program and allocate resources based on survey and inspection data and as acceptable to the Owner.

Apply rodenticide in strict accordance with EPA-approved label directions and the Rules and Regulations of the Massachusetts Department of Food and Agriculture. Maintain records of all bait placements in the manner described below. Where appropriate, especially for surface placements of rodent baits, use properly secured and tamper-resistant bait stations consistent with EPA regulation. Individually number and properly identify all bait stations.

Surface Applications:

Initial Surface Baiting - Rid the construction area of all detectable rodents before construction begins, or as acceptable to the Owner. Bait all observable rodent burrows. Install and secure bait stations at regular and appropriate intervals and locations, and document rodent activity (burrows, droppings, bait consumed, dead rodents). Replenish bait and shift bait stations as necessary to ensure complete control of rodent populations. Bait edge and accessible bordering areas as necessary to ensure that rodents will not be dispersed by construction activities and that rodents will not infest work areas.

Maintenance Surface Baiting - Establish a maintenance baiting program prior to mobilization by the Contractor, including construction areas and accessible bordering areas, as acceptable to the Owner. Check bait placements weekly. Use survey and baiting data to determine the most effective distribution of baiting locations and bait quantities. Shift and distribute bait and bait stations as appropriate to ensure continued control.

Subsurface Applications:

General - For situations involving underground construction/demolition, utility relocation, or utility construction, and for other situations when determined necessary by the Owner or Engineer, initiate subsurface baiting and rid underground environments of all detectable rodents before construction begins. Assign an identifying number to each manhole and catch basin where bait is placed so that locations of bait placements can be identified and rodent activity (droppings, bait consumed, dead rats) can be documented. Conduct bait applications during off-peak traffic hours unless otherwise directed by the Engineer. Access manholes according to the requirements of appropriate agencies and utility companies. Coordinate the Work with appropriate municipal agencies and utility companies.

Initial Subsurface Baiting - Apply appropriate baits to control rodent populations in manholes and catch basins. This will involve suspending and securing bait using noncorrosive wire (e.g., 24 gauge plastic coated). Place bait in all accessible manholes and catch basins within the construction work area. In addition, bait an appropriate set of manholes and catch basins in the blocks bordering the work area and as acceptable to the Owner. Identify all baited manholes and catch basins with a standardized paint mark on the street and a numbered tag to be attached to the suspending wire. Approximately seven days after completion of the first baiting, check all manhole and catch basin baits and record estimates on the amount of bait consumed. Replenish or increase the amount of bait applied according to the amount consumed or as acceptable to the Owner and Engineer. Repeat this process again approximately fourteen days later and until there is little or no bait consumed. Check manholes and catch basins weekly when they repeatedly have 100 percent of the bait consumed.

Maintenance Subsurface Baiting - Prior to mobilization by the Contractor, establish a maintenance baiting program appropriate for the rodent infestation patterns identified during initial subsurface baiting. This program shall ensure continued control and shall be performed in a manner acceptable to the Owner and Engineer. Maintain bait in manholes and catch basins that have rodent activity and those that had activity during initial baitings. Check each bait according to rodent activity levels. This could range from weekly to approximately every three months, depending upon the recent history of bait consumption. Use utility maps and baiting data to determine the most effective distribution of baiting locations and bait quantities. Shift and distribute baiting locations as necessary to ensure adequate interception points for controlling immigrating rodents.

Cleanup:
Remove visible rodent carcasses and dispose of them daily consistent with the pesticide label directions and applicable codes, laws, and regulations. Upon completion of any pest control operations at the site, remove remaining bait and dispose of it according to the pesticide label and applicable codes, laws, and regulations. Also remove all wires used for subsurface baiting and any bait stations or traps.

Prior to construction and throughout the duration of this Contract, identify and document harborage and food sources available to rodents on the construction site and in observable bordering areas. This includes any littering or improper or insufficient use of trash receptacles in construction areas. It also includes any bordering areas with sanitation conditions or structural deficiencies that violate City or State sanitation codes. Maintain records of sanitation conditions in the manner described below.

During construction, respond to pest-related complaints from the "adjacent" neighborhood (i.e. within 200 feet of the project limits) within 12 hours when directed by the Owner or Engineer. Inspect the particular premises and adjacent areas for sanitation and structural deficiencies and also signs of historic and recent pest activity. Provide sanitation and structural maintenance information to the property owner or manager. Use pesticides or traps as necessary and appropriate to resolve the complaint when there is a relationship between the pest infestation and construction activities, or when directed by the Owner or Engineer. Maintain records of all complaints investigated, including location, contact person, inspection results, and actions taken. Document the relatedness of the pest infestation to construction activities.

When directed by the Owner or Engineer, the Contractor shall determine appropriate methods for any pest control task not specifically identified above and shall submit them in writing to the Owner and Engineer for approval in advance. Such pest control tasks would relate to unanticipated pest control needs within construction areas or adjacent areas. This could include control of insects or vertebrates other than rats and mice. Maintain records of general pest control activities and results in the manner described below.

Use standardized data sheets acceptable to the Owner and Engineer to maintain accurate records of date, placement, type, and amount of pesticides or other control tools (e.g., traps) applied. Similarly, maintain records of surveys, inspections, changes in pest activity, sanitation conditions, and complaint calls. Submit data in a format acceptable to the Owner and Engineer.

The Engineer may authorize a percent (%) complete of Items 119.101 and 119.201 for payment if not all of the work has been accomplished. A breakdown of the lump sum price must be submitted to the Engineer at the start of work.

END OF SECTION