TOWN OF CHESHIRE, MASSACHUSETTS

CONTRACT FOR CONSTRUCTION OF PUBLIC WORKS

Public Works Projects Over $50,000

(M.G.L. Chapter 30, §39M)

WATER SYSTEM IMPOVEMENTS
DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
CHESHIRE, MA

JULY 2022

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TOWN OF CHESHIRE

CONTRACT FOR CONSTRUCTION OF PUBLIC WORKS

This Contract entered into this _____ day of _____ , 20___, by and between the TOWN OF CHESHIRE (hereinafter the "OWNER" or "TOWN"), a body politic organized under the laws of the Commonwealth of Massachusetts, with offices at 80 Main Street, Cheshire, MA 01225, and _____, a _____ with offices at _____, Massachusetts (hereinafter the "CONTRACTOR").

WHEREAS, the OWNER seeks to construct the following:

Installation or replacement of fire hydrants, water services and 8-inch diameter ductile iron pipe water main line beneath portions of Depot Street, Railroad Street and Mill Hill Road in the Town of Cheshire in accordance with the plans and specifications "Cheshire, MA, Depot Street, Railroad Street and Mill Hill Road, Water Line Replacement – July 2022".

WHEREAS, pursuant to contracts for public works construction or for the purchase of any material, shall be awarded to the lowest responsible and eligible bidder on the basis of competitive bids; and

WHEREAS, the OWNER has requested and received proposals for bids and selected the lowest responsible and eligible bidder.

NOW THEREFORE, the OWNER and the CONTRACTOR for valuable consideration agree as follows:

ARTICLE 1. THE CONTRACT DOCUMENTS AND BID PROCEDURES

The Contract Documents consist of the Contract and its Appendices (See Table of Appendices). These documents form the Contract and are as fully a part of the Contract as if attached to this Contract or repeated herein. The Contract represents the entire and integrated Agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral.

ARTICLE 2. THE WORK OF THIS CONTRACT

The CONTRACTOR shall execute the entire Work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3. DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

The date of commencement shall be not later than **September 1, 2022**. The CONTRACTOR shall perform everything agreed by it to be performed properly and promptly in accordance with the terms of this Contract and to the satisfaction of the Water Superintendent, or his duly-authorized representative; shall observe and comply with all existing and future state and federal laws and OWNER by-laws and regulations in any manner affecting those engaged or employed in the performance of this Contract.

The CONTRACTOR shall achieve substantial completion of the entire work not later than

November 15, 2022, subject to adjustments of this Contract Time as provided in the Contract Documents. By executing this Contract, the CONTRACTOR confirms that the contract time is a reasonable period of time for performing the work and achieving substantial completion.

The CONTRACTOR and the CONTRACTOR's surety shall be liable for and shall pay the OWNER the sum of two hundred dollars ($200.00) hereinafter stipulated as liquidated damages for each calendar day of delay until the Work is substantially completed.

Substantial completion shall mean either that the Work required by the Contract has been completed except for work having a Contract Price of less than one per cent of the then adjusted total Contract Price, or substantially all of the Work has been completed and opened to public use except for minor incomplete or unsatisfactory Work items that do not materially impair the usefulness of the Work required by the Contract. Partial use or occupancy shall not result in the work being deemed substantially complete, and such partial use or occupancy shall not be evidence of substantial completion.

ARTICLE 4. CONTRACT PRICE

The OWNER shall pay the CONTRACTOR for the CONTRACTOR's performance of the Contract, the Contract Price of _____ ($__), subject to additions and deductions by an amendment to the Contract Documents.

ARTICLE 5. CANCELLATION AND UNANTICIPATED CONDITIONS

If the CONTRACTOR shall neglect to perform the terms of this Contract promptly, the OWNER, by its duly-authorized representative may, after twenty-four (24) hours written notice to the CONTRACTOR, without prejudice to any other remedy it may have, make good such deficiencies, and may deduct the cost thereof from any payments then or thereafter due to the CONTRACTOR.

A. Unanticipated Subsurface or Latent Physical Conditions. Pursuant to G.L. c.30, §39N, if, during the progress of the Work, the CONTRACTOR or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the Contract Documents, either the CONTRACTOR or the contracting authority may request an equitable adjustment in the Contract Price of the Contract applying to Work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from the CONTRACTOR, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on (he plans or indicated in the Contract Documents or from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the plans and Contract Documents and are of such a nature as to cause an increase or decrease in the cost of performance of the Work or a change in the construction methods required for the performance of the Work which results in an increase or decrease in the cost of the Work, the contracting authority shall make an equitable adjustment in the Contract Price and the Contract shall be modified in writing accordingly.

ARTICLE 6. SUSPENSIONS AND DELAYS BY THE OWNER

In the event that a suspension or delay, interruption or failure to act by the OWNER increases the cost of performance to any Subcontractor, that Subcontractor shall have the same rights against the General CONTRACTOR for payment for an increase in the cost of his performance as provisions A and B below give the General CONTRACTOR against the OWNER, but nothing in provisions A and B below shall in any way change, modify or alter any other rights which the General CONTRACTOR or the Subcontractor may have against each other.

A. Suspensions, Delays, Interruptions. The OWNER may order the General CONTRACTOR in writing to suspend, delay, or interrupt all or any part of the Work for such period of time as it may determine to be appropriate for the convenience of the OWNER; provided however, that if there is a suspension, delay or interruption for fifteen (15) days or more due to a failure of the OWNER to act within the time specified in this Contract, the OWNER shall make an adjustment in the Contract Price for any increase in the cost of performance of this Contract, but shall not include any profit to the General CONTRACTOR on such increase; and provided further that the OWNER shall not make any adjustment in the Contract Price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this Contract provides for an equitable adjustment of the Contract Price under any other Contract provisions.

B. Claims. The General CONTRACTOR must submit the amount of a claim under provision 6A to the OWNER in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this Contract and, except for costs due to a suspension order, the OWNER shall not approve any costs in the claim incurred more than twenty (20) days before the General CONTRACTOR notified the OWNER in writing of the act or failure to act involved in the claim.

All claims by the CONTRACTOR shall set forth in detail all known facts and circumstances supporting the claim. The CONTRACTOR shall continue its performance under this Contract regardless of the submission or existence of any claims.

The liability of the OWNER under this Agreement is limited to the compensation provided herein for work actually performed to the extent that such compensation is permitted by law. The OWNER's liability shall in no event include liability for incidental, special or consequential damages or lost profits or for damages of loss from causes beyond the OWNER's reasonable control.

ARTICLE 7. PAYMENT TO CONTRACTORS

A. Payment to Contractors. Notwithstanding anything in the Contract. Documents to the contrary, any and all payments that the Town is required to make under this Contract shall be subject to appropriation or other availability of funds as certified by the Town Accountant. Payments shall be made in accordance with G.L. c.30, §39G, including all current amendments, generally as follows:

1. The OWNER shall pay the amount due pursuant to any periodic, substantial completion or final estimate within thirty-five (35) days after receipt of written acceptance of said estimate from the CONTRACTOR.

2. In case of periodic payments, the OWNER may deduct from its payment a retention based on its estimate of the fair value of its claims against the CONTRACTOR, a retention of direct payment to Subcontractors based on demands for same in accordance with the provisions of G.L. c.30 §39F, and a retention to secure satisfactory performance of the contractual work not exceeding five percent (5%) of the approved amount of any periodic payment.

3. The same right to retention shall apply to bonded Subcontractors entitled to direct payment under G.L. c.30 §39F.

4. A five percent (5%) value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

Acceptance of periodic payments by the CONTRACTOR shall constitute a waiver of claims known or knowable at the time by the payee except those previously made in writing and identified by the payee as unsettled at the time of periodic payment.

The payment of any periodic estimate or of any retained percentage shall in no way constitute an acceptance of the work or in no way prejudice or affect the obligation of the CONTRACTOR at its own cost or expense to repair, correct, renew, or replace any defects or imperfections in the work as well as all damages due or attributable to such defects, nor shall any such payments for any current estimate or of any retained percentages prejudice or affect the rights of the Town to hold the CONTRACTOR liable for breach of contract or avail itself of other remedies under this Contract.

If at any time there shall be evidence of any lien or other claim for which, if established, the Town may become liable, directly or indirectly, and which is chargeable to the CONTRACTOR, the Town may retain out of the payment then due or thereafter to become due, an amount sufficient to completely indemnify it against any such claim. If there proves to be any such claims after all the payments are made, the CONTRACTOR shall refund to the Town all moneys that the Town pays in discharging such claim in consequence of the CONTRACTOR's default.

C. Payment if the OWNER Causes Delay. In accordance with G.L. c.30, §390(a), the OWNER may order the General CONTRACTOR in writing to suspend, delay, or interrupt all or any part of the Work for such period of time as it may determine to be appropriate for the convenience of the OWNER; provided however, that if there is a suspension, 'delay or interruption for fifteen (15) days or more or due to a failure of the OWNER to act within the time specified in this Contract, the OWNER shall make an adjustment in the Contract Price for any increase in the cost of performance of this Contract but shall not include any profit to the General CONTRACTOR of such increase; and provided further, that the OWNER shall not make any adjustment in the Contract Price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this Contract provides for an equitable adjustment of the Contract Price under any other Contract provisions.

G.L. c.30, §390(b) provides that the General CONTRACTOR must submit the amount of a claim under provision (a) to the OWNER in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this Contract and, except for costs due to a suspension order, the OWNER shall not approve any costs in the claim incurred more than 20 days before the General CONTRACTOR notified the OWNER in writing of the act or failure to act involved in the claim.

ARTICLE 8. FINAL PAYMENT

Final payment shall be made by the OWNER to the CONTRACTOR when (a) a final Application for Payment, certified for payment by the Architect, Engineer, or the OWNER as the case may be, has been submitted to the OWNER, and (b) whichever of the following first occurs: (i) the CONTRACTOR has substantially completed the Work so that the value of the work remaining to be done is, in the estimate of the OWNER, less than one (1 %) per cent of the original Contract Price, or (ii) the CONTRACTOR has substantially completed the work and the OWNER takes possession for occupancy.

Final payment shall constitute payment of the entire balance due on the Contract less (i) a retention based on the OWNER's estimate of its claims against the CONTRACTOR and of the cost of completing the incomplete and unsatisfactory items of work and less (ii) a retention for direct payments to Subcontractors pursuant to the provisions of M.G.L. c.30, §39F.

Interest on overdue payments shall be paid pursuant to the provisions of G.L. c.30, §39K.

The final payment for work done under this Contract shall be made only after the CONTRACTOR has signed a statement under the penalty of perjury certifying that the work described in this Contract has been completed.

The payments of the amounts due under this Contract or in accordance with any written alterations of the same by the parties hereto shall release the OWNER and all of its officers, agents, and employees from any and all claims and liability in any way relating to this Contract or any such alternation thereof or anything relating thereto.

ARTICLE 9. PROJECT GUARANTEE

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

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

ARTICLE 10. TERMINATION, SUSPENSION, OR DELAY

A. Termination for Cause. The OWNER may terminate this Contract for cause by written notice, in accordance with Article 14 C. if the OWNER determines that any of the following circumstances have occurred:

1. The CONTRACTOR is adjudged bankrupt or has made a general assignment for the benefit of its creditors;

2. A receiver has been appointed of the CONTRACTOR's property;

3. All or a part of the Work has been abandoned;

4. The CONTRACTOR has sublet or assigned all or any portion of the Work, the Contract, or claims thereunder, without the prior written consent of the OWNER, except as provided in the Contract;

5. The Engineer or the OWNER has determined that the rate of progress required on the Project is not being met; or

6. The CONTRACTOR has substantially violated any provisions of this Contract.

In the event of such termination, the OWNER may hold the CONTRACTOR and its sureties

liable in damages as for a breach of contract, and/or the OWNER may notify the CONTRACTOR to discontinue all work, or any part thereof, and the CONTRACTOR shall discontinue all Work, or any part thereof, as the OWNER may designate.

The OWNER may complete the Work, or any part thereof, and charge the expense of completing the Work or part thereof, to the CONTRACTOR.

The OWNER may take possession of and use any materials, machinery, implements and tools found upon the site of said Work. The OWNER shall not be liable for any depreciation, loss or damage to said materials, machinery, implements or tools during said use and the CONTRACTOR shall be solely responsible for their removal from the Project site after the OWNER has no further use for them.

The OWNER may, at its option, require the surety or sureties to complete the Contract.

B. Termination Liabilities. All expenses charged under paragraph A shall be deducted and paid by the OWNER out of any monies then due or to become due the CONTRACTOR under this Contract; and in such accounting the OWNER shall not be held to obtain the lowest figures, by competitive bid or otherwise, for the work of completing the Contract or any part thereof. Because both parties recognize (1) that the time for completion of this Contact is of the essence, (2) that the Town will suffer loss if the work is not completed within the contract time specified, plus any extension thereof allowed in accordance with the provisions of this Contact, and (3) the delays, expense and difficulties involved in a legal proceeding to determine the actual loss suffered by the Town if the work is not completed in time, it is agreed that the CONTRACTOR will pay the Town as liquidated damages the sum of Two Hundred

Dollars ($200) per day for each and every day thereafter that it fails to deliver such work completed according to the requirements of the Contract. Such liquidated damages shall be paid not as a penalty, but to cover losses and expenses to the OWNER, including intangible costs and losses that are or may be impracticable to ascertain. Allowing the CONTRACTOR to continue to finish the work (or any portion of the work) after the time specified for completion of the work shall not operate as a waiver on the part of the Town of any of its rights under the Contract or otherwise under law or equity.

All sums actually paid by the OWNER to complete the Work shall be charged to the CONTRACTOR. In case the expenses charged are less than the sum which would have been payable under this Contract if the same had been completed by the CONTRACTOR, the CONTRACTOR shall be entitled to receive the difference. In case such expenses shall exceed the said sum, the CONTRACTOR shall pay the amount of the excess to the OWNER.

C. Termination - No Fault. The OWNER may terminate this Agreement by notice to the CONTRACTOR for the convenience of the OWNER. In the event that this Contract is so terminated by the OWNER or otherwise terminated by the OWNER, by written notice in accordance with Article 14c., and termination is not based on a reason listed in paragraph A., the CONTRACTOR shall be compensated for its costs incurred on the Project, including reasonable costs of demobilization, calculated on a percent completion basis, covering the period of time between the last periodic payment and the date of termination, less any hold back due to claims against the CONTRACTOR, pending resolution of same.

Payment by the OWNER pursuant to this paragraph shall be considered to fully compensate the CONTRACTOR for all claims and expenses and those of any consultants, Subcontractors, and suppliers, directly or indirectly attributable to the termination, including any claims for lost profits.

Should any termination for cause be determined to be invalid or not for proper cause, then the termination shall be deemed to have been for the convenience of the OWNER and the CONTRACTOR shall be entitled to payment as provided for herein.

Any termination or suspension shall not impair the right of the OWNER to recover damages occasioned by the fault of the CONTRACTOR. Any suspension shall not limit the right of the OWNER to terminate.

D. Suspension and Delay. Should the OWNER be prevented or enjoined from proceeding with Work either before or after the start of construction by reason of any litigation or other reason beyond the control of the OWNER, the CONTRACTOR shall not be entitled to make or assert claim for damage by reason of said delay but time for completion of the Work will be extended to such reasonable time as the OWNER may determine will compensate for time lost by such delay with such determination to be set forth in writing. See also Article 7C, citing G.L. c.30, § 390(a) and (b).

ARTICLE 11. REPRESENTATIONS AND CERTIFICATIONS OF THE CONTRACTOR

The CONTRACTOR hereby represents and certifies under the pains and penalties of perjury:

A. Organization. The CONTRACTOR is a duly organized and validly existing corporation/partnership/trust/sole proprietorship [select one] and is qualified to do business and is in good standing in the Commonwealth of Massachusetts, with full power and authority to consummate

the transactions contemplated hereby.

B. Authority. (Not applicable to sole proprietorships.) This Agreement has been duly executed and delivered on behalf of the CONTRACTOR by its president/treasurer/general partner/trustee/other [select one] to and in full compliance with the authority granted by its organizational documents and its votes or resolutions, which authority has not been amended, modified or rescinded as of the date hereof. The person executing this Agreement is, as of the date hereof, the president/treasurer/general partner/trustee/other [select one] of the CONTRACTOR.

C. Non-Collusion. The bid upon which this Agreement was based was made without collusion or fraud with any other person and was in all respects bona fide and fair. As used in this paragraph, the word, "person," shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

D. Tax and Contributions Compliance. The CONTRACTOR is in full compliance with all laws of the Commonwealth of Massachusetts relating to taxes and to contributions and payments in lieu of contributions.

CONTRACTOR's tax identification number is: _____

E. Municipal Taxes and Liens. The CONTRACTOR has paid all real estate, personal property or excise tax, water charges, fines and or any other municipal lien charges due to the Town of Cheshire.

F. Debarment. The CONTRACTOR certifies that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal or state department or agency.

G. Minimum Wage. The CONTRACTOR shall comply with the requirements of the G.L. c.l49, §§26 through 30, inclusive, as amended, all of which are hereby incorporated herein by reference, and Minimum Wage Rates and Health and Welfare and Pension Fund Contributions as determined by the Commissioner of Labor and Industries under the provision of the aforesaid statutes as applicable.

H. Licenses and Permits. The CONTRACTOR is in possession of all required licenses and permits for any activity that may occur from the CONTRACTOR's operations under this Agreement. The CONTRACTOR will submit copies of such licenses and/or permits upon request.

I. Discrimination. It is understood and agreed that it shall be a material breach of any contract resulting from this bid for the CONTRACTOR to engage in any practice which shall violate any provision of G.L. c.151B, relative to discrimination in hiring, discharge, compensation, or terms, conditions, or privileges of employment because of race, color, religion, creed, national origin, sex, sexual orientation, age or ancestry.

J. Conflict of Interest. The bidder certifies that no official or employee of the OWNER has a financial interest in this quotation or in the Contract which the bidder offers to execute or in the expected profits to arise there from, unless there has been compliance with provisions of G.L. c.43, §27 (Interest in Public Contracts by Public Employees), and G.L. c.268A, §20 (Conflict of Interest), and that

this quotation is made in good faith without fraud or collusion or connection with any other person submitting a quotation.

ARTICLE 12. INSURANCE

1. Broad form General Liability coverage naming the Town as additional insured, written on a "per occurrence" basis and with an aggregate cap no less than three times the required limit: $1,000,000 CSL. Such insurance shall (i) include contractual liability coverage, (ii) completed operations coverage; (iii) not be subject to any of the special property damage liability exclusions commonly referred to as XCV exclusions; and (iv) be extended by the addition of the so-called “broad Form Property Damage Endorsement”.

2. Automobile Liability coverage, including coverage for owned, hired or borrowed autos: $1,000,000 CSL.

3. Worker's Compensation coverage (per Massachusetts law) and Employer's Liability coverage: coverage A at statutory limits and coverage B at limits of $100,000/$500,000/$100,000.

4. Umbrella or Excell Liability coverage following form of underlying General and Automobile Liability coverage: $1,000,000 CSL.

5. Wherever applicable, including, but not limited to Contractor’s Comprehensive General Liability Insurance, all insurance coverage shall be on an “occurrence basis” and not a “claims-made basis”.

6. Certificates of Insurance and copies of policies acceptable to the Town shall be addressed to and filed with the Town Administrator prior to commencement of the work. Renewal certificates shall be filed with the Town Administrator at least thirty (30) days prior to the expiration date of required policies.

7. No insurance coverage shall be subject to cancellation or non-renewal without at least thirty (30) days prior written notice forwarded by registered or certified mail to the Town. The Contractor shall notify the Town of the attachment of any restrictive amendments, material changes or impairment to the policies.

8. All premium costs shall be included in the Contractor’s bid. The Contractor shall be responsible for the cost of any and all deductibles.

9. The Town of Cheshire (including its officials, employees, agents and representatives) shall be named as an additional insured on all the Contractor’s Insurance Policies.

Prior to the execution of a contract, the successful bidder shall furnish to the Town, Certificates of Insurance which evidence the maintenance of the above policies.

All Certificates of Insurance shall include the Town of Cheshire as an additional named insured

and shall require a thirty-day notice of cancellation to the Town.

ARTICLE 13. INDEMNIFICATION

The CONTRACTOR shall indemnify, defend and save the OWNER harmless from and against any and all liabilities, losses, damages, costs, expenses (including reasonable attorneys' expenses and fees), causes of action, suits, claims, demands or judgments or any nature whatsoever that may be imposed upon or incurred by or asserted against the OWNER by reason of any of the following occurrences during the term of this Contract:

1. Any accident, injury to, or death of any person or any damage to property arising out of or in any way referable to the work or the exercise by the CONTRACTOR or any of his employees, agents or Subcontractors, of any right or privilege hereby granted; or

2. Any use, non-use, condition, or occupation of the CONTRACTOR or any of his employees, agents or Subcontractors of the property; or

3. Any failure of the CONTRACTOR or any of his employees, agents or Subcontractors, to perform or comply with any contracts, agreements or restrictions, statutes, laws, ordinances or regulations affecting the Work or any part thereof.

ARTICLE 14. MISCELLANEOUS PROVISIONS

A. References. Where reference is made in this Contract to a provision of the General Conditions, the Technical Specifications or another Contract Documents, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

B. Terms Required by Law. All terms required by law to be included in this Contract are hereby included and shall be in as full effect as if set forth in full herein.

C. Notice.

1. Any notice required to be given to the CONTRACTOR under the terms of this Agreement shall be in writing and sent by registered or certified mail, postage prepaid, return receipt requested to: _____ _____or such other address as the CONTRACTOR from time to time may have designated by written notice to the OWNER and shall be deemed to have been given when mailed by the OWNER. All such addresses shall contain a street address.

2. Any notice required to be given to the OWNER by the CONTRACTOR under the terms of this Agreement shall be in writing and sent by registered or certified mail, postage prepaid, return receipt requested to:
Town of Cheshire, 80 Main Street, Cheshire, MA 01225 or such other address as the OWNER from time to time may have designated by written notice to the CONTRACTOR and shall be deemed to have been given when mailed by the OWNER.

D. Independent Contractor. The CONTRACTOR is not an agent or employee of the OWNER and

is not authorized to act on behalf of the OWNER. The CONTRACTOR is not entitled to any benefits or privileges of the OWNER's employees by reason of this agreement.

E. Complete Agreement. This Agreement supersedes all prior agreements and understandings between the parties and may not be changed unless mutually agreed upon in writing by both parties.

F. Assignment. The CONTRACTOR shall not assign this Agreement, or any interests therein, without prior written consent of the TOWN.

G. Subcontractors. The CONTRACTOR shall not engage any other company, Subcontractor or individual to perform any obligation hereunder, without the prior written consent of the OWNER.

H. Governing Law. This Agreement shall be governed by the law of the Commonwealth of Massachusetts.

I. Enforceability. In the event any provision of this Agreement is found to be legally unenforceable, such unenforceabi1ity shall not prevent enforcement of any other provision of the Agreement.

J. Personal Liability. No member, employee, official, office, agent, staff or consultant of the OWNER shall be under any personal obligation or liability by reason of this Contract, the execution thereof or anything relating thereto.

K. All section headings and captions used in this Agreement are solely for convenience and shall not affect the interpretation of this Agreement.

L. This Contract shall not be enforceable against the Town unless and until the CONTRACTOR complies with this section. This Contract is only binding upon, and enforceable against the Town if:

(i) The Contract is signed by the Board of Selectmen or its designee;

(ii) Endorsed with approval by the Town Accountant as to appropriation or availability of funds; and

(iii) Endorsed with the approval of the Town Counsel as to form.

M. This contract shall be binding upon the CONTRACTOR, its assigns, transferees, and/or successors in interest and, where not corporate, the heirs and estate of the CONTRACTOR.

IN WITNESS WHEREOF, the said OWNER and the said CONTRACTOR have executed this Agreement as a sealed instrument as of the date first written above.

_____ _____

_____ Representative of Contractor

_____

Town of Cheshire Board of Selectmen

Date:_____ Date:_____

APPENDIX A / B

INVITATION TO BIDDERS /

ADVERTISEMENT IN LOCAL NEWSPAPER AND CENTRAL REGISTER

William Francis Galvin
Secretary of the Commonwealth of Massachusetts

HOME DIRECTIONS CONTACT US

General contract submission confirmation

The following General Contract submission was successfully received.

Planned date of publish is 7/13/2022

Awarding Agency

Agency Name and Address:	**Town of Cheshire Board of Selectmen 80 Church Street Cheshire, MA 01225**
Project Number:	
Estimated Cost:	**$150,000.00**
Contractor Qualification:	

Required for DCAMM contracts over $150,000, Highway Division contracts over $50,000. Add categories to the Project description below.

Contact Information

Name:	**Jennifer Morse**		
Phone:	**413-743-1690**	Fax	
Email Address:	**jmorse@cheshire-ma.gov** **Notify email address listed when final publish date assigned.**		

Contract Information

Project:	**Water line improvements, Depot Street, Railroad Street and Mill Hill Road. Labor only. The Town has purchased pipeline materials previously.**		
Plans/Specifications Available: Place, date and time	**via email, and Town of Cheshire Town Hall, Wednesday, July 13, 2022 between hours of 8:30 am to 3:30 pm**		
General Bid Deadline*:	**07/29/2022**	Time	**10:00**
Sub Bid Deadline:		Time	
Sub Bid Categories:			
Additional Information			

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Town of Cheshire
Invitation to Bid

Depot Street, Railroad Street and Mill Hill Road, Water System Improvements – July 2022

The Town of Cheshire, acting through its Board of Selectmen, invites sealed bids for water line replacement activities along portions of Depot Street, Railroad Street and Mill Hill Road in the Town of Cheshire. The project shall include installation of 8-inch diameter ductile iron pipe water line, relocation or installation of fire hydrants and connections of services to the new water main. Total length of project is approximately 1,700 feet. Bid prices shall include all equipment, labor, and material (not provided by the Town of Cheshire) for a complete in place project as shown on project documents.

Contractors intending to bid on this project have a minimum of five years' experience in water line installation of 8" size piping or larger and must have documented experience to the satisfaction of the Town of Cheshire designated representative.

Specifications are available from Berkshire Engineering, Inc., 80 Run Way, Lee, MA 01238, via email in pdf format from staff@berkshireengineering.com Monday through Friday, 7:30 AM to 4:00 PM. (413-243-4122).

Sealed bids shall be labeled, "**Cheshire, MA, Depot Street, Railroad Street and Mill Hill Road, Water Line Replacement – July 2022"** and will be received by the Board of Selectmen at the Cheshire Town Hall, 80 Main Street, Cheshire, MA 01225 until **10:00 a.m. on July 29, 2022.** All bids will be opened and the total bid amount read aloud at this place and time.

Each bid shall be accompanied by a security or bond in the amount of 5% of the bid price. The successful bidder must furnish a 100% performance bond for the described work. No bidder may withdraw their bid for a period of thirty (30) days, excluding Saturdays, Sundays, and holidays after the opening date.

Wage rates are subject to the minimum wage rate as per M.G.L. CH. 149 section 26 to 27F inclusive.

The Town of Cheshire is an affirmative action/equal opportunity employer. The Office of the Select Board reserves the right to waive any informality or to reject any or all bids if deemed to be in the best interest of the Town of Cheshire.

Board of Selectmen
Town of Cheshire, MA

APPENDIX C

SPECIFICATIONS

SECTION 01110- CONTROL OF WORK AND MATERIALS

1. Hauling, Handling and Storage of Materials
2. Easements
3. Open Excavations
4. Care and Protection of Property
5. Protection and Relocation of Existing Structures and Utilities
6. Maintenance of Flow
7. Rejected Materials and Defective Work
8. Sanitary Regulations
9. Safety and Health Regulations
10. Site Investigation
11. Hazardous Waste

1 HAULING, HANDING AND STORAGE OF MATERIALS

A. The Contractor shall, at his own expense, handle and haul all materials furnished by him and shall remove any of his surplus materials at the completion of the work.

B. The Contractor shall provide suitable and adequate storage for equipment and materials furnished by him that are liable to injury and shall be responsible for any loss of or damage to any equipment or materials by theft, breakage, or otherwise.

C. All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such location as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.

D. The Contractor shall be responsible for all damages to the work under construction during its progress and until final completion and acceptance even though partial payments have been made under the Contract.

2 EASEMENTS

A. As indicated on the drawings, the work is located in easements obtained by the Owner. The Contractor has no rights outside of the easements unless they are obtained from the property owner.

B. Contractor shall schedule work so that it will cause minimum inconvenience and nuisance to abutting property owners, over the shortest possible time.

C. Easements shall be kept clean; no rubbish or discarded construction materials shall be allowed to accumulate. Storage of excess construction materials, including soil, ledge, equipment, or machinery on easements will not be allowed.

D. Restoration of fences, shrubs, trees and grass shall be completed promptly following completion of the work in an easement, to minimize disruption and inconvenience to property owners.

3 OPEN EXCAVATIONS

A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at his own expense, provide suitable and safe means for completely covering all open excavations and for accommodating travel when work is not in progress.

B. Bridges provided for access to private property during construction shall be removed when no longer required.

C. The length of open trench will be controlled by the particular surrounding conditions but shall always be confined to the limits prescribed by the Engineer.

D. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, then special construction procedures shall be taken, such as limiting the length of trench and prohibiting stocking excavated material in the street.

E. All street excavations shall be completely closed at the end of each work day. Backfilling or use of steel plates of adequate strength to carry traffic shall beused.

4 CARE AND PROTECTION OF PROPERTY

The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be promptly restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, to the satisfaction of the Engineer.

5 PROTECTION AND RELOCATION 0F EXISTING STRUCTURES AND UTILITIES

A. All existing buildings, utilities, pipes, poles, wires fences, curbings, property line markers and other structures which the Engineer decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the contractor. Should such property be damaged, it shall be restored by the Contractor, at no additional cost to the Owner.

B. The Contractor shall determine the location of all underground structures and utilities (including existing water services, drain lines, electrical lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by Contractor.

C. When fences interfere with the Contractor's operations, he shall remove and (unless otherwise. specified) promptly restore them in accordance with Section 01564 EXISTING FENCES.

D. On paved surfaces the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels which are shaped so as to cut or otherwise damage such surfaces.

E. All property damaged by the Contractor's operations shall be restored to a condition at least equal to that in which it was found immediately before work was begun. Suitable materials and methods shall be used for such restoration.

F. Restoration of existing property and structures shall be carried out as promptly as practicable and shall not be left until the end of the construction period.

6 MAINTENANCE OF FLOW

A. The Contractor shall at his own cost, provide for the flow of sewers and drains interrupted during the progress of the work, and shall immediately cart away and dispose of all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.

B. All existing drainage facilities including, but not limited to; brooks, streams, canals, channels, ditches, culverts, catch basins and drainage piping shall be adequately safeguarded so as not to impede drainage or to cause siltation of downstream areas in any manner whatsoever. If the Contractor damages or impairs any of the aforesaid drainage facilities, he shall repair the same within the same day.

C. At the conclusion of the work, the Contractor shall remove all silt in drainage structures caused by his operations as described in Section 01740, CLEANING UP.

7 REJECTED MATERIALS AND DEFECTIVE WORK

A. Materials furnished by the Contractor and condemned by the Engineer as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor, and shall not be made use of elsewhere in the work.

B. Any errors, defects or omissions in the execution of the work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Engineer.

C. The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect, error, omission or act of the Contractor or his employees, as determined by the Engineer, occurring previous to the final payment.

8 SANITARY REGULATIONS

Sanitary conveniences for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers in such manner and at such locations as may be approved. The contents shall be removed and disposed of in a satisfactory manner as the occasion requires. The Contractor shall rigorously prohibit the committing of nuisances within, on or about the work. Any employees found violating these provisions shall be discharged and not again employed on the work without the written consent of the Engineer. The sanitary conveniences specified above shall be the obligation and responsibility of the Contractor.

9 SAFETY AND HEALTH REGULATIONS

This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CPR, Part 1926, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of

Accidents in Construction Operations (454 CMR 10.0 et. seq.)." Contractors shall be familiar with the requirements of these regulations.

10 SITE INVESTIGATION

The Contractor acknowledges that he has satisfied himself as to the conditions existing at the site of the work, the type of equipment required to perform this work, the quality and quantity of the materials furnished insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the drawings and specifications made a part of this contract. Any failure of the Contractor to acquaint himself with available information will not relieve him from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusion or interpretation made by the Contractor on the basis of the information made available by the Owner.

11 HAZARDOUS WASTE

Should the Contractor, while performing work under this contract, uncover hazardous materials, as defined in Massachusetts Hazardous Waste Regulations 310 CMR 30.00, he shall immediately notify the Engineer. The Contractor is not, and has no authority to act as, a handler, generator, operator or disposer of hazardous or toxic substances found or identified at the site, and the Owner shall undertake all such functions.

SECTION 01140 - SPECIAL PROVISIONS

1. Water for Construction Purposes
2. Pipe Location
3. Dimensions of Existing Structures
4. Occupying Private Property
5. Existing Utility Locations– Contractor's Responsibility
6. Coordination of Work
7. Time for Completion of Contract
8. Maintenance of Trench Surface
9. Wetland Protection Sign
10. Compliance with Permits
11. Cutting, Fitting and Patching
12. Connections to Existing System
13. Contractor's Representative
14. Visual Recording
15. Hours of Construction Activity
16. Construction Crews
17. Applications for Payments

1 WATER FOR CONSTRUCTION PURPOSES

A. In locations where water is in sufficient supply, the Contractor may be allowed to use water without charge for jetting backfill and other construction purposes. The express approval of the Owner shall be obtained before water is used. Waste of water by the Contractor shall be sufficient cause for withdrawing the privilege o f unrestricted use.

B. If no water is available, the Contractor shall supply water at no additional cost to the Owner.

2 PIPE LOCATION

Pipe shall be located substantially as indicated on drawings. The Owner reserves the right, acting through the Engineer, to make such modifications as may be deemed desirable to avoid interference with existing structures or for other reasons.

3 DIMENSIONS OF EXISTING STRUCTURES

Where the dimensions and locations of existing structures are of critical importance in the installation or connections of new 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.

4 OCCUPYING PRIVATE PROPERTY

The Contractor shall not enter upon nor occupy with men, equipment or materials any property outside of the public highways or Owner's easements, except with the written consent of the property owner or property owner's agent.

5 EXISTING UTILITY LOCATIONS - CONTRACTOR'S RESPONSIBILITY

A. The location of existing underground services and utilities shown on the drawings is based on available records. It is not warranted that all existing utilities and services are shown, nor that

shown locations are correct. The Contractor shall be responsible for having the utility companies locate their respective utilities on the ground prior to excavating.

B. To satisfy the requirements of Massachusetts law, Chapter 82, Section 40, the Contractor shall, at least 72 hours, exclusive of Saturdays, Sundays and holidays, prior to excavation in the proximity of telephone, gas, cable television and electric utilities, notify the utilities concerned by calling "DIG SAFE" at telephone number: 1-888-344-7233.

C. The Contractor shall coordinate all work involving utilities and shall satisfy himself as to the existing conditions of the areas in which he is to perform his work. He shall conduct and arrange his work so as not to impede or interfere with the work of other contractors working in the same or adjacent areas.

6 COORDINATION OF WORK

The General Contractor shall be responsible for coordinating his own work as well as that of any subcontractors. He shall be responsible for notification of the Engineer when each phase of work is expected to begin and the approximate completion date.

7 TIME FOR COMPLETION OF CONTRACT

The time for completion of this contract is stipulated in the Form of General Bid. The Bidder shall base his bid on completing the proposed work by the completion date stipulated in the BID PROPOSAL FORM.

8 MAINTENANCE OF TRENCH SURFACE

After backfilling and compacting the trench, the Contractor shall be responsible for keeping the ground surface dry and passable at all times until the surface has been restored to original conditions.

9 COMPLIANCE WITH PERMITS

A. The Contractor shall perform all work in conformance with requirements of the Permits, which appear in Section 00890 Permits.

10 CUTTING, FITTING AND PATCHING

A. The Contractor shall do all cutting, fitting, or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other Contractors, as shown upon or reasonably implied by the drawings and the specifications for the completed structure, including all existing work.

B. The Contractor shall not endanger any work by cutting, digging, or otherwise and shall not cut or alter the work of any other Contractor, save with the consent of the Engineer.

C. All holes or openings required to be made in new or existing work, particularly at pipe, conduit, or other penetrations not covered by escutcheons or plates shall be neatly patched. All such holes shall be made completely watertight as approved by the Engineer.

D. Size and locations of holes required in steel, concrete, or other structural or finish materials for piping, wiring, ducts, etc., which have not been located and detailed on the drawings shall be

approved by the Engineer prior to layout and cutting there of. All holes shall be suitably reinforced as required by the Engineer.

E. Workmanship and materials of patching and repair work shall match the adjacent similar work and shall conform to the applicable sections of the specification. Patches and joints with existing work shall provide, as applicable in each case, visual, structural, and waterproofing continuity.

11 CONNECTIONS TO EXISTING WATER SYSTEMS

A. The Owner will, upon 24-hour notice from the Contractor, assist the Contractor by locating and opening or closing any and all valves required for draining or admitting water to the various sections of the water main as required to perform the proposed work. 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.

B. Connections to the existing distribution system shall be made with the mains under pressure unless the lines can be temporarily taken out of service as approved by the Owner.

C. The Contractor will be required to make test excavations to ascertain that the proposed position of the connections will be clear of joints, fittings, or other obstructions.

D. If any failure occurs in connection to existing mains, service shall be restored in the shortest possible time, the Contractor working around the clock, if necessary. He shall cooperate with the Owner in notifying the consumers or supplying emergency water. If required by Owner, the Contractor shall make connections to water mains during night hours, on Sunday or at other times of off-peak demand for water.

12 CONTRACTOR'S REPRESENTATIVE

The Contractor shall designate a representative who will be available to respond to emergency calls by the Owner at any time day and night and on weekends and holidays should such a situation arise.

13 HOURS OF CONSTRUCTION ACTIVITY

A. The Contractor shall conduct all construction activity between 7:00 a.m. and 3:30 p.m., Monday through Friday. No construction work shall be allowed on Saturdays, Sundays or Holidays without written authorization from the Owner.

B. The Owner will provide personnel for assistance in locating and operating valves at no cost to the Contractor during the Owner's normal working hours (Monday through Friday 7:00 a.m. to 3:00 p.m.). When this assistance is required by the Contractor outside of the Owner's normal working hours the cost will be incurred by the Contractor at the prevailing overtime rate of pay for the personnel providing the assistance. The Owner will bill the Contractor directly.

14 CONSTRUCTION CREWS

The Contractor shall not increase the number of construction crews assigned to the work without providing one week advance notice to the Engineer and Town.

15 APPLICATIONS FOR PAYMENT

The OWNER will make payments to the Contractor as required by the CONTRACT DOCUMENTS and consistent with the requirements of the funding' source. The CONTRACTOR will provide a payment schedule for each month the work is in progress for the project. The schedule will be provided to the OWNER at the preconstruction meeting. The OWNER may hold payment for in the event the Contractor has not provided required payroll documentation, testing results, certifications or other documentation to verify that all work has completed in accordance with the Contract Documents.

REVISED August 15, 2019

SECTION 01180 - GENERAL WATER PROVISIONS

1 GENERAL

These general water provisions apply to all specifications for work on water system, and by reference is part of each section of those specifications.

2 MATERIALS

Materials and product manufacturer shall be in accordance with the current Town of Cheshire Water Department's Approved Products List or approved equivalent.

2.01 Hardware

Hardware is to be made of blue fluorocarbon coated, cold formed, high strength, low-alloy steel in accordance with ANSI/AWWA C111/A21.11.

2.02 Warning Tape

Warning tape is to be 3-inch wide blue colored direct burial detectable metallic-lamination tape designed to locate and warn excavators of existing buried water pipes. Warning tape is to be marked in bold readable lettering "**CAUTION WATER LINE BURIED BELOW**".

2.03 Material Certification

Manufacturers and suppliers certifications are to be furnished to Engineer stating that materials furnished have passed acceptance tests listed in appropriate specification.

Water pipe, fittings and appurtenances that come into contact with drinking water are to be certified by an ANSI approved third-party North American certification program or laboratory for conformance with American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 for health effects and also ANSI/NSF Standard 61-Annex G or ANSI/NSF Standard 372 for "lead free" lead content requirements.

2.04 Thrust Restraint

Concrete for thrust blocks is to be Class K in conformance with requirements of Section 03300 Cast in Place Concrete and can be either central, transit or truck mixed. With prior approval of Engineer, an on-site mixed concrete can be used in lieu of Class K mix. Use of dry unmixed cement for constructing thrust blocks is prohibited.

Push-on joints and mechanical joints may require restraint by utilizing restraining devices as described in the Materials Section of 15140, Water Main Pipe and Fittings. Restraining device is to be installed according to manufacturer's instructions. See Standard Detail for length of water pipe, including all pipe joints within the given length, required to be restrained.

Tie rods and clamps may be used in lieu of restraining device and are subject to approval of Engineer prior to their use in water work. Tie rods, clamps and hardware are to be in conformance with requirements of Section 2.01.

Number and diameter of tie rods to be used for restrained joints shall be as shown in the following table:

NUMBER OF TIE RODS REQUIRED FOR JOINT RESTRAINT						
Water Pipe Size (inches)	**Domestic System Rod Diameter**			**Holly System Rod Diameter**		
	5/8 inch	**3/4 inch**	**1 inch**	**5/8 inch**	**3/4 inch**	**1 inch**
4	2	-	-	2	-	-
6	-	2	-	-	2	-
8	-	2	-	-	2	-
10	-	2	-	-	2	-
12	-	2	-	-	4	-
16	-	4	2	-	4	2
20	-	4	2	-	6	4

Prior to backfilling, uncoated tie rods, clamps and any components made of metal used for restrained joints are to receive hand brushed application of an approved bitumastic coating specifically manufactured for underground use or wax tape coating system.

2.05 Bedding and Backfill Materials

Sand material is to be used for embedment around water pipe and fittings and is to be in conformance with requirements of Section 02300 Earthwork. Use of select granular backfill (water) or locally excavated materials for purpose of embedment around water pipe and fittings is prohibited. Only an approved sand material is to be used for purpose of embedding water pipe and fittings.

Select granular backfill (water) material to be used as backfill above sand embedment course is to be in conformance with requirements of Section 02300 Earthwork.

In lieu of select granular backfill (water) material, locally excavated material that is determined suitable for use by Engineer can be used as backfill above sand embedment course.

Suitable locally excavated material consists of hard durable materials and soil that is free of clay, frozen, organic and other extraneous materials, and stones that are dimensionally greater than 3 inch in diameter.

2.06 Controlled Density Fill Material

Controlled density fill material is to have a compressive strength of 50 to 100 pounds per square inch, and must not contain fly ash or other pozzolan containing materials.

2.07 Surface Restoration Materials

Following materials are to be used:

- Gravel Subbase, Class I Bituminous Concrete, Type I-1, Class I Bituminous Concrete Pavement MHD M3.11.03, and Seal Coat MHD M3.03.3 in conformance with requirements of Section 02745 Paving
- Seeding in conformance with requirements of Section 02920 Loaming and Seeing
- Topsoil in conformance with requirements of Section 02921 Surface Restoration of Cross Country Areas

3 CONSTRUCTION DETAILS

3.01 General

Work on water system is to be coordinated with the Water Superintendent. Location and disposition of water services must be verified before beginning any water system related work.

Where existing water system is required to be shut down as approved by the Engineer, Water Superintendent will close existing water valves needed to isolate that section of existing water system. Water Superintendent is to be notified minimum of 10 working days in advance of intent to do work that requires section of existing water system to be shut down, and again minimum of 2 working days in advance of when actual work is to begin. Water valves and hydrants are to be operated only by authorized Cheshire Water Department personnel.

Work is to be scheduled so as to maintain adequate level of water service, with interruptions being of minimum duration. Affected water service customer is to be notified by Contractor minimum of 24 hours in advance of any planned water service disruption. Temporary water service is to be provided to water service customer where water service is to be discontinued for more than 8 hours, or when indicated in Contract Documents. Method of providing temporary water service is to be in conformance with requirements of Section 02516 Temporary Bypass.

Businesses and sensitive water service customers that require continuous water service for their basic operation are to receive a written notification by Contractor minimum of 72 hours in advance of planned water service disruption and be provided with temporary water supply when water system is shut down, or water shut shall be coordinated such that it occurs outside normal business operating hours.

Permit is required from Water Superintendent to use water from hydrants. Permit requires use of water meter and backflow preventer being supplied by the Water Superintendent.

Water Superintendent and Engineer must be immediately notified when existing hydrant is put out of service. Dispatcher will inform Fire Department of out of service hydrant, and Contractor is to red tag out of service hydrant. Dispatcher must be notified when hydrant is placed back in service.

Contractor is to provide record information of all water service work to Water Superintendent. Record information is to be submitted in form of water service card. Water service card is to be submitted for approval to the Water Superintendent all required information completely filled in. Record information to be provided on each water service card includes street address, coordinate location of water service pipe and curb stop, sizes and type of material installed, and Contractor’s and inspector’s names.

Excavation is to be in conformance with requirements of Section 02300 Earthwork and Section 02252 Support of Excavation. Excavation for new water construction is to be only to sufficient length, width and depth needed to perform work in safe manner, to expose existing water pipe, and for proper installation of new water pipe and fittings.

Appropriate measures are to be taken to prevent extraneous material and ground water from contaminating water system. Ground water level is never to be less than 12 inches below invert of water pipe. To prevent contamination, open ends of water pipe that are left unattended are to be plugged with watertight plug, and wrapped in a double layer of polyethylene plastic and tightly taped or tied.

Prior to installation, water valves and hydrants are to be inspected, cleaned, lubricated and tested to insure they are in proper working order and bolts and nuts are torqued to manufacturer’s specifications.

Prior to installation of any new water pipe and fittings, open end of existing water pipe is to be cleaned, removing all external dirt, scale and rust for minimum distance of 12 inches beyond end of new water pipe and fittings. Extraneous material that ends up inside water pipe must be removed via scouring by manipulating respective water valve.

Trenches located within existing pavement areas are to be surface finished with temporary pavement before end of work day. Temporary pavement is to be in conformance with requirements of Section 02745 Paving.

Extra caution is to be taken when working in vicinity of existing water pipe which is to remain in service. No vibratory equipment is to be used within 5 feet horizontally of existing cast iron, steel, asbestos cement and prestressed concrete cylinder water pipe.

Cut and open water pipe ends on abandoned water main and hydrant branch pipes are to be plugged with concrete. Concrete plug is to completely fill and seal end of abandoned water pipe to minimum depth of 12 inches. Abandoned water valves and curb stops are to be permanently closed and are to be left in shut position.

New water service taps may be installed during installation of water pipe as approved by the Engineer.

3.02 Installation

Water pipe and fittings are to be installed to required alignment and depth as required in Contract Documents and as approved by Engineer. Alignment and depth of water pipe and fittings specified in Contract Documents is approximate only. Actual alignment and depth may be adjusted to meet field conditions at time of installation as approved by Engineer. Control points are to be carefully preserved.

Full depth pavement saw cutting is required for trenching in pavement areas that are located outside of full pavement reconstruction. All pavement saw cutting is to be done prior to commencing any water work, and is to be done in conformance with requirements of Section 02745 Paving.

Excavation limits for installation of water pipe and fittings are to be to required alignment and depth to provide for minimum cover over water pipe and fittings, as measured between finished grade and top of water pipe and fittings shall be (unless noted otherwise on plans):

- 5 feet for water pipe

Trench is to be de-watered, and kept free of water at all times during the work.

Where trench bottom is determined to be unstable by Engineer, unsuitable material is to be removed to width and depth as approved by Engineer, and excavated area shall be backfilled with select granular backfill or subbase course material.

Rock that is encountered within bounds of required excavation, embedment and backfill limits, is to be removed.

Prior to installation, interior of water pipe and fittings that cannot be normally disinfected shall be swabbed with 1 to 5 percent minimum hypochlorite solution.

Where it is required to cut or remove section of existing water pipe, cut is to be made straight, smooth and perpendicular to centerline of existing water pipe. Prior to cutting of water pipe, pipe cutting equipment and methods are to be as approved by Engineer.

3.03 Bedding and Backfill

Water pipe and fittings are to be completely embedded within sand material, as measured from exterior limit of water pipe and fitting to minimum extent of:

- 12 inches on each side
- 6 inches below bottom

- 12 inches above top

Sand embedment material is to be installed and compacted in conformance with requirements of Section 02300 Earthwork. Sand bedding is to provide solid bearing through entire length of water pipe and fittings. Timber blocking is not to be used without prior approval of Engineer, and is to be removed prior to backfilling of trench.

Warning tape is to be placed in open trench 12 inches above water pipe that is 4 inch and larger. Warning tape is to run continuously above and along centerline of water pipe, with wording facing up.

Backfill under paved areas is to be select granular backfill (water), and is to be installed and compacted in conformance with requirements of Section 02300 Earthwork, with following modifications:

- Lift thickness is not to exceed 12 inches
- Minimum density for all backfill materials is to be 95 percent of Standard Proctor Maximum Density

3.04 Filling and Flushing

Water pipe is to be slowly filled with water of potable quality at maximum velocity of 1 foot per second while all air is expelled from water pipe. Precautions are to be taken to prevent entrapping air in water pipe. After filling, water pipe is to be flushed at blow-offs and dead-ends at minimum velocity of 3 feet per second. Minimum of three changes of potable water are to be used in flushing operation.

3.05 Testing

A. General

A hydrostatic pressure test is to be conducted on the water main after all required pipe and fittings have been installed including hydrant branches up to the hydrant and water services four (4) inches in diameter and larger. The length of water pipe to be pressure tested will be as approved by the Engineer. The test shall be conducted using equipment that is capable of accurately measuring the pressure within the pipe and the amount of water added to the pipe during the test. The pressure test is to be witnessed by the Engineer.

The section of water pipe to be pressure tested shall be filled with water of potable quality and all air expelled. Temporary taps on the water pipe are to be made at high points and other locations along the pipe, as needed, to release air from the pipe or for other testing purposes. All temporary taps shall be permanently plugged after successful completion of the hydrostatic test.

The Contractor shall notify the Engineer 24 hours in advance of beginning the hydrostatic pressure test. The Contractor shall furnish the pressure testing apparatus. The apparatus shall include a water pressure gauge and water meter that have been properly calibrated for the work. Calibration testing of the gauge and meter shall be performed by an ISO 17025-accredited laboratory. The pressure gauge shall have a maximum range of 0 to 300 pounds per square inch (p.s.i.), a 3-1/2 inch minimum diameter dial with a graduation of 2 p.s.i. or smaller, and a gauge accuracy of at least 0.50 per cent.

The testing apparatus shall be equipped with a second port being a 1/4 inch NPT female quick-connect fitting to accommodate a second pressure gauge by the Water Superintendent when ordered by the Engineer. The ports shall be plumbed so that the gauges are installed in the upright position. The allowable difference between the Contractor's pressure gauge and the Water Superintendent's pressure gauge shall not exceed 10 p.s.i. at the specified test pressure.

B. General - Ductile Iron, Polyvinyl Chloride (PVC), Molecularly Oriented Polyvinyl Chloride (PVCO) Water Pipe

For the hydrostatic pressure test, water pressure is to be raised (based on elevation at lowest point of water pipe under test and corrected to gauge location) to minimum pressure of:

- 150 pounds per square inch gauge for domestic water main
- 250 pounds per square inch gauge for Holly water main

After all visible leaks have been stopped, full test-pressure is to be maintained for minimum of 1 continuous hour with zero (0) gallons allowable leakage for each section of water pipe being tested.

If section of water pipe should fail to pass pressure test, defective section of water pipe is to be uncovered and repaired. Continually repeat pressure test, making repairs as necessary, until entire length of water pipe passes required pressure test.

C. High Density Polyethylene Water Pipe

Pressure test is to be done in accordance with requirements of ASTM F 2164.

For initial expansion phase of pressure test, water pressure is to be raised gradually to minimum test pressure of 240 pounds per square inch (based on elevation at lowest point of water pipe in pressure test and corrected to gauge location) and maintain pressure for up to 4 hours. The test pressure shall not exceed that of lowest pressure rated component. Additional make-up water will be required to be added to maintain test pressure at hourly intervals for initial expansion phase.

Following initial expansion phase, actual test phase begins. For actual test, minimum test pressure shall be reduced 10 psi and monitored continuously for period of 1 hour without additional make-up water. There shall be no visible leakage and pressure loss during test phase shall not be more than 5 per cent different from test phase pressure for section of water pipe being tested.

Under no circumstances should total time water pipe is under continuous test pressure exceed 8 hours. If pressure test is not completed due to leakage, equipment failure or for any other reason within 8 hour time period, water pipe test section should be permitted to "relax" for continuous 8 hour period prior to performing any further pressure testing.

3.06 Disinfection

Disinfection of water main/temporary bypass pipe is to be done in accordance with latest requirements of ANSI/AWWA C651. Disinfection is required for domestic water system mains.

After section of water main/temporary bypass pipe has been successfully pressure tested, section of water main/temporary bypass pipe shall be thoroughly flushed. Method of flushing will be as approved by Engineer. Minimum flushing velocity is to be 2.5 feet per second.

Flows to produce minimum velocity of 2.5 feet per second shall be as shown in the following table:

FLOWS TO PRODUCE MINIMUM VELOCITY OF 2.5 FEET PER SECOND		
Water Pipe Size (inches)	**Flow in Gallons per Minute (gpm)**	**Hydrant Openings at 40 Pounds per Square Inch (psi) Residual Pressure**
4	100	one 2-1/2 inches
6	200	one 2-1/2 inches
8	400	one 2-1/2 inches
10	600	one 2-1/2 inches
12	900	two 2-1/2 inches
16	1,600	two 2-1/2 inches
20	2,500	one 4-1/2 inches

See Table 3 AWWA C651 for number and size of blow-off taps, if blow-off taps are required.

Upon completion of flushing operations, water main/temporary bypass pipe is to be disinfected with chlorine solution using continuous feed method. Strength of chlorine solution is to be such that a residual of at least 25 milligrams per liter of chlorine is to be retained in water main/temporary bypass pipe after 24 hour period. For HDPE water pipe, chlorine solution is not to exceed 12 percent active chlorine due to chemical attack and degradation of polyethylene. Disinfection is to be in accordance with requirements of the Massachusetts Department of Environmental Protection Drinking Water Program and of ANSI/AWWA C651, except that tablet method will not be allowed.

Water pipe, fittings, valves, exterior pipe surfaces on existing water main (such as for tapping sleeves, cutting-in valves, insertion sleeves, connections to existing water main and service saddles) in addition to tools and equipment that are to be in contact with encapsulated system water which will be installed without standard 24 hour disinfection detention period are to be spray disinfected or swabbed with minimum 1 to 5 per cent solution of chlorine no more than 30 minutes prior to installation. Following disinfection, water main/temporary bypass pipe is to be flushed until chlorine concentration in water leaving water main/temporary bypass pipe is no more than that generally prevailing in existing water system.

Samples of water will be collected from water main/temporary bypass pipe by the Water Superintendent. The Water Superintendent requires minimum of 2 working days advance notification requesting such sampling services. Hydrants are not acceptable sampling points.

The Water Superintendent will collect samples of water for free chlorine residual, total coliform, Escherichia coli (E. coli) and turbidity. Water main/temporary bypass pipe must not be placed in service until so authorized by the Water Superintendent.

REVISED August 20, 2015

SECTION 01330 - SUBMITTALS

1 SHOP AND WORKING DRAWINGS

A. As required by the General Conditions, Contractor shall submit a schedule of shop and working drawing submittals.

B. In accordance with the accepted schedule, the Contractor shall submit promptly to the Engineer, through its authorized resident representative by email a copy of each shop or working drawing required as noted in the specifications, of equipment, structural details and materials fabricated for this Contract.

C. Such drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish of shop coat, grease fittings, etc., depending on the subject of the drawings. 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.

D. All shop and working drawings shall be submitted to the Engineer by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from his subcontractors and returning reviewed drawings to them. All shop and working drawings shall be prepared on standard size, 24-inch by 36-inch sheets, except those which are made by changing existing standard shop or working drawings. All drawings shall be clearly marked with the names of the Owner, Project, Contractor and building, equipment or structure to which the drawing applies, and shall be suitably numbered.

E. Only drawings which have been prepared, 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 Contract Documents in all respects. Shop drawings shall be reviewed and marked with the date, checker's name and indication of the Contractor's approval, and only then shall be submitted to the Engineer. Shop drawings unsatisfactory to the Contractor shall be returned directly to their source for correction, without submittal to the Engineer. Shop drawings submitted to the Engineer without the Contractor's approval stamp and signature will be rejected. Any deviation from the Contract Documents indicated on the shop drawings must be identified on the drawings and in a separate submittal to the Engineer.

F. The Contractor shall be responsible for the prompt submittal and resubmittal, as necessary, of all shop and working drawings so that there will be no delay in the work due to the absence of such drawings.

G. The Engineer will review the shop and working drawings as to their general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections of comments made on the drawings during the review do not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor is responsible for conforming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner. The review of the shop drawings is general and shall not relieve the

Contractor of the responsibility for details of design, dimensions, code compliance, etc., necessary for interfacing with other components, proper fitting and construction of the work required by the Contract and for achieving the specified performance. The Engineer will review submittals two times: once upon original submission and a second time if a revision or corrections are required by the Engineer. The Contractor shall reimburse the Owner amounts charged to the Owner by the Engineer for performing any review of a submittal for the third time or greater.

H. With few exceptions, shop drawings will be reviewed and returned to the Contractor within 30 days of submittal.

I. No material or equipment shall be purchased or fabricated especially for this Contract nor shall the Contractor proceed with any portion of the work, the design and details of which are dependent upon the design and details of equipment or other features for which review is required, until the required shop and working drawings have been submitted and reviewed by the Engineer as to their general conformance and compliance with the project and its Contract Documents. All materials and work involved in the construction shall then be as represented by said drawings.

J. One copies of the shop and working drawings and/or catalog cuts will be returned to the Contractor. The Contractor shall furnish additional copies of such drawings or catalog cuts when he needs more than one copies or when so requested.

2 SAMPLES

A. Samples specified in individual Sections include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols, and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the work.

B. The number of samples submitted shall be as specified. Submittal and processing of samples shall follow the procedures outlined for shop and working drawings unless the specifications call for a field submittal or mock-up.

C. Acceptance of samples will be acknowledged via a copy of the transmittal noting status. When samples are not acceptable, prompt resubmittal will be required.

SECTION 01550 - SIGNAGE (TRAFFIC CONTROL)

1 GENERAL

1.01 Work Included

This Section covers furnishing and installing traffic control signs and other devices.

1.02 System Description

The Contractor shall furnish and install all construction signs deemed necessary by and in accordance with the latest edition of Part VI of the Manual on Uniform Traffic Control Devices(MUTCD) as published by the U.S. Department of Transportation.

2 PRODUCTS

2.01 Traffic Warning and Regulating Devices

Contractor shall provide warning signs, barricades and other devices in accordance with the specifications provided in the MUTCD. Size of signs, lettering, colors, method of support and other factors prescribed in the MUTCD shall be adhered to.

3 EXECUTION

3.01 Installation

A. Contractor shall erect barricades, barrier fences, traffic signs, and other traffic control devices as required by the MUTCD, or as directed by the Engineer, to protect the work area from traffic, pedestrians, and animals.

B. Contractor shall relocate barricades, signs and other devices as necessary as the work progresses.

C. Unless extended protection is required for specific areas, when the work has been completed, all temporary warning and regulatory devices used by the Contractor shall be removed so that traffic can move unimpeded through the area.

REVISED August 15, 2019

SECTION 01562 - DUST CONTROL

1 DESCRIPTION

This section of the specification covers the control of dust via calcium chloride and water, complete.

2 CALCIUM CHLORIDE

A. Calcium chloride shall conform to the requirements of AASHTO-M 144, Type I or Type II and Specification for Calcium Chloride, ASTM D98. The calcium chloride shall be packaged in moisture proof bags or in airtight drums with the manufacturer, name of product, net weight, and percentage of calcium chloride guaranteed by the manufacturer legibly marked on each container.

B. Calcium chloride failing to meet the requirements of the aforementioned specifications or that which has become caked or sticky in shipment, may be rejected by the Engineer.

3 WATER

Water shall not be brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

4 APPLICATION

A. Calcium chloride shall be applied when ordered by the Engineer and only in areas which will not be adversely affected by the application. See Section 01570, ENVIRONMENTAL PROTECTION.

B. Calcium chloride shall be uniformly applied at the rate of 1-1/2 pounds per square yard or at any other rate as directed by the Engineer. Application shall be by means of a mechanical spreader, or other approved methods. The number and frequency of applications shall be determined by the Engineer.

C. Water may be sprinkler applied with equipment including a tank with gauge-equipped pressure pump and a nozzle-equipped spray bar.

D. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

REVISED August 15, 2019

SECTION 01564 - EXISTING FENCES

1 DESCRIPTION

A. This section of the specification covers the removal and resetting of existing fences.

2 GENERAL

A. Where the removal of existing fences, at locations shown on the plans and where directed by the Engineer, is required, the Contractor shall remove and reset such fences as directed by the Engineer.

B. The materials removed shall be utilized to reset the fence. Where necessary, new posts and bases shall be furnished and installed by the Contractor. Any materials damaged or lost during or subsequent to removal shall be replaced by the Contractor without additional compensation.

C. All new materials required shall be equal in quality and design to the materials in the present fences.

3 REMOVAL OF EXISTING FENCES

A. The present fences shall be carefully removed together with all appurtenances and satisfactorily stored and protected until required for resetting.

4 ERECTION

A. Fences shall be reset plumb and to the grades required and shall conform to the original fence or as the Engineer directs. Backfilling around the posts shall consist of suitable material satisfactorily compacted. If the fence posts were originally set in concrete bases they shall be reset in concrete bases.

B. Painting, if required, shall be done as directed by the Engineer.

REVISED August 15, 2019

SECTION 01570 - ENVIRONMENTAL PROTECTION

1 DESCRIPTION

A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.

B. The requirements set forth in this section of the specifications apply to cross-country areas, river and stream crossings, and construction in and adjacent to wetlands, unless otherwise specifically stated.

C. All work under this Contract shall be in accordance with any conditional requirements applied, all of which are attached to Section 00890 Permits.

2 NOTIFICATION

The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Engineer may order stoppage of all or part of the work until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

3 IMPLEMENTATION

A. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer to develop mutual understandings relative to compliance of the environmental protection program.

B. The Contractor shall submit for approval two sets of details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of wetlands or across areas designated as wetlands.

4 AREA OF CONSTRUCTION ACTIVITY

Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

5 PROTECTION OF WATER RESOURCES

A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

B. Special measures should be taken to insure against spillage of any pollutants into public waters or Wetland Resource Areas.

6 PROTECTING AND MINIMIZING EXPOSED AREAS

A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided as specified.

B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to insure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

7 LOCATION OF STORAGE AREAS

A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project, and shall require written approval of the Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.

B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of baled hay or straw around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

C. There shall be no storage of equipment or materials in areas designated as wetlands.

D. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

E. Storage areas in cross-country locations shall be restored to pre-construction conditions with the planting of native species of trees and shrubs.

8 PROTECTION OF LANDSCAPE

A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.

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. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Engineer may direct the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of under the provisions of Section 02230, Clearing and Grubbing.

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

9 CLEARING AND GRUBBING

A. The Contractor shall clear and grub only on the Owner's land or the Owner's easements, and only the area required for construction operations, as approved by the Engineer. Removal of mature trees (4 inches or greater DBH) will not be allowed on temporary easements.

B. The Contractor shall not remove trees in the Owner's temporary easements without permission of the Engineer.

10 DISCHARGE OF DEWATERING OPERATIONS

A. Any water that is pumped and discharged from the trench and/or excavation as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.

B. Under no circumstances shall the Contractor discharge water to the areas designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.

C. The pumped water shall be filtered through baled hay, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

11 DUST CONTROL

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed. Calcium chloride shall be as specified under Section 01562 Dust Control.

B. Calcium Chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

12 SEPARATION AND REPLACEMENT OF TOPSOIL

Topsoil shall be carefully removed from cross-country areas where excavations are to be made, and separately stored to be used again as directed. The topsoil shall be stored in an area acceptable to the Engineer and adequate measures shall be employed to prevent erosion of said material.

13 BALED HAY OR STRAW

To trap sediment and to prevent sediment from clogging drainage systems, baled hay or straw shall be used where shown on the drawings. Care shall be taken to keep the bales from breaking apart. The bales should be securely staked to prevent overturning, flotation, or displacement. All deposited sediment shall be removed periodically. Hay bales shall not be placed within a waterway during construction of the pipeline crossing.

14 SILT FENCE

A. Where indicated on the drawings or where directed by the Engineer, the Contractor shall erect and maintain a temporary silt fence. In areas designated as wetlands, the Contractor shall line the limits of the construction easement with a silt fence. The silt fence shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction.

B. The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a 22-foot wide, continuous length support netting, and stapled to preweathered oak posts installed as shown on the drawings. The oak posts shall be 1 ½-inches by 1 ½- inches (Minimum Dimension) by 48 inches and shall be tapered. The support netting shall be industrial strength polypropylene. The bottom edge of the sediment control fabric shall be buried as shown on the drawings. The sediment control fabric shall conform to the following properties:

Property	Value	Test Method
1. Grab Strength (lbs.)	124	ASTM D-4632
2. Elongation (%)	15%	ASTM D-4632
3. Puncture Strength (lbs.)	65	ASTM D-4833
4. Burst Strength (psi)	300	ASTM D-3786
5. Trapezoid Tear (lbs.)	60	ASTM D-4533
6. Equivalent Opening Size (U.S. Sieve)	No. 30	ASTM D-4571
7. Permittivity (sec")	0.10	ASTM D-4491
8. Water Flow Rate (gal/min/sf.)	10	ASTM D-4491
9. UV Resistance (%)	70	ASTM D-4355

C. The silt fence shall be Mirafi Envirofence manufactured by Mirafi, Inc. or approved equal.

SECTION 01575 - HANDLING EXISTING FLOWS

1 GENERAL

1.01 Work Included

This Section covers all materials, equipment, and labor required to handle existing water, sanitary and combined sewage flows and installation and maintenance of all temporary connections, plugs, and by-pass pumping. Upon completion of the water main improvements, all temporary plugs and connections shall be removed and flows transferred to the new pipes.

1.02 Related Work

Section 01330 - SUBMITTALS

1.03 Submittals: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

One set of complete, checked shop drawings, showing equipment, method of by-passing, and the method of transferring flows from the existing system to the new system.

2 EXECUTION

2.01 Maintaining Existing Flows

A. The Contractor shall maintain all flows in the existing system until construction of the water main improvements is complete and ready for safe operation.

B. The Contractor shall protect against surcharging of the existing system upstream of the work area by installing adequate temporary by-pass pumping to handle dry weather and wet weather flows.

C. The Contractor shall repair any damage that occurs to existing pipes and structures to the satisfaction of the Engineer. Work performed under this section shall be considered incidental and shall not be measured separately for payment.

D. The Contractor shall not allow sanitary flow to discharge to any salt or fresh water body by means of overflow, by-pass pumping, or any other method that may contaminate these water areas.

SECTION 01740 - CLEANING UP

1 GENERAL

1.01 Description

The Contractor must employ at all times during the progress of his work adequate cleanup measures and safety precautions to prevent injuries to persons or damage to property. The Contractor shall immediately, upon direction by the Engineer provide adequate material, equipment and labor to cleanup and make safe any and all areas deemed necessary by the Engineer.

1.02 Related Work

A. Section 01110 CONTROL OF WORK AND MATERIALS

B. Section 01140 SPECIAL PROVISIONS

C. Section 01570 ENVIRONMENTAL PROTECTION

2 EXECUTION

2.01 Daily Cleanup

A. The Contractor shall clean up, at least daily, all refuse, rubbish, scrap and surplus material, debris and unneeded construction equipment resulting from the construction operations and sweep the area. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.

B. Upon written notification by the Engineer, the Contractor shall within 24 hours clean up those areas, which in the Engineer's opinion are in violation of this section and the above referenced sections of the specifications.

C. If in the opinion of the Engineer, the referenced areas are not satisfactorily cleaned up, all other work on the project shall stop until the cleanup is satisfactory.

2.02 Material or Debris in Drainage Facilities

Where material or debris has washed or flowed into or has been placed in existing watercourses, ditches, gutters, drains, pipes, structures, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the ditches, channels, drains, pipes, structures, and work shall, upon completion of the work, be left in a clean and neat condition.

2.03 Removal of Temporary Buildings, Structures and Equipment

On or before completion of the work, the Contractor shall, unless otherwise specifically 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 all rubbish from any grounds which he has occupied; shall remove silt fences and hay bales used for trapping sediment; and shall leave the roads and all parts of the property and adjacent property affected by his operations in a neat and satisfactory condition.

2.04 Restoration of Damaged Property

The Contractor shall restore or replace, when and as directed, any 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. Materials, equipment, and methods for such restoration shall be as approved by the Engineer.

2.05 Final Cleanup

Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the construction site to its original or specified condition. This cleanup shall include removing all trash and debris off of the premises. Before acceptance, the Engineer shall approve the condition of the site.

SECTION 01770 – PROJECT CLOSEOUT

1 GENERAL

1.01 Work Included

A. This Section covers administrative and procedural requirements for closing out the project, including, but not limited to:

1. Project as-built documents
2. Checkout and Certification
3. Final Cleaning
4. Substantial Completion
5. Closeout Procedures
6. Final Completion
7. Correction/Warranty Period

B. Closeout checklist to be completed by the Engineer.

1.02 Related Sections

A. General Requirements in their entirety.

1.03 As-Built Documents

A. Contractor shall maintain on site, separate from the documents used for construction, one set of the documents listed below, and as construction progresses, shall legibly record on these documents all changes made during construction.

1. Contract Drawings.
2. Specifications.
3. Addenda
4. Change Orders and other Modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Written interpretations and clarifications.
7. Field Orders.
8. Field test reports properly verified.

B. The completed set of as-built documents shall be submitted to the Engineer with the final Application for Payment.

1.04 Checkout and Certifications

A. Prior to checkout and certifications the following tasks shall be completed:

1. Construction shall be complete. For this purpose, completion of construction is defined as follows:

   a. The Contractor has completed construction and erection of the work in conformance with the Contract Drawings and Specifications.

2. All shop drawings shall have final approval.

1.05 Final Cleaning

A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

1. Clean the site, including landscape development areas of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved or planted, to smooth, even textured surfaces.

2. Remove waste and surplus materials, rubbish, fencing equipment, temporary utilities and construction facilities from the site, unless otherwise directed by the Engineer.

1.06 Substantial Completion

A. Substantial Completion is officially defined in the General and Supplementary Conditions. The date of substantial completion will be certified by the Engineer. This date will not be certified until the following requirements have been satisfied by the Contractor:

1. All Contract requirements are coordinated into a fully operational system. All individual units of equipment and treatment are fully operative and performing at specified efficiencies. Where efficiencies are not specified, performance shall meet acceptable standards for the particular unit.

2. All field tests have been satisfactorily completed and reports forwarded to the Engineer.

1.07 Closeout Procedures

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and is complete in accordance with Contract Documents and ready for Engineer's and Owner's inspection.

B. Accompany Engineer and Owner on inspection to verify conformance with the Contract Documents. Prepare a punch list of work items that have been determined by inspection to not conform with Contract Documents. Punch list items shall include work items that are missing, incomplete, damaged, incorrect items, or improperly installed or constructed. The Contractor shall correct the punch list deficiencies by re-work, modifications, or replacement, as appropriate, until the items conform to the Contract Documents. The initial punch list shall be produced by the Contractor, with copies to the Engineer and Owner. When the Contractor

has reduced the number of deficient items to a reasonable level, the Engineer will develop a definitive punch list for the use of the Contractor.

C. Provide submittals to Engineer that are required by governing or other authorities.

D. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due. The Contractor shall submit the following documents with or prior to Final Application for Payment: Set of as-built documents, Contract Completion and Acceptance Certificate, Consent of Surety to Final Payment, Release and Waiver of Liens and Claims, Affidavit of Payment of Debts and Claims, and remaining releases, waivers, warranties/guarantees, and all other data required by the Contract Documents.

1.08 Final Completion

A. Prior to final completion, the following tasks shall be completed:

1. All items in the punch list shall be completed.

2. All Contract closeout documentation shall be submitted to and accepted by the Engineer.

1.09 Correction/Warranty Period

A. During the correction period, the Contractor shall correct all deficiencies in equipment and materials.

B. During the warranty period, the Contractor shall perform all corrective work on warranty deficiencies.

C. Corrective work will be identified by the Engineer or Owner, as appropriate. The Contractor will be notified of the item(s) requiring corrective work.

D. The Contractor shall begin work on all corrective work within ten days of being notified of the deficiency by the Engineer and shall then work continuously until the deficiency is corrected. Upon completion of the corrective work, the Contractor shall submit a letter report to the Engineer describing the deficiency and the corrective action that was taken.

E. The Contractor shall coordinate all corrective work with the Engineer and/or the Owner.

1.10 Completion Checklist

A. The Project Completion Checklist which follows shall be completed as the project nears completion. When the project has been fully completed, Final Payment can be approved.

PROJECT COMPLETION CHECKLIST

Owner: Town of Cheshire Water Department

Project: Water System Improvement Project

As part of the project closeout, all items listed below must be checked off as being complete or otherwise accounted for. The person verifying completion of the item shall list the completion date and his/her initials.

Project Closeout Checklist	Date Completion Verified	Verified by
AS-BUILT DOCUMENTS HANDED OVER		
1. Contract Drawings		
2. Specifications		
3. Addenda		
4. Change Orders/Contract Modifications		
5. Reviewed Shop Drawings, Product Data and Samples		
6. Written Interpretations/Clarifications		
7. Field Orders		
8. Field Test Reports		
EQUIPMENT CHECKOUT AND CERTIFICATIONS		
1. Construction Complete per Drawings/Specifications		
2. All Shop Drawings have Final Approval		
FINAL CLEANING		
1. All Construction Facilities Removed		
2. All Construction Debris Removed		
3. All Areas Swept/Cleared		
SUBSTANTIAL COMPLETION		
1. All Items Coordinated into a Fully Operational System		
2. All Field Tests Completed and Reports Submitted		
CLOSEOUT PROCEDURES		
1. Written Certification Submitted that Work is Ready for Owner & Engineer Inspector		
2. Inspection by Owner, Engineer, Contractor completed		

3. Punch List of Nonconforming Items Prepared		
4. Documents Required by Governing or Other Authorities Submitted (List Them)		
5. Final Application for Payment Received		
6. Contact Completion and Acceptance Certificate Submittal		
7. Consent of Surety to Final Payment Submittal		
8. Release and Waiver of Liens and Claims Submitted		
9. Affidavit of Payment of Debts and Claims Submitted		
10. Warranties/Guarantees Submitted		
11. Other Required Releases and Waivers Submitted (List Them)		
12. Permits Submitted (List Them)		
13. Weekly Payrolls Submitted as Required by Law		
FINAL COMPLETION		
1. All items in Punch List Completed		
2. All Other Required Documentation Submitted (List It)		
CORRECTION WARRANTY PERIOD		
1. Correction Period Start Date: End Date:		
2. Specific Warranties Provided Item: Warranty Duration:		

Full name of persons signing their initials on this checklist:

SECTION 01780 - PERMITS

1 GENERAL

A. The Owner has obtained or will obtain and pay for the permits listed below, which are required for this project. The Contractor shall assist in obtaining certain permits, as indicated. The Contractor shall obtain and pay for all other permits required.

Permits by Owner

BRP WS 33 Distribution Modification Permit - MassDEP	(PENDING)
RDA – From Cheshire Conservation Commission	(ON FILE)

B. The Contractor shall perform the work in accordance with the Contract Documents, including any permit conditions included by approving authorities.

REVISED September 2, 2019

SECTION 02058 - CONTROLLED DENSITY FILL (CDF)

1 GENERAL

1.01 Description

A. Controlled Density Fill (CDF) material is a flowable, self consolidating, rigid setting, low density material that can be substituted for compacted gravel for backfills, fills and structural fills.

B. There are two main categories of Controlled Density Fill; excavatable and non-excavatable, with a subcategory of flowable and very flowable.

C. Controlled Density Fill is to be used where indicated on the contract drawings or as described in any Massachusetts Highway Department road opening permits included in the project.

1.02 Related Work

A. Section 00890, PERMITS

B. Section 01330, SUBMITTALS

C. Section 02300, EARTHWORK

D. Section 02252, SUPPORT OF EXCAVATION

1.03 References

Commonwealth of Massachusetts Highway Department (MHD) Standard Specification for Highways and Bridges - Subsection M4.08.0, CONTROLLED DENSITY FILL.

1.04 Submittals

Proposed Mix Designs for the type(s) of Controlled Density Fill shall be submitted for review and approval from the Contractor's Ready Mix provider in accordance with Section 01330.

2 PRODUCTS

2.01 Materials

Materials employed in the Controlled Density Fill shall meet the requirements as described in l\1HD Standard Specifications Subsection M4.08.0.

2.02 Type of Controlled Density Fill

Controlled Density Fill for this project shall be Type 2E - Flowable (Excavatable), as described in l\1HD Subsection M4.08.0.

3 EXECUTION

3.01 General

A. Controlled Density Fill shall be batched at a ready mix plant and is to be used at a high or very high slump of approximately 10- to 12-inches. It shall be flowable, require no vibration and after it has been placed for Type lE and 2E, be excavatable by hand tools and/or small machines.

B. Controlled Density Fill shall be placed so as to not disturb adjacent structures, utilities or the sidewalls of trenches.

C. Controlled Density Fill shall be installed to the limits shown on the drawings, or required by permit and shall be kept below the top of the trench to allow for the placement of the required depth of pavement as specified in these documents or as indicated in the contract drawings.

D. The Controlled Density Fill shall be protected by steel road plates until the fill reaches a point that it will not be deformed by traffic passing over it.

SECTION 02071- GEOTEXTILE FABRICS

1 GENERAL

1.01 Work Included

This Section covers furnishing of all labor, materials, and equipment necessary to install specified geotextile fabrics in locations shown on the drawings and as directed by the Engineer.

1.02 Submittals: IN ACCORDANCE WITH REQUIREMENT'S OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

One PDF set of shop drawings or working drawings and material specifications shall be emailed to the Engineer for review for each type of geotextile fabric furnished. General installation practices and installation schedule shall be included.

2 PRODUCTS

2.01 Erosion Control Fabric "A"

A. Erosion control fabric "A" shall be composed of continuous-filament fibers bonded together to form a sheet. The fabric shall be an average of 20 mils thick and possess the pore-size distribution of Mirafi 600X Fabric.

B. Erosion Control fabric "A" shall be Mirafi 600X as manufactured by Mirafi, Inc., Pendergrass, GA; or approved equal.

2.02 Erosion Control Fabric "B"

A. Erosion Control Fabric "B" shall be of the best quality proven design and construction and shall be entirely suitable in every respect for the intended service.

B. Erosion Control fabric "B" shall be Miramat Erosion Control/Revegetation MAT (ECRM) as manufactured by Mirafi Inc., Pendergrass, GA; Enkamat Soil Erosion Matting as manufactured by BASF Corporation Fibers Division, Enka, N.C.; Tenax Erosion Control Netting as manufactured by ATP Corporation, Ashtabula; Ohio or approved equal.

2.03 Soil Reinforcement Fabric

A. The soil reinforcement fabric shall be an integrally formed structure with aperture geometry and rib thickness sufficient to permit mechanical interlock with the surrounding particle media. The soil reinforcement fabric shall have flexural rigidity and high tensile modulus with continuity of tensile strength through all ribs and junctions of the structure. The fabric shall be composed of polypropylene stabilized with carbon black to resist ultraviolet degradation and be resistant to biological and chemical degradation due to all naturally occurring organisms or reagents normally encountered in natural soil environments.

B. The soil reinforcement fabric shall be a Tensar SS-2 (BX1200) Geogrid, by Contech Construction Products Inc., Marlboro, MA; Mirafi 500X fabric, by Mirafi Inc., Pendergrass, GA; or approved equal.

2.04 Soil Reinforcement Grid

A. The soil reinforcement grid shall permit free passage of moisture, be of sufficient strength to prevent deformation and impairment of function when subjected to wheel loads, and interact with overlying soil to stabilize the overburden on slopes as steep as three to one.

B. Soil reinforcement grid shall by Poly Net 3000, by National Seal Company; Mirafi Multigrid, by Mirafic, Inc.; or approved equal.

2.05 Filter/Drainage Fabric

A. The filter/drainage fabric shall be composed of continuous-filament fibers bonded together to form a sheet. The fabric shall be an average of 20 mils thick and possess the characteristics of Mirafi 140N.

B. The filter/drainage fabric shall be Mirafi 140N as manufactured by Mirafi Inc., Pendergrass, GA; Foss-65 by Foss Manufacturing Co., Hampton, NH; US 120NW, as manufactured by US Fabrics, Cincinnati, OH, or approved equal.

2.06 Geotextile Liner Protector

A. The geotextile liner protector shall be a non-woven, needle punched polyester or extruded polypropylene, not less than 110 mils thick.

B. The geotextile liner protector shall be Trevira Spunbond, by Hoechst Celanese Corporation, Spartanburg, S.C.; Mirafi 180 N, by Mirafi, Inc., Pendergrass, GA; or approved equal.

3 EXECUTION

3.01 Installation

A. GENERAL:

Installation of geotextile fabrics shall be strictly in accordance with manufacturer's instructions and specific layout plans and details reviewed by the Engineer.

B. EROSION CONTROL FABRIC "A":

Erosion control fabric "A" shall be installed on detention basin slopes and at drainage swale ends prior to placement of riprap and at other locations as shown on the drawings or as directed by the Engineer. The fabric in place shall cover the entire riprap area. Each width of fabric shall be overlapped by the subsequent width a minimum of two feet. The Contractor shall follow the manufacturer's installation recommendations to ensure proper completion of the fabric installation, including top toe-in and bottom toe wrap.

C. EROSION CONTROL FABRIC "B":

Erosion control fabric "B" shall be placed over the prepared surface in drainage swales and other locations as directed by the Engineer. The fabric shall be unrolled, placed in the direction of water flow, overlapped, pinned down with wood stakes, and seeded. All installation work shall be in accordance with manufacturer's recommendations or as directed by the Engineer.

D. SOIL REINFORCEMENT FABRIC:

The soil reinforcement fabric shall be installed on the prepared subgrade prior to placement of the gravel base and bituminous concrete pavement. The fabric in place shall be beneath the entire proposed paved area. Each width of fabric shall be overlapped by the subsequent width a minimum of two feet. The Contractor shall follow the manufacturer's installation recommendations.

E. SOIL REINFORCEMENT GRID:

The soil reinforcement grid shall be placed on the flexible membrane liner, securely fastened at the top of all slopes and interlocked to form a continuous grid below the supports, all in accordance with manufacturer's recommendations and specific project details. The reinforcement grid shall provide stability for the overlying soil drainage layer, while permitting free passage of moisture.

F. FILTER/DRAJNAGE FABRIC:

1. The filter/drainage fabric shall be installed in the final graded trench bottom prior to placement of the crushed stone bedding and at other locations shown on the drawings or designated by the Engineer. The drainage fabric in place shall cover the entire trench bottom and trench sides as shown on the drawings. Each width of drainage fabric shall be overlapped in accordance with manufacturer's recommendations, but not less than 2 feet, to prevent intrusion of soil fines into the bedding.

2. On landfill projects, the filter/drainage fabric shall be installed over the drainage layer prior to loaming and seeding, per manufacturer's installation recommendations.

G. GEOTEXTILE LINER PROTECTOR:

The geotextile liner protector shall be installed on top of the gas-venting layer and shall be covered by the flexible membrane liner. The protector shall provide a smooth surface to support the liner and protect against liner damage due to projections. The installation shall be strictly in accordance with manufacturer's recommendations.

3.02 Final Inspection and Acceptance

A. The Contractor shall, at his expense, have a manufacturer's representative inspect the work at completion of the installation. Any work found to be unsatisfactory shall be corrected at the Contractor's expense.

B. The Engineer, at the Contractor's expense, reserves the right to have a manufacturer's representative inspect the installation process at any time during construction.

SECTION 02230 - CLEARING AND GRUBBING

1 GENERAL

1.01 Work Included

A. The Contractor shall do all required clearing and grubbing as indicated on the drawings or herein specified in the area required for construction operations on the Owner's land or in the Owner's permanent or temporary easements and shall remove all debris resulting therefrom.

B. Unless otherwise noted, all areas to be cleared shall also be grubbed.

C. The Contractor shall not clear and grub outside of the area required for construction operations.

1.02 Related Work

Any trees and shrubs specifically designated by the Owner not to be cut, removed, destroyed, or trimmed shall be saved from harm and injury.

2 EXECUTION

2.01 Right to Wood and Logs

The Owner shall have the right to cut and remove logs and other wood of value in advance of the Contractor's operations. All remaining logs and other wood to be removed in the course of clearing shall become the property of the Contractor.

2.02 Clearing

A. Unless otherwise indicated, the Contractor shall cut or otherwise remove all trees, saplings, brush and vines, windfalls, logs and trees lying on the ground, dead trees and stubs more than 1-foot high above the ground surface (but not their stumps), trees which have been partially uprooted by natural or other causes (including their stumps), and other vegetable matter such as shags, sawdust, bark, refuse, and similar materials.

B. The Contractor shall not remove mature trees (4 inches or greater DBH) in the Owner's temporary easements.

C. Except where clearing is done by uprooting with machinery or where stumps are left longer to facilitate subsequent grubbing operations, trees, stumps, and stubs to be cleared shall be cut as close to the ground as practicable but not more than 6-inches above the ground surface in the case of small trees, and 12-inches in the case of large trees. Saplings, brush and vines shall be cut close to the ground.

2.03 Grubbing

A. Unless otherwise indicated, the Contractor shall completely remove all stumps and roots to a depth of 18-inches, or if the Contractor elects to grind the stumps, they shall be ground to a minimum depth of 6-inches.

B. Any depression remaining from the removal of a stump and not filled in by backfilling shall be filled with gravel borrow and/or loam, whichever is appropriate to the proposed ground surface.

2.04 Disposal

All material collected in the course of the clearing and grubbing which is not to remain shall be disposed of in a satisfactory manner away from the site or as otherwise approved. Such disposal shall be carried on as promptly as possible and shall not be left until the final clean-up period.

SECTION 02240 - DEWATERING

1 GENERAL

1.01 Work Included

This section specifies designing, furnishing, installing, maintaining, operating and removing temporary dewatering systems as required to lower and control water levels and hydrostatic pressures during construction; disposing of pumped water; constructing, maintaining, observing and, except where indicated or required to remain in place, removing of equipment and instrumentation for control of the system.

1.02 Related Work

A. Section 00890, PERMITS

B. Section 02252, SUPPORT OF EXCAVATION

C. Section 02300, EARTHWORK

1.03 System Description

Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from the slopes or bottom of the excavation; increasing the stability of excavated slopes; preventing loss of material from beneath the slopes or bottom of the excavation; reducing lateral loads on sheeting and bracing; improving the excavation and hauling characteristics of sandy soil; preventing rupture or heaving of the bottom of any excavation; and disposing of pumped water.

1.04 Quality Assurance

A. The Contractor is responsible for the adequacy of the dewatering systems.

B. The dewatering systems shall be capable of effectively reducing the hydrostatic pressure and lowering the groundwater levels to a minimum of 2 feet below excavation bottom, unless otherwise directed by the Engineer, so that all excavation bottoms are firm and dry.

C. The dewatering system shall be capable of maintaining a dry and stable subgrade until the structures, pipes and appurtenances to be built therein have been completed to the extent that they will not be floated or otherwise damaged.

D. The dewatering system and excavation support (see Section 02252 Support of Excavation) shall be designed so that lowering of the groundwater level within the work area does not adversely affect structures, utilities or wells outside of the work area.

1.05 Submittals

Contractor shall submit one PDF copy of a plan indicating how they intend to control the discharge from any dewatering operation on the project, whether it is discharge of groundwater from excavations or stormwater runoff during the life of the project.

2 EXECUTION

2.01 Dewatering Operations

A. All water pumped or drained from the work shall be disposed of in a manner which will not result in undue interference with other work or damage to adjacent properties, pavements and other surfaces, buildings, structures and utilities. Suitable temporary pipes, flumes or channels shall be provided for water that may flow along or across the site of the work. All disposal of pumped water shall conform to the provisions of Section 00890 Permits.

B. Dewatering facilities shall be located where they will not interfere with utilities and construction work to be done by others.

C. Dewatering procedures to be used shall be as described below:

1. Crushed stone shall encapsulate the suction end of the pump to aid in minimizing the amount of silt discharged.

2. For dewatering operations with relatively minor flows, pump discharges shall be directed into haybale sedimentation traps lined with filter fabric. Water is to be filtered through the haybales and filter fabric prior to being allowed to seep out into its natural water course.

3. For dewatering operations with larger flows, pump discharges shall be into a steel dewatering basin. Steel baffle plates shall in used to slow water velocities to increase the contact time and allow adequate settlement of sediment prior to discharge into waterways.

4. Where indicated on the contract drawings or in conditions of excess silt suspended in the discharge water, silt control bags are to utilized in catch basins.

D. The Contractor shall be responsible for repair of any damage caused by his dewatering operations, at no cost to the Owner.

SECTION 02252 - SUPPORT OF EXCAVATION

1 GENERAL

1.01 Work Included

A. This section covers wood and steel sheeting or soldier piles and lagging with internal bracing for support of excavations. The requirements of this section shall also apply, as appropriate, to any methods of excavation support and underpinning which the Contractor elects to use to complete the work.

B. The Contractor shall furnish and place timber or steel sheeting or soldier piles and lagging of the kinds and dimensions required, complying with these specifications, where required by regulation, indicated on the drawings or ordered by the Engineer.

1.02 Related Work

A. Section 02240, DEWATERING

B. Section 02300, EARTHWORK

1.03 Quality Assurance

A. This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et seq.)." Contractors shall be familiar with the requirements of these regulations.

B. The excavation support system shall be of sufficient strength and be provided with adequate bracing to support all loads to which it will be subjected. The excavation support system shall be designed to prevent any movement of earth that would diminish the width of the excavation or damage or endanger adjacent structures.

2 PRODUCTS

2.01 Materials

A. Timber sheeting shall be sound spruce, pine, or hemlock, and either tongue and grooved or splined. Timber sheeting shall not be less than nominal 2 inches thick.

B. Timber and steel used for bracing shall be of such size and strength as required in the excavation support design. Timber or steel used for bracing shall be new or undamaged used material which does not contain splices, cutouts, patches, or other alterations which would impair its integrity or strength.

3 EXECUTION

3.01 Installation

A. Work shall not be started until all materials and equipment necessary for construction are either on the site of the work or satisfactorily available for immediate use as required.

B. The sheeting shall be securely and satisfactorily braced to withstand all pressures to which it may be subjected and be sufficiently tight to minimize lowering of the groundwater level outside the excavation, as required in Section 02240 Dewatering.

C. The sheeting shall be driven by approved means to the design elevation. No sheeting shall be left so as to create a possible hazard to safety of the public or a hindrance to traffic of any kind.

D. If boulders or very dense soils are encountered, making it impractical to drive a section to the desired depth, the section shall, as directed by Engineer, be cut off.

E. The sheeting shall be left in place where indicated on the drawings or ordered by the Engineer in writing. At all other locations, the sheeting may be left in place or salvaged at the option of the Contractor. Wood or steel sheeting permanently left in place shall be cut off at a depth of not less than two feet below finish grade unless otherwise directed.

G. All cut-off material are the property of the Contractor and shall be promptly removed by him from the site.

H. Responsibility for the satisfactory construction and maintenance of the excavation support system, complete in place, shall be the responsibility of the Contractor. Any work done, including incidental construction, which is not acceptable for the intended purpose shall be either repaired or removed and reconstructed by the Contractor at his expense.

I. The Contractor shall be solely responsible for repairing all damage associated with the installation, performance, or removal of the excavation support system.

SECTION 02300 - EARTHWORK

1 GENERAL

1.01 Work Included

The Contractor shall make excavations of normal depth in earth for trenches and structures, shall backfill and compact such excavations to the extent necessary, shall furnish the necessary material and construct embankments and fills, and shall make miscellaneous earth excavations and do miscellaneous grading.

1.02 Related Work

A. Section 00890, PERMITS

B. Section 02230, CLEARING AND GRUBBING

C. Section 02240, DEWATERING

D. Section 02252, SUPPORT OF EXCAVATION

E. Section 02324, ROCK EXCAVATION AND DISPOSAL

F. Section 02920, LOAMING AND SEEDING

1.03 References

American Society for Testing and Materials (ASTM)

ASTM	Cl31	Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM	C136	Method for Sieve Analysis of Fine and Coarse Aggregates.
ASTM	C330	Specification for Lightweight Aggregate for Structural Concrete.
ASTM	D1556	Test Method for Density of Soil in Place by the Sand Cone Method.
ASTM	D1557	Test Methods for Moisture-density Relations of Soils and Soil Aggregate Mixtures Using Ten-pound (10 Lb.) Hammer and Eighteen-inch (18") Drop.
ASTM	D2922	Test Methods for Density of Soil and Soil-aggregate in Place by Nuclear Methods (Shallow Depth)

Commonwealth of Massachusetts Highway Department Standard Specification for

Highways and Bridges.

Code of Massachusetts Regulations (CMR) 310.40.0032 Contaminated Media and Contaminated Debris

1.04 Submittals: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Samples of all materials proposed for the project shall be submitted to the Engineer for review. Size of the samples shall be as approved by the Engineer.

1.05 Protection of Existing Property

A. The work shall be executed in such manner as to prevent any damage to facilities at the site and adjacent property and existing improvements, such as but not limited to streets, curbs, paving, service utility lines, structures, monuments, bench marks, observation wells, and other public or private property. Protect existing improvements from damage caused by settlement, lateral movements, undermining, washout and other hazards created by earthwork operations.

B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at its own expense, make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to at least the condition that existed at the start of operations. The Contractor shall replace, at his own cost, existing benchmarks, observation wells, monuments, and other reference points, which are disturbed or destroyed.

C. Buried drainage structures and pipes, observation wells and piezometers, including those which project less than eighteen inches (18") above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment, and shall be maintained at all times until completion of project.

1.06 Drainage

A. The Contractor shall provide, at its own expense, adequate drainage facilities to complete all work items in an acceptable manner. Drainage shall be done in a manner so that runoff will not adversely affect construction procedures or cause excessive disturbance of underlying natural ground or abutting properties.

1.07 Frost Protection and Snow Removal

A. The Contractor shall, at its own expense, keep earthwork operations clear and free of accumulations of snow as required to carry out the work.

B. The Contractor shall protect the subgrade beneath new structures and pipes from frost penetration when freezing temperatures are expected.

2 PRODUCTS

2.01 Materials

A. GRAVEL BORROW:

Gravel Borrow shall satisfy the requirements listed in MHD Specification Section M 1.03.0, Type b.

B. CRUSHED STONE:

Crushed stone shall satisfy the requirements listed in MHD Specification Section M2.01. C.

C. SAND BORROW:

Sand Borrow shall satisfy the requirements listed in MHD Specification Section MI.04.0. D.

D. PEASTONE:

Peastone shall be smooth, hard, naturally occurring, rounded stone meeting the following gradation requirements:

Passing 5/8 inch square sieve opening	100%
Passing No. 8 sieve opening	0%

E. BACKFILL MATERIALS:

1. Class B Backfill:
   Class B backfill shall be granular, well graded friable soil; free of rubbish, ice, snow, tree stumps, roots, clay and organic matter; with 30 percent or less passing the No. 200 sieve; no stone greater than two-third (2/3) loose lift thickness, or six inches, whichever is smaller.

2. Select Backfill:
   Select backfill shall be granular, well graded friable soil, free of rubbish, ice, snow, tree stumps, roots, clay and organic matter, and other deleterious or organic material; graded within the following limits:

Sieve Size	Percent Finer by Weight
3"	100
No. IO	30-95
No.40	1O-70
No. 200	0-10

I. PROCESSED GRAVEL:

1. Processed gravel shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The coarse aggregate shall have a percentage of wear, by the Los Angeles Abrasion Test, of not more than 50.

2. The gradation shall meet the following requirements:

Sieve Designation	Percentage Passing
3 in.	100
1 ½ in.	70 - 100
¼ in.	50 - 85
No. 4	30 - 60
No. 200	0 - 10

3. The approved source of bank-run gravel material shall be processed by mechanical means. The equipment for producing crushed gravel shall be of adequate size with sufficient adjustments to produce the desired materials. The processed material shall be stockpiled in such a manner to minimize segregation of particle sizes. All processed gravel shall come from approved stockpiles.

3 EXECUTION

3.01 Disturbance of Excavated and Filled Areas During Construction

A. Contractor shall take the necessary steps to avoid disturbance of subgrade during excavation and filling operations, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials, dewatering and other acceptable control measures.

B. All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that will not meet compaction requirements as specified herein shall be removed and replaced with a minimum 12-inch layer of compacted crushed stone wrapped all around in non-woven filter fabric. Costs of removal and replacement shall be borne by the Contractor.

C. The Contractor shall place a minimum of 12-inch layer of special bedding materials and crushed stone wrapped in filter fabric over the natural underlying soil to stabilize areas which may become disturbed as a result of rain, surface water runoff or groundwater seepage pressures, all at no additional cost to the Owner. The Contractor also has the option of drying materials in-place and compacting to specified densities.

3.02 Excavation

A. GENERAL:

1. The Contractor shall perform all work of any nature and description required to accomplish the work as shown on the Drawings and as specified.

2. Excavations, unless otherwise required by the Engineer, shall be carried only to the depths and limits shown on the Drawings. If unauthorized excavation is carried out below required subgrade and/or beyond minimum lateral limits shown on Drawings, it shall be backfilled with gravel borrow and compacted at the Contractor's expense as specified below, except as otherwise indicated. Excavations shall be kept in dry and good conditions at all times, and all voids shall be filled to the satisfaction of the Engineer.

3. In all excavation areas, the Contractor shall strip the surficial topsoil layer and underlying subsoil layer separate from underlying soils. In paved areas, the Contractor shall first cut pavement as specified in paragraph 3.02 B.1 of this specification, strip pavement and pavement subbase separately from underlying soils. All excavated materials shall be stockpiled separately from each other within the limits of work.

4. The Contractor shall follow a construction procedure, which permits visual identification of stable natural ground. Where groundwater is encountered, the size of the open excavation shall be limited to that which can be handled by the Contractor's chosen method of dewatering and which will allow visual observation of the bottom and backfill in the dry.

5. The Contractor shall excavate unsuitable materials to stable natural ground where encountered at proposed excavation subgrade, as directed by the Engineer. Unsuitable material includes topsoil, loam, peat, other organic materials, snow, ice, and trash. Unless specified elsewhere or otherwise directed by the Engineer, areas where unsuitable materials have been excavated to stable ground shall be backfilled with compacted special bedding materials or crushed stone wrapped all around in non-woven filter fabric.

B. TRENCHES:

1. Prior to excavation, trenches in pavement shall have the traveled way surface cut in a straight line by a concrete saw or equivalent method, to the full depth of pavement. Excavation shall only be between these cuts. Excavation support shall be provided as required to avoid undermining of pavement. Cutting operations shall not be done by ripping equipment.

2. The Contractor shall satisfy all dewatering requirements specified in Section 02240 Dewatering, before performing trench excavations.

3. Trenches shall be excavated to such depths as will permit the pipe to be laid at the elevations, slopes, and depths of cover indicated on the Drawings. Trench widths shall be as shown on the Drawings or as specified.

4. Where pipe is to be laid in bedding material, the trench may be excavated by machinery to, or just below, the designated subgrade provided that the material remaining in the bottom of the trench is not disturbed.

5. If pipe is to be laid in embankments or other recently filled areas, the fill material shall first be placed to a height of at least 12-inches above the top of the pipe before excavation.

6. Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until back-filling has been completed.

7. If, in the opinion of the Engineer, the subgrade, during trench excavation, has been disturbed as a result of rain, surface water runoff or groundwater seepage pressures, the Contractor shall remove such disturbed subgrade to a minimum of 12 inches and replace with crushed stone wrapped in filter fabric. Cost of removal and replacement shall be borne by the Contractor.

C. BUILDING AND FOUNDATION EXCAVATION:

1. Excavations shall not be wider than required to set, brace, and remove forms for concrete, or perform other necessary work.

1. After the excavation has been made, and before forms are set for footings, mats, slabs, or other structures, and before reinforcing is placed, all loose or disturbed material shall be removed from the subgrade. The bearing surface shall then be compacted to meet the requirements of this specification.

3. If, in the opinion of the Engineer, the existing material at subgrade elevation is unsuitable for structural support, the Contractor shall excavate and dispose of the unsuitable material to the required width and depth as directed by the Engineer. If, in the opinion of the Engineer, filter fabric is required; the Contractor shall place filter fabric, approved by the Engineer, as per manufacturer's recommendations. Crushed stone shall then be placed in lifts and compacted to required densities. Backfill shall be placed to the bottom of the proposed excavation.

D. EXCAVATION NEAR EXISTING STRUCTURES:

1. Attention is directed to the fact that there are pipes, manholes, drains, and other utilities in certain locations. An attempt has been made to locate all utilities on the drawings, but the completeness or accuracy of the given information is not guaranteed.

2. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and excavation shall be done by means of hand tools, as required. Such manual excavation, when incidental to normal excavation, shall be included in the work to be done under items involving normal excavation.

3. Where determination of the exact location of a pipe or other underground structure is necessary for properly performing the work, the Contractor shall excavate test pits to determine the locations.

3.03 Backfill Placement and Compaction

A. GENERAL

1. Prior to backfilling, the Contractor shall compact the exposed natural subgrade to the densities as specified herein.

2. After approval of subgrade by the Engineer, the Contractor shall backfill areas to required contours and elevations with specified materials.

3. The Contractor shall place and compact materials to the specified density in continuous horizontal layers. The degree of compaction shall be based on maximum dry density as determined by ASTM Test D1557, Method C. The minimum degree of compaction for fill placed shall be as follows:

Location	Percent of Maximum Density
Below pipe centerline	95%
Above pipe centerline	92%
Below pavement (upper 3 ft.)	95%
Embankments	95%
Below pipe in embankments	95%
Adjacent to structures	92%
Below structures	95%

4. COMPACTION TESTING:

a. The Contractor shall test backfill for conformance to the specifications. Compaction testing shall be performed by an inspection laboratory approved by the Owner and Engineer.

b. Prior to paving and at a minimum, the Contractor shall complete 10 nuclear density tests.

c. If test results indicate work does not conform to specification requirements, the Contractor shall remove or correct the defective Work by recompacting where appropriate or replacing as necessary and approved by the Engineer, to bring the work into compliance, at no additional cost to the Owner.

d. All backfilled materials under structures and buildings shall be field tested for compliance with the requirements of this specification.

5. Where horizontal layers meet a rising slope, the Contractor shall key each layer by benching into the slope.

6. If the material removed from the excavation is suitable for backfill with the exception that it contains stones larger than permitted, the Contractor has the option to remove the

oversized stones and use the material for backfill or to provide replacement backfill at no additional cost to the Owner.

7. The Contractor shall remove loam and topsoil, loose vegetation, stumps, large roots, etc., from areas upon which embankments will be built or areas where material will be placed for grading. The subgrade shall be shaped as indicated on the Drawings and shall be prepared by forking, furrowing, or plowing so that the first layer of the fill material placed on the subgrade will be well bonded to the subgrade.

B. TRENCHES:

1. Bedding as detailed and specified shall be furnished and installed beneath the pipeline prior to placement of the pipeline. A minimum bedding thickness shall be maintained between the pipe and undisturbed material, as shown on the Drawings.

2. As soon as practicable after pipes have been laid, backfilling shall be started.

3. Unless otherwise indicated on the Drawings, select backfill shall be placed by hand shovel in 6-inch thick lifts up to a minimum level of 12-inches above the top of pipe. This area of backfill is considered the zone around the pipe and shall be thoroughly compacted before the remainder of the trench is backfilled. Compaction of each lift in the zone around the pipe shall be done by use of power-driven tampers weighing at least 20 pounds or by vibratory compactors. Care shall be taken that material close to the bank, as well as in all other portions of the trench, is thoroughly compacted to densities required.

4. Class B backfill shall be placed from the top of the select backfill to the specified material at grade (loam, pavement subbase, etc.). Fill compaction shall meet the density requirements of this specification.

5. Water Jetting:

a. Water jetting may be used when the backfill material contains less than 10 percent passing the number 200 sieve, but shall be used only if approved by the Engineer.

b. Contractor shall submit a detailed plan describing the procedures he intends to use for water jetting to the Engineer for approval prior to any water jetting taking place.

c. Compaction of backfill placed by water jetting shall conform to the requirements of this specification.

6. If the materials above the trench bottom are unsuitable for backfill, the Contractor shall furnish and place backfill materials meeting the requirements for trench backfill, as shown on the drawings or specified herein.

7. Should the Engineer order crushed stone for utility supports or for other purposes, the Contractor shall furnish and install the crushed stone as directed.

8. In shoulders of streets and road, the top 12-inch layer of trench backfill shall consist of processed gravel for sub-base, satisfying the requirements listed in :MI-ID standard specification MI.03.1.

C. BACKFILLING UNDER BUILDINGS AND FOUNDATIONS:

Material to be used as structural fill under structures shall be special bedding material or gravel borrow, as shown on the Drawings or as directed by the Engineer. Where gravel borrow fill is required to support proposed footings, walls, slabs, and other structures, the material shall be placed in a manner accepted by the Engineer. Compaction of each lift shall meet the density requirements of this specification.

D. BACKFILLING ADJACENT TO STRUCTURES:

1. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads to which they will be subjected. Excavated material approved by the Engineer may be used in backfilling around structures. Backfill material shall be thoroughly compacted to meet the requirements of this specification.

2. Contractor shall use extra care when compacting adjacent to pipes and drainage structures. Backfill and compaction shall proceed along sides of drainage structures so that the difference in top of fill level on any side of the structure shall not exceed two feet (2') at any stage of construction.

3. Where backfill is to be placed on only one side of a structural wall, only hand• operated roller or plate compactors shall be used within a lateral distance of five feet (5') of the wall for walls less than fifteen feet (15') high and within ten feet (10') of the wall for walls more than fifteen feet (15') high.

3.04 Disposal of Surplus Materials

A. Surplus excavated materials, which are acceptable to the Engineer, shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill. Upon written approval of the Engineer, surplus excavated materials shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions; or shall be neatly deposited for other purposes as indicated by the Owner, within its jurisdictional limits; all at no additional cost to the Owner.

B. Surplus excavated material not needed as specified above shall be hauled away and disposed of by the Contractor at no additional cost to the Owner, at appropriate locations, and in accordance with arrangements made by him. Disposal of all rubble shall be in accordance with all applicable local, state and federal regulations.

C. No excavated material shall be removed from the site of the work or disposed of by the Contractor unless approved by the Engineer.

D. The Contractor shall comply with Massachusetts regulations (310 CMR 40.0032) that govern the removal and disposal of surplus excavated materials. Materials, including contaminated soils, having concentrations of oil or hazardous materials less than an otherwise Reportable Concentration and that are not a hazardous waste, may not

be disposed of at locations where concentrations of oil and/or hazardous material at the receiving site are significantly lower than the levels of those oil and /or hazardous materials present in the soil being disposed or reused.

SECTION 02324 - ROCK EXCAVATION AND DISPOSAL

1. GENERAL

1.01 Work Included

The Contractor shall excavate rock, if encountered, to the lines and grades indicated on the drawings or as directed, shall dispose of the excavated material, and shall furnish the required material as specified in Section 02300 Earthwork, for backfill in place of the excavated rock.

1.02 Related Work

A. Section 02300, EARTHWORK

B. Section 02252, SUPPORT OF EXCAVATION

C. Section 03302, CAST-IN-PLACE CONCRETE

1.03 Definitions

A. The word "rock," wherever used as the name of the excavated material or material to be excavated, shall mean only boulders and pieces of concrete or masonry exceeding one cubic yard in volume, or solid ledge rock which, in the opinion of the Engineer, requires for its removal, drilling and blasting, wedging, sledging, barring, or breaking up with a power-operated tool. No soft or disintegrated rock which can be removed by normal earth excavation methods, no loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere, and no rock exterior to the maximum limits of measurement allowed, which may fall into the excavation, will be measured or allowed as "rock."

B. The word "earth," wherever used as the name of an excavated material, or material to be excavated shall mean all kinds of material other than rock as above defined.

1.04 Quality Assurance

A. The Contractor shall conform to all municipal ordinances and state and federal laws relating to the transportation, storage, handling, and use of explosives. In the event that any of the above mentioned laws, ordinances, or regulations require a licensed blaster to perform or supervise the work of blasting, said licensed blaster shall, at all times, have his license on the work site and shall permit examination thereof by the Engineer or other officials having jurisdiction.

B. The Contractor shall procure all permits required for blasting.

1.05 Submittals

A. At least two weeks before beginning blasting operations, the Contractor shall submit to the Engineer for record the following data:

1. Name of Contractor or Subcontractor responsible for blasting and monitoring operations and license number.

2. Name, affiliation, and license number of the person or persons who will be directly responsible for designing each blast, supervising the loading of the shot, and firing it.

B. Copies of all permits required for blasting.

C. Results of pre-blast survey.

D. When blasting is in progress, daily reports on blasting operations and blast monitoring results.

1.06 Delivery/Storage and Handling

Delivery, storage and handling of explosives shall conform to all federal, state and local regulations and permits.

2 EXECUTION

2.01 Preparation/Pre-Blast Survey

If required, the pre-blast survey shall be conducted in accordance with state regulations and/or local permit requirements.

2.02 Excavation

A. The Contractor shall excavate rock to the lines and grades indicated on the drawings or as directed by the Engineer. The excavated rock shall be removed and disposed of by the Contractor as specified for surplus excavated materials under Section 02300 Earthwork.

B. Work damaged by blasting shall be repaired or replaced at the Contractor's expense.

C. If rock is excavated beyond the limits of payment indicated on the drawings, specified, or authorized in writing by the Engineer, the excess excavation, whether resulting from overbreakage or other causes, shall be backfilled, by and at the expense of the Contractor, as specified below:

1. In pipe trenches, excess excavation shall be filled with the required material and compacted in the same manner as specified for the material in the zone around the pipe under Section 02300 Earthwork.

2. In excavations for structures, excess excavation in the rock beneath foundations shall be filled with concrete which shall have a minimum 28-day compressive strength of 3000 psi. Other excess excavation shall be filled with Class B backfill compacted to a minimum of 92 percent density (ASTM D1557 Method C) as specified under Section 02300 Earthwork.

3. 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 crushed stone may

be used for backfill, if approved. All such removal and backfilling shall be done by and at the expense of the Contractor.

D. When directed by the Engineer, the Contractor shall remove all dirt and loose rock from designated areas and shall clean the surface of the rock thoroughly to determine whether seams or other defects exist.

E. When concrete is to be placed on rock, the rock shall be free of all vegetation, dirt, sand, clay, boulders, scale, excessively cracked rock, loose fragments, water, ice, snow, and other objectionable substances.

2.03 Vibration and Air Blast Monitoring

A. The Contractor shall measure air blast and vibration levels of blasting operations to assure compliance with all applicable regulations and local permits.

B. Records of each day's air blast and vibration measurements shall be submitted to the Engineer in writing no later than the start of the next day's work. Records shall include, as a minimum:

Identification of instrument

Name of observer

Name of interpreter

Distance and direction of recording station from the area of detonation

Date and exact time of reading

Type of ground at recording station

Peak particle velocity for all components as well as resultant for all frequencies of vibrations

Duration of motion with a velocity in excess of one thousandth of an inch per second

A copy of the photographic record of seismograph readings

Peak air blast level.

2.04 Blasting Records

The Contractor shall prepare and submit to the Engineer daily blast reports, including logs of each blast. Reports shall be submitted to the Engineer no later than the start of the next day's work. However, during each day of blasting, the Contractor shall review and shall provide access for the Engineer to review the data from that day's blasting. Reports after each blast shall include at least the following information for each blast:

Date, time, and location of blast

Permit number and expiration date

Amount and type of explosives used by weight and number of cartridges

Total number of delays used and number of holes used for each delay

On a diagram of the blast pattern, indicate total number and depth of holes, maximum charge per delay, maximum charge per hole, and corresponding delay number

An evaluation of the blast indicating areas of significant overbreak, unusual results, and any recommended adjustments for the next blast.

2.05 Post Blasting Inspections

The Contractor shall examine any properties, structures, and conditions where complaints of damage have been received or damage claims have been filed. Advance notice shall be given to all interested parties so that the parties may be present during the final examination. Records of the final examination shall be signed and distributed to the owner of the property, the head of the local fire department, and the Engineer.

SECTION 02371 - RIPRAP

1 GENERAL

1.01 Work Included

A. This Section covers riprap for slope protection, drainage swales and pipe ends, complete.

B. Grading and compaction of earth slopes and other slope preparation for the riprap are included under other sections of the specification.

1.02 Related Work

A. Section 02071, GEOTEXTILE FABRICS.

B. Section 02300, EARTHWORK.

1.03 References

A. The following standard forms a part of these specifications and indicates minimum standards required:

Commonwealth of Massachusetts Highway Department Standard Specifications for Highways and Bridges.

2 PRODUCTS

2.01 Materials

A. SLOPE PROTECTION:

Stone for slope protection shall be angular and shall be in accordance with MHD Specification Section M2.02.2, Dumped Riprap.

B. PIPE ENDS:

Stone for pipe ends shall be angular and shall be in accordance with MHD Specification Section M2.02.3, Stone for Pipe Ends.

C. DRAINAGE SWALES:

Stone for drainage swale ends shall conform to MHD Specification Section M2.02.3, and shall be not weigh less than 50 pounds or more than 125 pounds and least 75% of the volume shall consist of stones not less than 75 pounds each. The stones shall be so graded that when placed with larger stones, the entire mass will be compact.

D. GEOTEXTILE FABRIC:

Geotextile fabric shall be Erosion Control Fabric "A" as specified in Section 02071, GEOTEXTILE FABRICS.

3 EXECUTION

3.01 Installation

A. Geotextile fabric shall be installed where shown on the drawings, prior to placing the riprap.

B. Riprap for slope protection and pipe ends shall be placed on the prepared slope or area in a manner which will produce a reasonably well-graded mass of stone with the minimum practicable percentage of voids and a maximum void of 12 inches.

C. Riprap shall be placed to its full course thickness in one operation and in such a manner as to avoid displacing the underlying material. Placing of riprap in layers or by dumping into chutes or by other similar methods likely to cause segregation will not be permitted.

D. Riprap stones shall be placed and distributed such that there will be no large accumulation of either the larger or smaller stones in any given area.

E. It is the intent of these specifications to produce compact riprap protection in which all required sizes of stone are placed in the proper proportions. Hand placing or rearranging of individual stones by mechanical equipment shall be utilized to the extent necessary to secure the desired results.

SECTION 02400 - Horizontal Directional Drilling (Boring)

HORIZONTAL DIRECTIONAL BORING ACTIVITIES:

1. The contractor assumes responsibility for the satisfactory completion of this work.
2. The contractor shall prepare and submit a general work plan prior to the commencement of drilling operations. The work plan shall outline the proposed procedure and schedule to complete boring and installation. The work plan shall also include the contractor's calculations associated with boring and pull-back and a project profile showing bore path. A desired depth of placement shall be specified by the owner or engineer.
3. The contractor shall prepare and submit relevant training and experience descriptions for all personnel to be used to complete boring and installation.
4. The contractor shall prepare and submit specifications for equipment and material to be used to complete boring and installation. The equipment and material shall consist of a minimum of:
    a. Boring Rig – Shall consist of a hydraulically powered system to rotate, push, and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable boring head. Shall be grounded/anchored during boring and pull-back operations to withstand rotational, pushing, and pulling forces. Shall have a self-contained hydraulic power system that is free of leaks. Shall have a system to monitor and record pull-back pressure during pull-back operations.
    b. Boring Head – Shall be guidable by changing its rotation. Shall provide the necessary cutting surfaces and boring fluid jets.
    c. Drill Pipe – Shall be constructed of high quality seamless tubing (grade D or better) with threaded box and pins. Shall have hardened tool joints.
    d. Guidance System – Shall be of a proven type that is set up and operated by trained and experienced personnel. If a magnetic system, personnel shall be aware of magnetic anomalies and consider operational influences.
    e. Boring Fluid – Shall be composed of bentonite clay, clean water (pH 6.5 – 9), and an appropriate additive. Shall be mixed thoroughly in a self-contained closed system and be absent of clumps. Shall be continually agitated during boring to maintain a viscosity sufficient to suspend cuttings and maintain bore wall integrity.
    f. Delivery System – Shall be capable of delivering boring fluid as required to support boring activities. Shall contain in-line filters to prevent solids from being pumped into the drill pipe.
5. The boring equipment, boring fluid mixing system, entry and exit pits, and boring fluid recycling system shall be contained within an appropriate berm to prevent spills into the surrounding environment.
6. Used boring fluid shall be contained and properly disposed of. Pumps and/or vacuum trucks shall convey excess boring fluid from containment areas to designated facilities.
7. The work site, as indicated on project drawings, shall be graded or filled to provide a level area. The contractor shall confine all activities to designated work areas. No alterations beyond what is required for drilling operations are to be made to the work site.

8. The contractor shall place silt fence between all drilling operations and any waterways, wetlands, or drainage conveyances present around the work site. Bulk fuel or oil shall not be stored within 100 feet of a waterway, wetland, or drainage conveyance.
9. The bore path shall be as direct as possible. The bore path shall be accurately surveyed with entry and exit stakes placed at appropriate locations. If a magnetic guidance system is being used, the bore path shall be surveyed for geo-magnetic anomalies that may influence operations. To the extent possible, sources of interference shall be identified and eliminated.
10. The contractor shall have all underground utilities and structure located prior to the commencement of drilling operations. The contractor shall physically identify the utilities and structures by vacuum or hand excavation to identify actual location and path which may be within 2 feet of the bore path. The contractor shall not commence drilling operations until all underground utilities and structures have been verified.
11. The pipe shall be connected as one length prior to pull-back operations. The pipe shall be placed on pipe rollers before pulling through the bore hole. The pipe rollers shall be spaced to prevent excessive sagging.
12. The contractor shall pressure test the length of pipe as noted in the applicable section of this specifications.
13. The contractor shall drill a pilot hole along the bore path with no deviations greater than 5% of depth over a length of 100 feet. Deviations greater than 5% shall be immediately reported to the owner and the engineer and may require re-drilling from a location prior to the deviation.
14. Upon successful completion of the pilot hole, the contractor shall ream the bore hole to a minimum of 25% greater than the outside diameter of the pipe. The diameter of the bore hole shall be increased in increments of 6 inches or less per pass.
15. Upon successful completion of reaming, the contractor shall commence pull-back operations. A swivel shall be located in front of the pipe. Pull-back operations shall be completed without interruption until the pipe is completely in the bore hole. The contractor shall not apply more than the maximum safe pipe pull pressure at any time during pull-back operations. If the pipe becomes stuck, the contractor shall allow sufficient time for potential hydro-lock to subside. If the pipe remains stuck, the contractor shall immediate report to the owner and the engineer.
16. Upon successful completion of pull-back operations, the contractor shall flush and sanitize the pipe prior to connection to the existing water system.
17. The contractor shall restore the work site to a condition acceptable to the owner. All excavations shall be backfilled and compacted to 95% of original density.
18. The contractor shall maintain a daily log of drilling operations, including a log of the guidance system readings. The log shall be submitted upon completion of the project.

SECTION 02510 - CONNECT NEW WATER MAIN TO EXISTING WATER MAIN

1 DESCRIPTION

Work consists of the connection of a new water main to an existing water main as required in the Contract Documents and as directed by the Engineer.

Work and materials are to be in conformance with requirements of Section 01180 General Water Provisions and Section 15140 Water Main Pipe and Fittings.

2 MATERIALS

All fittings and joint connection materials required to make the connection shall be as approved by the Engineer prior to installation. Generally, the fittings and connection materials shall be the same material as the existing pipe: ductile iron fittings shall be required when connecting new ductile iron or PVC/PVCO pipe to existing cast or ductile iron pipe; and injection molded PVC fittings shall be required when connecting new PVC/PVCO pipe to existing PVC/PVCO pipe that is 12 inch diameter or less.

3 CONSTRUCTION DETAILS

New water main shall be connected to the existing water main using approved and appropriate gaskets, materials and fittings. Fit between the new water main and the existing water main shall not exceed a gap of 1/8 inch.

The interior of all water main pipe and fittings not receiving 24 hour chlorine disinfection contact time must be spray or swab disinfected with a 1 to 5 percent solution of chlorine no more than 30 minutes prior to installation. The interior and exterior of cut ends of existing pipe shall also be cleaned and disinfected.

All fittings shall be solidly braced against the trench wall to prevent any deflection due to thrust pressure. Bracing shall be accomplished by the use of cast-in-place concrete thrust blocks and restrained joints.

All water pipe joints shall be made watertight. Prior to backfilling, the water main shall be filled with potable water and installation tested for leaks under line pressure in the presence of the Engineer.

Prior to backfilling, uncoated tie rods, clamps and any components made of metal used for restrained joints are to receive hand brushed application of an approved bitumastic coating specifically manufactured for underground use or petrolatum wax tape coating system.

Non epoxy coated ductile iron fittings installed on PVC/PVCO water main pipe shall be coated with petrolatum wax tape coating system applied in conformance with manufacturer's instructions. One nine pound anode shall be attached to each ductile iron fitting.

When connecting a new ductile iron or PVC/PVCO water main to an existing cast or ductile iron water main, one 32 pound anode shall be thermite welded to the existing water main.

4 METHOD OF MEASUREMENT

The quantity to be measured for payment shall be the number of connections actually made.

5 BASIS OF PAYMENT

The unit price bid shall include the cost of: cutting and removing a piece of the existing water main; removing the existing plug; dewatering and cleaning existing water main; furnishing and using all temporary plugs; disinfectant to prevent contamination of the existing water main; connecting the new water main to

the existing water main; furnishing and placing all pipe, pipe specials, gaskets, fittings, joints, hardware and thrust blocks; protective coating; restrained joints; plugging the abandoned water main with concrete; pavement saw cutting; leak testing; and furnishing all labor, material and equipment necessary to complete the work.

Excavation, rock excavation, furnishing and placing of magnesium anodes, bedding and select granular backfill, and surface restoration will be paid for under separate bid items.

Payment for installation of a tee or cross into existing water main shall be considered as one connection.

REVISED August 16, 2019

SECTION 02511 - CUT AND PLUG EXISTING WATER MAIN

1 DESCRIPTION

Work consists of cutting and plugging or capping existing water mains that are to remain in service, as required in the Contract Documents and as directed by the Engineer.

Work is to be in conformance with the requirements of Section 01180 General Water Provisions and Section 15140 Water Main Pipe and Fittings.

2 MATERIALS

Ductile iron plugs and caps shall be required on ductile iron, cast iron and PVC/PVCO pipe. PVC plugs and caps are not to be used. Plugs and caps are to be in conformance with the requirements of Section 15140 Water Main Pipe and Fittings. Tapped plugs and caps, if used, shall have a 2 inch tap and brass plug.

Plugs and caps installed on ductile iron and PVC/PVCO pipe shall be restrained to the pipe using mechanical joint or harness type joint restraint device in conformance with the requirements of Section 15140 Water Main Pipe and Fittings.

Tie rods, socket clamps and tie bars may be used on cast iron pipe, in lieu of mechanical joint or harness type joint restraint device, subject to the prior approval of the Engineer. Number and size of tie rods shall be as specified in Section 01180 General Water Provisions. Tie bars shall be 3 inch steel channels, 5 pounds per foot.

3 CONSTRUCTION DETAILS

Whenever possible, plug shall be installed at a tee, cross or similar connection fitting. Where the water main is to be plugged at a water pipe joint, the plug shall be installed in the bell end of the water pipe.

A section of water main pipe shall be cut and removed and the interior of all water main pipe and fittings not receiving 24 hour chlorine disinfection contact time must be spray or swab disinfected with a 1 to 5 percent solution of chlorine no more than 30 minutes prior to installation. The interior and exterior of existing fitting or pipe joint and cut end of existing pipe which will be plugged or capped shall also be cleaned and disinfected.

On cast iron water pipe and fittings, where plugs cannot be bolted directly to the water pipe or fitting joint or otherwise restrained using a mechanical joint or harness type joint restraint device, the plug or cap shall be installed and held in place by a retaining bar extending across the center of the plug. A socket clamp shall be installed on the water pipe or fitting behind the bell, and the retaining bar secured to the socket clamp with steel rods, socket clamp washers, lock washers and nuts.

Prior to backfilling, uncoated tie rods, clamps and any components made of metal used for restrained joints are to receive hand brushed application of an approved bitumastic coating specifically manufactured for underground use or petrolatum wax tape coating system.

Non epoxy coated ductile iron fittings installed on PVC/PVCO water main pipe shall be coated with petrolatum wax tape coating system applied in conformance with manufacturer's instructions. One nine pound anode shall be thermite welded to each ductile iron fitting.

All joints shall be made watertight. Prior to backfilling, the water main shall be filled with potable water and installation tested for leaks under line pressure in the presence of the Water Superintendent.

In conjunction with mechanical restraints, cast-in-place concrete thrust blocks shall be provided to transmit

the thrust due to water pressure to undisturbed earth. Prior to placing the concrete, all wet and undesirable material shall be removed from the excavation. Timber blocking will not be allowed.

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SECTION 02514 - HYDRANT

1 DESCRIPTION

Work consists of installation of new hydrants, relocation or removal of existing hydrants as required in Contract Documents and as directed by Engineer.

Work is to be in conformance with requirements of Section 01180 General Water Provisions.

2 MATERIALS

2.01 Hydrant

Hydrant is to be in conformance with requirements of ANSI/AWWA C502, and as approved and provided by Town of Cheshire.

Hydrant is to be 5-1/4 inch, dry-barrel, break-away hydrant, manufactured for 5 feet 6 inches bury where hydrant branch pipe cover depth is 4 feet 6 inches, and 6 feet bury where hydrant branch pipe cover depth is 5 feet. Hydrant is to be open-left with one 1-1/2 inch pentagon operating nut, two 2-1/2 inch National Standard hose connections, and one 4-1/2 inch National Standard pumper connection. Inlet connection is to be 6 inch mechanical joint.

External bolting on hydrant is to be manufactured of 304 stainless steel. Furnish with corrosion resistant steel nozzle cap chains.

2.02 Extension Kit

Extension kit for height adjustment of hydrant is to be available in 6 inch increments with maximum of 24 inches allowed, and is to be manufactured by same company that manufactures hydrant. Extension kit is to include rod and barrel units, with non-breakable rod and barrel couplings complete with gaskets and fasteners.

2.03 Miscellaneous

Paint for hydrant is to be fusion bonded yellow epoxy or Insl-x Silathane Gloss Enamel Yellow No.520-35, or approved equivalent.

Interior coatings are to be in conformance with requirements of ANSI/AWWA C550.

Hydrant drain material is to be No. 2 crushed stone in conformance with requirements of MADOT Section M3.11.04.A. Coarse Aggregate.

Plastic barrier material is to be 6 mil polyethylene.

2.03 Hydrant Marker - Furnished

Hydrant marker is to be supplied by and obtained from the Town’s Water Department.

3 CONSTRUCTION DETAILS

3.01 General

Existing hydrants are property of Town of Cheshire, and upon removal are to be delivered to the Water

Superintendent at the Water Department Pump House. Upon delivery, Contractor is to obtain written receipt from the Water Superintendent stating number of hydrants returned and who received them. Contractor is to provide Engineer with copy of receipt.

3.02 Installation

Excavation is to be in conformance with requirements of Section 02300 Earthwork, and to appropriate depth to permit proper connection of hydrant to hydrant branch pipe.

Minimum cover over hydrant branch pipe and fittings, as measured between finished grade and top of exterior limit of hydrant branch pipe and fittings, is to be, unless otherwise shown in plans or ordered by Engineer:

- 4 feet 6 inches for domestic water pipe
- 5 feet for Holly system water pipe

After installation of hydrant, there is to be resultant clearance of minimum of 2 inches and maximum of 6 inches between finished ground elevation and bottom of the breakaway flange coupling on hydrant.

Adjustment for proper height of hydrant may be accomplished by use of mechanical joint offset or hydrant extension kit. Hydrant extension kit is to be installed in accordance with manufacturer's recommendation and the Water Department's standards and specifications. The installation of more than one extension kit on a hydrant must be approved by the Engineer and will require replacement of the lower stem with a longer one that reaches the breakaway flange.

Generally, hydrant is to be located such that centerline of hydrant is at least:

- 2 feet behind face of curb
- 2 feet behind back edge of concrete gutter
- 10 feet away from point of curvature of radius at street intersection
- 10 feet away from outer edge of driveway
- 10 feet away from outer edge of pole
- 15 feet away from outer edge of tree

Minimum distance of 4 feet is to be maintained between hydrant and hydrant branch valve, and if necessary, use horizontal bend to achieve required minimum distance.

Hydrant is to be oriented with pumper connection nozzle at right angles to and facing pavement.

Hydrant is to be installed in vertically plumbed position on solid concrete block support. Proper alignment of hydrant is to be maintained until completion of Project.

For new hydrant installation, hydrant branch pipe material will be as required and with restrained joints.

For hydrant being replaced or relocated on existing hydrant branch pipe that is ductile iron anchor pipe, any extension of existing hydrant branch pipe is to be done using ductile iron anchor pipe.

For hydrant being replaced or relocated on existing hydrant branch pipe that is not ductile iron anchor pipe, solid concrete blocks are to be used for temporary thrust blocking to allow hydrant to be immediately pressurized. Temporary thrust blocking is to be incorporated in permanent poured concrete thrust blocks.

Embed hydrant within crushed stone material from bottom of excavation to point 12 inches above hydrant weep holes (drains), cover crushed stone material with plastic polyethylene sheet barrier, then backfill remaining portion of excavation.

Should ground water be encountered within 7 feet of finished grade, hydrant weep holes (drains) are to be plugged and Water Department notified in writing that weep holes (drains) have been plugged.

Hydrant is to be brush painted with approved yellow paint. All scrapes and other bare patches on hydrants are to be repaired by repainting, then one overall coat of paint applied to hydrant.

Hydrant installation is to be pressure tested and made watertight. Hydrant installation is to be red tagged until hydrant is put into active service. Red tag will be supplied by and obtained from the Water Department, and is to be installed on hydrant by Contractor.

If one or more bollards are installed to protect the hydrant, bollards must be located at least 3 feet from the hydrant and must not be on the same alignment as any of the nozzles.

Upon completion of work, excavation is to be backfilled and disturbed surface area restored.

3.03 Relocate Existing Hydrant

Existing hydrant and hydrant marker or hydrant marker post are to be removed and hydrant reinstalled at new location. Reinstallation of hydrant is to be in conformance with requirements of Subsection 3.02 Installation. Operating stem, main valve, valve seat, drain and drainage passages are to be cleaned and inspected. Prior to installation and after reassembly, hydrant is to be checked for proper operation.

Contractor is to notify Engineer if existing hydrant is unsuitable to be relocated. Engineer will determine whether or not existing hydrant can be relocated, or new hydrant should be installed.

Existing hydrant marker post is to be disposed of and a new hydrant marker is to be installed on relocated hydrant.

3.04 Remove Existing Hydrant

Existing hydrant branch valve box and hydrant marker post are to be removed and disposed of. The branch valve box shall remain only if the branch valve is to remain in use and the valve box is properly aligned over the valve and not damaged.

Expose existing water main and hydrant branch pipe, disconnect and remove existing hydrant. Hydrant is to be delivered to the Cheshire Water Department Pump House, Pumphouse Road, Cheshire MA. On existing water main to be abandoned, open end of hydrant branch pipe is to be completely plugged with concrete to depth of 12 inches. On existing water main to remain in service, hydrant branch pipe is to be either cut and plugged at tee in conformance with requirements of Section 02511 Cut and Plug Existing Water Main, or tee removed and replaced with new section of water main pipe in conformance with requirements of Section 13123 Insertion Sleeve, as indicated in Contract Documents.

3.05 Hydrant Marker - Furnished

The Town will supply hydrant markers. The Contractor will obtain hydrant markers from the Water Department and install them on the hydrant, only as indicated in Contract Documents. Hydrant markers are not required to be installed within general limits of Central Business District.

The color of the hydrant marker to be installed on each hydrant shall be determined by the Water Department based on the anticipated maximum flow rate available at the hydrant. Blue markers are to be installed where available flows are 1,500 gallons per minute (gpm) or greater; green markers where flows are between 1,000 gpm and 1,500 gpm; orange or yellow markers where flows are between 500 gpm and 1,000 gpm and red markers where flows are less than 500 gpm.

Hydrant marker is to be installed in accordance with manufacturer’s instructions.
REVISED August 16, 2019

SECTION 02515 - WATER SERVICE (2 INCH AND SMALLER)

1 DESCRIPTION

Work consists of the installation of new water service tubing as required in the Contract Documents and as directed by the Engineer.

Work is to be in conformance with the requirements of Section 01180 General Water Provisions.

2 MATERIALS

2.01 Copper Water Service

Copper water service tubing is to be Type K in conformance with requirements of ASTM B88, in sizes 3/4 inch, 1 inch, 1-1/2 inch and 2 inch.

Joints are to be of flared type.

Couplings used for connecting copper water service tubing to corporation stop are to be of flared type.

2.02 Polyethylene (PE) and Cross-Linked Polyethylene (PEX) Water Service

PE water service tubing shall be high density, copper tube size (CTS), SDR 9 (Standard Dimension Ratio), PE 4710 - pressure class 250 psi blue outer layer, in conformance with the requirements of ANSI/AWWA C901 and ASTM D2737 Standard Specification for Polyethylene (PE) Plastic Tubing, in sizes 1 inch, 1-1/2 inch and 2 inches.

PEX water service tubing shall be copper tube size (CTS), SDR 9, PEXa, pressure class 200 psi/73.4°F @ 0.63 design factor, material designation 3306, with blue outer layer, in conformance with the requirements of ANSI/AWWA C904, in sizes 1 inch, 1-1/2 inch and 2 inches.

PE and PEX water service tubing shall bear permanent identification markings that will remain legible during normal handling, storage, installation and service life and that will not reduce strength or otherwise damage tubing. Markings shall be applied at intervals not more than 5 feet and shall include: nominal size, standard material designation, (PE 4710 or PEX 3306), pressure class, AWWA designation number (C901 for PE or C904 for PEX), manufacturer's name or trademark and production record code, seal or mark of testing agency that certified suitability of tubing material for potable water products. For PE pipe, include PE compound oxidative resistance classification per ASTM D3350 (i.e., CC2 or CC3).

Joint couplings for PE and PEX tubing shall be Quick Joint compression type with solid stainless steel internal stiffeners inside ends of PE tubing.

Where soils are contaminated with solvents or petroleum products, copper tubing shall be used instead of PE or PEX tubing.

2.03 Tracer Wire for Polyethylene (PE) and Cross-Linked Polyethylene (PEX) Water Service

Tracer wire for PE and PEX water service tubing shall be in conformance with the requirements of Section 15140 Water Main Pipe and Fittings for tracer wire.

3 CONSTRUCTION DETAILS

3.01 General

Minimum cover over water service tubing and fittings, as measured between finished grade and top of exterior limit of water service tubing and fittings is to be 4 feet 6 inches, unless otherwise shown on plans or as ordered by Engineer.

Contractor shall have the option to install water service tubing by means of open trenching or tunneling, or a combination thereof, except for those water services where tunneling is required to be used as shown in the Contract Documents.

Water service tubing shall be installed in a single piece without joints between corporation stop and curb stop. Water service tubing may be curved around obstructions in the trench. Water service tubing shall be laid at a right angle to the water main and in a straight path from the corporation stop to the curb stop. There shall be no kinks, joints, gouges or crimps in the water service tubing, and Contractor shall avoid any unnecessary flexing and bending of the water service tubing. Bending radius for PE and PEX tubing shall not be less than 30 times pipe diameter. PE and PEX tubing should be laid with moderate slack or snaking to accommodate any contraction. PE and PEX tubing should be allowed to cool in trench before cutting to required length between fittings to reduce stress from thermal contraction. Distance between bends and fittings in PE and PEX tubing should not be less than 10 pipe diameters to minimize bending stresses at connection point.

Water service tubing shall be connected to corporation stop, curb stop and existing water service tubing by using approved and appropriate gaskets, joint and connection materials, or fittings required to make the connections. Extend installation of water service tubing to include removal of the existing curb stop and box. Water service connections and appurtenances shall be made watertight. Prior to flaring copper tubing, Contractor shall verify that the end of the tube is round and cut at a right angle to the axis of the tubing. For PE and PEX water service connection, internal stiffener shall be required at ends of PE and PEX tubing and stiffener shall not extend beyond end of connection fitting. For connecting PE and PEX water service to existing non-copper inside water service (service pipe on customer's side of curb stop), PE and PEX water service shall extend minimum 1 foot beyond curb stop, eliminating need for dielectric insulator. Prior to connecting new water service to existing service, new service line shall be flushed with clean water making sure all debris is removed from the line.

For connections of water service tubing to new or existing corporation stops, a horizontal expansion curve (goose neck) shall be formed into the water service tubing. Expansion curve shall start at the outlet end of the corporation stop and extend 3 feet along the water service tubing with a horizontal dimension of from 6 inches to 12 inches.

Copper tubing connected to new or existing ductile iron or cast iron water main pipe shall be coated with bitumastic coating or petrolatum wax tape coating system (primer and tape) from tap, including corporation stop and portion of water main immediately surrounding tap, to minimum distance of 3 feet from tap.

Service saddles are required for connecting all water service tubing to PVC/PVCO water main pipe. Service saddles shall be used as specified in Section 15112 Corporation Stop and Connection; Abandon Existing Water Service Tap (2 Inch and Smaller) for connecting PE, PEX or copper water service tubing to ductile iron or cast iron water main pipe.

Copper water services that are connected to PVC/PVCO water main shall require one-five pound magnesium anode be connected to copper tubing using copper tube nut (sizes 1 inch or less) or bronze ground clamp (sizes greater than 1 inch). Anode shall be located 2 feet away from water main and at least 6 inches below the bottom of the main and shall be surrounded with native backfill.

Upon completion of the work and testing of the water service, the excavation shall be backfilled and the disturbed surface area restored. Backfilling of the trench shall be done in a manner so as to avoid damage

to the water service.

All hazardous waste, including lead water service materials, removed from the excavation shall be disposed of in accordance with all applicable Massachusetts Department of Environmental Protection (MADEP) and United States Environmental Protection Agency (USEPA) solid and/or hazardous waste management regulations. Solid hazardous waste must be disposed of at waste management or recycling facilities permitted to receive specific waste. Proposed disposal or recycling facilities must be approved by the Town of Cheshire prior to shipment by the Contractor. Disposal or recycling receipts must be provided to the Town by the Contractor.

3.02 Water Service Tubing Sizing

For sizing of new water service tubing, use the following:

Existing Water Service (nominal outside diameter)	Copper Water Service Tubing (nominal outside diameter)	PE or PEX Water Service Tubing (nominal outside diameter)
5/8 and 3/4 inch	3/4 inch	1 inch
1 inch	1 inch	1-1/2 inch
1-1/2 inch	1-1/2 inch	2 inch
2 inch	2 inch	-

3.03 Tunneling

Where the Contractor opts to install water service tubing by means of tunneling, approval shall be obtained from the Engineer before commencing work.

At locations where tunneling is to be performed, Contractor shall open cut and excavate both boring and receiving pits. Pit excavations shall be kept as small as practical, but large enough so as not to jeopardize safe tunneling operations. Excavations and tunneling operation shall be to a depth to ensure that the water service tubing will be installed at required minimum depth. Contractor has the option of tunneling-in the water service tubing by either boring, drilling or missiling. “Washing-in” of water service tubing is not allowed under any circumstances.

Contractor shall open cut and excavate a sight pit at any location where an existing underground utility line is in the direct path of the tunneling operation. Sight pit shall be large enough and deep enough to be able to ensure that no damage occurs to the existing underground utility line during the tunneling operation.

In most cases, the boring and receiving pits will generally be located at the water main or curb line, and at the curb stop. In some instances the pits may be located in other areas as shown in the Contract Documents or as directed by the Engineer.

3.04 Installation of New Water Service Tubing at Existing Appurtenances

For connection of new water service tubing to existing corporation stop that is to remain, existing corporation stop must not be leaking or damaged, and must be at least 5/8 inch diameter for connecting copper water service tubing or PE/PEX water service tubing. Water service shall be shut down at the existing corporation stop. Existing water service tubing is to be disconnected and removed, new water service tubing connected to the existing corporation stop.

For connection of new water service tubing to existing curb stop that is to remain, existing curb stop must not be leaking or damaged and fully operational. Water service shall be shut down at the existing curb

stop. Existing water service tubing is to be disconnected and removed, new water service tubing connected to the existing curb stop, and existing curb stop returned to full open position.

For replacement of an existing water service, installation of the new water service tubing shall be extended to include removal of the existing curb stop and box.

For existing corporation stop that is found to be broken, leaking, undersized, or otherwise determined unsatisfactory by the Engineer, existing corporation stop shall be abandoned (closed and plugged) and a new corporation stop installed. Cost of abandoning an existing corporation stop under this work shall be included in the unit price bid for a new corporation stop under Section 15112 Corporation Stop and Connection; Abandon Existing Water Service at Tap (2 inch and smaller).

Tighten existing corporation stop that is found to be leaking at the threaded tap. If leak cannot be stopped by tightening and existing corporation stop made watertight, existing corporation stop shall be replaced by installing a new tapping saddle and corporation stop.

3.05 Tracer Wire Installation with Polyethylene (PE) and Cross-Linked Polyethylene (PEX) Water Service

Tracer wire shall be installed with PE and PEX water service tubing and secured to the top of the tubing using nylon cable zip ties at intervals not to exceed 8 feet. Tracer wire should not be taped to or wrapped around the service tubing. Tracer wire shall be installed in such a manner as to enable its detection with electronic locating equipment.

Tracer wire shall be from corporation stop extended continuously along PE and PEX water service tubing to the curb stop and up to top of curb stop box. Where PE and PEX water service is installed on ductile iron water mains, tracer wire shall be secured at the corporation stop. Where PE and PEX water service is installed on PVC water mains, tracer wire for PE and PEX water service tubing shall be spliced to the tracer wire for the PVC water main. Tracer wire shall travel up the inside of the curb box with enough extra tracer wire to extend a distance of 4 feet beyond the top of the curb box. The extra tracer wire shall be coiled and stored underside the curb box cover within the curb box.

Number of splices made on the tracer wire shall be kept to a minimum. Splices shall be made using an approved connector and shall be water tight and corrosion resistant. Wire nuts shall not be used. The use of split bolt style connectors shall require the installation of three successive layers each of rubber splicing and vinyl tapes.

After installation of tracer wire on mains and services has been completed, the Contractor shall test the tracer wire for electrical continuity. Upon successful completion of system test, tracer wire system shall be checked for functionality by the Water Superintendent. Deficiencies in the tracer wire system shall be repaired by the Contractor at no additional cost to the Town and the tracer wire system shall be retested.

3.06 Flushing Water Service Lines and Restoration of Service

After installation of the new water service the Contractor shall flush the new service line before reconnecting the new service and curb stop to the (private) inside service. If the existing service that is replaced with the new water service is composed of lead or galvanized steel the contractor shall perform the following procedure for a complete and final flushing of the entire water service. The final flush out of the service will be through the hose connection to the outside hose bib or through another plumbing fixture approved by the Engineer. The Contractor must make arrangements to remove the water meter and install a splice pipe. The water service may not be flushed through the water meter. Each service shall be flushed for a period of at least 10 minutes, prior to reinstallation of the water meter. Flushing water shall travel from the charged water main through the new water service and the existing inside water service, through a portion of the internal plumbing and flushed out through an outside hose bib or laundry tub on the inside of the building. The water service curb stop must be left in the full open position for the duration of the flush. Precautions must be taken to ensure the flushing water is directed to the street and directed away from the building and

lawn areas.

Following the flush, the splice piece shall be removed and the meter reinstalled. The same procedure will apply in cases where the meter is located in an exterior meter crock.

Multiple services may be flushed at the same time. Water meters shall be reinstalled on the same day that the service flush takes place. If a water meter cannot be installed on the same day, a re-flush of the service will be required.

The contractor will record the size and material of the water service as it enters the premise up stream of the water meter on individual tie cards for the Water Department. These cards will be turned into the Water Superintendent at the completion of work on each street in the project.

Instructions for interior flushing of the premise plumbing shall be issued to each household following installation of the water meter. The Water Department will provide the contractor with the appropriate *pamphlets and/or door hangers* for distribution. The contractor's representative shall advise the resident not to drink water until the resident has completed the flushing of the internal premise plumbing

3.07 Testing Water Services

Prior to backfilling the trench, water service work, including but not limited to connections, joints and unions, shall be tested for leaks under line pressure in the presence of the Engineer. Any defective work shall be repaired and retested until installation is accepted.

SECTION 02516 - TEMPORARY BYPASS

1 DESCRIPTION

Work consists of the installation of a temporary bypass water system as required in the Contract Documents and as directed by the Engineer.

Work is to be in conformance with the requirements of Section 01180 General Water Provisions and AWWA C602 Cement Mortar Lining of Water Pipelines in Place – 4 In. and Larger, Section 4.6 Temporary Bypass to Customers.

2 MATERIALS

2.01 General

All materials furnished for use as temporary bypass pipe, service hose, connections and related appurtenances that come into contact with drinking water are to be certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61) by an American National Standards Institute (ANSI) approved third-party certification program or laboratory. All materials shall be fully adequate to withstand the required water pressure and all other conditions of use, and shall provide adequate water tightness before being put into service.

Temporary bypass pipe must be drawn from water main equipment stocks that are dedicated exclusively for use in pipe projects involving fresh potable water.

Temporary bypass pipe shall be PVC or steel having a minimum working pressure rating of 200 pounds per square inch with restrained couplings.

Water service hose to be used for connection from the temporary bypass pipe to the building/residence shall have a minimum working pressure rating of 200 pounds per square inch and be made of a material that will not have an adverse effect on the taste or odor of the water.

2.02 Bulkhead (Temporary Line Cap)

Bulkhead (temporary line cap) shall consist of a bolted sleeve type pipe coupling with steel end cap capable of sliding over the cut end of the water main pipe.

2.03 Temporary Fire Hydrant

Temporary fire hydrant shall consist of a 4 inch by 4 inch tee or 4 inch 90˚ bend, with a butterfly valve connected to the end of the tee or bend, and an operating nut to control the valve. Temporary fire hydrant shall be equipped with a 4-1/2 inch diameter National Standard threaded nozzle with hydrant cap installed.

2.04 High Performance Asphalt

High performance asphalt shall be composed of laboratory approved aggregates, plant mixed with QPR liquid oil blend from Gernatt Asphalt Products., or approved equivalent. The mix ratio shall be 110 pounds of asphalt blend per 2,000 pounds of high performance asphalt material. The asphalt blend shall not be heated above 300^{O}F

Aggregates

The aggregate shall consist of 100% crushed limestone or a laboratory approved equivalent under ASTM C-136

Screen Sizes Percentage Passing

SIEVE SIZE	PERCENT PASSING BY WEIGHT
3/8 inch	100
No. 4	20 to 85
No. 8	2to 40
No. 16	0 to 10
No. 50	0 to 6
No 200	0-2

Bituminous Material

The modified bituminous liquid oil blend shall be QPR, or equal which meets the following requirements: ASTM D-1310; ASTM D-2170; ASTM D-95; ASTM D-401

The mix shall be produced through conventional asphalt plant methods under the direction of a representative of the asphalt blend manufacturer. Before use, the final mix shall be approved by the representative of the asphalt blend manufacturer.

3 CONSTRUCTION DETAILS

3.01 General

One week prior to bypass work, the Contractor shall deliver “door hanger” notices supplied by the Water Department to each affected residence and business.

Temporary bypass system shall include temporary bypass pipe, hoses, connections and related appurtenances necessary to maintain a continuous supply of water. Temporary bypass system shall be maintained in a safe and operative condition at all times.

For protection of the work and the public, flashers and barricades shall be installed at locations as directed by the Engineer. The flashers and barricades shall be maintained in proper operating condition.

Where required, the Contractor shall install bulkheads (temporary line caps) on the existing water main to keep the section of the existing water main pressurized and capable of supplying a continuous flow of water. The bulkheads shall be fitted with a bolted sleeve type pipe coupling having a steel end cap and outlet fitting so that the temporary bypass pipe can be fed through the end of the bulkhead. The coupling shall be slid over the end of the water main, and braced or restrained so that it will support normal operating line pressure.

To prevent contamination, open cut water main ends that are left unattended shall be wrapped by a double layer of polyethylene plastic and tightly tied or covered with a water tight plug. All fire hydrant nozzles shall be capped when not in use.

Valves shall be installed on the temporary bypass pipe at all appropriate locations, Valve spacing should generally not exceed 800 feet.

Temporary bypass pipe crossing streets and sidewalk access ramps shall be installed in a trench and shall not block or otherwise impede access to any sidewalk access ramp. The existing pavement shall be saw

cut and excavated to a depth sufficient to contain the temporary bypass pipe. The Contractor shall maintain uninterrupted accessibility to sidewalk access ramps at all times.

Temporary bypass pipe in other areas may also be required to be installed in a trench as required in the Contract Documents and as directed by the Engineer.

To minimize interference with vehicle and pedestrian traffic, whenever temporary bypass pipe crosses a driveway or sidewalk, the temporary bypass pipe shall be covered with a mound of high performance asphalt material, or suitable ramps.

The Town will furnish the Contractor with copies of a notice alerting customers about the possibility of seeing discolored water. The Contractor shall distribute these notices to all affected customers immediately prior to transferring the water supply from the temporary bypass pipes and hoses back to the water main. After completion of the water main work and restoration of the supply of water back to the water main, the Contractor shall remove all temporary bypass pipe and related appurtenances. The street, sidewalks and adjacent property shall be restored to a neat and orderly condition.

3.02 Disinfection

All bypass pipes shall be disinfected per the requirements of Section 01180, the Massachusetts Department of Environmental Protection Drinking Water Program and the Contract Documents.

The Contractor shall disinfect the hydrant standpipe prior to connecting the bypass pipe to the hydrant by pouring 1 quart of commercially available bleach (solution containing approximately 5% sodium hypochlorite) into the hydrant. The hydrant shall be filled with clean water and let stand for a minimum of 20 minutes. The hydrant shall then be flushed and the bypass pipe connected to it.

3.03 Temporary Water Service Connection

The Contractor shall make all connections to the customer's water service line on a day and at a time that is convenient to the customer.

Connection from the temporary bypass pipe to the water service line shall be made inside the building at the meter, outside at the hose bib, or any suitable area not directly in the street.

Hose shall be run into the building through a window, or a temporary opening shall be made in the building wall of a size just large enough to pass the hose through. Dryer vents are not to be used. The opening shall be secured to prevent any access by unauthorized individuals, and shall be completely sealed to prevent access by rodents, water intrusion, and to minimize heat loss.

Hose connection made at the hose bib shall be done by connecting a 2 hose Y-adaptor with dual shutoff capable of allowing independent use of two hoses from one faucet.

If access into the building is impossible or impractical, and the hose bib is not accessible, the connection shall be made to the water service line in any suitable area not directly in the street. The Contractor shall excavate, expose and cut the water service line, and connect the hose. The Contractor shall either backfill excavated area or install orange construction fencing with flashers around the excavated area. If the area where the excavation is made is paved, the Contractor shall cover the excavation with heavy gauge steel plates capable of supporting an AASHTO H20 Highway Loading.

The Contractor shall make satisfactory arrangements with the customer so that stop and waste valves shall be accessible at all times.

3.04 Flushing Water Service Lines and Restoration of Service

After completion of lining the water main, the Contractor shall clear the water service lines by back flushing with potable water. Once the water main has been health tested, recharged and put back into service, each water service shall be flushed at full velocity for a period of at least 10 minutes, prior to re-installation of the water meter. The hose connection from the inlet side of the meter, out to the street shall be utilized for the flush. Flush water will travel from the charged water main through the existing water service to the meter inlet hose connection and out through the hose to the street. The water service curb valve must be left in the full open position for the duration of the flush. Precautions must be taken to ensure the hose outlet is directed to the street and directed away from any lawn areas.

In the instances where the outside hose bib is used for the bypass pipe connection to the home instead of at the inside meter location, the final flush out of the service will be through the hose connection to the outside hose bib. The contractor must make arrangements to remove the meter and install a splice pipe. The water service may not be flushed through the water meter. Following the flush, the splice piece shall be removed and the meter reinstalled. The same procedure will apply in cases where the meter is located in an exterior meter crock.

Multiple services may be flushed at the same time.

The contractor will record the size and material of the water service as it enters the premise up stream of the water meter on tie cards for the Water Department. These cards will be turned into the Water Superintendent at the completion of work on each street in the project.

The Contractor shall disconnect the hose, restore the water service line back to normal conditions, and restore water flow. Access points shall be properly restored to pre-construction status. Temporary openings into buildings/residences shall be permanently repaired using a material and method acceptable to the Engineer.

When temporary bypass is used during a water main cleaning and lining project, and the situation arises where a Town-owned building is vacant and boarded-up, the Town will make arrangements to allow the Contractor to gain access to the building to connect a temporary bypass hose for use in flushing back the water service to clean out debris that may accumulate at the location where the service is connected to the water main. For non-Town-owned vacant buildings, if the Contractor is not able to gain access to the building after making every reasonable attempt to contact the building owner or his representative, the Engineer may direct the Contractor to clean and line the water main without making provision to flush back the service. In some cases for non-Town-owned vacant buildings, the Engineer may direct the Contractor to excavate the water service at the curb stop to connect a flush-back hose before the water main is cleaned and lined. In other cases, after the water main has been cleaned and lined, the Engineer may direct the Contractor to excavate at the location where the service to the vacant building is connected to the water main, disconnect the service and clean out any debris that may have accumulated in the service at this location. Once cleaned out, the service shall be reconnected to the water main, the excavation backfilled and the surface restored.

3.05 Temporary Fire Hydrants

Temporary fire hydrants shall be installed where indicated on the plans or as directed by the Engineer. Temporary fire hydrants shall be required on temporary bypass pipe which is 4 inch in diameter or larger in size. The pipe threads shall be protected with a hydrant cap when not in use. Temporary fire hydrants shall be serviceable at all times. Hydrants are subject to inspection at any time by either the Water Superintendent or the Town of Cheshire Fire Department. If they are found to be unserviceable, immediate correction shall be made.

3.06 High Performance Asphalt

High performance asphalt material shall be used for all trenches used in burying temporary bypass pipe, for covering temporary bypass pipe that crosses a driveway or sidewalk, and for forming a ramp over edges of steel road plates.

High performance asphalt material shall be compacted with the use of a plate tamper to provide for an asphalt patch that is both cohesive and firm, and that adheres tightly to the existing asphalt pavement. The high performance asphalt material shall be maintained at all times in a reasonably smooth and hard condition. The high performance asphalt surface shall be well drained, free of potholes, bumps, irregularities and depressions. The Contractor shall provide extra maintenance of the high performance asphalt material on holidays, weekends and during the winter season.

3.07 24 Hour Maintenance

The Contractor shall be responsible for maintenance and repair of the temporary bypass system. The Contractor shall be equipped to make all repairs necessary, at the Project site, for the duration of the installation. The Water Department shall be provided with a 24-hour emergency telephone number at which the Contractor may be reached, in case it is necessary to make any repairs.

REVISED August 16, 2019

SECTION 02517 - TEMPORARY CUT AND PLUG EXISTING WATER MAIN

1 DESCRIPTION

Work consists of cutting and temporarily plugging or capping existing water mains, as required in the Contract Documents and as directed by the Engineer.

Work is to be in conformance with the requirements of Section 01180 General Water Provisions and Section 15140 Water Main Pipe and Fittings.

2 MATERIALS

2.01 Temporary Plugs and Caps

Plugs and caps are to be ductile iron in conformance with the requirements of Section 15140 Water Main Pipe and Fittings or bolted sleeve type steel or ductile iron end cap couplings in accordance with ANSI/AWWA C219. PVC caps or plugs are not to be used.

Tapped plugs or caps are to be provided when a temporary blow-off is specified, or when directed by the Engineer.

2.02 Temporary Blow-off

Blow-off pipe is to be 1 inch minimum diameter Type K copper tubing conforming to the requirements of Section 02515 Water Service (2 Inch and Smaller) or Schedule 40 galvanized steel with threaded joints. Ball valve curb stops are to be same size as blow-off pipe and in conformance with the requirements of Section 15113 Curb Stop and Box.

3 CONSTRUCTION DETAILS

A section of water main pipe shall be cut and removed. The interior of the new cap or plug and fittings must be spray or swab disinfected with a 1 to 5 percent solution of chlorine no more than 30 minutes prior to installation. The interior and exterior of the cut end of existing pipe which will be plugged or capped shall also be cleaned and disinfected.

Cap or plug shall be restrained and braced in a manner sufficient to support system working pressures, and thrust forces.

When a temporary blow-off is required, the blow-off pipe shall be connected to a tapped plug or cap and a curb stop installed on the blow-off pipe. Tapped plug or cap and blow-off shall be protected from damage by vehicular traffic and vandalism by backfilling or plating the excavation. When freezing temperatures are anticipated, the plug or cap and blow-off must be protected from freezing. The blow-off must be made accessible for use by the Water Department as needed.

All joints shall be made watertight. Prior to backfilling or plating, the water main shall be filled with potable water and installation tested for leaks under line pressure in the presence of the Water Superintendent.

Temporary plug or cap assembly and blow-off shall be removed when no longer needed.

REVISED August 16, 2019

SECTION 02520 - CLEANING AND LINING OF WATER MAINS

1 DESCRIPTION

Work consists of cleaning and cement-mortar lining existing buried metallic water main pipe as required in the Contract Documents and as directed by the Engineer.

Work is to be in conformance with the requirements of Section 01180 General Water Provisions and AWWA C602 Cement-Mortar Lining of Water Pipelines in Place- 4 In. and Larger.

2 MATERIALS

2.01 Pipe and Fittings

Water main pipe and fittings shall be ductile iron in conformance with the requirements of Section 15140 Water Main Pipe and Fittings.

2.02 Thrust Restraint

Thrust restraint shall be in conformance with the requirements of Section 01180 General Water Provisions.

2.03 Sleeves and Couplings

Sleeves and couplings shall conform to the requirements of Section 13123 Insertion Sleeve.

2.04 Portland Cement

Portland cement shall conform to the requirements of ASTM C150 Standard Specification for Portland Cement, for Type I or Type II cement, or as otherwise specified by the Engineer.

2.05 Sand

Sand shall consist of inert granular material. The grains shall be strong, durable and uncoated. The sand shall be well graded and shall pass a No. 16 mesh screen, with not more than 5 percent passing a US Standard Sieve No. 100. (For screen and sieve sizes, refer to ASTM E11). Sand shall be clean. The total combined weight of dust, clay lumps, shale, soft or flaky particles, mica, loam, oil, alkali and other deleterious substances shall not exceed 3 percent of the total combined weight of the deleterious substances and the sand containing them. In addition, the following limitations shall apply to specific substances: The maximum percentages by weight of deleterious substances shall not exceed the following limits:

SUBSTANCE	MAXIMUM ALLOWABLE PERCENTAGE BY WEIGHT
Shale	1
Clay Lumps	1
Mica and Other Deleterious Substances Other Than Shale or Clay Lumps	2

Sand shall not show a color value darker than the reference standard color solution prepared as required in ASTM C40 Standard Method of Test for Organic Impurities in Sands for Concrete.

2.06 Water

The water used shall be potable water as approved, by the Engineer. Water shall be supplied by the Town without charge as specified. Disposal of cleaning water shall be done by the Contractor so as to provide as little interference to traffic as possible. Cleaning water is to be discharged to a sanitary or combined sewer and not to the storm sewer or the ground surface. Solids shall be separated from the cleaning water and not be allowed to enter any residential sewer systems.

2.07 Admixtures

To improve workability, density, and strength in the mortar, admixtures conforming to ASTM C494 may be used at the option of the Contractor, unless otherwise required by the Engineer, provided that the ratio of admixture to portland cement does not exceed that used in the qualification tests of ASTM C494. No admixtures shall be used that would have deleterious effect on potable water flowing in the pipe after the lining has been placed.

2.08 Bedding, Backfill and Surface Restoration

Bedding, backfill, and surface restoration materials, and methods of placement shall conform to the requirements of Section 01180 General Water Provisions, unless otherwise indicated in the Contract Documents or directed by the Engineer.

3 CONSTRUCTION DETAILS

3.01 Equipment

The Contractor's equipment for cleaning, applying and troweling cement-mortar in the pipe and for curing the cement-mortar shall be so designed and manufactured and in a condition to permit the workers to follow the procedure and obtain the results prescribed in this specification. The Town shall have the option of inspecting the Contractors' equipment for conformance to these requirements prior to award of the Contract.

All water main cleaning, lining, and investigation equipment shall be drawn from water main cleaning and lining equipment stocks that are dedicated for use only in projects involving contact with only potable water.

3.02 Excavation

The Contractor shall saw cut the pavement in a straight and neat fashion. The saw cut depth shall be equal to the depth of the pavement.

The excavations and removal of all materials shall be made in such a manner that the edges of the trench will be in a reasonably straight line and the width thereof at a minimum consistent with good workmanship.

The Contractor shall use care in all material removal so as not to damage any adjoining areas. All adjacent property, sidewalks and roadway sections shall be protected from damage by the Contractor for the duration of the work. The public shall be protected in the construction area for the duration of the Contract.

The Contractor shall be required to allay all dust caused by his work by means of sprinkling and covering or other suitable methods during all periods of excavation, material removal and construction.

Noise level on the construction site shall be limited to that allowed by Town Ordinance and any plan to deviate from normal work hours must be approved by the Engineer.

Trenches and openings made in pavements shall be protected prior to backfilling. When not in actual use for performing any of the work structurally safe steel plates shall be laid flush with the surface in order that pedestrian and vehicular traffic may be maintained. If road plates are not flush with the pavement, high

performance asphalt material must be compacted around the plate perimeter as a ramp. Plates must be securely staked to the pavement. Unless approved by the Engineer, steel road plates will not be allowed during the winter snow plowing season. Where approved for use, steel road plates shall be capable of supporting an AASHTO H20 Highway Loading, and must be countersunk into the pavement and staked to prevent movement.

3.03 Protection of Utilities

The Contractor will be required to give all utility companies/agencies at least 2 full working days for stakeout notice before doing any work which may interfere with the operation of such utilities. Utilities encountered during the work shall be protected and maintained in their existing locations, until provided for otherwise.

If service or utility lines not shown on the plans are encountered, excavation and grading shall be done with caution in order that these services are not disturbed until proper disposition of them is made by their Owners.

All costs for all ensuing repairs or replacement due to damage by the Contractor will be borne by the Contractor. All repair work shall be completed to the satisfaction of the Engineer and the pertinent utility company.

All pavement markings disturbed by the Contractors' operations shall be repaired in conformance with the requirements of the Monroe County Department of Transportation. All costs for repair shall be borne solely by the Contractor.

The Contractor's plant and storage of material shall not be placed over the water lines. All necessary precautions shall be taken to prevent damage to the water lines. The Contractor shall make adequate provision for the protection of water lines from undermining or other damage which might result from action of the water discharge during the cleaning operation.

3.04 Cleaning of Pipes

The method for cutting the pipe must be approved by the Engineer. Any damage to the adjacent pipe caused by the Contractor shall be repaired by the Contractor.

Locations chosen for openings shall be in the least offensive places possible and shall be approved by the Engineer.

Where the Contractor requires additional openings into the water lines for the admission of material or equipment, the entire expense of making these openings, including excavation, cutting an opening into the water line, properly closing the opening, and backfilling shall be included in the bid price for cleaning and lining the lines.

Before any pipe cuts are made, temporary bypass pipe must be disinfected and approved for use by the Water Superintendent and temporary water service connections completed. Additionally, all valve shuts must be held for a 24 hour period for testing purposes. Any exception to this must have a prior approval of the Engineer.

Pipes shall be dewatered by the Contractor under the supervision of the Engineer.

All valves, blow-offs, air valves and hydrants shall be operated by the Contractor as directed by the Bureau of Water, under the supervision of the Engineer. Coordination of the work for operation of water valves shall be in conformance with Section 01180 General Water Provisions. Valve operation cards shall be filled out by the Contractor under the supervision of the Water Superintendent.

After dewatering, the Contractor shall remove the remaining water from the low spots, dips and depressions in the pipe line.

The Contractor shall dewater all water main excavations required for the cleaning and lining procedure and shall maintain the water level in the excavation at least 1 foot below the invert of the water main. As an additional precaution, bulkheads or other means are to be used at the terminals of dewatering sections to prevent dirt, mud, water and debris from entering the water main.

The Contractor shall exercise the side line valves prior to beginning the cleaning operation. This work shall be performed by the Contractor under the supervision of the Water Superintendent and shall consist of locating and operating valves for appropriate mainline subsections and identifying potential leaking or inoperative valves. This evaluation shall indicate to the Contractor the general magnitude of side line valve replacement required to properly perform the work prior to mobilization of the full-scale cleaning and lining operation. This work must be performed in such a manner as to minimize customer disturbance and/or interference. Work may have to be performed nights or other off-hours as required. Work shall be coordinated with the Water Department.

Equipment (pigs, scrappers, cameras, etc.) shall be disinfected by brushing with a 5 percent hypochlorite solution prior to insertion into the water main.

All rust, tubercles, deposits, loose or deteriorated remains of original coatings, projecting wooden plugs that have been inserted to make repairs, and other foreign materials shall be removed from the inside of the pipe by hydraulic cleaning, and hand cleaning, or other approved methods. The cleaned surface shall be treated as may be necessary to insure a successful application of a durable lining. Oil and grease shall be removed. Cleaning water shall be discharged to a sanitary or combined sewer and not to a storm sewer or the ground surface. Accumulations of water on the bottom of the interior of the pipe shall be removed.

The water main cleaning debris that is pushed inside the side street water mains/laterals must be removed via scouring by manipulating the respective side street water main/lateral gate valve.

The open water main ends that are left unattended shall be wrapped by a double-layered polyethylene plastic fabric and tightly tied to prevent contamination.

The Contractor shall use flushing or other appropriate methods of removing rust deposits and leave the street in a condition satisfactory to the Engineer.

The Contractor shall remove all 16 inch and smaller main line valves prior to lining. All valves shall be replaced with new valves unless otherwise noted on the plans. All sleeves used for installation of the new valves shall be as specified under Section 3.13 of this specification. See detail drawings for valve installation configuration.

The Contractor will be responsible for any damage done to water valves during the cleaning process. Any damage to valves must be repaired by the Contractor to the satisfaction of the Engineer at no cost to the Owner.

Where main line valves in vaults, larger than 16 inches are encountered, lining shall not be applied by mechanical means within 3 feet of the seat ring of the valve on either side. Lining in this area must be done by hand and must be approved by the Engineer. Where ordered by the Engineer, the Contractor shall allow Water Department personnel access to the vault in order to make repairs on the valves.

3.05 Cement-Mortar Lining

Immediately prior to the lining, all foreign material, including sand and loose mortar shall be removed by flushing.

A. Machine Application

The lining shall be applied in one or more courses by a machine traveling through the pipe and distributing the mortar uniformly across the full section and long radius bends of the pipe. The mortar shall be projected against the interior surfaces without injurious rebound and with sufficient velocity to cause the mortar to be densely packed and to adhere in place. The rate of travel of the machine and the rate of mortar discharge shall be mechanically controlled to produce a smooth surface and uniform thickness of lining throughout the interior of the pipeline. The machine shall be provided with attachments for mechanically troweling the mortar. Both the application and troweling of mortar shall take place at the rear of the machine so that freshly placed and troweled mortar will not be damaged. The trowel attachment shall be such that the pressure applied to the lining will be uniform and produce a lining of uniform thickness with a smooth, finished surface, free of spiral shoulders.

Under no circumstances will lining through valves be permitted.

B. Hand Mortar Work

Where machine placed mortar is impractical, cement-mortar lining of sharp bends, specials, and areas closely adjacent to valves, together with the correcting of defective areas, shall be done by handwork.

Cement-mortar for handwork shall be of the same materials as the mortar for machine lining.

Areas shall be thoroughly cleaned of all loose and foreign material, and, if necessary, shall be moistened with water just prior to the placing of the mortar being applied by hand.

Steel finishing trowels shall be used for the hand application of cement-mortar, except at bends. The outer edges of hand troweled areas may be brushed to reduce the abutting offset.

All hand finishing work in a section of the pipe line shall be completed within 24 hours after the machine application of mortar lining to that particular section of the pipe line which has been completed. Machine application of mortar lining shall be slowed down or stopped, if necessary, to assure hand patching of defective machine-lined areas in accordance with this schedule.

C. Appurtenances

Pipe less than 24 inches in diameter. After the mortar lining has been placed, but before it takes final set, laterals and services 2 inches and smaller in diameter shall be cleared by backflushing with water wherever necessary. The backflushing shall be performed in a manner that will not damage the freshly applied lining. Unless a lateral is to be cleaned and lined, it shall not be excavated.

Pipe 24 inches and larger in diameter. Before the lining is placed, the openings in the pipeline that lead to air valves, blow-offs, manholes and other appurtenances, as well as to laterals and connections from the pipeline shall be temporarily covered or plugged with suitable devices. These devices shall be removed later without damaging the cement-mortar. When working inside the pipe is impractical, the Contractor may clear connecting pipelines by flushing. Such protection shall be inspected and approved by the Engineer before lining begins. and shall repair to the satisfaction of the Engineer any lining damaged in the removal of these devices. Where the pipeline has been cut to provide for admission of materials or equipment, the Contractor shall, in the area of the resulting patch, take particular care to provide a smooth lining that will firmly bond to the patch and the adjacent pipe.

D. Proportions

Mortar for the lining shall be composed of cement, sand and water, well-mixed and of proper consistency to obtain a dense, homogeneous lining that will adhere firmly to the pipe surface.

The proportions of cement and sand in the mortar for lining shall be one part of portland cement, to one to one and one-half parts of sand by volume, the exact proportions to be determined by the characteristics of the sand used. Admixtures, if added, shall be used in strict compliance with the manufacturer's printed recommendations.

The water content shall be the minimum quantity that produces a workable mixture, with full allowance made for moisture collecting on the interior of the pipe surfaces. Slump tests should be made periodically on freshly mixed mortar immediately before the mortar is conveyed to the lining machine. The tests shall be made in accordance with ANSI/ASTM C143. Nominal slumps of cement-mortar mixes for application of linings are based on type of feed system and pipe inside diameters as indicated in Figures 1 and 2 of ANSI/AWWA C602 Cement-Mortar Lining of Water Pipelines In Place – 4 In. and Larger.

Pre-mixing of mortar used in the lining process, shall be for a sufficient length of time to obtain maximum plastiTown. The mortar shall be used promptly after mixing and in no case shall mortar which has attained its initial set be used.

E. Thickness of Cement-Mortar Lining

The cement-mortar lining shall be continuous, dense, and smooth, without variation in quality and of uniform thickness. The thickness shall be 3/16 to 5/16 inch for pipes 24 inches in diameter and smaller and 1/4 to 3/8 inch for pipes 30 inches in diameter and larger. No minus tolerance for thickness is allowed.

3.06 Water

The Town will furnish water at normal operating pressure for the hydraulic cleaning, flushing, disinfection and temporary bypass lines. The Water Department does not guarantee the pressure and volume of water provided. The Contractor may need to supply a booster pump so that the pressure is adequate to perform hydraulic cleaning.

3.07 Curing

Curing operations shall begin immediately after completion of the mortar lining and hand finishing of a section of the pipe line. This pipe shall be closed, and a moist atmosphere shall be maintained in this section of the pipe line to keep the lining damp and to prevent evaporation of water from the mortar lining.

After a section of pipe has been cement-lined, all 2 inch and smaller services shall be flushed back with water. A minimum of three hours shall elapse after completion of the lining before these flush backs are begun. All flush backs shall be performed by the Contractor using water. Air flush backs will not be permitted.

Sections of the cement-mortar-lined pipe shall be filled with water, in such a manner as not to damage the lining, as soon as possible after lining operations have been completed and the pipe has been televised or otherwise inspected by the Engineer. There shall be no pressure on any section until the mortar lining has been in place for at least 24 hours, except for pressure induced by variations in the grade of the pipe-line. The Contractor shall be responsible for careful curing of the mortar lining of completed sections of the pipe lines until the lining work has been accepted by the Engineer.

The exterior surfaces of pipe exposed to sunlight shall be sprinkled with water in the daytime during the lining, finishing, and curing period.

3.08 Surface Finish

The mortar lining of all pipe shall be mechanically troweled, except where otherwise noted in these specifications or otherwise approved by the Engineer. The finished surface shall be smooth and shall not have a sand finish. For pipe sizes 24 inch diameter and larger, 10 places shall be selected in straight sections of the pipe lined and troweled in each day's run. In each of the 10 places, a 12 inch straightedge shall be laid parallel to the axis of the pipe. In 9 of the 10 places, the space between the lined surface and the straightedge shall at no point be greater than 1/16 inch for smoothbore pipe in good condition and 1/8 inch for pipe with a rough or irregular interior

For locations where machine applied, untroweled linings are placed, with prior approval by the Engineer, the finished surface shall be smooth and regular, except that it may exhibit a slightly dimpled appearance similar to the surface of an orange. Ridges or uneven buildup caused by irregularity in the travel rate of the machine shall not be allowed.

Hand-placed mortar shall have a uniform surface with smooth transitions to adjacent machine-placed linings.

3.09 Permits

Permits will be required by the Town prior to any excavation, construction, water use, erection of barricades or any other related activity undertaken within Town limits. All Town permits will be granted at no cost to the prime Contractor only. Subcontractors will be required to pay the standard cost for any such permits. Permits shall be obtained at the Cheshire Town Hall, 80 Church Street, Cheshire, MA.

The Contractor shall abide by the Massachusetts Department of Environmental Protection Drinking Water Program Guidance for Public Water Systems Chapter 9: Distribution System Piping and Appurtenances and all other applicable Federal, State and Local laws.

All replacement materials used in the state right-of-way must conform to Massachusetts State Standard Specifications.

3.10 Guarantee of Lining

Every precaution shall be taken to prevent damage to the lining. Should it be damaged by fault of the Contractor, or reveal evidence of defective work or materials, at any time prior to the completion of the work or during the guarantee period, such damaged or defective portions shall be removed to the extent directed, and replaced to the satisfaction of the Engineer. Defective lining work or material including, but not restricted to, sand pockets, voids, over sanded areas, blisters, dummy areas, excessively cracked areas, and unsatisfactory thin spots shall be removed to the pipe wall, and the area shall be repaired by hand application to the full required thickness of the mortar lining. Defective areas encompassing the full diameter of the pipe shall be replaced by machine wherever practical. The lining shall be guaranteed for a period of two years from the time of substantial completion of the Project.

3.11 Guarantee of Coefficient

The Contractor guarantees to restore all cleaned and cement-mortar lined water mains to the following minimum coefficient "C" in the Hazen-Williams formula, all based on nominal pipe diameters with proper allowance being made for bends and fittings in accordance with accepted practice.

NOMINAL PIPE DIAMETER	GUARANTEED COEFFICIENT "C" HAZEN-WILLIAMS FORMULA
4 inch	90
6 inch	100
8 inch	110
10 inch	115
12 inch	120
14 to 20 inch	125
Greater than 20 inch	130

After the mains under this Contract have been cleaned and cement-mortar lined and restored to service, the Water Department shall perform hydraulic testing, at the Town's expense, to determine the coefficient "C" in the Hazen-Williams formula.

If in any section of cleaned and lined water main, the coefficient "C" as determined by the loss of head coefficient is less than the guaranteed figure, the Contract price for payment will be decreased as follows:

For a drop of fifteen points or less below the guaranteed coefficient the Contract price shall be reduced 1 percent per point.

For a drop in excess of fifteen points below the guaranteed coefficient, the Engineer will decide whether a further reduction in payment of 2 percent per point below fifteen points will be made or if the cement mortar lining shall be removed and the water main properly cement mortar lined at no expense to the Owner.

For the purpose of establishing the "C" coefficient of such mains where it is not practical to carry the loss-of-head test through the full extent of the cleaned and cement-mortar lines main, several sections thereof shall be tested and the weighted average coefficient "C" from tests of such portions shall be considered to be acceptable for the whole of the cleaned and cement-mortar lined main.

All tests for establishing the coefficient "C" for water mains cleaned and cement-mortar lined under this Contract shall be completed prior to final acceptance of this job.

3.12 Inspection

The entire procedure of applying cement-mortar lining may be subject to continuous inspection by the Engineer, but such inspection shall not relieve the Contractor of his responsibility to furnish material and perform work in accordance with this specification. All cement-mortar lining not applied in accordance with these specifications shall be subject to rejection by the Engineer. Lining so rejected shall be removed and replaced by the Contractor at his own expense with lining complying in all respects with these specifications.

The Engineer shall have free access to those parts of all areas, places, or facilities that are concerned with the furnishing of material or the performance of work under this standard.

The Contractor shall furnish the Engineer reasonable assistance, without charge, for inspection and obtaining such information as he desires with respect to the character of material used and the progress and manner of the work. The Contractor shall provide the Engineer a 2-way radio for this purpose, which will be returned to the Contractor at the end of the Contract.

The Engineer may collect standard test cylinder samples and test the cement-mortar for compressive strength. Cement-mortar test cylinders shall attain a minimum compressive strength of 4,500 pounds per square inch in 28 days. Pipe with cement-mortar lining that does not meet this strength requirement shall be subject to rejection.

After the cleaning operation, the Engineer shall without delay, examine the pipe for any deep pitting, defective joints or other defects or for any evidence of leakage or infiltration which must be repaired before the lining of the water line so that the Town may, at its own expense, effect repairs, and the Contractor shall not line any defective section until it has been repaired unless otherwise directed by the Engineer.

When, in the opinion of the Contractor, the work is ready for final inspection, he shall so notify the Engineer in writing. The Engineer, with assistance furnished by the Contractor shall give the work a complete and thorough inspection in person or by a designated representative. Before final payment is made, any defects or omissions in the work performed which are noted in this inspection must be corrected to the satisfaction of the Engineer without additional compensation to the Contractor.

3.13 Restoring Pipe to Service

Upon completion of the cleaning and cement lining, portions of pipelines removed in connection with the work shall be replaced by the Contractor in conformance with Section 13123 Insertion Sleeve. The interior of all water main pipe and fittings not receiving 24 hour chlorine disinfection contact time must be spray or swab disinfected with a 1 to 5 percent solution of chlorine no more than 30 minutes prior to installation. The interior and exterior of cut ends of existing pipe shall also be cleaned and disinfected.

There shall be no restrictions to any lateral or service pipe, unless otherwise approved by the Engineer, as a result of the placing of the lining and all other work in this Contract.

Any and all thrust blocks damaged, disturbed or removed shall be replaced in accordance with Section 01180 General Water Provisions. The cost of repairing or replacing thrust blocks shall be borne by the Contractor.

Before backfilling excavations where pipe and appurtenances were removed and replaced, the water main shall be filled with potable water furnished by the Town and installation tested for leaks under line pressure in the presence of the Engineer. Before the line is placed in service following any cleaning or lining operation, the Contractor shall thoroughly flush the main and disinfect it using the continuous feed method in accordance with Section 01180 General Water Provisions and the Contract Documents. The main shall be flushed by operating the gate valves on each lateral side street water main.

The water main shall not be placed in service until after the Water Superintendent has collected and tested water samples and test results indicate that the samples are bacteriologically potable and authorization has been granted by the Engineer.

3.14 Bedding and Backfill

Pipe bedding and cover shall be sand, and shall extend to 12 inches minimum on each side of the pipe, 6 inches below the bottom of the pipe, and 12 inches above the top of the pipe. All pipe bedding and cover shall be compacted according to the requirements of Section 02300 Earthwork. Bedding shall provide a solid bearing through the entire pipe length. Timber blocking shall not be used without the permission of the Engineer. Timber blocking, if allowed in the work, shall be removed prior to trench backfilling. Trenches and excavations shall be restored in accordance with the Standard Detail Drawings.

Backfill shall be placed according to the requirements of MADOT Standard Specifications for Highways and Bridges Section 150.64 with the following modifications:

A. Lift thickness of select granular backfill shall not exceed 8 inches.
B. Minimum density for all backfill materials shall be 95 percent of Standard Proctor Maximum Density.

The Contractor is required to strictly adhere to this pavement and compaction requirement.

The Contractor shall use select granular backfill (water) for backfill in areas outside of pavement. The backfill shall conform to the requirements of Section 02300 Earthwork.

3.15 Pavement Restoration

After completion of the work, the Contractor shall reconstruct foundation and pavement courses required to replace similar foundation and surface courses removed and/or disturbed during the work of this Contract. Access openings shall be restored to their original condition within 10 working days after completion of cleaning and lining in that particular area.

Pavement restoration shall be performed in accordance with Standard Detail Drawings, or as shown on the plans, the cost of which is included in the unit price bid for this work.

All saw cuts in pavement shall be saw cut to a minimum depth of 6 inches or the actual thickness of the pavement (whichever is greater) so that none of the adjoining pavement is disturbed. The saw cuts shall be straight and clean and outside of the former trench wall.

The surface paving shall be removed an additional distance of not less than 6 inches around the entire perimeter of the excavation in order to provide a bond on the original base.

After the satisfactory completion of the required cleaning and lining, and in accordance with the specification and as directed by the Engineer, the Contractor shall be required to clean and sweep the street and other work areas of all debris, unused materials and equipment. All debris to be removed as specified herein shall be transported and disposed of at locations secured by the Contractor. The disposal sites must be approved by the Engineer.

The Contractor shall have a local representative available during the guarantee period to fulfill the obligations set forth under the guarantees.

SECTION 02745 - PAVING

1 GENERAL

1.01 Work Included

The Contractor shall furnish all labor, materials and equipment and shall replace the pavements as indicated on the drawings and as herein specified.

1.02 Related Work

A. Section 00890, PERMITS

B. Section 01562, DUST CONTROL

C. Section 02300, EARTHWORK

D. Section 09900, PAINTING

1.03 System Description

A. GENERAL

The types of pavement systems to be utilized on this project are as follows:

TYPE 1. PERMANENT TRENCH PAVEMENT
TYPE 2. CURB TO CURB OVERLAY

PAVEMENT SCHEDULE

B. TYPE 1. PERMANENT TRENCH PAVEMENT

SCHEDULE

Areas shall be paved with temporary trench binder course pavement, 2 inches thick, as soon as practicable after installation of individual pipeline segments. Temporary pavement shall be maintained a minimum of 90 days prior to installation of permanent trench binder course pavement, 2 inches thick and permanent trench top course pavement, 1-1/2 inches thick. This may require that the temporary pavement be maintained until the following year, at which time the permanent pavement shall be installed. Permanent trench binder course and trench top course pavement shall be installed only with the approval of the Engineer.

C. TYPE 2. CURB-TO-CURB OVERLAY

Areas shall be paved with permanent trench binder course pavement, 2-inches thick, in lieu of temporary pavement. Permanent trench binder course pavement shall be installed flush with the existing pavement and maintained until such time as the permanent curb to curb top course pavement, · 1-1/2 inches thick, is installed. The permanent curb-to-curb top course pavement shall not be installed until the following year or, at a minimum, until the

trench binder pavement has been in place not less than 90 days, as approved by the Engineer.

1.04 References

The following standards form a part of these specifications and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM D1557	Test for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 Pound Rammer and 18-Inch Drop

Commonwealth of Massachusetts Highway Department
Standard Specification for Highway and Bridges (MHD)

MHD 405	Gravel Base Course
MHD 420	Class I Bituminous Concrete Base Course, Type I-1
MHD 460	Class I Bituminous Concrete Pavement
MHD 476	Cement Concrete Pavement
MHD 860	Reflectorized Pavement Markings

Federal Specifications

SS-S-1401	Sealants, Joint, Non-Jet-Fuel-Resistant, Hot Applied, for Portland Cement and Asphalt Concrete Pavement

AASHTO Standard Specifications for Materials and Methods of Sampling and Testing

1.05 Submittals: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:
Six sets of complete job mix formula shall be submitted to the Engineer at least two weeks before any of the work of this section is to begin

2 PRODUCTS

2.01 State Highway Trench Repair

A. See the state highway permit in Section 00890 Permits, for trench repair detail and Section 02300 Earthwork, for Controlled Density Fill mix information. The CDF shall satisfy the requirements listed in MHD Specification Section M4.08.0 FOR MHD Permits.

B. The concrete slab for state highways shall consist of Class F, Type ill Hi-Early strength, air• entrained cement concrete, as shown in MHD 476. Reinforcing steel shall be as called for in MHD 476, sized and located as shown on the drawings.

2.02 Gravel Subbase

A. Gravel subbase shall consist of inert material that is hard durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials.

B. Gradation requirements for gravel subbase shall be as specified in Section 02300 Earthwork for Gravel Borrow.

2.03 Bituminous Concrete Pavement

A. Bituminous concrete pavements shall consist of Class I Bituminous Concrete, Type I-1. B.

Bituminous concrete mixtures shall be within the composition limits of base courses, binder courses, top courses and surface treatment, in accordance with MHD M3.11.03, with constituents that conform to Table A, below.

TABLE A
PERCENT BY WEIGHT PASSING SIEVE DESIGNATION

Standard Sieves (in.)	Base Course	Binder Course	Top Course	Surface Treat.
2 in	100			
1 in	55-80	100		
%in		80-100		
5/8 in			100	
Vl in	40-65	55-75	95-100	
3/8 in			80-100	100
No.4	20-45	28-50	50-76	80-100
No.8	15-33	20-38	37-54	64-85
No.16			26-40	46-68

Standard Sieves (in.)	Base Course	Binder Course	Top Course	Surface Treat.
No.30	8-17	8-22	17-29	26-50
No.50	4-12	5-15	10-21	13-31
No.100*			5-16	7-17
No.200	0-4	0-5	2-7	3-8
Bitumen	4-5	4.5-5.5	5.5-7.0	7-8

* Percentages shown for aggregate sizes are stated as proportional percentages of total aggregate for the *mix.*

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

Less than 4% passing No. 200 for Top Course.
Less than 6% bitumen for Top Course.

C. The joint sealant shall be a hot poured rubberized emulsified asphalt sealant meeting the requirements of FS SS-S-1401.

D. The tack coat shall be an asphalt emulsion, RS-1 if required, conforming to MHD Section M3.03.0.

2.04 Seal Coat

A. Seal coats shall be within the composition limits for protective seal coat emulsion in accordance with MHD M3.03.3.

B. Silica sand when blended with seal coat emulsion shall be No. 30 silica sand.

2.05 Pavement markings

A. Pavement markings shall conform to the requirements of MHD 860.

B. The mixture of the marking material shall be within the composition limits for reflectorized pavement markings as described in the 11HD Specifications as follows:

Thermoplastic reflectorized pavement markings – M7.01.03/04.

C. Application of the glass beads to be used as reflector material on the striping shall conform to Sections 860.62 and M7.03.07 of the MHD Specifications.

2.06 Paint for Parking Lots

A. Paint for parking lot lines shall conform to Federal Specification TT-P-115-E Type 1. Paint shall be 11-3 PPG Industries, Pittsburgh, PA or approved equal.

3 EXECUTION

3.01 General

Paving courses required for the project shall be as shown on the drawings and as specified herein. Pavement thicknesses specified are measured in compacted inches. If a pavement course thickness exceeds 2-1/2 compacted inches, the course shall be installed in multiple lifts with each lift not exceeding 2-1/2 compacted inches in thickness.

3.02 State Highway Trench Repair

Contractor shall construct and repair trenches in state highways in accordance with the state highway permit. Trench shall be backfilled with Controlled Density Fill or with earth, as stipulated in the permit and in Section 02300 Earthwork.

3.03 Gravel Subbase

A. The gravel subbase to be placed under pavement shall consist of 12-inches of gravel evenly spread and thoroughly compacted.

B. The gravel shall be spread in layers not more than 4-inches thick, compacted measure. All layers shall be compacted to not less than 95 percent of the maximum dry density of the material as determined by ASTM DI557 Method Cat optimum moisture content.

3.04 Temporary Bituminous Pavement

A. Where specified and directed by the Engineer and after placement of the gravel subbase, the Contractor shall place temporary bituminous pavement above the trench, between the edges of the existing pavement. It shall consist of Class I Bituminous Concrete Pavement, Type 1-1, 2-inches thick, in accordance with MHD 460.

B. The temporary pavement shall be repaired as necessary to maintain the surface of the pavement until replaced by permanent pavement. When so directed by the Engineer, the Contractor shall remove the temporary pavement and install or regrade the subbase for installation of permanent pavement.

3.05 Permanent Bituminous Pavement

A. The bituminous paving mixture, equipment, methods of mixing and placing, and the precautions to be observed as to weather, condition of base, etc., shall be in accordance with MHD 460.

B. BASE COURSE AND BINDER COURSE PAVEMENT:

1. Immediately prior to installing the base and/or binder course, the trimmed edges shall be made stable and unyielding, free of loose or broken pieces and all edges shall be thoroughly broomed clean. Contact surfaces of trench sides, curbings, manholes, catch basins, or other appurtenant structures in the pavement shall be painted thoroughly with a uniform coating of asphalt emulsion (tack coat), just before any mixture is placed against them.

2. The binder course shall be repaired as necessary to maintain the surface of the pavement until placement of the permanent overlay. If required, the Contractor shall place a leveling course before placing the permanent overlay.

C. TOP COURSE OR SURFACE TREATMENT PAVE:MENT (PERMANENT OVERLAY):

1. Top course or surface treatment shall be placed over the trench or full width as shown on the drawings or as specified.

2. Prior to placement of the top course or surface treatment, the entire surface over which the top course or surface treatment is to be placed shall be broom cleaned and tack coated.

3. Top course or surface treatment pavement placed over trenches may be feathered to meet existing paved surfaces, if approved by the Engineer.

4. Prior to placing full width top course or surface treatment pavements, keyways shall be cut in all intersecting streets.

3.08 Pavement Placement

A. Unless otherwise permitted by the Engineer for particular conditions, only machine methods of placing the pavement shall be used. The equipment for spreading and finishing shall be mechanical, self-powered pavers, capable of spreading and finishing the mixture true to line, grade, width and crown. The mixtures shall be placed and compacted only at such times as to permit proper inspection and checking by the Engineer.

B. After the paving mixtures have been properly spread, initial and intermediate compaction shall be obtained by the use of steel wheel rollers having a weight of not less than 240 pounds per inch width of tread.

B. Final rolling of the top course or surface treatment pavement shall be performed by a steel wheel roller weighing not less than 285 pounds per inch width of tread at a mix temperature and time sufficient to allow for final smoothing of the surface and thorough compaction.

C. Immediately after placement of top course or surface treatment pavement, all joints between the existing and new top course or surface treatment pavements shall be sealed with hot poured rubberized asphalt joint sealant.

D. Where there is no backing for the edges of the curb-to-curb pavement, the Contractor shall provide a gravel transition. The gravel transition shall be installed immediately after the pavement is placed, shall be feathered and extend a minimum of 18 inches, and shall be compacted using the same equipment as for pavement compaction. The gravel shall be uniformly graded material with a maximum size of 3/8 to 1/2 inch.

E. When directed by the Engineer, the Contractor shall furnish and install additional paving to provide satisfactory transition for driveways and walkways impacted by a new curb-to-curb pavement installation. The transition installation will be considered incidental to the curb-to-curb pavement installation.

3.09 Additional Paving

A. If the Engineer determines that the existing bituminous concrete pavement on local streets is thicker than the permanent pavement specified herein, the Contractor may be required to install additional Type I-1 bituminous concrete to obtain the depth of the existing pavement.

B. If for the installation of full width paving, the Engineer determines that the existing road surface requires additional leveling pavement, then the Contractor shall install additional Type I-1 bituminous concrete to bring the section to proper line and cross section. Additional paving required to restore the proper line and cross section of binder course installed by the Contractor which has become rough and uneven shall be furnished and installed at the expense of the Contractor.

3.10 Parking Lots and Driveways

A. Pavement shall consist of a 2-inch binder course and a 1-1/2-inch top course on a 12-inch gravel sub-base. All thicknesses are compacted thicknesses.

B. Adjacent concrete work, slate work, sidewalks, structures, etc., shall be protected from stain and damage during the entire operation. Damaged or stained areas shall be replaced or repaired to equal their original condition.

C. All joints between binder and top course shall be staggered a minimum of 6-inches.

D. After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until it has cooled and hardened sufficiently to prevent distortion and loss of fines, and in no case in less than 6 hours.

E. Smoothness of all areas of the finished surface shall not vary more than 1/4-inch when tested with a 16 foot straight-edge, applied both parallel to and at right angles to the centerline of the paved area. At building entrances, curbs, and other locations where an essentially flush transition is required, pavement elevation tolerance shall not exceed plus or minus 1/8-inch. Irregularities exceeding these amounts, or which retain water on the surface, shall be corrected by removing the defective work and replacing or repairing it to the satisfaction of the Engineer.

F. The surface area to be seal coated, as shown on the drawings, shall be swept and air cleaned. The first coat shall be applied with eight (8) pounds of #30 silica sand blended with each gallon of emulsion applied at a rate of 0.15 gallons per square yard. The second coat shall be a straight sealer applied at the rate of 0.1 gallons per square yard.

G. The Contractor shall prepare the pavement surface for painting lines according to the recommendations of the paint manufacturer. Applied markings shall have clean-cut edges, true and smooth alignment and uniform film thickness of 15 mils,+/- 1.0. The Contractor shall be responsible for removing, to the satisfaction of the Engineer, tracing marks, and spilled paint applied in an unauthorized area.

3.11 Raising and Adjusting Castings

A. In areas of permanent top course paving, existing municipally-owned catch basin and manhole castings and valve boxes shall be raised to the proper grade where directed by the Engineer.

B. Castings owned by private utilities shall be raised by their own forces. The Contractor shall be responsible for coordinating this work.

C. The method of adjusting these castings shall be as follows: Cut around catch basin or manhole castings a minimum of 8-inches from casting. Excavate and if required rebuild up to 12-inches of masonry below the bottom of the casting. Backfill with suitable material and compact to bottom of casting. Place high, early strength cement or bituminous concrete collar, as directed, to approximately 1Yi-inches below the raised casting grade.

D. In some areas, raising of castings may not be required. Where directed by the Engineer, castings not to be raised shall have at least 12-inches of bituminous concrete pavement chipped and removed around the casting. New bituminous concrete pavement shall be placed and compacted around such castings to approximately 1-1/2-inches below the top of the casting. The overlay course shall then be sloped down to the level of the casting.

E . The method of raising valve boxes shall be as follows: Cut around valve box a minimum of 8-inches from valve box. Excavate as required and raise the valve box. Pour high early strength cement or bituminous concrete collar, as directed, to approximately 1-1/2-inches below the top of the valve box.

F. Castings which need to be raised or adjusted to complete permanent curb to curb paving shall be done immediately prior to paving.

3.12 Pavement Markings

A. The Contractor shall replace all pavement markings removed or covered-over in carrying out the work, and as directed by the Engineer, no sooner than 48 hours after completion of permanent pavement. The markings shall be 4-inches wide, white or yellow, single or double lines as required.

B. When directed by the Engineer, the Contractor shall provide temporary markings at no additional cost to the Owner.

3.13 Pavement Repair

A. If required in the contract or if permanent pavement becomes rough or uneven, permanent pavement patches and trenches shall be repaired and brought to grade utilizing "infrared" paving methods following completion of the construction.

B. The Contractor performing the work shall use care to avoid overheating the pavement being repaired.

C. Pavement repair shall extend a minimum of 6-inches beyond all edges of the pavement patch to assure adequate bonding at the pavement joints.

SECTION 02920 - LOAMING AND SEEDING

1 GENERAL

1.01 Work Included

This section covers all labor, materials, and equipment necessary to do all loaming, seeding and related work as indicated on the drawings and as herein specified. All lawns disturbed by the Contractor's operations shall be repaired as herein specified.

1.02 Quality Assurance

A. For a particular source of loam, the Engineer may require the Contractor to send approximately 10 pounds of loam to an approved testing laboratory and have the following tests conducted:

1. Organic concentration
2. pH
3. Nitrogen concentration
4. Phosphorous concentration
5. Potash concentration

B. These tests shall be at the Contractor's expense. Test results, with soil conditioning and fertilizing recommendations, shall be forwarded to the Engineer.

1.04 Submittals: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. One set of information detailing the seed mixes, fertilizers, mulch material, slope protection material (if required) and origin of loam shall be submitted to the Engineer for review.

B. Three sets of test results shall be submitted to the Engineer for review.

2 PRODUCTS

2.01 Materials

A. LOAM:

1. Loam shall be a natural, fertile, friable soil, typical of productive soils in the vicinity, obtained from naturally well-drained areas, neither excessively acid nor alkaline, and containing no substances harmful to grass growth. Loam shall not be delivered to the site in frozen or muddy condition and 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.
2. The loam shall contain not less than 4 percent nor more than 20 percent organic matter as determined by the loss of weight by ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F.

B. LIME:

Lime shall be standard commercial ground limestone containing at least 50 percent total oxides (calcium oxide and magnesium oxide), and 50 percent of the material must pass through a No. 100 mesh sieve with 98 percent passing a No. 2 mesh sieve.

C. FERTILIZER:

Fertilizer shall be commercial fertilizer, 10-10-10 fertilizer mixture containing at least 40 percent of organic nitrogen. It shall be delivered to the site in the original sealed containers, each showing the manufacturer's guaranteed analysis. Fertilizer shall be stored so that when used it will be dry and free flowing. No fertilizer shall be used which has not been marketed in accordance with State and Federal Laws, relating to fertilizers.

D. MULCH:

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

2. Hay Mulch - Hay Mulch shall consist of mowed and properly cured grass, clover or other acceptable plants. No salt hay shall be used.

3. Straw Mulch - Straw Mulch shall consist of stalks or stems of grain after threshing.

4. Wood Fibre Mulch - Wood Fibre Mulch shall consist of wood fibre produced from clean, whole uncooked wood, formed into resilient bundles having a high degree of internal friction and shall be dry when delivered to the project.

E. SEED:

1. Seed shall be of an approved mixture, the previous year's crop, clean, high in germinating value, a perennial variety, and low in weed seed: Seed shall be obtained from a reliable seed company and shall be accompanied by certificates relative to mixture purity and germinating value.

2. Grass seed for lawn areas shall conform to the following requirements:

	Proportion by Weight	Germination Purity	Purity Minimum
Chewing' s Fescue	30%	70%	97%
Kentucky 31 Fescue	30%	90%	98%
Kentucky Blue Grass	20%	80%	85%
Domestic Rye Grass	20%	90%	98%

F. TEMPORARY COVER CROP:

1. Temporary cover crop shall conform to the following requirements:

	% Weight	Germination Minimum
Winter Rye	80 min.	85%
Red Fescue (creeping)	4min.	80%
Perennial Rye Grass	3 min.	90%
Red Clover	3 min. 90%	
Other Crop Grass	0.5 max.	
Noxious Weed Seed	0.5 max.	
Inert Matter	1.0 max.	

G. SLOPE EROSION PROTECTION:

1. Erosion control blanket shall be 100% degradable plastic mesh with 100% degradable straw or straw/coconut fill. Fill shall be held together by degradable fastening. Weight shall be 0.50 lb/sq. yd. Erosion control blankets shall be applied parallel to direction of water flow. The erosion control blankets shall be by North American Green, Evansville, IN or approved equal. For slopes 2: 1 or greater, Model SC150 shall be used. For slopes less than 2: 1, Model S 150 shall be used.

2. Six inch wire staples shall be placed according to manufacturers recommendations to anchor the mesh material. Staples shall be designed to decompose.

3 EXECUTION

3.01 Surface Preparation

A. After approval of rough grading, loam shall be placed on areas affected by the Contractor's operations. Loam shall be at least 6 inches compacted thickness.

B. Lime shall be applied to bring the pH to 6.5 or, without a soil test, at the rate of 2-3 tons of lime per acre.

C. Fertilizer shall be applied according to the soil test, or without a soil test, at the rate of 1000 pounds per acre.

D. Loam shall be worked a minimum of 3 inches deep, thoroughly incorporating the lime and fertilizer into the soil. The loam shall then be raked until the surface is finely pulverized and smooth and compacted with rollers, weighing not over 100 pounds per linear foot of tread, to an even surface conforming to the prescribed lines and grades. Minimum depth shall be 6-inches after completion.

3.02 Seeding

A. Seeding shall be done when weather conditions are approved as suitable, in the periods between April 1 and May 30 or August 15 to October 1, unless otherwise approved.

B. If there is a delay in seeding, during which weeds grow or soil is washed out, the Contractor shall remove the weeds or replace the soil before sowing the seed, without additional compensation. Immediately before seeding is begun, the soil shall be lightly raked.

C. Seed shall be sown at the approved rate, on a calm day by machine.

D. One half the seed shall be sown in one direction and the other half at right angles. Seed shall be raked lightly into the soil to a depth oflf4 inch and rolled with a roller weighing not more than 100 pounds per linear foot of tread.

E. The surface shall be kept moist by a fine spray until the grass shows uniform germination over the entire area. Wherever poor germination occurs in areas larger than 3 sq. ft., the Contractor shall reseed, roll, and water as necessary to obtain proper germination.

F. The Contractor shall water, weed, cut and otherwise maintain and protect seeded areas as necessary to produce a dense, healthy growth of perennial lawn grass.

G. If there is insufficient time in the planting season to complete the fertilizing and seeding, permanent seeding may be left until the following planting season, at the option of the Contractor or on order of the Engineer. In that event, a temporary cover crop shall be sown. This cover crop shall be cut and watered as necessary until the beginning of the following planting season, at

which time it shall be plowed or harrowed into the soil, the area shall be fertilized and the permanent seed crop shall be sown as specified.

3.03 Placing Mulch

A. Hay or Straw Mulch shall be loosely spread to a uniform depth over all areas designated on the plans, at the rate of 4-1/2 tons per acre, or as otherwise directed.

B. Hay or Straw Mulch may be applied by mechanical apparatus, if in the judgment 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 percent of the hay or straw in lengths of 6-inches or more, otherwise it shall be spread by hand without additional compensation.

C. Wood Fibre Mulch shall be uniformly spread over certain selected seeded areas at the minimum rate of 1,400 pounds per acre unless otherwise directed. It shall be placed by spraying from an approved spraying machine having pressure sufficient to cover the entire area in one operation.

3.04 Seeding And Mulching By Spray Machine

A. The application of lime, fertilizer, grass seed and mulch 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 lime, fertilizer, grass seed and mulch shall be equal to the specified quantities.

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, grass seed and mulch per 100 gallons 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 lime, fertilizer, grass seed and mulch by other methods.

3.05 Inspection and Acceptance

At the beginning of the planting season following that in which the permanent grass crop is sown, the seeded areas will be inspected. Any section not showing dense, vigorous growth at that time shall be promptly reseeded by the Contractor at his own expense. The seeded areas shall be watered, weeded, cut and otherwise maintained by the Contractor until the end of that planting season, when they will be accepted if the sections show dense, vigorous growth.

REVISED on August 20, 2019

SECTION 02921 - SURFACE RESTORATION OF CROSS-COUNTRY AREAS

1 GENERAL

1.01 Work Included

This section covers labor, materials, and equipment necessary to restore cross country areas affected by the Contractor's operations.

1.02 Related Work

A. Work in cross country areas shall also be in accordance with Section 01570 Environmental Protection.

B. Restoring lawn areas is specified in Section 02920 Loaming and Seeding.

1.03 System Description

A. Cross country areas shall be restored as much as possible to their original condition. A vegetative cover shall be established as soon as possible to prevent erosion.

B. In areas within or adjacent to wetlands, the provisions of the Conservation Commission Order of Conditions shall be adhered to unless directed otherwise by the Engineer.

2 PRODUCTS

2.01 Materials

A. Erosion control/Restoration and Conservation/Wildlife Seed Mixes shall consist of a certified mixture of the following seeds:

1. Erosion control/Restoration - Switchgrass, Virginia Wild Rye, Creeping Red Fescue, Fox Sedge, Creeping Bentgrass, Silky Wild rye, Nodding Bur-marigold, Soft Rush, Grass-leaved Goldenrod, Sensitive Fem, Joe-Pye Weed, Boneset, Flat-top Aster, New York Aster and Blue Vervain.

2. Conservation/Wildlife mix - Big Bluestem, Switchgrass, Little Bluestem, Canada Wild Rye, Fox Sedge, Partridge Pea, Fringed Bromegrass, Pennsylvania Smartweed, Common Milkweed, Nodding Bur-marigold, Showy Tick-Trefoil, Silky Smooth Aster, Flat-top Aster.

B. Weed seed shall be less than 1 percent.

C. Lime and fertilizer shall be as specified in Section 02920 Loaming AND SEEDING;

1. Erosion control/restoration mix - fertilization is not required unless the soils are particularly infertile.

D. Mulch shall consist of weed-free straw.

3 EXECUTION

3.01 Separation of Surface Materials

Topsoil shall be carefully removed and separately stored to be used again as directed.

3.02 Surface Preparation

A. After approval of rough grading, the stockpiled topsoil shall be replaced in the areas affected by the Contractor's operations.

B. Seedbed shall be worked up a minimum of 3 inches deep. The topsoil shall then be raked until the surface is finely pulverized and smooth and shall be compacted with rollers weighing not over 100 pounds per linear foot of tread, to an even surface to the prescribed lines and grades.

3.03 Seeding

A. Seeding shall be done when weather conditions are approved as suitable, in the periods between April 1 and May 30 or August 15 to October 1, unless otherwise approved.

Straw mulch shall be used for summer and fall seeding for the following seed mixes:

Erosion Control/Restoration Mix

Straw mulch shall be used at all times that the Erosion Control/Restoration Mix for Dry Sites is applied.

B. Seed shall be sown at a rate applicable to the type of seed mix being applied. Application rates shall be as follows:

Erosion Control/Restoration Mix - 35 lb/acre

Conservation/Wildlife Mix - 25 lb/acre

Mix may be applied by hydro seeding, mechanical spreader, or by hand on small sites.

C. One half the seed shall be sown in one direction and the other half at right angles. Seed shall be raked lightly into the soil to a depth of 1/4 inch and rolled with a roller weighing not more than 100 pounds per linear foot of tread.

D. Wherever poor germination occurs in areas larger than 3 square feet, the Contractor shall reseed, roll, and water as necessary to obtain proper germination.

3.04 Inspection and Acceptance

A. At the beginning of the planting season following that in which the seed mix is sown, the seeded areas shall be inspected. Any section not showing dense, vigorous growth at that time shall be promptly reseeded by the Contractor at his own expense. If necessary, the Contractor shall furnish and apply soil conditioners and fertilizer to achieve acceptable growth.

B. The seeded areas shall be watered, cut and otherwise maintained by the Contractor until the end of that planting season, when they will be accepted if the sections show dense, vigorous growth.

REVISED on August 20, 2019

SECTION 02931 - TREE PROTECTION

1 GENERAL

It is responsibility of Contractor to provide tree protection fencing for all existing trees and tree root systems that are located within and immediately adjacent to Project limits to minimize any possible damage due to construction activities.

2 DESCRIPTION

Work consists of protection and care of existing trees as required in Contract Documents and as directed by Project Manager.

3 MATERIALS

Tree protection fence material may be either fluorescent orange construction safety fencing, or wood rail and post. Tree protection fence is to be at least 4 feet high.

4 CONSTRUCTION DETAILS

4.01 General

Tree protection is to be provided to protect all existing trees within and immediately adjacent to project limits against any accidental cutting, breaking, skinning, or bruising of tree roots, tree bark and tree branches due to Contractor's operations. Tree protection fencing is to be installed before any construction activities commence, and is to remain in place until Contractor is ready to perform final grading and seeding operations.

Contractor is not to place or stockpile any construction or excavated materials within limits of canopy of any existing tree to prevent smothering of existing tree's root system. Vehicles and other construction equipment are not to be parked on any tree root system, nor left running (idling) under limits of canopy of any existing tree.

Cutting of existing sod and topsoil materials within 4 feet of existing tree trunk for removal to establish new finished grade must be done manually.

Existing tree root system must remain adequate for existing tree to withstand heavy windstorms. If any existing tree roots that are 2 inches in diameter or larger are in conflict with any proposed work and need to be cut, before cutting those tree roots Contractor must notify the Water Superintendent for approval.

4.02 Fencing

Existing tree is to be fenced in such manner that tree protection fencing encompasses entire limit of canopy of existing tree. In no case is tree protection fencing to be less than 2 feet from outer edge of existing tree trunk. In those areas where existing tree is bordered by paved surface, curb, wall or building, and minimum tree protection fence dimensions cannot be achieved, tree protection fence is to be installed to within 12 inches of nearest edge of such paved surface, curb, wall or building.

Tree protection fencing is to be installed around existing tree according to following extents:

Tree Diameter (DBH) (inches)	Minimum Distance of Fence from Tree Trunk – each side (feet)
less than 10	6
10 thru 14	10
15 thru 19	12
20 and over	15

4.03 Maintenance

Tree protection fencing is to be maintained in good condition, and in an upright position. Tree protection fencing that has been damaged, collapsed or been knocked down, or otherwise damaged, is to be restored within 24 hours.

Where cutting of existing tree roots is necessary, it is to be done with sharp cutting tools. Exposed tree roots are to be re-buried as soon as possible. Until exposed tree roots can be re-buried, exposed tree roots are to be covered with wet burlap. Burlap is to be kept wet until exposed tree roots can be re-buried.

Where extensive cutting of existing tree root system has occurred, existing tree root system is to be watered to extent of limits of canopy of existing tree. Apply minimum 1/2 inch of water within 72 hours of when extensive cutting of existing tree root system has occurred.

When weather conditions are consistently dry and when less than 1/2 inch of rain has fallen during any given week, water existing tree root system to extent of limits of canopy of existing tree with at least 1 inch of water.

Existing trees that are damaged by construction activities are to be repaired within 72 hours using current arboricultural standards. Those existing trees that are determined by City Forester to be damaged beyond repair, are to be removed and replaced by Contractor.

4.04 Utility Installation

Where underground installation of new utility is required to be done within outer limits of canopy of existing tree, tunneling operation is to be used for installation of new utility. Tunneling within outer limits of canopy of existing tree is to be done according to following:

Tree Diameter (DBH) (inches)	Distance of Tunnel From Tree Trunk – each side (feet)	Minimum Recommended Depth (feet)
less than 10	6	2-1/2
10 thru 14	10	3
15 thru 19	12	3-1/2
20 and over	15	4

SECTION 03100 – CONCRETE FORM WORK

1 GENERAL

1.01 Work Included

This section of the specifications covers the furnishing and installation of forms for cast-in-place concrete.

1.02 Related Work

A. Section 03200, CONCRETE REINFORCEMENT

B. Section 03150, WATER-STOPS

C. Section 03300, CAST-IN-PLACE CONCRETE

1.03 References

The following standards form a part of this specification:

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 301 Standard Specifications for Structural Concrete

ACI 34 7 Recommended Practices for Concrete Form.work

U.S. ARMY CORPS OF ENGINEERS (CE)

CE 03300 Cast-in-Place Concrete

2 PRODUCTS

2.01 Materials

A. Forms for exterior and interior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered masonite, or other materials which will provide smooth concrete surfaces without subsequent surface plastering. Plastic or plastic-faced forms shall not be used, except with the prior approval of the Engineer.

B. Form ties shall be cone type or equal, with water-stop, which leaves no metal closer than 2-inches to finished face of concrete.

C. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as EZ strip by L&M Construction Chemicals, Omaha, NB and "Magic Kote" by Symons Corp., Des Plaines, IL or approved equal.

D. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete.

3 EXECUTION

3.01 Preparation

Surfaces of forms to be in contact with concrete shall be greased with nonstaining form release compound. Wetting will not be accepted as a substitute. Approval of the Engineer shall be obtained before use of coated materials or liners in lieu of form release compound, except as modified herein.

3.02 Construction

A. For concrete surfaces which will be visible after completion of the structure, painted or unpainted, the type and the precise location of form ties, nails joints between form members, and any other features which will leave a visible trace in the finished concrete, will be subject to the approval of the Engineer.

B. Form work shall be so constructed, braced, or tied that the formed surfaces of the concrete will be perfectly true, smooth, and to the dimensions shown on the drawings. All forms used for circular sections shall be true arcs as indicated on the drawings. Short chords will not be acceptable. Form line shall present an uninterrupted surface conforming to radii indicated on the drawings.

C. Forms shall be sufficiently tight to prevent leakage of mortar, and when necessary shall have temporary openings as required for thorough cleaning, and as required for introduction of concrete to avoid excessive free fall. Panels damaged in stripping or otherwise shall not be reused.

D. Unless otherwise noted on the design drawings, forms shall be filleted and chamfered at all sharp comers, and exposed edges with a 3/4-inch chamfer. Chamfer shall not be used where masonry or other material will subsequently be installed flush with one of the adjacent surfaces of the concrete. Where a wash or slope is indicated on the drawings no additional chamfer is required.

3.03 Removal of Forms

A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 30 percent of the ultimate strength prescribed by the design and not before reaching the following number of day-degrees [whichever is the longer]:

Forms for	Dav-Degree*
Beams and Slabs	500
Walls and vertical surfaces	200

* Day-Degree: Total number of days times average daily air temperature at surface of concrete. For example, 5 days at a daily weighted average temperature of 60 deg F equals 300 day-degrees. Temperatures below 50 deg Fare not to be considered in determining Day-Degree.

B. Where beams, girder, columns, walls and similar vertical forms are adequately supported on shores, the side forms may be removed after 24 hours of cumulative curing time provided the side forms support no loads other than the lateral pressure of the plastic concrete. Cumulative curing time represents the sum of time intervals, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 deg. F in accordance with American Concrete Institute standards.

C. Shoring shall not be removed until the concrete has attained at least 70 percent of the specified strength and sufficient strength to support safely its own weight and the construction live loads upon it.

D. Forms shall be removed in such a manner as not to impair safety and serviceability of the structure. Concrete exposed by form removal shall have sufficient strength not to be damaged by the removal operation.

REVISED on August 20, 2019

SECTION 03200 - CONCRETE REINFORCEMENT

1 GENERAL

1.01 Work Included

This section of the specification covers the furnishing and installation of reinforcement for cast-in-place concrete.

1.02 Related Work

A. Section 03100, CONCRETE FORMWORK

B. Section 03150, WATER-STOPS

C. Section 03300, CAST-IN-PLACE CONCRETE

1.03 System Description

Materials and construction shall conform to ACI 318 and ACI 350 unless otherwise noted on the design drawings or modified herein.

1.04 Submittals: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. The Contractor shall furnish the Engineer with complete checked, reinforcing steel shop drawings and bar lists. Shop drawing shall include grade of steel used as well as splice lengths.

B. Mill test reports shall accompany drawings. Fabrication shall not commence until the drawings and mill test reports have been released by the Engineer.

C. When fiber reinforcement is used, contractor shall submit manufacturer's data confirming that material meets the specification.

1.05 References

The following standards form a part of these specifications:

American Concrete Institute (ACI)

ACI SP-66 ACI Detailing Manual

ACI 318 Building Code Requirements for Concrete

ACI 350 Environmental Engineering Concrete Structures

American Society for Testing and Materials (ASTM)

ASTM A185 Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement

ASTM A497 Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement

ASTM A615 Deformed Billet-Steel Bars for Concrete Reinforcement

ASTM A775 Epoxy-coated Reinforcing Steel Bars

ASTM A884 Epoxy-coated Welded Wire Fabric

American Welding Society (AWS)

A WS 12.1 Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction

2 PRODUCTS

2.01 Materials

A. Steel reinforcing bars shall conform to ASTM A615, Grade 60, and A 77 5 if epoxy-coated bars are specified.

B. Welded steel wire fabric shall conform to ASTM Al 85 or ASTM A497 and ASTM A884 if epoxy-coated fabric is specified. Gauge and spacing of wires shall be as indicated on the drawings.

C. Reinforcing steel shall be detailed in accordance with ACI SP-66 modified as applicable to conform to ACI 350.

D. Reinforcement shall be accurately formed to the dimensions indicated on the drawings. Bars shall be shipped to the site with bars of the same size and shape, fastened in bundles with securely wired-on metal identification tags listing both size and mark.

E. Any bar showing cracks after bending shall be discarded.

F. Steel failing to meet the requirements of this specification or the drawings will be rejected and shall be removed from the site immediately.

2.02 Fiber Reinforcement

When called for on the drawings, concrete engineered reinforcing fibers shall be polypropylene, collated, fibrillated fibers from Fibermesh Co., 4019 Industry Drive, Chattanooga, TN; Forta Corporation, One Hundred Forta Drive, Grove City, PA; or approved equal. Only fibers designed and manufactured specifically for use in concrete from virgin polypropylene and so certified by the manufacturer shall be acceptable.

3 EXECUTION

3.01 Steel Installation

A. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt, and other coatings (including ice), that reduce or destroy bond. When there is a delay in depositing concrete after reinforcement is in place, bars shall be reinspected and cleaned as necessary.

B. After forms have been oiled, but before concrete is placed, all steel shall be securely wired in the exact position called for, and shall be maintained in that position until all concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Engineer.

C. Concrete blocks having a minimum bearing area of 2-inches by 2-inches and equal in quality to that specified for the slab, shall be used for supporting reinforcing bars for slabs on grade. Wood blocks, stones, brick chips, etc., shall not be used to support reinforcement.

D. Metal supports shall be of types that will not penetrate the surface offormwork or slab and which will not show through or stain surfaces that are to be exposed to view, painted or unpainted.

E. Welding of reinforcing bars will be permitted only where permission of the Engineer has been obtained in advance. Such welding shall be performed only under conditions established by the Engineer, and in accordance with AWS 12.1.

F. Reinforcement, which is to be exposed for a considerable length of time after having been placed, shall be painted with a heavy coat of cement grout, if required by the Engineer.

3.02 Fiber Installation

A. Fibermesh fibers shall be used in concrete as indicated on the drawings or as specified and in strict accordance with the manufacturer's recommendations as to type and amount. The fiber manufacturer or approved distributor shall provide the services of a qualified employee for pre-job meeting and initial job start up.

REVISED on August 20, 2019

SECTION 03300 - CAST-IN-PLACE CONCRETE

1 GENERAL

1.01 Work Included

This Section covers all concrete and all related items necessary to place and finish the concrete work.

1.02 Related Work

A. Section 02300, EARTHWORK

B. Section 03100, CONCRETE FORMWORK

C. Section 03200, CONCRETE REINFORCEMENT

D. Section 03150, WATER-STOPS

E. Items furnished under other Sections and installed under this Section include, but are not limited to:

Items embedded in concrete, including anchors, sleeves, floor drains, castings, frames for hatches, angles, nosings, and other miscellaneous metals.

1.03 References

The following standards form a part of these specifications:

American Concrete Institute (ACI)

ACI 301 Structural Concrete for Buildings

ACI 302 Recommended Practice for Concrete Floor and Slab Construction

ACI 304 Recommended Practice for Measuring, Mixing, Transporting, and Replacing Concrete

ACI 305 Recommended Practice for Hot Weather Concreting

ACI 306 Recommended Practice for Cold Weather Concreting

ACI 318 Building Code Requirements for Reinforced Concrete

ACI 34 7 Recommended Practice for Concrete Form work

ACI 350 Concrete Sanitary Engineering Structures

American Society for Testing and Materials (ASTM)

ASTM C33 Concrete Aggregates

ASTM C39 Compressive Strength of Cylindrical Concrete Specimens

ASTM C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

ASTM C87 Effect of Organic Impurities in Fine Aggregate on Strength of Mortar

ASTM C94 Ready-Mixed Concrete

ASTM C143 Standard Method for Slumps of Portland Cement Concrete

ASTM C150 Portland Cement

ASTM C171 Sheet Materials for Curing Concrete

ASTM C231 Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C260 Air-Entraining Admixtures for Concrete

ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C494 Chemical Admixtures for Concrete

1.04 Submittals: IN ACCORDANCE WITH REQUIREMENT'S OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. One set of shop drawings of the materials specified herein shall be submitted to the Engineer for review.

B. Six copies of the statement of materials constituting the design of mixes which satisfy the specified strength for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the contract.

C. Provide one copy of the "Certificate of Delivery" for each load of concrete as it arrives on the site, under the provisions of ASTM C94.

2 PRODUCTS

2.01 Concrete

A. Concrete conforming to the requirements listed below shall be used where indicated on the drawings. Unless otherwise indicated, concrete used as fill under foundations, and elsewhere approved by the Engineer, shall be the 3,000 psi mix.

TABLE

Minimum Comp. Strength at 28 days (psi)	Maximum Water/Cement ratio (gallons per bag of cement)*	Cement Factor: 94 lb. Bags per cubic yard minimum**
3000	0.59 (6.9)	5.5
4000	0.48 (5.6)	6.5
5000	0.40 (4.7)	7.4

* Based on air-entrained concrete. If non-air-entrained concrete is called for, the listed maximum water/cement ratios may be increased slightly, as approved by the Engineer. The water is the total water in the mix, including free water on the aggregate.

** These are minimum amounts; increase as necessary to meet mix requirements.

B. Concrete shall conform to ASTM C94. One copy of the Certificate of Delivery required by ASTM C94 shall be delivered to the Engineer immediately upon arrival of each load of concrete at the site. The Contractor shall be responsible for the design of the concrete mixtures.

C. Standard compression tests of all proposed mixes shall be made by the testing laboratory or other satisfactory evidence shall be presented that the design mixes will attain the minimum strengths listed on the design drawings or called for herein, within the limitations of the ACI Code. No concrete shall be delivered to the job site until the Engineer has approved the design mixes.

D. All concrete (unless otherwise directed) shall contain an air-entraining agent. Air entrained concrete shall have an air content by volume of 3 to 6 percent for 1-1/2-inch aggregate and 4 to 8 percent for 3/4-inch aggregate. The air content shall be the responsibility of the testing laboratory and in accordance with ASTM C231.

E. All concrete shall contain a mid-range water reducer to minimize cement and water content of the mix, at the specified slump, in accordance with ASTM C494.

F. Slump for all concrete shall be from 3-inch to 4-inch, except for concrete using a superplasticizer, when the maximum slump shall be 8 inches. Any concrete having a slump greater than 4 inches (8 inches with superplasticizer) shall be promptly removed from the site.

G. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixture other than those specified shall be used in concrete without the specific written permission of the Engineer in each case.

H. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

2.02 Cement

A. The cement shall be an approved brand of American manufactured Portland Cement, Type IlA conforming to ASTM Cl50. The brand name and type of cement proposed for use shall be submitted to the Engineer for approval immediately following award of contract. Only one color of cement, all of the same manufacture, shall be used for the work.

B. When the use of high-early-strength Portland cement (Type IIIA) is permitted by the Engineer the same strength requirements shall apply, but the indicated strengths shall be attained in 7 days instead of 28 days.

2.03 Admixtures

A. Air entraining agent shall be in accordance with ASTM C260.

B. Water reducing agent shall be a mid-range water reducer meeting ASTM C494, Type A.

C. Water reducing agent-retarder shall be in accordance with ASTM C494, Type D.

D. Superplasticizer agent shall be in accordance with ASTM C494, Type For Type G and contain no more than 0.1 % chloride ions. Product may be plant added or field added based on the best application considering distance, temperature and time.

2.04 Aggregates

A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.

B. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTMC33.

C. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33.

D. The following designated sizes of aggregate shall be the maximum employed in concrete.

2-inch for mass concrete
1 1/2-inch for reinforced sections 18-inch and over in thickness
3/4-inch for reinforced and unreinforced sections less than 18-inch thickness.

2.05 Water

Water for concrete shall be potable, free from injurious amounts of oil, acid, alkali, organic matter and other deleterious substances.

2.06 Grout

Grout shall be mixed in the proportions of one-part Portland Cement to 2 parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Aggregate for grout shall conform to the requirements of the reference specification for concrete. Prior approval of the Engineer shall be obtained for the use of proprietary grouts, and the instructions of the Engineer shall be followed in their use.

2.07 Curing Materials

A. Curing compound shall be a curing/hardener compound such as Acurion by AntiHydro, Sikaguard Cure/Hard by Sika, Super Diamond Clear by Euclid or approved equal.

B. Curing paper shall be a fiber-reinforced laminated Kraft bituminous product conforming to the requirements of ASTM Cl71.

2.08 Joint Filler

1. Preformed joint filler strip shall conform to ASTM Dl751 or Dl752, having a thickness as indicated on the drawings.

2. Fillers shall be provided in pieces of the full thickness required. Use of multiple layers of thin pieces to make-up the full thickness will not be permitted,

2.09 Joint Sealant

Joint sealant for construction and control joints shall be a two-part polysulfide base sealant conforming to Thiokol's Building Trade Performance Specification, Class A (self-leveling), Type IT (hardness: 35-45 Shore A).

3 EXECUTION

3.01 General

Under no circumstances shall concrete which has set or partially set before placing be used; and no retempering of concrete or grout will be permitted.

3.02 Preparation

A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or other material which would tend to reduce the bond.

B. Unless otherwise indicated, a moisture barrier shall be used under all slabs placed on the ground. The moisture barrier shall be fungi-resistant and shall have a vapor permeance rating

not exceeding 0.5 perm. The moisture barrier shall be asphalt-saturated waterproof reinforced Kraft paper, clear polyethylene sheeting 0.006-inch thick, polyethylene coated asphalt-saturated reinforced Kraft paper, two layers of 30-pound asphalt-saturated felt solidly mopped with hot bitumen, or other similar material meeting the requirements for fungi-resistance and vapor permeance. Sheets shall be lapped 6-inches at joints and sealed with 2-inch wide tape.

C. When no moisture barrier is used, the earth, concrete, masonry, or other water-permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.

D. When joining fresh concrete to concrete which has attained full set, the latter shall be cleaned by chipping and washing off all dirt and scum and laitance. It then shall be moistened prior to placing new concrete.

E. Concrete surfaces which act as a seat for structural members (other than those resting on grout) shall be troweled to an extremely flat and level surface. If necessary, such surfaces shall be ground off to achieve the required flatness and level.

F. Fill concrete on top of concrete shall be placed in the locations indicated on the drawings or designated by the Engineer. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before grout has dried or set. Fill concrete shall be brought to the lines and grades shown on the drawings or approved by the Engineer.

G. Concrete for thrust and anchor blocks shall be placed against undisturbed earth and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints. Minimum bearing areas and dimensions shall be as shown on the drawings.

3.03 Mixing

A. Concrete shall be ready-mixed, or transit-mixed, as produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Adding water in controlled amounts during the mixing cycle shall be done only with the express approval of, and under the direction of, the Engineer.

B. Ready-mix or transit-mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities for the respective conditions as stated on the name plate. Discharge at the site shall be within 1-1/2 hours after cement was first introduced into the mix. Central mixed concrete shall be plant-mixed a minimum of 1-1/2 minutes per batch and then shall be truck-mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the pre-mixed concrete is placed in the truck and shall continue without interruption until discharge. Transit-mixed concrete shall be mixed at mixing speed for at least 10 minutes immediately after charging the truck, followed by agitation without interruption until discharged.

C. All central plant and rolling stock equipment and methods shall conform to the latest Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers' Bureau of the National Ready-Mixed Concrete Association, as well as ACI 304 and ASTM C94.

D. Attention is called to the importance of dispatching trucks from the batching plant so that they shall arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

3.04 Installation/Application/Erection

A. PLACING:

1. No concrete shall be placed by pumping methods without the prior written approval of the Engineer. Should the Contractor be allowed to place concrete by pumping methods, procedures, mix design of concrete, and all other precautions shall be in accordance with ACI 304.2R and as approved by the Engineer.

2. Concrete shall be placed in alternate areas, as defined by the construction and control joints indicated on the design drawings. A minimum of 3 days shall elapse between placement of adjacent sections.

3. Segregation of the concrete shall be prevented during handling; should any segregation occur, the concrete shall be remixed before it is placed. Concrete shall be placed in the forms in horizontal layers not over 1 to 2 feet thick. Concrete shall not be allowed to drop freely more than 4 feet. If the free drop to the point of placement must exceed 4 feet, the Contractor shall obtain the approval of the Engineer for the proposed method of depositing the concrete. The concrete shall not be required to flow over distances greater than 3 feet in any direction in the forms or on the ground, unless otherwise permitted by the Engineer.

4. Unless otherwise noted, the work begun on any day shall be completed in daylight of the same day.

5. "Cold Joints" are to be avoided, but if they occur, they are to be treated as bonded construction joints.

6. Chutes for conveying concrete shall be of U-shaped design and sized to insure a continuous flow of concrete. Flat (coal) chutes shall not be employed. Chutes shall be metal or metal-lined, and each section shall have approximately the same slope. The slope shall not be less than 25 nor more than 45 degrees and shall be such as to prevent segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate or spout to prevent segregation. If the discharge end of the chute is more than 5 feet above the surface of the concrete in the forms, a spout shall be used and the lower end maintained as near the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a hopper. Chutes shall be thoroughly cleaned before and after each run, and the debris and any water shall be discharged outside the forms. Concrete shall not be allowed to flow horizontally more than 5 feet.

7. Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. Internal type mechanical vibrators shall be employed to produce the required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents or "pumping" or migration of air. All vibrators shall be supplemented by proper wooden spade puddling adjacent to forms to remove included bubbles and honeycomb. This is essential for the top lifts of walls. All vibrators shall travel at least 10,000 rpm and be of adequate capacity. At least one vibrator shall be used for every 10 cubic yards of concrete per hour. In addition, one spare vibrator in operating condition shall be on the site.

8. Concrete slabs on the ground shall be well-tamped into place and foundation material shall be wet, tamped, and rolled until thoroughly compacted prior to placing concrete.

9. Concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section. If a section cannot be placed

continuously, construction joints may be located at points as provided for in the drawings or approved by the Engineer.

10. Chutes, hoppers, spouts, adjacent work, etc., shall be thoroughly cleaned before and after each run, and the water and debris shall not be discharged inside the form.

B. CONCRETE PLACING DURING COLD WEATHER:

1. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40°F, or is expected to fall to below 40°F, within 72 hours, and the concrete after placing shall be protected by covering, heat, or both. No accelerant shall be used to prevent freezing.

2. The temperature of concrete surfaces shall not be permitted to drop below 50°F. for at least 7 days after placement of the concrete.

3. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Engineer. All procedures shall be in accordance with provisions of ACI 306.

C. CONCRETE PLACING DURING HOT WEATHER:

1. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays which will result in excessive mixing of the concrete after arrival on the job.

2. During periods of excessively hot weather (90°F, or above) ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90°F, when ready for placement will not be acceptable, and will be rejected.

3. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. The record shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

D. PIPES AND EMBEDDED METALS:

1. Special care shall be taken to bring the concrete into solid contact with pipes and iron work embedded in the walls and floors, particularly underneath and around all pipes where a head of water exists, making watertight joints.

2. In general, such embedded items are not shown on the structural design drawings. Design drawings of the other trades shall be consulted for their location and details.

3. Anchor bolt location, size and details shall be verified with the equipment manufacturer's certified drawings before installation.

4. Anchor bolts, reglets, sleeves, edge angles and similar embedded items will be provided, delivered to the site under other Sections of the specification, for installation under this Section.

5. Where edge angles, etc., have nuts welded on to receive machine screws, the threads of the nuts shall be protected from concrete, and the concrete shall be excluded from the space to be occupied by the screw, by the use of wood plugs or other effective means.

6. Inserts required for hanging mechanical and electrical items will be provided and installed in the forms under the mechanical and electrical Sections of the specification.

7. Should the Contractor be allowed to leave openings in the concrete for pipes or ironwork, to await the arrival of items which would delay the prosecution of the work, the openings shall be subject to the approval of the Engineer. Appropriate construction joints shall be provided. In filling any such openings with concrete, a mixture of 1: 1-1/2 : 3 shall be used and a watertight bond shall be secured between the old and new concrete.

8. In bolting miscellaneous items to concrete after the concrete has set, expansion bolts of an approved pattern and type shall be used. The Contractor shall submit to the Engineer, for approval, the types of expansion bolts. Expansion bolts shall not be used until they are approved.

E. CURING:

1. Concrete curing shall be performed as specified in ACI 301 and as stated herein. All curing procedures shall have prior approval of the Engineer.

2. Concrete Floors

Concrete floors which are to receive paint, concrete fill, mortar setting beds, grout fill, or any other subsequent finish shall be cured by one of the following procedures immediately after completion of placement and finishing:

a. Ponding or continuous sprinkling.

b. Application of absorptive mats or fabric kept continuously wet.

c. Application of sand kept continuously wet.

d. Application of waterproof sheet materials conforming to ASTM Cl71.

e. Application of curing compounds conforming to ASTM C309, if it can be demonstrated to the Engineer's satisfaction that the compound is applicable and that it will not prevent bonding of the subsequent finish to be received. Compound shall be placed at a rate of 200 square feet per gallon, in two applications perpendicular to each other.

3. Curing procedure shall be continued for at least 7 days.

a. Moisture loss from surface placed against metal or wood forms shall be minimized by keeping forms wet until removal.

b. Curing shall be continued for at least 7 days. When forms are removed during the curing period, surfaces shall be cured by spraying or by the use of a curing compound as previously specified.

c. Surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary; 1/2-inch thick plywood sheets shall be used to protect the exposed surface.

F. BRACING AND SUPPORTS:

1. All concrete members shall be adequately and safely supported and braced until the permanent supports and braces are installed.

2. Backfilling against exterior walls shall not be done until supporting slabs are in place and have attained 70 percent-of design strength, otherwise walls shall be braced against earth lateral pressure, using a system approved by the Engineer.

3. Backfilling against retaining walls shall not commence until the wall concrete has reached its 28 day strength.

G. REMOVING FORMS AND SUPPORTS:

1. Removal of forms shall take place in accordance with ACI 347, Section 3.6. Except as otherwise specifically authorized by the Engineer, forms shall not be removed until the concrete has aged for the following number of day-degrees or attained 50 percent strength. (Day-degrees equals the total of number of days times the average daily air temperature at the surface of concrete. For example, 5 days at a daily average temperature of 60°F. equals 300 day-degrees.)

Location	Dav-Degrees
Beams and Slabs	500
Walls and Vertical Surfaces	200

2. Shores under beams and slabs shall not be removed until the concrete has attained at least 70 percent of the specified cylinder strength and also sufficient strength t o support safely its own weight and the construction loads upon it.

H. PATCHING:

1. Defective concrete and honeycombed areas as determined by the Engineer shall be chipped down reasonably square and at least one-inch deep to sound concre t e by means of hand chisels or pneumatic chipping hammers. Irregular voids or surface stones need not be removed if they are sound, free oflaitance, and firmly imbedded in the parent concrete, subject to Engineer’s final inspection. If honeycomb exists around reinforcement, chip to provide a clear space at least I-inch wide all around the steel. For areas less than 1-1/2 inches deep, the patch may be made following the procedure for filling form tie holes, described in the subsection below, using adequately dry (non-trowelable) mixtures to avoid sagging. Thicker repairs will require build-up in 1-inch layers on successive days. Unless otherwise indicated, thicker repairs shall be made with Vertipatch mortar mixture blended with Acryl-Se t , both by Master Builders, Inc., Cleveland, Ohio, or approved equal.

2. For concrete areas exposed to serious abrasion and/or impact forces, the Engineer may order the use of grout with a non-shrink metallic aggregate (Embeco by Master Builders, Inc.; Ironite by Fox Industries, Madison, IL; or approved equal) as an additive in the proportions listed below:

Small Patches Large Formed Patches Material Volumes Weights Volumes Weights Cement 1.0 1.0 1.0 1.0 Metal Aggregate 0.15 0.25 0.2 0.33 Sand 1.5 1.5 1.5 1.0 Pea Gravel 1.5 1.5

I. FINISHING OF FORMED SURFACES:

1. All concrete which is to be left exposed to view shall be scraped to remove projecting imperfections left by voids in the forms.

2. In addition to scraping, exterior exposed concrete shall be covered with a cement-base plaster mix. The mix shall consist of Thoroseal Plastic Mix and Acryl 60, as manufactured by Standard Drywall Products, Miami, FL, or approved equal. It shall be mixed and applied in accordance with the manufacturer's recommendations. 3. In addition to scraping, interior concrete surfaces which will be exposed to view and concrete surfaces which are to be prepared and painted as specified in Section 09900, PAINTING, shall receive a smooth rubbedfinish, in accordance with ACI 301 and as described below.

4. To permit satisfactory finishing, forms shall be removed from the vertical faces of the concrete as early as is possible without damaging the surface. Immediately after stripping forms, any fins or projections left by the forms shall be chipped off, and the surfaces rubbed smooth.

5. Form tie holes and other voids and faults shall be patched. Voids shall be cleaned out, roughened, thoroughly wetted, coated with neat cement paste, and filled with mortar of cement and sand in the same proportions, materials, and color as used in the concrete. The surface of the patch shall be flush with the surrounding surface after finishing operations are complete. Surface shall be kept continuously damp until patches are firm enough to be rubbed without damage.

6. Rubbing shall be performed while the surface is wet using a carborundum or cement sand brick, to achieve a smooth uniform, even textured finish. Patched and chipped areas shall be blended to match as closely as possible the appearance of the rest of the surface. No cement wash or plastering will be permitted, and no mortar shall be used except as required above.

7. Where finishing is performed before the end of the curing period, concrete shall under no circumstances be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

J. CONCRETE FLOOR FINISHING REQUIREMENTS:

Unless designated otherwise, concrete floors shall have a troweled finish as specified in Section 11.7 of ACI 301. Troweled finishes shall conform to the requirements of "Class A Tolerances," Section 11.9 as specified in ACI 301.

K. TESTING:

1. The Contractor shall provide all field testing and inspection services, and shall pay for all such services. The Engineer shall approve the testing. laboratory and shall inform the Contractor when samples are to be taken for testing. The Contractor shall forward all test results to the Engineer as soon as they are available.

a. The Testing Laboratory shall conform to the requirements of ASTM E-329 as modified in 780 CMR Rl in the State Building Code. They shall be licensed by the State Board of Building Regulations and Standards.

2. At least one slump test shall be performed from each truck load of concrete. The sample for slump shall be taken from the middle third of a truck load. Air content tests shall be made at the discretion of the Engineer. If the measured slump or air content falls outside the specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be considered to have failed the requirements of the specification and shall be immediately removed from the jobsite to be discarded.

3. The Contractor shall advise the Engineer of his readiness to proceed with concrete placement at least one working day prior to each placement. The Engineer will inspect the preparations for

concrete, including the preparation of previously placed concrete, the reinforcing, and the alignment and tightness of formwork. No placement shall be made without the prior approval of the Engineer.

4. A minimum of four standard compression test cylinders shall be made and tested for each 100 cubic yards or fraction thereof for each type and design strength of concrete from each day's placement of concrete. One cylinder shall be tested at 7 days and two cylinders at 28 days. The fourth cylinder from each set shall be kept until the 28-day test report on the second and third cylinders in the same set has been received. The Engineer reserves the right to require test cylinders to be made for each truckload of concrete if the nature of the project or project experience indicates such additional tests are required for proper control of concrete quality; such tests will be at the Contractor's expense.

5. The strength level shall be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength f'c, and no individual strength test (average of two cylinders) result falls below the specified strength f c by more than 500 psi.

6. In the event the average compressive strength of the two 28-day cylinders do not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days.

L. FAILURE TO MEET REQUIREMENTS:

1. The Engineer shall have the right to reject concrete represented by low strength tests or to agree to further testing of the concrete. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected or additional tests shall be conducted shall be final. All direct and indirect costs associated with further curing and testing of the concrete shall be at the Contractor's expense. All costs associated with removing rejected concrete, placing new concrete, and conducting tests on new concrete shall be at the Contractor's expense.

2. If the Engineer agrees to consider further curing and/or testing of the concrete before making a final decision, the Contractor shall submit a detailed plan to the Engineer, including proposed criteria for acceptance of the concrete. The plan may include additional curing of the concrete, drilling and testing of cores, load testing of the structure, or a combination.

3. If additional curing is permitted before further inspection and testing, the Contractor shall provide any necessary materials and labor to further cure the suspect concrete.

4. If drilling and testing of cores is permitted, the Contractor shall be responsible for obtaining the cores, including provision of ladders, scaffolding, and such incidental equipment as may be required. If additional curing is permitted, cores shall be drilled after the curing period, and shall be in accordance with ASTM Methods C39 and C42. The Contractor shall repair all core holes to the satisfaction of the Engineer.

5. The burden of proof, including, but not limited to the work of cutting and testing the cores, inspection, evaluation, engineering, repair of the holes, or removal and replacement of the concrete in question, and all associated costs therefor, shall be at the expense of the Contractor.

6. If load testing of the concrete is permitted, and if not otherwise indicated, slabs or beams under load test shall be loaded with their own weights plus a superimposed load of 2 times the design live load. The load shall be applied uniformly over the portion being tested in the approved manner and left in position for 24 hours. The structure shall be considered satisfactory if deflection "D" in feet, at end of 24-hour period, does not exceed the following value:

D equals 0.001 (L x L)/t

in which "L" is span in feet, "t" is depth of slab, or beam in inches. If deflection exceeds "D" in the above formula, the concrete shall be considered faulty unless within 24 hours after removal of the load, the slab, or beam under test recovers at least 75 percent of the observed deflection.

7. If the suspect concrete still fails to meet specification requirements, the Engineer shall have the right to reject the concrete, have it removed and replaced, in accordance with paragraph 5 above, or to require mechanical strengthening of the concrete to satisfy project requirements. The Contractor shall submit a removal and replacement plan for review by the Engineer.

M. TEST FOR WATERTIGHTNESS:

1. All concrete shall be watertight against leakage or groundwater infiltration. Special care shall be taken in the construction joints and any noticeable leakage or seepage causing wet spots on the concrete walls or slabs shall be repaired by and at the expense of the Contractor and by methods approved by the Engineer.

2. All liquid holding concrete structures shall be tested for leakage before backfilling and after the concrete has attained the specified minimum 28-day design strength, as indicated by test cylinders.

3. The structure shall be filled with water to the overflow level, allowed to stand for at least 24-hours, and refilled to overflow to begin the test. After 72 hours, the liquid loss per 24-hour period shall be determined, either by measuring the amount required to refill the tank to overflow, by measuring the drop in water level, or by an equivalent procedure approved by the Engineer. Evaporative losses shall be calculated and deducted from the measured loss to determine net liquid loss (leakage). If the leakage per 24-hour period exceeds the allowable, the structure shall be repaired and retested until the leakage falls within the allowable limit.

4. For structures designed to hold water, one twentieth of one percent leakage will be allowed during a 24-hour period. No leakage (zero leakage) will be permitted for structures designed to hold liquid chemicals or fuels.

5. The Contractor shall pay all costs (including water) incurred in the testing for watertightness.

6. The Engineer shall be given a minimum notice of 48 hours prior to commencement of the leakage test.

SECTION 03302 - FIELD CONCRETE

1 GENERAL

1.01 WORK INCLUDED:

A. This Section covers concrete and all related items necessary to place and finish the concrete work.

B. Concrete thrust, and anchor blocks, to be provided at all water main bends, tees, plugs and wyes and at other locations required by the Engineer shall be installed in accordance with the details shown on the drawings and as specified in this section.

1.02 RELATEDWORK:

A. Section 02300 EARTHWORK

B. Section 15140 WATER MAIN PIPE AND FITTINGS

1.03 REFERENCES:

A. The following standards form a part of this specification:

American Concrete Institute (ACI)

ACI 304	Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
ACI 305	Recommended Practice for Hot Weather Concreting
ACI 3O6	Recommended Practice for Cold Weather Concreting
ACI SP-66 ACI	Detailing Manual
ACI 318	Building Code Requirements for Reinforced Concrete

American Society for Testing and Materials (ASTM)

ASTM A615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C33	Concrete Aggregates
ASTM C94	Ready-Mixed Concrete

ASTM C143	Test for Slump of Portland Cement Concrete
ASTM C150	Portland Cement
ASTM C260	Air Entraining Admixtures for Concrete
ASTM C494	Chemical Admixtures for Concrete

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

One copy of the statement of materials constituting the design of mixes for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the Contract.

2 PRODUCTS

2.01 CONCRETE:

A. All concrete, reinforced or non-reinforced shall have a 28 day compressive strength of 3000 psi unless otherwise noted on the design drawings. A minimum of 5.5 sacks of cement per cubic yard and a maximum water cement ratio of 6.9 gallons per sack shall be used.

B. Concrete shall conform to ASTM C94. The Contractor shall be responsible for the design of the concrete mixtures. Slump shall be a maximum of 4-inches and a minimum of 2-inches, determined in accordance with ASTM C143.

C. Admixtures shall be as specified in subsection 2.05. No additional admixtures shall be used unless approved by the Engineer.

D. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

2.02 REINFORCING:

Reinforcing as shown on the plans or as directed by the Engineer, shall conform to ACI 318 and ASTM A615 and shall be detailed in accordance with ACI SP-66. All Steel reinforcing bars shall be grade 60.

2.03 CEMENT:

The cement shall be an approved brand of American manufactured Portland Cement, Type II conforming to the applicable requirements of ASTM C150.

2.04 AGGREGATES

A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.

B. Maximum size aggregate shall be 3/4-inch.

2.05 ADMIXTURES:

A. All concrete (unless otherwise directed) shall contain an air entraining agent. Air entrained concrete shall have air content by volume of 4 to 8 percent for 3/4-inch aggregate.

B. Air entraining agent shall be in accordance with ASTM C260 and shall be Darex AEA, as manufactured by W.R. Grace & Company; Placewel (air entraining Type), as manufactured by Johns Manville; Sika AER as manufactured by Sika Chemical Company; or an approved equal product.

C. Water reducing agent shall be WRDA, as manufactured by W.R Grace & Company; Placewel (non-air entraining Type), as manufactured by Johns Manville; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.

D. Water reducing agent-retarder shall be "Daratard," as manufactured by W.R. Grace & Company; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.

2.06 WATER:

A. Water for concrete shall be potable, free of deleterious amounts of oil, acid, alkali, organic matter and other deleterious substances.

3 EXECUTION

3.01 PREPARATION:

A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or the material which would tend to reduce the bond.

B. Earth, concrete, masonry, or other water permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed.

C. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.

3.02 THRUST AND ANCHOR BLOCKS:

A. Minimum bearing areas for thrust blocks and dimensions of anchor blocks shall be as shown on the drawings.

B. Concrete for thrust and anchor blocks shall be placed against undisturbed earth, and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints.

3.03 FILL CONCRETE:

A. Fill concrete shall be placed in those locations as indicated on the design drawings. Fill concrete shall consist of materials as previously specified, with a minimum 28-day compressive strength of 3000 psi.

B. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1 :2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before grout has dried or set.

C. Fill concrete shall be brought to lines and grades as shown on the design drawings.

3.04 CONCRETE PLACING DURING COLD WEATHER:

A. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when temperature is below 40°F, or is expected to fall to below 40°F, within 73 hours, and the concrete after placing shall be protected by covering, heat, or both.

B. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Engineer. All procedures shall be in accordance with provisions of ACI 306.

3.05 CONCRETE PLACING DURING HOT WEATHER:

A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing, shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays, which will result in excessive mixing of the concrete after arrival on the job.

B. During periods of excessively hot weather (90°F or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90°F, when ready for placement, will not be acceptable, and will be rejected.

3.06 FIELD QUALITY CONTROL:

A. Concrete inspection and testing shall be performed by the Engineer or by an inspection laboratory, designated by the Engineer, engaged and paid for by the Owner. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.

B. At least 4 standard compression test cylinders shall be made and tested and 1 slump test from each day's placement of concrete. A minimum of four compression test cylinders shall be made and tested for each 100 cubic yards of each type and design strength of concrete placed. One cylinder shall be tested at 7 days, and two at 28 days. The fourth cylinder from each set shall be kept until the 28-day test report on the second and third cylinders in the same set has been received. If the average compressive strength of the two 28 day cylinders do not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days. If job experience indicates additional cylinder tests or other tests are required for proper control or determination of concrete quality, such tests shall be made.

C. The Engineer shall have the right to reject concrete represented by low strength tests. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected shall be final.

SECTION 09900 - PAINTING

1 GENERAL

1.01 Work Included:

A. This Section covers field painting and coating of surfaces, complete. Shop painting of metal items is specified under the applicable item.

B. A schedule listing the various types of surfaces to be painted and the types of paints to be applied is included herein.

C. Unless otherwise indicated, the following items shall not be painted:

1. Labels on equipment, such as Underwriters' Laboratories and Factory Mutual, equipment identification, performance rating, and name or nomenclature plates.

2. Moving parts of operating units, exposed bolt threads, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts.

3. Electrical conduit unless mounted on painted or finished surfaces or exposed in a finished room.

4. Structural steel not exposed to view, and other parts of buildings also not exposed to view.

5. Stainless steel.

6. Concrete.

7. Plumbing fixtures.

8. Fiberglass and polyethylene storage tanks.

9. Uninsulated PVC piping (to be banded only)

* 10. Factory prefinished architectural components.

* 11. Electrical panels and cabinets factory finish painted.

* Except for touch-up painting when required

1.02 Related Work:

Section 09970, SURFACE PREPARATION AND SHOP PRIME PAINTING

1.03 System Description:

A. The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, organic or inorganic, whether used as prime, intermediate, or finish coats.

B. The Contractor shall do a complete painting job throughout the work in accordance with generally approved modem practices for work of high quality. Unless otherwise specified, all materials and surfaces customarily painted shall be given not less than one shop coat and two field coats or one prime coat and two finish coats, regardless of whether or not the surface to be painted is specifically mentioned.

C. Paints containing lead shall not be used.

D. To ensure a satisfactory painting job it is essential that the paints applied in the shop and in the field be mutually compatible. The Contractor shall determine what shop paints have been used and shall verify that field applied paints are compatible therewith.

E. The colors of finish coatings shall be selected by the Engineer from color chips submitted by the Contractor for review. The color selection shall be in the form of a schedule indicating the colors to be used on the various surfaces: The colors used in the final work shall be in accordance with the color schedule and shall match the selected color chips.

F. All coating systems used for potable water applications shall be previously approved by the National Sanitation Foundation (N.S.F.) in accordance with Standard 61. Evidence of such approval shall be an approval letter from N.S.F. listing the submitted materials.

G. Paints submitted shall meet all Federal and State E.P.A. regulations pertaining to volatile organic compounds (VOC) compliance.

1.04 References:

A. The following standards form a part of these specifications, and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM F1869 Moisture Vapor Emission Rate Using Anhydrous Calcium Chloride

1.05 Submittals: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL CONDITIONS, SUBMIT THE FOLLOWING:

A. One (1) set of manufacturers literature of proposed paints shall be submitted to the Engineer for review.

B. One (1) set of the painting schedule shall be submitted to the Engineer for review.

C. Three (3) sets of color chips shall be submitted to the Engineer for selection of colors.

1.06 Delivery and Storage:

A. Paint shall be delivered to the site in the manufacturer's sealed containers. Each container shall bear the manufacturer's label, listing the brand name, type and color of paint, and instructions for thinning. Thinning shall be done only in accordance with directions of the manufacturer. Job mixing or job tinting may be done when approved by the Engineer and for preparing sample colors.

B. Painting materials shall be stored and mixed in a single location designated by the Engineer for this purpose. The Contractor shall not use any plumbing fixture or pipe for mixing or for disposal of any refuse. He shall carry all necessary water to his mixing room, and shall dispose of all waste outside of the building in a suitable receptacle. The Contractor will be held responsible for any damage done due to failure to observe these precautions.

C. The paint storage area shall be kept clean at all times, and any damage thereto or to its surroundings shall be repaired. Any oily rags, waste, etc., shall be removed from the building every night, and every precaution shall be taken to avoid danger of fire.

D. Heat must be provided in the storage area if paints are to be stored during winter months. The temperature shall be maintained above 40 degrees F. at all times. 2 **2**

2 PRODUCTS

2.01 Materials:

A. PAINT SCHEDULE:

Except as otherwise indicated, all paint used shall be of the type listed in the schedule below, by Tnemec Company, Inc., or equivalent paints by Sherwin-Williams Company, International Paints, or other approved paint fully equal to paint manufactured by the above named companies. No brand other than those named will be considered for approval unless the brand and type of paint proposed for each item in the following painting schedule are submitted in writing to the Engineer, along with sufficient data supported by certified tests.

PAINT SCHEDULE

Key		Tnemec	Note 1
AGE	Aklyd Gloss Enamel	2H Tneme-Gloss	3.5
APE	Acrylic Polyurethane	73 Endura-Shield Enamel	3.0
ABF	Cementitious Block Filler	130 Envirofill	80-100 s.f./gal
BO	Bleaching Oil	Note 5	
CEE	Catalyzed	66 H.B. Epoxoline II	4.0
CEM	Catalyzed Epoxy Mastic	27 Typoxy	Note 3
CEP	Catalyzed Epoxy Primer	Series 66 Epoxoline	3.0
EMC	Epoxy Modified Cement	218 Mortar-Clad	Fill/Surface
EP	Epoxy-Polyamide (thinned 30% #4 thinner)	20 Pota-pox	3.0-5.0
EPW	Water-based Epoxy Primer	151 Elasto-Grip	1.0-1.5

HGV	High Gloss Varnish		Note 2
HSE	High Solids Epoxy (Minimum 69%)	N69 Epoxy	6.0
MA	Modified Acrylic	115 Uni-bond	3.0
MAE	Modified Acrylic Elastomer	156 Envirocrete	6.0-8.0
NE	Novolac Epoxy	282 Tneme-Glaze	7.5
PEF	Polyamine Epoxy Finish	280 Tneme-Glaze	6.0-8.0
PEP	Polyamine Epoxy Primer	201 Epoxoprime	6.0-8.0
PVA	PVA Sealer	51-792 PVA Sealer	1.5
PWC	Potable Water Coating	Series FC 20-1255 Beige Pota Pox or FC 20-15BL Tank White PotaPox	7.0
SA	Silicone Aluminum	39-1261 (Note 4)	1.5
VE	Vinyl Ester Coating	120 Vinester	12.0
WP	Wood Primer	Note 2	
WS	Wood Sealer	Note 2	
Z	Zich-Rich Primer	90-97 Tneme-Zinc	2.5

Notes:
1: Minimum Dry Film Thickness/Coat (mils)
2: Furnished by reputable manufacturer and acceptable to the Engineer.
3: Shall be used as a tie-coat between incompatible paints @ 3.0-4.0 mils.
4: This paint is suitable for temperatures up to 1200°F and must be final cured at 400°F for one hour.
5: Bleaching oil is a translucent gray paint stain with a chemical additive to enhance the natural bleaching tendencies of cedar shingles.

B. PAINTING SCHEDULE:

Paint shall be applied in accordance with the paint key listed on the following schedule and defined in the preceding Paint Schedule:

Item	**Field Coats**		
Metals:	1st	2nd	3rd
Interior miscellaneous galvanized and non-ferrous metals and piping	CEE	CEE	--
Exterior miscellaneous galvanized and non ferrous metals and piping (SP7 required)	CEE	APE	--
Miscellaneous interior ferrous piping, metalwork, ferrous parts or operating devices, valve handles, levers, pumps, and ferrous hangers and supports (exterior exposure)	CEP	CEE	--

Exposed electrical conduit, conduit fittings, outlet boxes	CEP	CEE	APE
	Same as adjacent wall or ceiling		
Piping:			
PVC Piping designated to be painted (SP7 or hand sand)	CEE	CEE	--
Pipe insulation (plastic or metal sheathed paint as scheduled for plastic or metal surface)	PVA	CEE	CEE
Other piping (see metals)			

B. SPARE PAINT:

1. Furnish to the Owner one unopened gallon of each type and color of paint used on the work.

2. Furnish both components for each type and color of epoxy paints used on the work

3 EXECUTION

3.01 Surface Preparation:

A. Before any surface is painted, it shall be cleaned carefully of all dust, dirt, grease, loose rust, mill scale, old weathered paint, efflorescence, etc. All necessary special preparatory treatment shall then be applied. Where required, imperfections and holes in surfaces to be painted shall be filled in an approved manner.

B. Cleaning and painting shall be so programmed that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surfaces which have been cleaned, pretreated, or otherwise prepared for painting, shall be painted with the first field coat as soon as practicable after such preparation has been completed, but in any event prior to any deterioration of the prepared surface.

D. Wood shall be sanded to a smooth and even surface and then dusted off. Before priming wood which is to be painted, shellac shall be applied to all knots, pitch and sapwood. After priming or stain coat has been applied, nail holes and cracks shall be thoroughly filled with plastic wood or putty. For natural finish work, putty shall be colored to be imperceptible in the finished work.

E. Exposed nails and other ferrous metal or surfaces to be painted with water-thinned paint shall be spot primed with aluminum.

F. Cracks and holes in masonry and concrete surfaces to be painted shall be filled with portland cement mortar. Surfaces shall be clean and dry before painting. All efflorescence, grease, oil, etc., shall be removed before painting, and all loose, crumbling material shall be removed by vigorous wire brushing over entire surface, followed by removal of all dust. All high areas on masonry and concrete surfaces such as mortar daubs, mortar ridges at joints, and ridges at form joints in concrete shall be removed.

G. All holes in plaster shall be filled with plaster of paris and all cracks shall be cut out and filled. No sandpaper shall be used on plastered surfaces. Prior to painting, surfaces shall be tested with a moisture detecting device, such as Kaydel Plaster Tester, Type CP-48, as manufactured

by Hard Moisture Gauges, Inc. No sealer or paint shall be applied when the moisture content of the plaster exceeds 8 percent, as determined by the test. Testing shall be done in the presence of the Engineer's representative, and in as many locations as directed. Plaster shall be thoroughly dry-brushed before painting or sealing.

H. All nonferrous metal surfaces to be painted shall be cleaned of all dirt, grease, oil and other foreign substances per SSPC SP 7.

I. All galvanized surfaces to be painted shall be brush blasted per SSPC SP7.

J. Before application of the first full field coat, abraded areas of all non-galvanized ferrous metal items having shop coats shall be touched up with paint of the type indicated on the Painting Schedule.

K. All items of equipment such as motors, pumps, instrumentation panels, electrical switchgear, and similar items, that have been given shop coats, paint filler, enamel or other treatment customary with the manufacturer, shall have, after installation, all scratches and blemishes touch up prior to application of the first field coat. Factory prefinished items not to be field painted shall be touched up with matching paint to repair any areas damaged during installation.

L. All submerged concrete surfaces which are to receive an epoxy coating shall be brush blasted to remove surface laitance and provide a uniform surface profile. Surface preparation may commence one week after the concrete has been pronounced cured. The curing period is defined as that length of time during which the concrete is fully hydrated (28 day cure). Patch holes and voids with specified modified epoxy cement prior to coating.

M. Concrete floors that are to receive epoxy coating shall be brush blasted or shot blasted (Blastrack). Check for excessive moisture migration per ASTM F1869, Moisture Vapor Emission Rate Using Anhydrous Calcium Chloride. Test results not to exceed 3 lbs per 1,000 square feet in one 24-hour period.

N. Hardware accessories, machine surfaces, plates, lighting fixtures, and similar items in place prior to cleaning and painting, and not intended to be painted, shall be removed during painting operations and repositioned upon completion of each area or shall otherwise be protected.

O. All PVC pipe to be painted shall be brush blasted per SSPC SP7 or shall be sanded to provide a uniform surface profile.

3.02 Application:

A. Paint shall be used and applied as recommended by the manufacturer without being extended or modified, and with particular attention to the correct preparation and condition of surfaces to be painted.

B. Paint shall be applied only within the temperature range recommended by the manufacturer. Painting of surfaces when they are exposed to the sun shall be avoided.

C. Paint shall not be applied to wet or damp surfaces and shall not be applied in rain, snow, fog, or mist, or when the relative humidity exceeds 85 percent.

D. No paint shall be applied when it is expected that the relative humidity will exceed 85 percent or that the air temperature will drop below 40°F within 18 hours after the application of paint. Dew or moisture condensation should be anticipated and if such conditions are prevalent, painting shall be delayed until midmorning to be certain that the

surfaces are dry. Further, the days painting should be completed well in advance of the probable time of day when condensation will occur, in order to permit the film an appreciable drying time prior to the formation of moisture.

E. All paint shall be applied under favorable conditions by skilled painters and shall be brushed out carefully to a smooth, even coating without run or sags. Enamel shall be applied evenly and smoothly. Each coat of paint shall be allowed to dry thoroughly, not only on the surface but throughout the thickness of the paint film before the next coat is applied. Finish surfaces shall be uniform in finish and color, and free from flash spots and brush marks. In all cases, the paint film produced shall be satisfactory in all respects to the Engineer.

F. Exposed nails and other ferrous metal or surfaces to be painted with water-thinned paints shall be spot primed with aluminum paints.

G. In order to provide contrast between successive coats, each coat shall be of such tint as will distinguish it from preceding coats.

H. The Contractor shall not only protect his work at all times, but shall also protect all adjacent work and materials by the use of sufficient drop cloths during the progress of his work. Upon completion of the work, he shall clean up all paint, spots, oil, and stains from floors, glass, hardware, and similar finished items.

I. Paint shall be applied so as to obtain coverage per gallon and the dry film thickness recommended by the manufacturer. Dry film thickness readings shall be taken to insure that required thicknesses have been achieved. The Contractor shall record in a manner satisfactory to the Engineer, the quantities of paint used for successive coats on the various parts of the work.

J. Spraying with adequate apparatus may be substituted for brush application of those paints and in those locations for which spraying is suitable.

K. If paints are thinned for spraying, the film thickness after application shall be the same as though the unthinned paint were applied by brush. That is, the addition of a thinner shall not be used as a means of extending the coverage of the paint, but the area covered shall be no greater than the area which would have been covered with the same quantity of unthinned paint.

L. Blast cleaned metal surfaces shall be coated immediately after cleaning, before any rusting or other deterioration or contamination of the surface occurs. Blast cleaned surfaces shall be coated not later than 8 hours after cleaning under ideal conditions or sooner if conditions are not ideal.

M. The use of carbon dioxide or carbon monoxide emitting heaters is not permitted during the painting operation. Only indirect hot-air systems shall be permitted.

3.03 Piping Color Code:

The following Tnemec colors shall be utilized to facilitate identification of piping. Only insulation is to be painted on chemical feed lines.

1. Water Lines

Potable – Tank Influent	Dark Blue	SC06
Potable – Tank Effluent	Dark Blue	SC06

B. In situations where two colors do not have sufficient contrast to easily differentiate between them, a 6-inch band of contrasting color shall be painted on one of the pipes at approximately 30-inch intervals.

C. Piping which is not painted shall be color coded with bands placed at each change in direction and no more than 5 feet apart on straight runs.

3.04 Piping Identification:

A. After painting, piping shall be identified by stenciling using the same specified paint as used on the pipes. Stenciling shall be of wording and color selected by the Engineer and sized as follows:

Outside Diameter of Pipe or Covering	Size of Legend Letters
3/4-inch to 1-1/4-inch	2-inch
1-1/2-inch to 2-inch	3/4-inch
2-1/2-inch to 6-inch	1-1/4-inch
8-inch to 10-inch	2-1/2-inch
Over 10-inch	3-1/2-inch

B. Arrows shall indicate direction of flows. Where "a" is equal to 3/4 of outside diameter of pipe or covering, the arrow shaft shall be 2 "a" long by 3/8 "a" wide. The arrow head shall be an equilateral triangle with sides equal to "a." Maximum "a" dimension shall be 6-inches.

C. Where pipe passes through a wall, use pipe markers and directional arrows on each side of the wall.

D. Use pipe markers and directional arrows every 50 feet along continuous pipe lines.

E. Use a pipe marker and directional arrow at each rise and "T" joint.

F. When using directional arrows, point arrowhead away from pipe markers and in direction of flow. If flow can be in both directions, use a double-headed directional arrow.

G. The Engineer will assist in determining pipe content and direction of flows.

3.05 Cleanup:

A. The Contractor shall at all times keep the premises free from accumulation of waste material and rubbish caused by his employees or work. At the completion of the painting, he shall remove all of his tools, scaffolding, surplus materials, and all of his rubbish from and about the buildings and shall leave his work "broom clean" unless more exactly specified.

B. The Contractor shall also, upon completion, remove all paint where it has been spilled, splashed, or splattered on all surfaces, including floors, fixtures, equipment, furniture, glass, hardware, etc., leaving the work ready for inspection.

SECTION 09970 - SURFACE PREPARATION AND SHOP PRIME PAINTING

1 GENERAL

1.01 Work Included:

This section covers the furnishing of all labor, materials, equipment and incidentals required for the surface preparation and application of shop primers on ferrous metals, excluding stainless steels, as specified herein.

1.02 Related Work:

Field painting is included in Section 09900.

1.03 Submittals: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Submit to the Engineer for review, manufacturer's specifications and data on the proposed primers and detailed surface preparation, application procedures and dry mil thicknesses.

B. Submit representative physical samples of the proposed primers, if required by the Engineer. PA

2 PRODUCTS

2.01 Materials:

A. Submerged surfaces - Shop primer for ferrous metals which will be submerged or which are subject to splash action or which are specified to be considered a submerged surface shall be spray applied one coat of Tnemec 394 PreimePrime Primer, dry film thickness 2.5 to 3.5 mils by Tnemec Co., or approved equal.

B. Non-galvanized Miscellaneous Metals - spray apply one coat Tnemec 394 PreimePrime zinc/mio primer or approved equal.

C. Other Non-Galvanized and Non-Submerged Surfaces including process equipment - Spray apply one coat of Tnemec Series 394 by Tnemec Co.; or approved equal.

D. Non-Primer Surfaces - Gears, bearings surfaces, and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust-resistant coating. This coating shall be maintained as necessary to prevent corrosion during all periods of storage and erection and shall be satisfactory to the Engineer up to the time of the final acceptance test.

E. Compatibility of Coating Systems - Shop priming shall be performed with materials specified above. However, shop painting shall be done with primers that are guaranteed by the manufacturer to be compatible with the corresponding finish coats specified in Section 09900.

3 EXECUTION

3.01 Surface Preparation:

A. Non-submerged service components scheduled for priming, as defined above, shall be sand blasted clean in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming.

B. Submerged service components scheduled for priming, as defined above, shall be sandblasted clean in accordance with SSPC-SP-10, near White, immediately prior to priming.

C. Surface shall be dry and free of dust, oil, grease and other foreign material before priming.

D. Shop prime in accordance with approved manufacturer's recommendations.

SECTION 13112 – POLYETHYLENE ENCASEMENT

1 DESCRIPTION

Work consists of installing polyethylene encasement over the pipes and fittings, to protect a portion of new or existing cast or ductile iron water main, service or hydrant branch pipe and new ductile iron fittings and copper water services, as required in the Contract Documents and as directed by the Engineer.

Work is to be in conformance with the requirements of Section 01180 General Water Provisions.

2 MATERIALS

2.01 Polyethylene Encasement

Polyethylene encasement shall be Class C, black pigmented, 8 mils. thick, linear low density, polyethylene conforming to the requirements of ANSI/AWWA C105/A21.5. The encasement may be supplied in flat sheets or tubes at the Contractor's option. Tape used to repair or patch the encasement shall be manufactured from synthetic materials. Duct tape shall not be used for repairs. Appropriately sized encasement shall be provided based on vendors requirements for the particular pipe size in use.

3 CONSTRUCTION DETAILS

3.01 General

Polyethylene (PE) encasement shall be installed on all ductile and cast-iron water mains, water valves, fittings and water services using Method A or B as detailed in AWWA/ANSI C105/A21.5 except that the encasement shall consist of double wrapping. All pipe and fittings encased with PE shall be handled, repaired and installed in conformance to guidelines published by DIPRA. The Contractor shall double wrap and seal with tape all bolted connections, anchoring couplings, anchoring elbows, valves, and fire hydrants. Encasement for fittings and valves on PVC pipe shall extend a minimum of 18" past the joint. The Contractor shall ensure that hydrant drain holes are not blocked or covered. All water main and service valves shall be doubled wrapped, fully encased and sealed with tape around the valve stem operator underneath the operating nut.

The Contractor shall wrap all copper supply pipes from the tap extending 5’ away from any ductile or cast iron main, and shall repair all PE encasement at the tap location. Copper services connected to PVC water mains are not required to be encased, unless otherwise noted. All ductile iron fittings used on PVC water services shall be doubled wrapped.

SECTION 13120 - WATER VALVE BOX

1 DESCRIPTION

The work shall consist of the installation of a new water valve box assembly, removal or adjustment of existing water valve box or installation of new water valve box top section and lid as required in the Contract Documents and as directed by the Engineer.

The work shall be in conformance with the requirements of Section 01180 General Water Provisions.

2 MATERIALS

2.01 Water Valve Box

Water valve box shall be two piece Buffalo Style, 5-1/4 inch shaft, cast iron boxes with a slip type extension with flange at top of upper section (2-3 inches from top).

2.02 Adjustment Ring

Adjustment ring shall be cast iron and capable of fitting on Buffalo style water valve box, and be in 1 inch increments.

2.03 Water Valve Box Top Section

Replacement water valve box top section and lid shall be cast iron with flange at top, Buffalo Style.

2.04 Water Valve Box (Pitometer)

Water valve box for pitometer shall be three piece Buffalo Style screw type, 7 inch diameter, with cast iron shaft.

3 CONSTRUCTION DETAILS

3.01 General

Prior to adjusting or installing water valve box on water valve which is to remain in service, water valve shall be operated by the Water Department to insure that it is functioning properly. A water valve that does not function properly shall be replaced only as approved by the Engineer. Water valves are to be operated only by authorized representatives of the Cheshire Water Department.

3.02 Installation

An existing water valve box that is found damaged, not of sufficient length to be raised to the required finished grade, or determined by the Water Superintendent to be in need of replacement, shall be removed and replaced with a new water valve box assembly.

Water valve box shall be carefully set over the stem. Top section shall be adjustable for elevation, and the base centered over the operating nut. Water valve box shall be carefully set and braced to insure that it remains in a vertical position centered on the stem during and after backfilling. Proper alignment and height of water valve box shall be maintained, until completion of the Project. Top of the water valve box shall be flush with the finished grade. Backfilling of the trench shall be done in a manner so as to avoid damage to the water valve and water valve box.

Upon completion of the work, the excavation shall be backfilled and the surface area restored.

3.03 Removal of Existing Water Valve Box Assembly

Existing water valve box on abandoned water valve shall be removed to a minimum of 18 inches below the finished grade.

3.04 Installation of New Water Valve Box Assembly

Existing water valve box shall be removed and a new water valve box assembly installed. New water valve box shall be carefully set over the existing stem, the base centered over the operating nut and the top section adjusted for elevation.

3.05 Replacement of Water Valve Box Top Section

A sufficient area shall be excavated to enable the upper section of the water valve box to be removed. No debris shall be allowed to fall into the existing water valve box. New top section shall be carefully set over the existing bottom section and adjusted to the proper elevation.

3.06 Water Valve Box Adjustment

A. Water Valve Box Adjustment with Cast Iron Rings

Prior to resurfacing of a pavement surface, the top elevation of an existing water valve box shall be adjusted to finished grade by adding or removing cast iron adjustment rings. Cast iron rings required to raise water valve box other than the Buffalo Style shall be provided by the Water Department. Department shall be notified 2 working days in advance when adjustment rings are required for adjustment. Adjustment ring shall be secured into the existing water valve box with a fast setting adhesive. Adhesive shall be two-part epoxy, ET500 as manufactured by Permabond, or approved equivalent.

B. Water Valve Box Adjustment with Slip or Screw Type Extensions

Existing water valve box shall be raised or lowered to the finished grade. Prior to adjustment, the water valve box shall be checked for proper alignment. If a water valve box is found to be out of alignment, the Engineer shall be notified immediately.

Flanges on existing water valve box sections are not to be broken to facilitate adjustment.

SECTION 13121 - WATER MANHOLE

1 DESCRIPTION

Work consists of adjustment or replacement of existing water vault manhole frame and cover as required in the Contract Documents and as directed by the Engineer.

Work is to be in conformance with the requirements of Section 01180 General Water Provisions.

2 MATERIALS

2.01 Manhole

New manhole frame and cover shall be heavy duty conforming to the type and model as indicated in the Contract Documents, or approved equivalent. Manhole covers are to have non-penetrating pick holes and a rubber gasket cemented into a machined groove on the underside of the manhole cover. Manhole frame and cover are to be coated with one coat of a coal tar pitch varnish. Word “WATER” shall be cast into the top of the cover.

2.02 Brick

Brick shall be first quality, sound, hard-burned common brick conforming to ASTM C32, manhole brick, grade MS (for grade adjustment). Brick shall be culled of all irregulars and unsound or damaged brick before laying.

2.03 Mortar

Mortar is to be portland cement mortar conforming to ASTM C270, Type M, mortar for unit masonry.

3 CONSTRUCTION DETAILS

3.01 General

All work shall be coordinated with the Water Superintendent.

Appropriate measures shall be taken to prevent dirt, debris, and surface water from entering into the vault. Following completion of the work, all debris shall be removed from inside the vault and properly disposed of, and the inside of the vault left in a broom clean condition.

3.02 Replace Existing Water Manhole

Existing manhole frame and cover shall be removed, cleaned of all extraneous debris and delivered to the Water Department Pump House.

After removal of the existing frame and cover, exposed portion of the vault structure shall be prepared for installation of the new manhole frame and cover, and new manhole frame and cover installed within 2 days of the removal of the existing frame and cover.

New manhole frame and cover shall be placed true to line and grade. Suitable measures shall be taken to ensure that cover has continuous, full and uniform bearing contact with corresponding frame. Cover shall be non-rocking when in place and under influence of traffic or other loads. Suitable methods to achieve non-rocking fits between cover and corresponding frame shall include, but not be limited to, the following:

- Ground mating surfaces
- Machined and milled mating surfaces (horizontal and vertical)
- Match marked elements
- Locking elements

If match marked elements are utilized, care shall be taken to retain the identity of the elements in order to correctly match them and assure proper fit.

Field repair procedures for improperly fitting castings shall be as approved by the Engineer. Field repairs may include grinding or proper welding techniques for the material involved. Repairs that involve welding shall be allowed only on steel castings and only with prior approval of the Engineer. Repairs shall result in units whose parts have continuous, full and uniform bearing contact with each other, and that the cover does not rock or move under influence of traffic or other loads.

New manhole frame and cover shall be encased 12 inches all around with a minimum thickness of 8 inches of concrete. Concrete encasement shall be a minimum of 3-1/2 inches below grade in pavement area, and 5 inches below grade in sidewalk or lawn area.

3.03 Adjust Existing Water Manhole

Existing manhole frame and cover shall be removed and cleaned of all extraneous debris. Existing frame and cover shall not be removed unless they can be reinstalled the same day. Under no circumstances shall the opening be left uncovered overnight.

After removal of the existing frame and cover, exposed portion of the vault structure shall be prepared for reinstallation of the frame and cover.

Manhole frame and cover shall be placed true to line and grade. Suitable measures shall be taken to ensure that the cover shall have continuous full and uniform bearing contact with the frame, and shall be non-rocking when in place and under the influence of traffic or other loads, as outlined under subsection 3.02 Replace Existing Water Manhole. Brick and mortar leveling course shall be constructed so the manhole frame and cover shall be flush with the finished road surface and centered over the existing opening in the vault roof.

Manhole frame and cover shall be encased 12 inches all around with a minimum thickness of 8 inches of concrete. Concrete encasement shall be a minimum of 3-1/2 inches below grade in pavement area, and 5 inches below grade in sidewalk or lawn area.

REVISED: September 2, 2019

SECTION 13122 - TAPPING SLEEVE WITH VALVE AND VALVE BOX

1 DESCRIPTION

Work consists of installation of tapping sleeve with valve and valve box in existing water pipe, as required in Contract Documents and as directed by Engineer.

Work and materials are to be in conformance with requirements of Section 01180 General Water Provisions and 15140 Water Main Pipe and Fittings.

2 MATERIALS

2.01 Cast/Ductile Iron Tapping Sleeve

Cast or ductile iron tapping sleeve is to be a split body tapping sleeve with mechanical joint ends and machined recess flanged outlet to accommodate tapping valve, capable of being installed on ductile iron, cast iron or PVC/PVCO water main pipe. It shall have a 3/4 inch tapped outlet with brass plug for testing and have a cement mortar lining or fusion bonded epoxy lining on the interior of the outlet branch. Sleeve is to be furnished with all glands, gaskets and fluorocarbon coated, cold formed, high strength, low-alloy steel bolts, washers and nuts.

Cast/ductile iron tapping sleeve is to be designed for maximum working pressures of at least:

Water Main Pipe Size	Pounds per Square Inch (psi)
4 through 12 inch	250 psi
16 through 24 inch	200 psi
larger than 24 inch	150 psi

2.02 Stainless Steel Tapping Sleeve

Stainless steel tapping sleeves may only be used in lieu of cast/ductile tapping sleeves on domestic water mains when the nominal diameter of the tapped outlet is at least one pipe size smaller than the nominal diameter of the existing water main pipe being tapped. When the nominal diameter of the tapped outlet is equal to the nominal diameter of the domestic water main pipe being tapped, a cast/ductile iron tapping sleeve must be used or a new tee cut into the existing water main.

Stainless steel tapping sleeves shall be fabricated two piece shell Type 304 stainless steel with a gridded SBR or Nitrile (Buna-N) rubber shell gasket. Flange shall be Type 304 stainless steel with recess to accommodate tapping valve. Sleeve shall be capable of being installed on ductile iron, cast iron and PVC/PVCO water main pipe. It shall have a 3/4 inch tapped outlet with stainless steel plug for testing. Sleeve is to be furnished with stainless steel bolts, washers and nuts. Nuts shall have a fusion bonded or fluoropolymer coating to prevent seizing and galling.

Stainless steel tapping sleeve is to be designed for maximum working pressures of at least:

Water Main Pipe Size	Pounds per Square Inch (psi)
4 inch through 20 inch	200 psi
larger than 20 inch	150 psi

2.03 Tapping Valve

Tapping valve is to be resilient seat tapping gate valve in conformance with requirements of Section 15110 Resilient Seat Gate Valve with Valve Box. Valve shall be designed to connect directly to the flanged end of the tapping sleeve. Tapping valve is to be provided with full face gasket at the flanged end and fluorocarbon coated, cold formed, high strength, low-alloy steel nuts and bolts.

2.04 Valve Box

Valve box is to be in conformance with requirements of Section 13120 Water Valve Box.

2.05 Drilling/Tapping Machine and Tools

Drilling/tapping machine is to be capable of attaching to and cutting through tapping valve, and is to be designed to operate with drilling/cutting tools required for the specific pipe material being drilled. When tapping PVC/PVCO water main pipe, cutting tool is to be toothed core cutter of shell-type design with minimum of two slots to allow the cut material to exit the hole and retains the coupon after penetration of water pipe.

3 CONSTRUCTION DETAILS

Tap is to be made with drilling/tapping machine specially designed for intended work, and must be in good working condition. Hand-held drills are not to be used for making taps.

Contractor is responsible to obtain actual outside diameter of existing water pipe to be tapped for proper sizing of tapping sleeve. Additional excavation is normally required to obtain actual outside diameter measurement of existing water pipe.

Tapping sleeve and valve are to be installed in conformance with manufacturer's instructions and as approved by Engineer.

Before tapping the main - the pipe exterior, tapping saddle and valve and drilling/cutting tools are to be cleaned and disinfected using a chlorine solution; tapping sleeve and valve is to be inspected; and tapping sleeve and valve shall be hydrostatically pressure tested with water after installation at 150 p.s.i. for minimum 15 minutes to ensure that tapping sleeve and valve is not leaking.

Valve is to be installed with stem in vertical position.

Installation and joints are to be watertight, both prior to and after making connection.

Tapping sleeve and valve, including mechanical joint glands, are to be wrapped with polyethylene encasement and sealed with polyethylene tape.

Special attention is to be paid to backfill material placed under valve to ensure that it is well compacted for bedding valve.

To prevent any deflection of tapping sleeve installation due to thrust pressure, cast-in-place concrete thrust block is to be constructed between tapping sleeve and undisturbed soil to solidly brace and support tapping sleeve independently of water pipe. Concrete thrust block is to be left in place after tapping sleeve installation is completed.

Valve box is to be carefully set over valve stem or beveled gear shaft. Valve box top section is to be adjusted for elevation, and base centered over operating nut. Top of valve box is to be flush with finished surface.

Valve box is to be carefully set and braced to ensure that it remains in proper vertical position and centered

on valve stem during and after backfilling operation. Backfilling of trench is to be done in manner so as to avoid damage to valve and valve box.

Proper alignment and height of valve box is to be maintained until completion of Project.

REVISED September 2, 2019

SECTION 13123 - INSERTION SLEEVE

1 DESCRIPTION

Work consists of the replacement of a section of existing water main pipe, valve or fitting by installation of an insertion sleeve as required in the Contract Documents and as directed by the Engineer.

Work and materials are to be in conformance with requirements of Sections 01180 General Water Provisions and 15140 Water Main Pipe and Fittings.

2 MATERIALS

2.01 General

Replacement material shall consist of either an insertion sleeve consisting of two solid sleeves for ductile iron or cast iron pipe, or two PVC repair couplings for PVC/PVCO pipe, and section of new water main pipe, as required for each installation.

Water main pipe, fittings, joints and hardware shall be in conformance with the requirements of Sections 01180, General Water Provisions, and 15140, Water Main Pipe and Fittings.

Material shall be the same as the existing pipe. Ductile iron pipe and fittings shall be required where the existing pipe is iron pipe. PVC/PVCO shall be required to match where the existing pipe is PVC/PVCO.

2.02 Insertion Sleeve - Ductile Iron Pipe

Insertion sleeve shall be mechanical joint ductile iron solid sleeve, long pattern. Insertion sleeve shall be of the dual purpose type for use in plain ends of either centrifugal or pit cast iron pressure pipe and shall be in conformance with the latest requirements of ANSI/AWWA C110.

Water pipe is to be ductile iron in conformance with requirements of Section 15140 Water Main Pipe and Fittings

For connecting to existing cast iron pipe 24 inches in diameter and larger, Contractor shall use bolted sleeve type steel couplings in accordance with ANSI/AWWA C219 furnished with an epoxy coating , gaskets and fluorocarbon coated, cold formed, high strength low-alloy steel nuts and bolts.

Prior to backfilling, any uncoated hardware shall receive a brushed application of an approved bitumastic coating specifically manufactured for underground use or a wax tape coating system.

2.03 Insertion Sleeve - Polyvinyl Chloride (PVC/PVCO) Pipe

For PVC/PVCO water main pipe 4 inch through 8 inch in diameter, coupling shall be injection molded PVC Repair Coupling with gasket on both ends. Pipe larger than 8 inch in diameter shall require ductile iron solid sleeves. Non-epoxy coated ductile iron solid sleeves on PVC water main shall be covered with petrolatum wax tape coating system.

Water pipe is to be PVC/PVCO in conformance with requirements of Section 15140 Water Main Pipe and Fittings.

3 CONSTRUCTION DETAILS

3.01 General

Contractor is responsible to obtain actual outside diameter of existing water pipe to be cut for proper sizing of sleeve and couplings.

Section of water main pipe shall be installed according to the requirements of Section 15140 Water Main Pipe and Fittings.

The interior of all water main pipe and fittings not receiving 24 hour chlorine disinfection contact time must be spray or swab disinfected with a 1 to 5 percent solution of chlorine no more than 30 minutes prior to installation. The interior and exterior of cut ends of existing pipe shall also be cleaned and disinfected.

Fit between the existing water main pipe and new water main pipe shall not exceed a gap of 1/8 inch. All joints shall be made watertight. Prior to backfilling, existing water main shall be filled with potable water and installation tested for leaks under line pressure in the presence of the Engineer.

3.02 Insertion Sleeve - Ductile Iron Pipe

Section of existing ductile iron water main pipe to be replaced shall be cut out and removed. Open ends shall be thoroughly cleaned of all debris, scale and rust to a minimum distance of 12 inches from the open ends of the existing water main pipe. Insertion sleeve shall be centered over the connection, and installed according to the manufacturer's latest instructions and as approved by the Engineer.

3.03 Insertion Sleeve - Polyvinyl Chloride (PVC/PVCO) Pipe

Section of existing PVC/PVCO water main pipe to be replaced shall be cut out and removed. Cut ends shall be square with remaining water main pipe and cut ends beveled at appropriate angle necessary for proper installation of the couplings. Cut ends shall be thoroughly cleaned of all debris, scale and excess cuttings.

PVC/PVCO pipe and coupling shall be prepared for connection in conformance with the requirements of Section S901 Water Main Pipe and Fittings.

Non epoxy coated ductile iron fittings installed on PVC/PVCO water main pipe shall be coated with petrolatum wax tape coating system applied in conformance with manufacturer's instructions.

One nine pound anode shall be thermite welded to each ductile iron fitting attached to PVC/PVCO pipe.

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SECTION 13124 - REMOVAL AND REPLACEMENT OR REINSTALLATION OF WATER MAIN OBSTRUCTION

1 DESCRIPTION

Work consists of removing and reinstalling or replacing an additional section of the existing water main which acts as an obstruction to the passage of water main cleaning and lining equipment, that has not been identified on the Contract Documents.

An obstruction is defined as a bend, offset or other water main fitting or appurtenance which prevents the passage of water main cleaning and lining equipment.

Work is to be in conformance with the requirements of Sections 01180 General Water Provisions, 15140 Water Main Pipe and Fittings and 13123 Insertion Sleeve.

2 MATERIAL

2.01 Pipe and Fittings

Pipe and fittings shall be ductile iron in conformance with requirements of Section 15140 Water Main Pipe and Fittings.

2.02 Sleeves and Couplings

Sleeves and couplings shall conform to the requirements of Section 13123 Insertion Sleeve.

S931-2.03 Thrust Restraint

Concrete thrust blocks and restrained joints shall conform to the requirements of Section 01180 General Water Provisions.

3 CONSTRUCTION DETAILS

3.01 General

All valves shall be operated by the Contractor as directed by the Water Superintendent, and under the supervision of the Engineer. Coordination of the work for operation of water valves shall be in conformance with Section 01180 General Water Provisions. Valve operation cards shall be properly filled out by the Contractor and submitted to the Water Bureau on a daily basis. The Bureau of Water will supply the necessary cards.

The interior of all water main pipe and fittings not receiving 24 hour chlorine disinfection contact time must be spray or swab disinfected with a 1 to 5 percent solution of chlorine no more than 30 minutes prior to installation. The interior and exterior of cut ends of existing pipe shall also be cleaned and disinfected.

Fit between the existing water main pipe and new water main pipe shall not exceed a gap of 1/8 inch. All joints shall be made watertight. Prior to backfilling, existing water main shall be filled with potable water and installation tested for leaks under line pressure in the presence of the Engineer.

3.02 Removal of Obstruction

Pavement saw cutting shall be required prior to all excavation work in streets. All street cuts shall be made by a pavement saw and shall conform to the requirements of Section 02745 Paving.

Excavation shall be only to a sufficient length, width and depth needed to expose, cut and remove a section of the existing water main containing the obstruction. Excavation shall conform to the requirements of Section 02300 Earthwork.

The existing water main shall be cut, and the obstruction removed. Prior to cutting the existing water main, pipe cutting equipment and methods shall be as approved by the Engineer. All cuts shall be straight, smooth, and perpendicular to the centerline of the pipe.

3.03 Reinstallation of Obstruction

The existing obstruction may only be reinstalled if it is properly cleaned, its interior lined with cement mortar and reinstallation approved by the Engineer. Pipe and fittings shall be installed according to the requirements of Section 15140 Water Main Pipe and Fittings. New sleeves or couplings shall be used to connect the reinstalled obstruction to the existing pipe.

3.04 Replacement of Obstruction

Pipe, fittings and sleeves or couplings used shall be new and shall be installed according to the requirements of Sections 15140 Water Main Pipe and Fittings and 13123 Insertion Sleeve.

REVISED: September 2, 2019

SECTION 13125 - ABANDON EXISTING WATER VALVE VAULT; INSTALL DIRECT BURIAL VALVE(S)

1 DESCRIPTION

Work consists of the abandonment of existing water valve vaults, removing existing gate valve(s) and installing new direct burial butterfly valve(s), as required in Contract Documents or as directed by Engineer.

Work is to be in conformance with the requirements of Section 01180 General Water Provisions.

2 MATERIALS

2.01 Bedding, Backfill and Surface Restoration Materials

All bedding, backfill and surface restoration materials shall be in conformance with requirements of Section 01180 General Water Provisions.

2.02 Valves and Valve Boxes

All valves and valve boxes shall be furnished by the Contractor. Valves will be direct burial butterfly valves with mechanical joint ends. Valves come equipped with a 10 ft long valve shaft, to be cut to length in the field, and a torque limiting device with shear pin, to be installed near the road surface.

2.03 Bolted Sleeve Type Transition Couplings

Bolted sleeve type transition couplings shall conform to ANSI/AWWA Standard C219 Standard, latest revision. The coupling shall be designed for minimum 150 psi working pressure. Coupling shall have a solid center sleeve not less than 10 inches long. Gaskets shall be Nitrile, (Buna N) or SBR. Nuts and bolts shall be fluorocarbon coated, cold formed, high strength, low alloy steel in accordance with ANSI/AWWA C111/A21.11. Coupling shall be epoxy coated inside and outside.

Couplings shall be used for connecting new ductile iron water pipe with existing cast iron water pipe of different outside diameters. The following chart shows the range of outside diameters expected.

Nominal Diameter	Cast Iron Pipe Diameter Range		Ductile Iron Pipe Diameter Range	
	Minimum	Maximum	Minimum	Maximum
24”	25.7”	26.4”	25.7”	25.9”
30”	31.7”	32.8”	31.9”	32.1”
36”	37.9”	39.2”	38.2”	38.4”

2.04 Mechanical Joint Restraints

Restraint devices used to restrain mechanical joint ends of valve to new spool pieces of ductile iron pipe shall be in conformance with requirements of Section 01180 General Water Provisions and Section 15140 Water Main Pipe and Fittings.

2.05 Ductile Iron Pipe

Ductile iron pipe shall be Class 52, in conformance with requirements of Section 15140 Water Main Pipe and Fittings.

3 CONSTRUCTION DETAILS

Prior to ordering pipe couplings, the contractor shall coordinate with the Water Superintendent to gain access to the vault. The Contractor may need to excavate test pits adjacent to vault, where new pipe will be connected to existing pipe, in order to obtain precise pipe diameter measurements. The pipe diameter inside of vault may not be the same as the pipe diameter outside of the vault. Shop drawings with diameter measurements must be approved by the Engineer prior to ordering couplings. The Contractor should confirm delivery time for couplings, since there may be a long lead time for delivery of these items.

Valves required to isolate the valve vault shall be operated only by authorized Water Department personnel. Dry shuts are not guaranteed. The Contractor must be prepared to work around leaking valves and will be responsible for draining the water mains at the work site.

Temporary bypass pipe and services may be required to maintain water service to customers affected by the shut. If temporary bypass is anticipated, it will be shown on the Contract Drawings and work performed in accordance with Section 02516 Temporary Bypass.

The Water Department may require that some valve parts (i.e. gears, valve stems, bypass valves, etc.) be salvaged for re-use by the Bureau. Before work begins, the Water Superintendent will identify which parts are to be salvaged. The Contractor shall remove and store salvaged valve parts for pick-up by the Water Superintendent. The Contractor shall be responsible for properly recycling or disposing of the remainder of the valve.

The water valve vault roof, including manhole frame(s) and cover(s) shall be completely removed and properly disposed of without damaging the contents of the vault. Vault walls shall be removed to a depth of at least 4 feet below the surface.

The Contractor shall saw cut the pipe on either side of the existing valve(s) and carefully remove them from the vault. The valve(s) shall not be scrapped until parts to be salvaged have been removed. If necessary, cut ends of existing pipe shall be re-cut to accommodate installation of new valve(s), pipe and couplings.

Water-tight pipe plugs shall be inserted into open cut ends of pipe to prevent groundwater or debris from entering the pipe whenever the pipe is left unattended. The new valve(s), pipe and couplings shall be spray- or swab-disinfected prior to installation.

Marks shall be made near pipe ends to assist in centering couplings at pipe joints during installation. The gap between pipe ends at couplings shall not exceed that specified by the coupling manufacturer. Mechanical joint restraint shall be installed on both ends of new valve(s). Installation of valve(s) and couplings shall be in accordance with manufacturer’s instructions.

Any drains in the vault shall be plugged with concrete and the vault floor shall be broken-up to keep groundwater from ponding in the bottom of the vault.

To allow the venting of air from the water main when it is refilled, the Water Department may require that the Contractor install a 3/4-inch corporation stop on top of the pipe. The corporation stop shall be closed and a brass cap installed on the outlet after the water main has been filled and prior to backfilling.

The water main shall be filled prior to backfilling and all joints visually inspected for leaks at line pressure. Leaks shall be repaired by the Contractor before backfilling. The Water Superintendent will flush the water main until the chlorine concentration of water leaving the water main is the same as that generally prevailing in the system. A sample of water will be collected by the Water Superintendent and tested for the presence of bacteria.

The valve shaft shall be cut to the appropriate length and the torque limiting device installed on the top of the shaft. The bottom of the shaft shall sit on top of the valve operating nut, but shall not be fastened to it. Valve box(es) shall be installed in accordance with Section 13120 Water Valve Box.

The area shall be backfilled with select granular backfill in 6 inch lifts, with each lift being thoroughly compacted. Special attention shall be made to insure that backfill is properly placed under the new valve(s) and fittings.

Surface restoration shall be completed as required in the Contract Documents or as directed by the Engineer.

The Contractor shall properly dispose of all removed materials and debris. Any hazardous waste removed from the excavation or vault shall be disposed of in accordance with all applicable Massachusetts Department of Environmental Protection (MADEP) and the United States Environmental Protection Agency (USEPA) solid and/or hazardous waste management regulations. Solid hazardous waste must be disposed of at waste management or recycling facilities permitted to receive specific waste. Proposed disposal or recycling facilities must be approved by the Town of Cheshire prior to shipment by the Contractor. Disposal or recycling receipts must be provided to the Town.

REVISED September 2, 2019

SECTION 15110 - RESILIENT SEAT GATE VALVE WITH VALVE BOX

1 DESCRIPTION

Work consists of installation of resilient seat gate valve with valve box, as required in Contract Documents and as directed by Engineer.

Work and materials are to be in conformance with requirements of Section 01180 General Water Provisions and 15140 Water Main Pipe and Fittings.

2 MATERIALS

2.01 Resilient Seat Gate Valve

Resilient seat gate valve is to have non-rising stem (NRS), O-ring stem seals, standard 2 inch square AWWA operating nut, and open right (clockwise). Resilient seat gate valve 12 inch diameter and smaller is to meet or exceed all requirements of ANSI/AWWA C509. Resilient seat gate valve 16 inch through 24 inch in diameter is to meet or exceed all requirements of ANSI/AWWA C515.

Resilient seat gate valve sizes 4 through 12 inch are to have design working pressure of 250 pounds per square inch and test pressure (gate open) of 500 pounds per square inch. Resilient seat gate valve sizes 16 through 24 inch are to have design working pressure of 200 pounds per square inch and test pressure of 500 pounds per square inch. Pressure rating is to be cast on outside of resilient seat gate valve body.

Resilient seat gate valve body, bonnet and gate for valves 4 through12 inch are to be cast iron or ductile iron. Valve body and bonnet for valves 16 through 24 inch are to be ductile iron with either cast iron or ductile iron gate. Interior and exterior surface of resilient seat gate valve body and bonnet are to be coated with fusion bonded epoxy in conformance with requirements of ANSI/AWWA C550.

Gate is to be completely encapsulated with rubber over all ferrous surfaces. Rubber is to be securely bonded to gate, including part which houses stem nut.

Resilient seat gate valve stem is to be made of high strength bronze having minimum tensile strength of 70,000 pounds per square inch and minimum yield strength of 32,000 pounds per square inch. Stem sealing is to utilize "O" ring seals which can be replaced while resilient seat gate valve is under pressure in both fully open and fully closed position.

Gate guides are to be provided to insure that gate is kept in proper alignment with body so that rubber sealing surfaces are evenly compressed when gate is closed to provide zero leakage at required design working pressure.

Resilient seat gate valve is to be designed so that during operation, or cycling of resilient seat gate valve, there is no friction, abrasion or rubbing together of gate and body that can wear away any rubber and epoxy, thus exposing bare metal.

Bolts and nuts for fastening bonnet to body of resilient seat gate valve are to be stainless steel.

Resilient seat gate valves 4 through 12 inch are to be vertical type. Unless otherwise specified, all resilient seat gate valves 16 inch and larger shall be horizontal type.

2.02 Vertical Resilient Seat Gate Valve - Sizes 16 Inch to 24 Inch

Vertical resilient seat gate valve sizes 20 and 24 inch are to have 2:1 ratio enclosed low-profile spur gearing for buried service with AWWA 2 inch square operating nut to allow above ground operation through valve box.

Bolts and nuts on spur gear box are to be stainless steel.

Vertical resilient seat gate valves 16 inch and larger may only be used in locations where water main cover depths exceed 6 feet.

2.03 Horizontal Resilient Seat Gate Valve

Horizontal resilient seat gate valves 16 inch and larger are to have 2:1 ratio right angle enclosed bevel gearing with AWWA 2 inch square operating nut to allow above ground operation through valve box.

Bolts and nuts on beveled gear box are to be stainless steel.

2.04 Valve Box

Valve box is to be in conformance with material requirements of Section 13120 Water Valve Box.

3 CONSTRUCTION DETAILS

Resilient seat gate valve is to be installed with new water pipe in conformance with requirements of ANSI/AWWA C509 Appendix A, C515 Appendix A.

Resilient seat gate valve is to be inspected, cleaned and bolts and nuts checked for tightness before installation to ensure that it is in proper working order.

Vertical type resilient seat gate valve is to be installed with stem in vertical position. Horizontal type resilient seat gate valve is to be installed with valve stem in horizontal position and shaft of enclosed beveled gear box in vertical position.

Joints are to be watertight.

Valves, including mechanical joint glands, installed on metallic and non-metallic pipe shall be wrapped with polyethylene encasement and sealed with polyethylene tape.

Special attention is to be paid to backfill material placed under resilient seat gate valve to ensure that it is well compacted for bedding resilient seat gate valve.

Valve box is to be carefully set over stem or beveled gear shaft. Valve box is to be braced to ensure that it remains in proper vertical position and centered on valve stem during and after backfilling operation. Valve box top section is to be adjusted for elevation, and base centered over operating nut. Top of valve box is to be flush with finished surface. Backfilling of trench is to be done in manner so as to avoid damage to resilient seat gate valve and valve box.

Proper alignment and height of valve box is to be maintained until completion of Project.

REVISED September 2, 2019

SECTION 15111 - SALVAGE EXISTING WATER VALVE

1 DESCRIPTION

Work consists of removing and salvaging existing water valve as required in Contract Documents and as directed by Engineer.

Work is to be in conformance with requirements of Section 01180 General Water Provisions.

2 MATERIALS

None specified.

3 CONSTRUCTION DETAILS

On existing water main pipe to be abandoned, existing water valve to be salvaged shall be removed, cleaned of extraneous debris and delivered to the Water Superintendent at the Cheshire Water Department Pump House, Pump House Road, Cheshire, MA.

After removal of water valve, open ends of abandoned water main pipe are to be plugged with concrete, completely filling abandoned water main pipe to minimum depth of 12 inches.

REVISED September 2, 2019

SECTION 15112 - CORPORATION STOP AND CONNECTION; ABANDON EXISTING WATER SERVICE AT TAP (2 INCH AND SMALLER)

1 DESCRIPTION

Work consists of the installation of a new corporation stop or the abandonment of an existing water service as required in the Contract Documents and as directed by the Engineer.

Work is to be in conformance with the requirements of Section 01180 General Water Provisions.

2 MATERIALS

For new service taps: size of tap, corporation stop and service saddle for new water services shall be the same nominal size as the new water service tubing, unless otherwise noted.

2.01 Corporation Stop

For copper water service tubing - corporation stop is to be cast brass ball valve type with inlet being AWWA taper threads and outlet fitted for flared couplings.

For polyethylene water service tubing - corporation stop is to be cast brass ball valve type with inlet being AWWA taper threads and outlet fitted for quick joint compression couplings.

2.02 Water Service Saddle

For water service connecting to iron water main, water service saddle is to be double strap all brass tapping saddle with Buna-N (Nitrile) or EPDM rubber gaskets and AWWA tapered threads.

For water service connecting to PVC/PVCO water main, water service saddle is to be wide strap all brass tapping saddle with Buna-N (Nitrile) or EPDM rubber gaskets and AWWA tapered threads

Taps for HDPE water main shall require the Contractor to submit proposed methods and materials to the Water Department for approval.

2.03 Drilling/Tapping Machine and Tools

Tap is to be made with drilling/tapping machine specially designed for the intended work and must be in good working condition. Hand-held drills are not to be used for making taps.

Tapping machine is to be capable of attaching to and cutting through corporation stop, and is to be designed to operate with drilling/cutting tools required for the specific pipe material being tapped. When tapping PVC/PVCO water main pipe, cutting tool is to be a core cutter with minimum of two exit slots, which retains coupon after penetration of water pipe, and also has sufficient throat depth to cut heavy walled water pipe. For PVC/PVCO mains, core cutter sizes shall be as follows:

Tap Size on PVC/PVCO Water Main	Minimum Diameter of Core Cutter
1-inch	7/8-inch
1-1/2-inch	1-3/8-inch
2-inch	1-3/4-inch

3 CONSTRUCTION DETAILS

3.01 General

Tap shall be made with a tapping machine and in accordance with the requirements of ANSI/AWWA C600 for ductile iron pipe and ANSI/AWWA C605 for polyvinyl pipe.
Only equipment specially designed for this purpose and that is in good working condition shall be used.

In no case shall a hand-held drill be used for making taps.

Tap shall be made on the customer's side of the water main at an angle between 5 and 15 degrees up from the horizontal centerline of the main. Tap shall be no closer than 2 feet from back end of bell or spigot insertion line. Multiple taps shall be staggered at least 18 inches apart lengthwise.

Do not tap curved PVC/PVCO water pipe.

When drilling, care shall be taken to completely cut through the water pipe wall. Thoroughly clean all tapped threads, making sure to remove any remnants of water pipe materials.

Threaded end of corporation stop shall be wrapped with Teflon tape and corporation stop threaded into tapped hole and tightened so as to be watertight. For leaking corporation stops, repeat process as necessary until a successful installation is made.

Backfilling of the trench shall be done in a manner so as to avoid damage to the corporation stop.

For water main pipe that is wrapped in polyethylene, method of making direct tap shall consist of applying two or three wraps of polyethylene adhesive tape completely around the water main pipe to cover the area where the tapping machine and chain will be mounted to minimize possible damage to the polyethylene during the direct tapping procedure. After the tapping machine is mounted, install corporation stop directly through the tape and polyethylene. After direct tap is completed, entire circumferential area of the polyethylene should be closely inspected for damage, making any repairs as needed.

Contractor is prohibited from tapping either the backside or top of the water main pipe.

3.02 Water Service Saddle

On ductile or cast iron water main pipe, saddle shall be used in conjunction with a tap when the tap size exceeds the following:

Water Pipe Size	Maximum Tap Size allowed without Service Saddle
4 to 6 inch	all taps require saddle
8 to 10 inch	3/4 inch
12 inch	1 inch
16 inch or larger	1-1/2 inch

All taps on PVC/PVCO water main shall require service saddles. Saddle tap and corporation stop sizes for PE services on PVC/PVCO water mains shall conform to the following:

PE Water Service Size	Saddle Tap Size	Corporation Stop Size
1 inch	1 inch	1 inch
1-1/2 inch	1-1/2 inch	1-1/2 inch
2 inch	2 inch	2 inch

3.03 Abandon Existing Water Service at Tap

Existing corporation stop shall be completely closed before the water service line is disconnected at the existing corporation stop. After removal of the service line from the corporation stop, a bronze cap or plug shall be installed on the outlet side of the corporation stop. If the water service line cannot be removed without damaging the existing corporation stop and/or creating a leak, the water service line shall be sawed off at the existing corporation stop. Nut on the bottom of the existing corporation stop, if present, shall be completely tightened. If the existing corporation stop leaks when fully closed or after being tightened, the existing corporation stop shall be completely plugged as approved by the Engineer. The curb box shall be removed and properly disposed of with no additional payment.

Existing curb boxes found on previously abandoned water services shall be removed and payment made under Section 15113 Curb Stop and Box.

REVISED September 2, 2019

SECTION 15113 - CURB STOP AND BOX

1 DESCRIPTION

Work consists of the installation of new curb stops and curb boxes, adjusting existing curb boxes, removal of existing curb boxes, removal of existing water meter pits, or adjusting existing water meter pits as required in the Contract Documents and as directed by the Engineer.

Work is to be in conformance with requirements of Section 01180 General Water Provisions.

2 MATERIALS

2.01 Curb Stop

For copper water service tubing, curb stop is to be open left ball valve type with cast brass body, “O” ring seals fitted with flared couplings for copper water service tubing connections, and is to include water service line insulator which is to be located on customer’s (downstream) side of curb stop.

For polyethylene water service tubing, curb stop is to be open left ball valve type with cast brass body, “O” ring seals fitted with quick joint compression couplings for polyethylene water service tubing connections.

2.02 Water Service Line Insulator

Water service line insulator is to be installed for purpose of providing protection against electrical shock and water service line electrolysis by stray electric current, and is to be made and supplied by manufacturer of curb stop. Water service line insulator is to be made from nylon, with high dielectric, compressive and impact strength characteristics. Nylon is to be inert and recommended for water service applications. Water service line insulator is to be supplied with necessary fittings that permit connection between curb stop and existing water service tubing. Insulator will not be necessary if connecting to a non-metallic inside water service. Insulator is required only where new copper water services are installed.

2.03 Curb Box

Curb box is to be two piece 2-1/2 inch new style screw extension type curb box capable of extending to at least 5 feet 4 inches. Service box screw extension may be required for greater depths. Curb box is to consist of cast or ductile iron screw top section and cast iron, ductile iron or white injection molded plastic screw bottom section, new style, heavy duty, cast or ductile iron flush fit cover, stationary rod, centering ring and pin. For 1-1/2 inch and 2 inch curb stop, curb box is to be supplied with enlarged base. All metallic components are to be heavily coated with asphalt base paint.

Curb box cover is to be cast, with word "WATER" cast into top of cover. Curb box cover is to be supplied with brass pentagon shaped head bolt.

3 CONSTRUCTION DETAILS

3.01 General

Existing curb box that is found to be defective shall be replaced as directed by the Engineer

Upon completion of the work, excavation shall be backfilled and disturbed surface area restored.

3.02 Installation

New curb stop shall be placed in the trench on a precast solid concrete block support at an elevation to provide a minimum cover of 4 feet 6 inches.

Curb stop shall be installed complete with water service pipe insulator positioned on customer's (downstream) side of curb stop. Water service line insulator shall be installed in conformance with manufacturer's and AWWA recommendations.

Overall installation shall be tested for leaks under line pressure in the presence of the Engineer prior to backfilling, and all connections made watertight and free from leakage.

Curb box shall be carefully set and braced to insure that it remains in a vertical position centered on the curb stop during and after backfilling. Proper alignment and height of curb box shall be maintained, until completion of the Project. Top of curb box shall be flush with the finished grade. Backfilling of the trench shall be done in a manner so as to avoid damage to water service pipe and curb stop and box.

3.03 New Curb Stop and Box at New Water Service

New curb stop and box shall be connected to the new water service pipe as required, and existing curb stop and box removed. Cost of removing existing curb stop and box shall be included in Section 02515 Water Service Pipe (2 inch and Smaller).

S3.04 New Curb Stop and Box at Existing Water Service

Existing water service shall be shut off at corporation stop. Existing curb stop and box disconnected and removed, and new curb stop and box connected to the existing water service.

3.05 Replace Existing Curb Box Assembly

Existing curb box assembly shall be replaced with a new curb box assembly. Prior to installation, curb stop shall be checked for proper operation.

3.06 Adjust Existing Curb Box Assembly

Existing curb box shall be adjusted to finished grade. Prior to adjusting existing curb box, the Water Superintendent will check existing curb box to insure that it is functioning properly, and check existing curb stop that shut off rod is properly attached.

3.07 Remove Existing Curb Box Assembly

Existing curb box assembly on abandoned water service shall be removed and disposed of.

S914.25	Remove Existing Water Meter Pit	Each
S914.26	Remove Existing Water Meter Pit (Including Excavation and Backfill)	Each
S914.27	Remove Existing Water Meter Pit (Including Excavation, Backfill and Surface Restoration)	Each

REVISED September 2, 2019

SECTION 15120 - BELL JOINT LEAK CLAMP

1 DESCRIPTION

Work consists of the installation of new bell joint leak clamps on existing cast iron water main bell and spigot joints as required in the Contract Documents and as directed by the Engineer.

Work is to be in conformance with the requirements of Section 01180 General Water Provisions.

2 MATERIALS

2.01 Bell Joint Leak Clamp

Bell joint leak clamp bell and spigot rings shall be ductile iron in conformance with the requirements of ASTM 536, with fusion bonded epoxy coating.

Gaskets are to be SBR or Nitrile (Buna N) rubber or other rubber compound suitable for use with potable water.

Bolts and nuts shall be fluorocarbon coated, cold formed, high strength, low alloy steel in accordance with ANSI/AWWA C111/A21.11.

3 CONSTRUCTION DETAILS

Prior to ordering the bell joint leak clamp, the Contractor shall be responsible for measuring the outside diameter of the existing water pipe for proper sizing of the clamp. Excavation is normally required to obtain this measurement. Extended lead time may be required for delivery of clamp from the manufacturer.

Contractor shall locate the existing water pipe joint, and carefully excavate to expose the water pipe joint enough to install the new bell joint leak clamp. Existing water pipe shall be braced and supported as directed by the Engineer to maintain the structural integrity of the existing water pipe. Clean pipe joint thoroughly on back of bell, on bell face and on spigot where gasket will seat. Dirt, loose rust and scale must be removed from the gasket seating area. On caulked lead joints, if the caulking material extends beyond the face of the bell, excess caulking should be carefully removed. If the caulking is recessed more than 1/8-inch, it should be faced up to the bell with a suitable material.

New bell joint leak clamps shall be installed according to the manufacturer's instructions and as directed by the Engineer. All bolts and nuts on each bell joint leak clamp shall be evenly tightened with the proper torque, with no evidence of leakage occurring at the joint.

Placement of the pipe bedding material and backfilling of the trench shall be done in a manner so as to avoid damage to the water pipe and bell joint leak clamp, and in accordance with Section 15140 Water Main Pipe and Fittings.

REVISED September 2, 2019

SECTION 15140 - WATER MAIN PIPE AND FITTINGS

1 DESCRIPTION

Work consists of installation of water main pipe and fittings as required in Contract Documents and as directed by Engineer.

Work is to be in conformance with requirements of Section 01180 General Water Provisions.

2 MATERIALS

2.01 Ductile Iron Pipe and Fittings

Ductile iron pipe shall be Class 52 or Class 56, as indicated in Contract Documents, in conformance with requirements of ANSI/AWWA C151/A21.51, as supplied by the Town of Cheshire.

Fittings shall be ductile iron in conformance with requirements of ANSI/AWWA C110/A21.10 for full body fittings, and ANSI/AWWA C153/A21.53 for compact fittings. Fittings for ductile iron pipe that is 4 inches through 24 inches in diameter shall have rated working pressure of 350 pounds per square inch. Fittings for ductile iron pipe that is 30 inches through 48 inches in diameter shall have rated working pressure of 250 pounds per square inch.

Ductile iron pipe and fittings shall be of good quality, strength, of even grain, and soft enough to permit drilling and cutting. Each section of ductile iron pipe shall be free from any defects which would make it unfit for intended use. Ductile iron pipe shall be straight, and true circle in section with concentric inner and outer surfaces. Ductile iron pipe section to be cut during installation shall be fully gauged for field cutting. Ductile iron pipe metal shall be made without any admixture of cinder iron or other inferior material.

Interior of ductile iron pipe and fittings shall be cement mortar lined or epoxy coated. Cement mortar lined ductile iron pipe and fittings shall have interior lined with double thickness of cement mortar in conformance with requirements of ANSI/AWWA C104/A21.4, and have an asphalt coating on interior lining and exterior of pipe and fittings. Epoxy coated fittings shall have interior and exterior coated with 6 mil to 8 mil nominal thickness of fusion bonded epoxy in conformance with requirements of ANSI/AWWA C550 and C116/A21.16. Chips or breaks in the epoxy coating shall be repaired in the field by petrolatum wax tape coating system.

Joints shall be rubber gasketed Tyton Joint® push-on, mechanical joint, or mechanical joint anchoring type. Gaskets shall be made of SBR rubber. For ductile iron water main and fittings located within petroleum hydrocarbon and/or chlorinated solvent contaminated soils, gaskets shall be made of oil resistant Buna-N (Nitrile) rubber. When contaminated soil is encountered unexpectedly in the field, Contractor shall immediately notify Engineer. All joints shall be in conformance with requirements of ANSI/AWWA C111/A21.11.

Joint restraint devices or anchor pipe shall be required in conjunction with concrete thrust blocking at points of change in direction of flow and at new hydrant branches. Restraining device is to be installed according to manufacturer's instructions. Restraining device is to have epoxy coating or approved equivalent. Hardware shall be coated with blue fluorocarbon coating, 304 stainless steel or approved equivalent.

Follower gland for mechanical joint ductile iron pipe shall be in conformance with requirements of ANSI/AWWA C151/A21.51.

2.02 Polyethylene Tube Encasement for Ductile Iron Pipe

Polyethylene tube encasement for direct bury of ductile iron pipe 4 inches and larger in size shall consist of linear low-density polyethylene film 8 mil minimum thickness and polyethylene adhesive tape. Material and installation procedures shall be in conformance with requirements of ANSI/AWWA C105/A21.5.

2.03 C900 Polyvinyl Chloride (PVC) Pipe and Fittings

When specified, PVC pipe shall be designation DR 14 pressure class 305 pipe in sizes 4 inch through 12 inch in diameter, blue in color, and in conformance with requirements of AWWA C900 Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch for Water Distribution.

PVC pipe and fittings shall be of good quality and strength and be homogenous throughout, with inside and outside surfaces being free of sticky or tacky material. PVC pipe and fittings shall be free of blisters, cracks, cuts, foreign inclusions, holes, nicks, significant scratches, voids, and other defects that may affect overall integrity of PVC pipe and fittings. PVC pipe or fittings having any indication of cracking or crazing inside or outside shall be rejected. PVC pipe shall be straight and true circle in section with concentric inner and outer surfaces. Joining surfaces of PVC pipe spigots and integral-bell and sleeve-reinforced bell sockets shall be free of imperfections that might cause leakage at joints. PVC pipe shall be manufactured to cast iron pipe equivalent outside diameters to allow direct connection into cast iron and ductile iron pipe and fittings.

Fittings for PVC pipe sizes 4 inches through 12 inches in diameter shall be PVC injection molded fittings in conformance with requirements ANSI/AWWA C907.

Joints shall be SBR rubber gasket push-on type. For PVC water main and fittings located within petroleum hydrocarbon and/or chlorinated solvent contaminated soils, gaskets shall be made of oil resistant Buna-N (Nitrile) rubber. When contaminated soil is encountered unexpectedly in the field, Contractor shall immediately notify Engineer.

Mechanical joint restraint mechanism shall be required in conjunction with concrete thrust blocking at points of change in direction of flow and at new hydrant branches. Mechanical harness restraint shall be used for push-on joints.. Mechanical joint restraint mechanism shall have epoxy coating or approved equivalent. Hardware shall be coated with blue fluorocarbon coating, 304 stainless steel or approved equivalent. All mechanical joints on ductile iron fittings for PVC water main shall require mechanical restraint.

Ductile iron or cast iron fittings may be substituted for PVC fittings upon approval by the Water Superintendent. When so approved, non-epoxy coated ductile and cast iron fittings on PVC or PVCO water mains are to be covered with protective wax tape coating and all non-epoxy coated ductile and cast iron fitting on PVC/PVCO pipe shall be cathodically protected with a 9 pound anode thermite welded to the fitting.

2.04 C906 High Density Polyethylene (HDPE) Pipe and Fittings

HDPE pipe and fittings shall be designation DR 9 pressure class 200 pipe in sizes 4 inches through 20 inches in diameter, color striped blue, and in conformance with requirements of AWWA C906 Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 inch and larger for Water Distribution. HDPE pipe and fittings shall be made from resin meeting requirements of Plastic Pipe Institute (PPI) as PE3408. Resin material shall be in conformance with requirements of ASTM D3350 cell classification of 345464C.

HDPE pipe and fittings shall be of good quality and strength and be homogenous throughout, with inside and outside surfaces being semi-matte to glossy in appearance and free of sticky or tacky material. HDPE pipe and fittings shall be free of blisters, cracks, cuts, foreign inclusions, holes, nicks, significant scratches, voids, and other defects that may affect overall integrity of HDPE pipe and fittings. HDPE pipe or fittings having any indication of cracking or crazing inside or outside shall be rejected. HDPE pipe shall be straight and true circle in section with concentric inner and outer surfaces. Joining surfaces of HDPE pipe spigots and integral-bell and sleeve-reinforced bell sockets shall be free of imperfections that might cause leakage at joints. HDPE pipe shall be manufactured to cast iron pipe equivalent outside diameters to allow direct connection into cast iron and ductile iron pipe and fittings when necessary.

Fittings for HDPE pipe sizes 4 inches through 8 inches in diameter shall be thermal butt fusion molded fittings designation DR 11 with pressure rating of 160 pounds per square inch; except that 22½ degree bends may be fabricated fittings made of designation DR 9 HDPE pipe. Fittings for HDPE pipe 10 inches through 20 inches in diameter shall be thermal butt fusion fabricated fittings made of designation DR 9 HDPE pipe.

Electro fusion couplings, adapters and fittings shall be designation DR 11 or better and shall be installed according to the manufacturer's instructions.

Mechanical joint adapters shall be required for installation of mechanical joint valves, hydrants and metallic fittings. Mechanical joint adapters shall have same rating, material designation and standards equivalent to HDPE pipe. Mechanical joint adapters shall be equipped with stainless steel pipe stiffener insert, ductile iron gland ring, gasket and attachment bolts and nuts. Mechanical joint adapters shall be installed according to manufacturer's instructions.

Mechanical joints shall require SBR rubber gaskets.

Where joints cannot be made by thermal butt fusion or by mechanical joint adapter, mechanical joint restraint mechanism shall be required in conjunction with concrete thrust blocking at points of change in direction of flow. Mechanical joint restraint mechanism shall have epoxy coating or approved equivalent. Hardware shall be coated with blue fluorocarbon coating, 304 stainless steel or approved equivalent.

Mechanical joint restraint mechanism shall require pipe stiffener of sufficient length to support full bearing length of restrainer and prevent toe-in of pipe end. Pipe stiffener shall be made of T-304 stainless steel, 8 inches long, with reinforcing wedge. Pipe stiffener shall match DR designation of pipe on which it is to be used, and shall be installed according to manufacturer's instructions.

Small taps 3/4 inch through 3 inch in diameter on HDPE pipe shall be accomplished by Electro fusion transition tapping saddles equipped with internal AWWA brass threads.

For connecting HDPE pipe to ductile iron pipe or PVC pipe, connection shall be made by an adapter kit which includes HDPE bell mechanical joint fitting with stainless steel reinforcing collar, C-110 heavy body ductile iron gland ring, gasket and extra length T-bolts. Installation shall be made with mechanical joint restraining mechanism for ductile iron or PVC pipe. Adapter kit shall be installed according to manufacturer's instructions.

Use of ductile iron and cast iron fittings may be substituted for HDPE fittings upon approval by the Water Superintendent. When so approved, non-epoxy coated ductile and cast iron fittings on HDPE water main are to be covered with protective wax tape coating and all ductile and cast iron fitting on HDPE pipe shall be cathodically protected with a 9 pound magnesium anode thermite welded to the fitting.

2.05 C909 Molecularly Oriented Polyvinyl Chloride (PVCO) Pipe and Fittings

PVCO pipe shall be designation pressure class 235 CIOD pipe in sizes 4 inches through 12 inches in diameter, blue in color. PVCO pipe is to be in conformance with requirements of AWWA C909 Standard for Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, for Water Distribution.

PVCO pipe shall be of good quality and strength and be homogenous throughout, with inside and outside surfaces being free of sticky or tacky material. PVCO pipe shall be free of blisters, cracks, cuts, foreign inclusions, holes, nicks, significant scratches, voids, and other defects that may affect overall integrity of PVCO pipe. PVCO pipe having any indication of cracking or crazing inside or outside shall be rejected. PVCO pipe shall be straight and true circle in section with concentric inner and outer surfaces. Joining surfaces of PVCO pipe spigots and integral-bell and sleeve-reinforced bell sockets shall be free of imperfections that might cause leakage at joints. PVCO pipe shall be manufactured to cast iron pipe equivalent outside diameters to allow direct connection into cast iron and ductile iron pipe and fittings.

Fittings for PVCO pipe sizes 4 inches through 12 inches in diameter shall be PVC injection molded fittings in conformance with requirements ANSI/AWWA C907.

Joints shall be SBR rubber gasket push-on type. When petroleum hydrocarbon or chlorinated solvent contaminated soils are encountered unexpectedly in the field, ductile iron pipe with nitrile gaskets or PVC pipe with nitrile gaskets shall be used in place of PVCO pipe.

Mechanical joint restraint mechanism shall be required in conjunction with concrete thrust blocking at points

of change in direction of flow and at new hydrant branches.. Mechanical harness restraint shall be for push-on joints. Mechanical joint restraint mechanism shall have epoxy coating or approved equivalent. Hardware shall be coated with blue fluorocarbon coating, 304 stainless steel or approved equivalent. All mechanical joints on ductile iron fittings for PVCO water main shall require mechanical restraint.

Ductile iron or cast iron fittings may be substituted for PVC fittings upon approval by the City Water Bureau. When so approved, non=epoxy coated ductile and cast iron fittings on PVC/PVCO water main are to be covered with protective wax coating and all ductile and cast iron fittings on PVC/PVCO pipe shall be cathodically protected with a 9 pound magnesium anode thermite welded to the fitting.

2.06 Petrolatum Wax Tape Coating System for Metallic Fittings to be used with Polyvinyl Chloride (PVC) Pipe, Molecularly Oriented Polyvinyl Chloride (PVCO) Pipe and High Density Polyethylene (HDPE) Pipe

The primer and wax tape coating shall be in accordance with ANSI/AWWA C217. Wax tape coating system shall be composed of synthetic fabric, saturated with blend of petroleum wax, plasticizers and corrosion inhibitors. Wax tape coating system shall consist of primer paste and petrolatum tape.

2.07 Tracer Wire for Polyvinyl Chloride (PVC) Pipe, Molecularly Oriented Polyvinyl Chloride (PVCO) Pipe and High Density Polyethylene (HDPE) Pipe

Tracer wire shall be designed specifically for detecting buried utilities. Tracer wire for open cut installation shall be minimum of one (1) - 12 AWG copper wire, solid, coated with a blue colored minimum 30 mil high molecular weight polyethylene insulation (HDPE or HMWPE). Tracer wire for trenchless water main shall consist of minimum two (2) wires or as shown on plans and shall be minimum 12 AWG copper clad steel core wire, solid, with a blue 45 mil HDPE insulation.

2.08 Tracer Wire Termination Box

Termination box shall be cathode protection test box. Termination box shall be 4 feet long, have shaft size of 4 inches inside diameter, body made of ABS plastic flared at bottom, with cast iron rim and flush fit drop-turn locking lid with words "WATER TEST" cast on top of lid. Non-conductive terminal board designed for minimum of two stainless steel terminal connections shall be attached to inside of lid.

If termination box is to be installed in paved area, termination box shall be installed within 7 inch diameter valve box. Valve box shall be minimum 4 feet long cast iron, screw type with arched base, with word "WATER" cast on top of lid.

2.09 Impervious Clay Trench Plug

Impervious clay trench plug shall consist of a mixture of silt and clay soils free of rocks, stones and vegetation. All material shall pass through a 0.25 inch sieve and at least 95% by weight of the material shall pass through a #200 sieve. The hydraulic coefficient (coefficient of permeability) of the material shall be less than 1×10^{-6} cm/sec as measured using ASTM D5084.

3 CONSTRUCTION DETAILS

3.01 General

Water main pipe shall be installed in straight line horizontally and vertically. Deflection of water main pipe shall be achieved at pipe joints within manufacturer's allowable limits and with bend fittings. Water main pipe and fittings shall be handled in such manner that water main pipe and fittings, coatings and linings are not damaged. Nylon fabric choker sling capable of handling weight of water main pipe and fittings shall be used to lift, place and move water main pipe and fittings. Water main pipe and joints shall be uniformly supported and secured in place within required embedment material. Temporary support under water main pipe shall be removed upon securing water main pipe with permanent embedment material.

Refer to Section 3.02 for minimum cover over water main pipe and fittings, as measured between

finished grade and top of water main pipe and fittings.

Minimum vertical separation between crossing water main and sewer pipe lines is to be 18 inches when water main pipe passes under sewer pipe, or 6 inches when water main pipe crosses over sewer pipe, as measured from outside of respective pipes at point of crossing. One full standard laying length of water main pipe is to be centered under or over sewer pipe so that both joints of water main pipe will be as far from sewer pipe as possible. In addition, when water main pipe passes under sewer pipe, adequate structural support in form of compacted crushed stone bedding or class K concrete is to be provided for sewer pipe to prevent excessive deflection of sewer pipe joints and any settling of sewer pipe onto water main pipe.

Optimum minimum horizontal separation between parallel water main and sewer pipes, including manholes, vaults and junction chambers, is 10 feet as measured from outside of respective pipes, manholes, vaults and junction chambers. In no case is water main pipe to be installed less than 3 feet horizontally from parallel sewer pipe, including manholes, vaults and junction chambers.

Where water main pipe has less than minimum separation requirements either horizontally or vertically, all of joints of water main pipe located within 10 feet of sewer pipe are to be encased with controlled density fill material. Controlled density fill encasement is to be placed to minimum thickness of 6 inches around water main pipe for minimum length of 2 feet as centered on joint of water main pipe.

In all cases, where water main pipe crosses another utility, vertical separation shall not be less than 6 inches.

Tees, bends, offsets, reducers, caps, plugs and hydrants on water pipe shall be mechanically restrained and solidly braced to prevent any movement due to thrust pressure. Bracing shall be accomplished with use of cast-in-place concrete between fittings/hydrant and undisturbed soil. Water valves shall be mechanically restrained at both ends.

Disinfection/sampling taps are to be installed no more than 1,000 feet apart and at ends of all new water main installations.

Contractor is responsible for making sure that inside of pipe is clean and free of foreign material before pipe installation.

3.02 Ductile Iron Pipe and Fittings

Ductile iron pipe and fittings shall be installed in conformance with requirements of ANSI/AWWA C600, according to manufacturer's latest instructions, and as approved by Engineer.

Polyethylene tube encasement shall be installed on all ductile iron water mains, water services and hydrant branch pipe in conformance with ANSI/AWWA C105/A21.5.

Plugging, filing, burning-in or welding will not be allowed to repair any ductile iron pipe or fittings that have been damaged.

For ductile iron pipe, sizes 4-inch through 24-inch in diameter, 75-90 ft/lbs is recommended torque on nuts and 'T' bolts used for mechanical joints.

Install magnesium anodes as shown on drawings and as approved by Engineer.

The maximum allowable angular joint deflection for DIP pipe and DIP/Cast iron fittings shall not exceed the manufacturer's published limits.

Impervious clay trench plugs shall be installed around ductile iron pipe water mains and services where shown on the plans or as directed by the Engineer to stop the flow of contaminated groundwater through porous water main bedding and backfill material.

3.03 Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pipe and Fittings

PVC/PVCO pipe and fittings shall be installed in conformance with requirements of ANSI/AWWA C605, according to manufacturer's instructions, and as approved by Engineer.

Field cutting of PVC/PVCO pipe shall be made with square ends. Cut spigot end shall be re-beveled at same angle provided by factory-finished PVC/PVCO pipe using a manufacturer's approved beveling tool. On cut PVC/PVCO pipe an insertion line shall be marked on cut spigot end using factory marked spigot as guide. For connecting spigot end to shallow depth bell, such as mechanical joint valve and iron fitting, spigot end shall be cut so as to leave only slight bevel of 1/4 inch. Spigot end shall be inserted to full limit of shallow depth bell. For PVC (C900) pipe, sizes 4-inch through 24-inch in diameter, 75-90 ft/lbs is recommended torque on nuts and 'T' bolts used for mechanical joints. For PVCO (C909) pipe, 55 ft/lbs is recommended torque on nuts and 'T' bolts for mechanical joints.

In assembling PVC/PVCO pipe, gaskets and pipe ends shall be wiped clean and spigot end lubricated from beveled end to approximately mid-way from insertion line. If recommended by manufacturer, lubricant shall be applied inside bell, using lubricant that is supplied by manufacturer. Joining is complete when spigot end is inserted to insertion line. Care shall be taken not to over-insert spigot end into bell end. It is recommended newly laid pipe be partially backfilled before adding more pipe to minimize over-insertion of pipe joints on previously laid lengths of pipe. Joining shall not be made by use of heavy machinery.

The maximum allowable angular joint deflection for PVC/PVCO pipe and PVC fittings shall not exceed the manufacturer's published limits, which may be 1 degree or less.

Ductile iron or cast iron fittings shall be used when connecting PVC/PVCO pipe to existing ductile or cast iron pipe.

Taps 2 inches in diameter and smaller on PVC/PVCO pipe shall require wide strap, all brass tapping saddles manufactured for C900 PVC pipe. Refer to Section S912, Corporation Stop and Connection, Taps larger than 2 inches in diameter on PVC/PVCO pipe shall require tapping sleeve. Taps shall be made using equipment designed specifically for making taps on PVC/PVCO pipe. Tap shall be no closer than 2 feet from back end of bell or spigot insertion line. Multiple taps shall be staggered at least 18 inches apart lengthwise.

Asphalt coated metallic fittings installed on PVC/PVCO water main including tapping assemblies and hardware, shall be coated with petrolatum wax tape coating system applied in conformance with manufacturer instructions.

One nine pound anode shall be attached to all ductile and cast iron fittings on PVC/PVCO water pipe.

Precast concrete cement blocks or any hard objects shall not be used for thrust blocking or directly supporting PVC/PVCO water pipe.

3.04 High Density Polyethylene (HDPE) Pipe and Fittings

HDPE pipe and fittings shall be installed in conformance with manufacturer's instructions.

Field cutting of HDPE pipe shall be made with square ends.

Individual sections of HDPE water main pipe and fittings shall be joined together by thermal butt fusion method. Mechanical joining shall be used in locations where thermal butt fusion method cannot be used. Socket fusion, hot gas fusion, threading, solvent cements and adhesives such as epoxies shall not be used to join HDPE pipe. Electro fussed joining method may be used on fittings.

Thermal butt fusion procedures shall be in conformance with manufacturer's instructions and Plastic Pipe Institute (PPI). Fusion equipment operator shall be trained and certified in recommended procedure. Contractor shall be responsible to verify that fusion equipment is in good operating condition and that operator has been properly trained. Thermal butt fusion equipment shall be capable of meeting all conditions recommended by manufacturer, including, but not limited to, temperature requirements of 400°F,

alignment and an interfacial fusion pressure of 75 pounds per square inch. Butt fusion joining shall produce joint weld strength equal to or greater than tensile strength of HDPE pipe itself. Welds shall be made using Data Logger to record temperature and fusion pressure with graphic representation of fusion cycle and shall be part of Quality Control records. Thermal butt fusion and Electro fusion joining methods shall be done in dry environment. Individual sections of HDPE pipe should be joined into continuous lengths on job site above ground. Fusion beads shall not be removed from HDPE pipe.

For installation of mechanical joint adapters, bolts shall be tightened and torqued in conformance with manufacturer instructions.

Asphalt coated metallic fittings installed on HDPE water main including tapping assemblies and hardware, shall be coated with petrolatum wax tape coating system applied in conformance with manufacturer instructions. Hardware for epoxy coated fittings not having blue fluorocarbon coating will require petrolatum wax tape coating system.

Directional drilling method of pipe installation shall require the Contractor to record with survey grade accuracy and provide As Built map of the horizontal location and depth of pipe in reference to project stationing.

Thermite weld 9 pound magnesium anode to each metallic fitting.

3.05 Tracer Wire Installation with Polyvinyl Chloride (PVC) Pipe, Molecularly Oriented Polyvinyl Chloride (PVCO) Pipe and High Density Polyethylene (HDPE) Pipe

Tracer wire shall be installed along and above all PVC/PVCO/HDPE water pipe that is 4 inches in diameter and larger. Tracer wire shall be installed in such manner as to enable its detection with electronic locating equipment. Tracer wire shall be installed on top of PVC/PVCO/HDPE water pipe and shall be secured to water pipe with tape or plastic straps at 8 feet maximum intervals and at pipe bends. Tracer wire shall not be spiraled or otherwise wrapped around water pipe. At water service saddles, tracer wire shall be placed over and across water service saddle and water pipe. At valves, tracer wire shall be placed along the side of the water pipe so that the installation of a valve box will not damage the wire.

Tracer wire shall begin and terminate at all connections to existing metallic water pipes wherever possible. Tracer wire connections to existing metallic pipes shall be made with thermite weld. Thermite weld shall be completely sealed with a brush applied coats of an approved bitumastic coating specifically manufactured for underground use.

Route of tracer wire shall extend continuously along PVC/PVCO/HDPE water pipe, and shall be terminated at tracer wire termination box located near hydrant. Termination box shall be installed flush with finished grade and approximately 3 feet away from any given hydrant. Tracer wire shall extend up termination box and be connected to terminal board. Length of tracer wire extending up termination box shall be such that minimum of 3 feet of tracer wire can be coiled up and left tucked inside termination box.

Number of splices made on tracer wire shall be kept to minimum. Splices shall be made using an approved waterproof connector. Where polyethylene (PE) water services are installed with PVC/PVCO/HDPE water pipe, tracer wire for PE water service shall be spliced to tracer wire for PVC/PVCO/HDPE water main pipe, using an approved splice connector that slips over the main tracer wire without cutting it.

For directional drilling method of installing water main, Contractor shall attach tracer wires securely at beginning of pipe making sure wires will not become detached from pipe during drilling operation.

After installation of tracer wire on mains and services has been completed, the Contractor shall test the tracer wire for electrical continuity. Upon successful completion of system test, tracer wire system shall be checked for functionality by the Water Superintendent. Deficiencies in the tracer wire system shall be repaired by Contractor at no additional cost to the Town, and the tracer wire system shall be retested by Contractor.

3.06 Additional Fittings

If required, additional fittings shall be installed on new water main pipe that are not already shown in Contract Documents. Petrolatum wax tape coating system and one (1) 9-pound anode shall be installed on ductile and cast iron fittings on PVC/PVCO water main pipe.

3.07 Additional Concrete Thrust Blocks

If required, additional concrete thrust blocks shall be constructed that are not already shown to be constructed in Contract Documents.

REVISED September 2, 2019

APPENDIX D

BID PROPOSAL AND SURETY

Town of Cheshire, MA
Bid Proposal
Depot Street, Railroad Street and Mill Hill Road, Water Line Replacement – July 2022

The undersigned hereby declares that he has carefully examined all Bidding and Contract Documents and that he has personally inspected the actual location of the Work, together with the local sources of supply, has satisfied himself as to all the quantities and conditions, and understand that in signing this Bid he waives all right to plead any misunderstanding regarding the same.

Pursuant to and in compliance with Documents relating thereto, the Bidder hereby offers to furnish all plant, labor, materials, supplies, equipment and other facilities and things necessary or proper for, or incidental to the construction and completion of this Contract, as required by and in strict compliance with the applicable provisions of all Contract Documents, for the following unit and/or lump sum prices.

_____ _____

Contractor Bid (Words) Contractor Bid (Figures)

The undersigned further agrees to accept the unit prices, if any, set forth, as full payment for or the amount of credit to the owner for, any deletions, additions, modifications or changes to the portion or portions of Work covered by said unit prices.

The undersigned agrees to complete the Work by November **November 15, 2022** after the notice to proceed with the Work is issued. In the event the undersigned fails to complete the work within the specified time, or within the time to which such completion shall have been extended in accordance with the Contract Documents, he agrees to pay to the owner as liquidated damages the sum of $200 for each calendar day the Work is not completed plus such additional engineering and inspection expenses incurred by the Owner.

The undersigned will, within ten (10) calendar days after receipt of an Agreement from the Owner, execute and deliver the Contract or Contracts in the form of the Agreement attached hereto.

The undersigned hereby designates as his office address to which such notice of Award may be mailed, telegraphed or delivered:

_____

_____

The undersigned further agrees to comply with the requirements as to the conditions of employment, wage rates and hours of labor set forth in the Contract Documents.

This Bid may, be withdrawn at any time prior to the scheduled time for the opening of bids or any authorized postponement thereof.

The undersigned agrees that the following notices and/or addenda, which have been issued during the bidding period, have been received and have been considered both before and the preparation of this Bid and he further understands that failure to acknowledge any addenda will be sufficient basis for rejection of the Bid.

Addendum No. Date of Addendum

_____

_____

_____

Accompanying this proposal is bid security in the amount of 5%; said security is in the form of $_____ cash, $_____ certified check or checks, and $_____ Bid Bond which shall become the property of the Owner, if, in case this proposal shall be accepted by the Owner, the undersigned shall fail to execute a Contract with and give the required bonds and insurance to the Owner within ten (10) calendar days after Award.

_____

Dated Legal name of person, partnership, or corporation

By _____

Name and Title of Signatory

(Corporate seal, if no seal write "No Seal" across and sign).

Address_____

_____

_____

_____

Telephone No. _____

Town of Cheshire, MA
Bid Sheet
Depot Street, Railroad Street and Mill Hill Road, Water Line Replacement – July 2022

The Contractor shall insert prices for items both in words and in figures and is to show a total bid price. In the event of a discrepancy between the words and figures, the written words shall govern. In the event of an error in a bidders total bid amount, the corrected total bid obtained by the summation of the products of the unit prices multiplied by the respective quantities shall stand as the bidder's total bid price.

The Contractor is required to review any related plans, conduct a full site review, and read all the provisions in the document before inserting prices, and is further advised to make his own determination as to the accuracy of the estimated quantities before inserting bid prices.

All workmanship and materials are to be consistent with AWWA, MADEP, and other applicable codes, laws and regulations.

Item No.	Brief Description Unit or Lump Sum Price (in both words and figures)	**CONTRACT 1 - WATER MAIN IMPROVEMENTS**	
		Estimated Quantity[1], Unit	Total in Figures
BASE BID			
1	**WATER MAIN AND FITTINGS**		
1a	**Depot Street – install 8-inch ductile iron pipe and fittings, per linear foot (5' cover depth)**		
		550 LF	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
1b	**Railroad Street – install 8-inch ductile iron pipe and fittings, per linear foot (5' cover depth)**		
		410 LF	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
1c	**Mill Hill Road – install 8-inch ductile iron pipe and fittings, per linear foot (5' cover depth)**		
		520 LF	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
1d	**Additional fittings, per pound**		
		100 LB	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
2	**HYDRANTS AND VALVES**		
2a	**New hydrant assembly installed, per hydrant assembly**		
		1 EA	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		

Item No.	Brief Description Unit or Lump Sum Price (in both words and figures)	CONTRACT 1 - WATER MAIN IMPROVEMENTS	
		Estimated Quantity[(1)], Unit	Total in Figures
2b	**Existing Hydrant assembly, remove and reinstall**		
		2 EA	$
	Unit Price, Dollars and Cents (words) $ Unit Price in figures		
2c	**8-inch gate valves and box, per valve**		
		2 EA	$
	Unit Price, Dollars and Cents (words) $ Unit Price in figures		
3	**WATER SERVICE CONNECTIONS**		
3a	**1-inch corporation stops, per stop (labor)**		
		23 EA	$
	Unit Price, Dollars and Cents (words) $ Unit Price in figures		
3b	**1-inch curb stops, per stop (labor)**		
		23 EA	$
	Unit Price, Dollars and Cents (words) $ Unit Price in figures		
3c	**1-inch copper service line, per linear foot (labor)**		
		715 LF	$
	Unit Price, Dollars and Cents (words) $ Unit Price in figures		
4	**MAJOR WATER CONNECTIONS**		
4a	**3-way Intersection with 3 gate valves (Depot Street, Railroad Street and Mill Hill Road)**		
		1 LS	$
	Unit Price, Dollars and Cents (words) $ Unit Price in figures		
4b	**Connect new water main to existing gate valve (Railroad Street).**		
		1 LS	$
	Unit Price, Dollars and Cents (words) $ Unit Price in figures		

Item No.	Brief Description Unit or Lump Sum Price (in both words and figures)	CONTRACT 1 - WATER MAIN IMPROVEMENTS	
		Estimated Quantity[1], Unit	Total in Figures
4c	**Connection to existing at Depot Street**		
		1 LS	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
5	**ROCK EXCAVATION AND DISPOSAL**		
5a	**Rock excavation and disposal, per cubic yard**		
		100 CY	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
6	**MISCELLANEOUS EARTHWORK**		
6a	**Changes in earthwork, per cubic yard**		
		10 CY	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
6b	**Unsuitable Material, per cubic yard - removal**		
		10 CY	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
6c	**Additional crushed stone, per cubic yard**		
		10 CY	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
6d	**Test pits, per cubic yard**		
		50 CY	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
7	**SURFACE RESTORATION**		
7a	**Loaming and seeding, per lump sum**		
		1 LS	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		

Item No.	Brief Description Unit or Lump Sum Price (in both words and figures)	CONTRACT 1 - WATER MAIN IMPROVEMENTS	
		Estimated Quantity[1], Unit	Total in Figures
8	**PAVEMENT REPLACEMENT**		
8a	**Temporary trench pavement, per linear foot**		
		1848 LF	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
8b	**Additional Pavement per Ton**		
		10 TON	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
9	**SIDEWALK CONSTRUCTION AND REPLACEMENT**		
9a	**Bituminous sidewalk and ramps, per square foot**		
		100 S.F.	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
10	**SEWER AND DRAIN RECONSTRUCTION**		
10a	**Reconstruction of existing sewers, drains, and water mains, per reconstruction**		
		10 EA	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
11	**DUST CONTROL**		
11a	**Calcium chloride, per pound**		
		200 LB	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
12	**ENVIRONMENTAL PROTECTION**		
12a	**Silt fence, per linear foot**		
		300 LF	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		
13	**MOBILIZATION**		
13a	**Mobilization (not more than 5% of the total of all items), lump sum**		
		1 LS	$
	Unit Price, Dollars and Cents (words) $		
	Unit Price in figures		

The proposed contract price for the Base Bid, Items 1 through 13a is:	**CONTRACT 1 - WATER MAIN IMPROVEMENTS**	
		Total in Figures
		Total Bid in Figures
		Total Bid, Dollars and Cents (words)

DESCRIPTION OF WORK TASKS:

SECTION 1 - WATER MAIN AND FITTINGS

1a. Depot Street - 8-inch ductile iron pipe and fittings, per linear foot, labor and equipment only (5' cover depth)

1b. Railroad Street - 8-inch ductile iron pipe and fittings, per linear foot, labor and equipment only (5' cover depth)

1c. Mill Hill Road - 8-inch ductile iron pipe and fittings, per linear foot, labor and equipment only (5' cover depth)

1d. Additional fittings, per pound, labor and equipment only.

SECTION 2 - HYDRANTS AND VALVES

2a. New hydrant assembly, per hydrant assembly, labor and equipment only.

2b. Remove and reinstall existing hydrant.

2c. 8-inch gate valves and box, per valve, labor and equipment only

SECTION 3 - WATER SERVICE CONNECTIONS

3a. 1-inch corporation stops, per stop, labor only

3b. 1-inch curb stops, per stop, labor only

3c. 1-inch copper service line, per linear foot, labor only

SECTION 4 – MAJOR WATER CONNECTIONS

4a. 3-way Intersection with 3 gate valves (Depot Street, Railroad Street and Mill Hill Road)

4b. Railroad Street connection of new main to existing gate valve.

SECTION 5 - ROCK EXCAVATION AND DISPOSAL

5a. Rock excavation and disposal, per cubic yard

SECTION 6 - MISCELLANEOUS EARTHWORK

6a. Changes in earthwork, per cubic yard

6b. Removal of unsuitable material, per cubic yard

6c. Additional crushed stone for backfill, per cubic yard

6d. Test pits per cubic yard

SECTION 7 - SURFACE RESTORATION

7a. Loaming and seeding, per lump sum

SECTION 8 – PAVEMENT REPLACEMENT

8a. Temporary trench pavement, per linear foot

8b. Additional pavement, per ton

SECTION 9 - SIDEWALK CONSTRUCTION AND REPLACEMENT

9a. Bituminous sidewalk and ramps, per square foot

SECTION 10 - SEWER AND DRAIN RECONSTRUCTION

10a. Reconstruction of existing sewers, drains, and water mains, per reconstruction

SECTION 11 – DUST CONTROL

11a. Calcium chloride, per pound

SECTION 12 – ENVIRONMENTAL PROCETION

Work Task 12a. Silt fence, per linear foot.

SECTION 13 - MOBILIZATION

13a. Mobilization (not more than 5% of the total of all items), lump sum

STATEMENT OF SURETY'S INTENT

To:_____
(Owner)

We have reviewed the Bid of:

_____
(Contractor)

of_____
(Address)

for_____
(Project)

Bids for which will be received on

_____
(Bid Opening Date)

and wish to advise that should this Bid of the Contractor be accepted and the Contract awarded to him, it is our present intention to become surety on the performance bond and labor and material bond required by the Contract.

Any arrangement for the bonds required by the Contract is a matter between the Contractor and ourselves and we assume no liability to you or third parties if for any reason we do not execute the requisite bonds.

We are duly authorized to do business in the Commonwealth of Massachusetts.

Attest:

_____ _____
Surety's Authorized Signature(s)

Attach Power of Attorney

(Corporate seal if no seal write "No Seal" and sign.)
(This Form Must Be Completed and Submitted with the Bid)

ATTACH BID SECURITY HERE

APPENDIX E

NON-COLLUSION CERTIFICATION
AND
EXECUTIVE ORDER 481 CERTIFICATION

NON-COLLUSIVE BIDDING CERTIFICATION

By submission of this bid, the Bidder and each person signing on behalf of the Bidder, certify under penalty of perjury that to the best of knowledge and belief:

1. The prices in this bid, have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor.

2. Unless otherwise required by law, the prices which have been quoted in the bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and

3. No attempt has been made or will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

The foregoing statement is affirmed as true under penalty of perjury.

Name_____

Title_____

For the Bidder_____

Date_____

(Corporate seal, if no seal write “No Seal” sign)
(This Form Must Be Completed and Submitted with the Bid)

Issued March 2007

COMMONWEALTH OF MASSACHUSETTS

EXECUTIVE ORDER 481 - CONTRACTOR CERTIFICATION

PROHIBITING THE USE OF UNDOCUMENTED WORKERS ON STATE CONTRACTS

CONTRACTOR LEGAL NAME:
CONTRACTOR VENDOR/CUSTOMER CODE:

INSTRUCTIONS:

Executive Order 481 applies to all state agencies in the Executive Branch, including all executive offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established. As it is the policy of the Executive Branch to prohibit the use of undocumented workers in connection with the performance of state contracts, all contracts entered into after February 23, 2007 require that contractors, as a condition of receiving Commonwealth funds under any Executive Branch contract, make the following certification:

CONTRACTOR CERTIFICATION:

As evidenced by the signature of the Contractor's Authorized Signatory below, the Contractor certifies under the pains and penalties of perjury that the Contractor shall not knowingly use undocumented workers in connection with the performance of all Executive Branch contracts; that pursuant to federal requirements, the Contractor shall verify the immigration status of all workers assigned to such contracts without engaging in unlawful discrimination; and that the Contractor shall not knowingly or recklessly alter, falsify, or accept altered or falsified documents from any such worker(s). The Contractor understands and agrees that breach of any of these terms during the period of each contract may be regarded as a material breach, subjecting the Contractor to sanctions, including but not limited to monetary penalties, withholding of payments, contract suspension or termination.

_____ Date: _____
Contractor Authorizing Signature

_____
Print Name

Title:_____ Telephone: _____

Fax: _____ Email: _____

The Contractor is required to sign this Certification only once and may provide a copy of the signed Certification for any contract executed with an Executive Branch Department. A copy of this signed Certification must be attached to the "record copy" of all contracts with this Contractor that are filed with the contracting Department.

APPENDIX F

BONDS

ATTACH BONDS HERE

APPENDIX G

CONTRACTORS RESOLUTION

RESOLUTION ACCOMPANYING BID

(Corporate Bidders Only)

To the Town of Cheshire:

I HEREBY CERTIFY that the following is a true and correct copy of resolutions duly adopted at a meeting of the Board of Directors of _____, a corporation incorporated under the Laws of the State of Massachusetts duly called and held on the_____day of_____, 20____, a quorum then being present; that the said resolutions have been entered upon the regular minute book of the corporation and are in accordance with the certificate of incorporation and the by-laws and are now in full force and effect:

RESOLVED THAT_____be and hereby is authorized to sign and submit the bid proposal of this corporation for the following project:

_____

_____

and to include in such bid proposal the certificate as to non-collusion required by law as the act and deed of such corporation, and for all inaccuracies or misstatements in such certificate this corporation shall be liable under the penalty of perjury; and to enter into the contract if awarded to this corporation;

RESOLVED that the following officer(s) of this corporation is/are authorized on behalf of this corporation to sign the bid proposal and the contract:

_____
(Authorized Officer(s))

I FURTHER CERTIFY that the names of the persons holding titles referred to in the foregoing resolutions are as follows:

NAME	TITLE
_____	_____
_____	_____
_____	_____

Secretary:_____

Dated:_____

(Corporate Seal, if no seal write “No Seal” and sign)
(This Form Must Be Completed and Submitted with the Bid)

APPENDIX H

PAYROLL FORMS
AND
MINIMUM AND PREVAILING WAGE RATES

WEEKLY PAYROLL RECORDS REPORT
& STATEMENT OF COMPLIANCE

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

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

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

STATEMENT OF COMPLIANCE

_____, 20_____

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

do hereby state:

That I pay or supervise the payment of the persons employed by

_____ on the _____
(Contractor, subcontractor or public body) (Building or project)

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

Signature _____

Title _____

05/14

MASSACHUSETTS WEEKLY CERTIFIED PAYROLL REPORT FORM

Company's Name:	Address:	Phone No.:		Payroll No.:
Employer's Signature:	**Title:**	**Contract No:**	**Tax Payer ID Number**	**Work Week Ending:**
Awarding Authority's Name:	**Public Works Project Name:**	**Public Works Project Location:**		**Min. Wage Rate Sheet Number**
General / Prime Contractor's Name:	**Subcontractor's Name:**		**"Employer" Hourly Fringe Benefit Contributions**	

Employee Name & Complete Address	Work Classification:	Employee is OSHA 10 certified (?)	Appr. Rate (%)	Hours Worked							Project Hours (A)	Hourly Base Wage (B)	Health & Welfare Insurance (C)	ERISA Pension Plan (D)	(B+C+D+E) Supp. Unemp. (E)	(A x F) Total Hourly Prev. Wage (F)	Project Gross Wages / Total Gross Wages	Check No. (H)
				Su.	Mo.	Tu.	We.	Th.	Fr.	Sa.	All Other Hours							

Are all apprentice employees identified above currently registered with the MA DLS's Division of Apprentice Standards? YES ☐ NO ☐

For all apprentices performing work during the reporting period, attach a copy of the apprentice identification card issued by the Massachusetts Department of Labor Standards / Division of Apprentice Standards. No apprentices are identified above ☐

NOTE: Pursuant to MGL c. 149, s. 27B, every contractor and subcontractor is required to submit a **true and accurate** copy of their certified weekly payroll records to the awarding authority by first-class mail or e-mail. In addition, each weekly payroll must be accompanied by a statement of compliance signed by the employer. Failure to comply may result in the commencement of a criminal action or the issuance of a civil citation.

Page _____of_____

Date Received by Awarding Authority
/ /

PREVAILING WAGE RATES

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

Prevailing Wage Rates

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

CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

ROSALIN ACOSTA
Secretary

MICHAEL FLANAGAN
Director

Awarding Authority: Town of Cheshire

Contract Number:

City/Town: CHESHIRE

Description of Work: Upgrade of water mains and water services in area of Mill Hill Road, Depot Street and Railroad Street, in Cheshire, MA. Installation of up to 1,700 l.f. of 8" cement lined ductile iron water main.

Job Location: Mill Hill, Depot Street and Railroad Street

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

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

Issue Date: 07/08/2022 **Wage Request Number:** 20220708-008

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$35.95	$13.41	$16.01	$0.00	$65.37
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.02	$13.41	$16.01	$0.00	$65.44
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.14	$13.41	$16.01	$0.00	$65.56
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$30.23	$9.10	$13.62	$0.00	$52.95
	12/01/2022	$31.04	$9.10	$13.62	$0.00	$53.76
	06/01/2023	$31.86	$9.10	$13.62	$0.00	$54.58
	12/01/2023	$32.67	$9.10	$13.62	$0.00	$55.39
	06/01/2024	$33.49	$9.10	$13.62	$0.00	$56.21
	12/01/2024	$34.30	$9.10	$13.62	$0.00	$57.02
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2021	$31.12	$9.10	$14.69	$0.00	$54.91
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASBESTOS WORKER (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)*	12/01/2020	$34.29	$12.80	$8.95	$0.00	$56.04
ASPHALT RAKER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.73	$9.10	$13.62	$0.00	$52.45
	12/01/2022	$30.54	$9.10	$13.62	$0.00	$53.26
	06/01/2023	$31.36	$9.10	$13.62	$0.00	$54.08
	12/01/2023	$32.17	$9.10	$13.62	$0.00	$54.89
	06/01/2024	$32.99	$9.10	$13.62	$0.00	$55.71
	12/01/2024	$33.80	$9.10	$13.62	$0.00	$56.52
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2021	$30.62	$9.10	$14.69	$0.00	$54.41
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
AUTOMATIC GRADER-EXCAVATOR (RECLAIMER) *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$38.74	$12.47	$14.50	$0.00	$65.71
	12/01/2022	$39.62	$12.47	$14.50	$0.00	$66.59
	06/01/2023	$40.57	$12.47	$14.50	$0.00	$67.54
	12/01/2023	$41.52	$12.47	$14.50	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER OPERATOR *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$38.74	$12.47	$14.50	$0.00	$65.71
	12/01/2022	$39.62	$12.47	$14.50	$0.00	$66.59
	06/01/2023	$40.57	$12.47	$14.50	$0.00	$67.54
	12/01/2023	$41.52	$12.47	$14.50	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.73	$9.10	$13.62	$0.00	$52.45
	12/01/2022	$30.54	$9.10	$13.62	$0.00	$53.26
	06/01/2023	$31.36	$9.10	$13.62	$0.00	$54.08
	12/01/2023	$32.17	$9.10	$13.62	$0.00	$54.89
	06/01/2024	$32.99	$9.10	$13.62	$0.00	$55.71
	12/01/2024	$33.80	$9.10	$13.62	$0.00	$56.52

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
BATCH/CEMENT PLANT - ON SITE *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$38.21	$12.47	$14.50	$0.00	$65.18
	12/01/2022	$39.09	$12.47	$14.50	$0.00	$66.06
	06/01/2023	$40.04	$12.47	$14.50	$0.00	$67.01
	12/01/2023	$40.99	$12.47	$14.50	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$30.23	$9.10	$13.62	$0.00	$52.95
	12/01/2022	$31.04	$9.10	$13.62	$0.00	$53.76
	06/01/2023	$31.86	$9.10	$13.62	$0.00	$54.58
	12/01/2023	$32.67	$9.10	$13.62	$0.00	$55.39
	06/01/2024	$33.49	$9.10	$13.62	$0.00	$56.21
	12/01/2024	$34.30	$9.10	$13.62	$0.00	$57.02
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)* For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2021	$31.12	$9.10	$14.69	$0.00	$54.91
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2020	$46.10	$7.07	$17.98	$0.00	$71.15

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$29.97	$7.07	$11.69	$0.00	$48.73
2	65	$29.97	$7.07	$11.69	$0.00	$48.73
3	70	$32.27	$7.07	$12.59	$0.00	$51.93
4	75	$34.58	$7.07	$13.49	$0.00	$55.14
5	80	$36.88	$7.07	$14.38	$0.00	$58.33
6	85	$39.19	$7.07	$15.29	$0.00	$61.55
7	90	$41.49	$7.07	$16.18	$0.00	$64.74
8	95	$43.80	$7.07	$17.09	$0.00	$67.96

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)*	02/01/2022	$45.56	$11.39	$20.21	$0.00	$77.16

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Springfield/Pittsfield*

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.78	$11.39	$20.21	$0.00	$54.38
2	60	$27.34	$11.39	$20.21	$0.00	$58.94
3	70	$31.89	$11.39	$20.21	$0.00	$63.49
4	80	$36.45	$11.39	$20.21	$0.00	$68.05
5	90	$41.00	$11.39	$20.21	$0.00	$72.60

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/POWER SHOVEL/TREE SHREDDER /CLAM SHELL*OPERATING ENGINEERS LOCAL 98*	06/01/2022	$38.74	$12.47	$14.50	$0.00	$65.71
	12/01/2022	$39.62	$12.47	$14.50	$0.00	$66.59
	06/01/2023	$40.57	$12.47	$14.50	$0.00	$67.54
	12/01/2023	$41.52	$12.47	$14.50	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$42.33	$9.10	$17.72	$0.00	$69.15
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$41.18	$9.10	$17.72	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$41.18	$9.10	$17.72	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.73	$9.10	$13.62	$0.00	$52.45
	12/01/2022	$30.54	$9.10	$13.62	$0.00	$53.26
	06/01/2023	$31.36	$9.10	$13.62	$0.00	$54.08
	12/01/2023	$32.17	$9.10	$13.62	$0.00	$54.89
	06/01/2024	$32.99	$9.10	$13.62	$0.00	$55.71
	12/01/2024	$33.80	$9.10	$13.62	$0.00	$56.52
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS LOCAL 336 - BERKSHIRE COUNTY*	03/01/2022	$39.32	$7.16	$18.15	$0.00	$64.63
	09/01/2022	$39.82	$7.16	$18.15	$0.00	$65.13
	03/01/2023	$40.32	$7.16	$18.15	$0.00	$65.63

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER - Local 336 Berkshire*

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.66	$7.16	$1.40	$0.00	$28.22
2	60	$23.59	$7.16	$1.40	$0.00	$32.15
3	70	$27.52	$7.16	$13.95	$0.00	$48.63
4	75	$29.49	$7.16	$13.95	$0.00	$50.60
5	80	$31.46	$7.16	$15.35	$0.00	$53.97
6	80	$31.46	$7.16	$15.35	$0.00	$53.97
7	90	$35.39	$7.16	$16.75	$0.00	$59.30
8	90	$35.39	$7.16	$16.75	$0.00	$59.30

Effective Date - 09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.91	$7.16	$1.40	$0.00	$28.47
2	60	$23.89	$7.16	$1.40	$0.00	$32.45
3	70	$27.87	$7.16	$13.95	$0.00	$48.98
4	75	$29.87	$7.16	$13.95	$0.00	$50.98
5	80	$31.86	$7.16	$15.35	$0.00	$54.37
6	80	$31.86	$7.16	$15.35	$0.00	$54.37
7	90	$35.84	$7.16	$16.75	$0.00	$59.75
8	90	$35.84	$7.16	$16.75	$0.00	$59.75

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $26.25/ 3&4 $31.55/ 5&6 50.03/ 7&8 $55.37

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME *CARPENTERS-ZONE 3 (Wood Frame)*	04/01/2022	$23.66	$7.21	$4.80	$0.00	$35.67
	04/01/2023	$24.16	$7.21	$4.80	$0.00	$36.17

All Aspects of New Wood Frame Work

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER (Wood Frame) - Zone 3*

Effective Date - 04/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$14.20	$7.21	$0.00	$0.00	$21.41
2	60	$14.20	$7.21	$0.00	$0.00	$21.41
3	65	$15.38	$7.21	$0.00	$0.00	$22.59
4	70	$16.56	$7.21	$0.00	$0.00	$23.77
5	75	$17.75	$7.21	$3.80	$0.00	$28.76
6	80	$18.93	$7.21	$3.80	$0.00	$29.94
7	85	$20.11	$7.21	$3.80	$0.00	$31.12
8	90	$21.29	$7.21	$3.80	$0.00	$32.30

Effective Date - 04/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$14.50	$7.21	$0.00	$0.00	$21.71
2	60	$14.50	$7.21	$0.00	$0.00	$21.71
3	65	$15.70	$7.21	$0.00	$0.00	$22.91
4	70	$16.91	$7.21	$0.00	$0.00	$24.12
5	75	$18.12	$7.21	$3.80	$0.00	$29.13
6	80	$19.33	$7.21	$3.80	$0.00	$30.34
7	85	$20.54	$7.21	$3.80	$0.00	$31.55
8	90	$21.74	$7.21	$3.80	$0.00	$32.75

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $17.86/ 3&4 $20.22/ 5&6 $27.57/ 7&8 $29.94

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)*	01/01/2020	$41.94	$12.70	$17.64	$0.62	$72.90

Apprentice - *CEMENT MASONRY/PLASTERING - Springfield/Pittsfield*

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.97	$12.70	$15.41	$0.00	$49.08
2	60	$25.16	$12.70	$17.64	$0.62	$56.12
3	65	$27.26	$12.70	$17.64	$0.62	$58.22
4	70	$29.36	$12.70	$17.64	$0.62	$60.32
5	75	$31.46	$12.70	$17.64	$0.62	$62.42
6	80	$33.55	$12.70	$17.64	$0.62	$64.51
7	90	$37.75	$12.70	$17.64	$0.62	$68.71

Notes:

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

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CHAIN SAW OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.73	$9.10	$13.62	$0.00	$52.45
	12/01/2022	$30.54	$9.10	$13.62	$0.00	$53.26
	06/01/2023	$31.36	$9.10	$13.62	$0.00	$54.08
	12/01/2023	$32.17	$9.10	$13.62	$0.00	$54.89
	06/01/2024	$32.99	$9.10	$13.62	$0.00	$55.71
	12/01/2024	$33.80	$9.10	$13.62	$0.00	$56.52
For apprentice rates see "Apprentice- LABORER"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$38.21	$12.47	$14.50	$0.00	$65.18
	12/01/2022	$39.09	$12.47	$14.50	$0.00	$66.06
	06/01/2023	$40.04	$12.47	$14.50	$0.00	$67.01
	12/01/2023	$40.99	$12.47	$14.50	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CRANE OPERATOR *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$42.24	$12.47	$14.50	$0.00	$69.21
	12/01/2022	$43.12	$12.47	$14.50	$0.00	$70.09
	06/01/2023	$44.07	$12.47	$14.50	$0.00	$71.04
	12/01/2023	$45.02	$12.47	$14.50	$0.00	$71.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 3*	07/01/2022	$54.86	$8.65	$23.05	$0.00	$86.56
	01/01/2023	$56.06	$8.65	$23.05	$0.00	$87.76
	07/01/2023	$57.26	$8.65	$23.05	$0.00	$88.96
	01/01/2024	$58.46	$8.65	$23.05	$0.00	$90.16
	07/01/2024	$59.66	$8.65	$23.05	$0.00	$91.36
	01/01/2025	$60.86	$8.65	$23.05	$0.00	$92.56

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.43	$8.65	$0.00	$0.00	$36.08
2	55	$30.17	$8.65	$6.27	$0.00	$45.09
3	60	$32.92	$8.65	$6.84	$0.00	$48.41
4	65	$35.66	$8.65	$7.41	$0.00	$51.72
5	70	$38.40	$8.65	$19.63	$0.00	$66.68
6	75	$41.15	$8.65	$20.20	$0.00	$70.00
7	80	$43.89	$8.65	$20.77	$0.00	$73.31
8	90	$49.37	$8.65	$21.91	$0.00	$79.93

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.03	$8.65	$0.00	$0.00	$36.68
2	55	$30.83	$8.65	$6.27	$0.00	$45.75
3	60	$33.64	$8.65	$6.84	$0.00	$49.13
4	65	$36.44	$8.65	$7.41	$0.00	$52.50
5	70	$39.24	$8.65	$19.63	$0.00	$67.52
6	75	$42.05	$8.65	$20.20	$0.00	$70.90
7	80	$44.85	$8.65	$20.77	$0.00	$74.27
8	90	$50.45	$8.65	$21.91	$0.00	$81.01

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$42.33	$9.10	$17.57	$0.00	$69.00
	12/01/2022	$43.33	$9.10	$17.57	$0.00	$70.00
	06/01/2023	$44.33	$9.10	$17.57	$0.00	$71.00
	12/01/2023	$45.58	$9.10	$17.57	$0.00	$72.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$43.33	$9.10	$17.57	$0.00	$70.00
	12/01/2022	$44.33	$9.10	$17.57	$0.00	$71.00
	06/01/2023	$45.33	$9.10	$17.57	$0.00	$72.00
	12/01/2023	$46.58	$9.10	$17.57	$0.00	$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$43.08	$9.10	$17.57	$0.00	$69.75
	12/01/2022	$44.08	$9.10	$17.57	$0.00	$70.75
	06/01/2023	$45.08	$9.10	$17.57	$0.00	$71.75
	12/01/2023	$46.33	$9.10	$17.57	$0.00	$73.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$43.33	$9.10	$17.57	$0.00	$70.00
	12/01/2022	$44.33	$9.10	$17.57	$0.00	$71.00
	06/01/2023	$45.33	$9.10	$17.57	$0.00	$72.00
	12/01/2023	$46.58	$9.10	$17.57	$0.00	$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$43.08	$9.10	$17.57	$0.00	$69.75
	12/01/2022	$44.08	$9.10	$17.57	$0.00	$70.75
	06/01/2023	$45.08	$9.10	$17.57	$0.00	$71.75
	12/01/2023	$46.33	$9.10	$17.57	$0.00	$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$42.33	$9.10	$17.57	$0.00	$69.00
	12/01/2022	$43.33	$9.10	$17.57	$0.00	$70.00
	06/01/2023	$44.33	$9.10	$17.57	$0.00	$71.00
	12/01/2023	$45.58	$9.10	$17.57	$0.00	$72.25
For apprentice rates see "Apprentice- LABORER"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$68.70	$9.40	$23.12	$0.00	$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$73.60	$9.40	$23.12	$0.00	$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) *DRAWBRIDGE - SEIU LOCAL 888*	07/01/2020	$26.77	$6.67	$3.93	$0.16	$37.53
ELECTRICIAN (Including Core Drilling) *ELECTRICIANS LOCAL 7*	07/03/2022	$46.41	$12.25	$13.69	$0.00	$72.35
	01/01/2023	$47.01	$12.50	$13.96	$0.00	$73.47

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 7*

Effective Date - 07/03/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$18.56	$7.35	$0.56	$0.00	$26.47
2	45	$20.88	$7.35	$0.63	$0.00	$28.86
3	50	$23.21	$12.25	$7.20	$0.00	$42.66
4	55	$25.53	$12.25	$7.27	$0.00	$45.05
5	65	$30.17	$12.25	$9.14	$0.00	$51.56
6	70	$32.49	$12.25	$10.37	$0.00	$55.11

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$18.80	$7.50	$0.56	$0.00	$26.86
2	45	$21.15	$7.50	$0.63	$0.00	$29.28
3	50	$23.51	$12.50	$7.26	$0.00	$43.27
4	55	$25.86	$12.50	$7.33	$0.00	$45.69
5	65	$30.56	$12.50	$9.27	$0.00	$52.33
6	70	$32.91	$12.50	$10.54	$0.00	$55.95

Notes:

Steps 1-2 are 1000 hrs; Steps 3-6 are 1500 hrs.

Apprentice to Journeyworker Ratio:2:3****

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 41*	01/01/2022	$58.62	$16.03	$20.21	$0.00	$94.86

Apprentice - *ELEVATOR CONSTRUCTOR - Local 41*

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$29.31	$16.03	$0.00	$0.00	$45.34
2	55	$32.24	$16.03	$20.21	$0.00	$68.48
3	65	$38.10	$16.03	$20.21	$0.00	$74.34
4	70	$41.03	$16.03	$20.21	$0.00	$77.27
5	80	$46.90	$16.03	$20.21	$0.00	$83.14

Notes:

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

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 41*	01/01/2022	$41.03	$16.03	$20.21	$0.00	$77.27

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FENCE & BEAM RAIL ERECTOR *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.73	$9.10	$13.62	$0.00	$52.45
	12/01/2022	$30.54	$9.10	$13.62	$0.00	$53.26
	06/01/2023	$31.36	$9.10	$13.62	$0.00	$54.08
	12/01/2023	$32.17	$9.10	$13.62	$0.00	$54.89
	06/01/2024	$32.99	$9.10	$13.62	$0.00	$55.71
	12/01/2024	$33.80	$9.10	$13.62	$0.00	$56.52
For apprentice rates see "Apprentice- LABORER"						
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2021	$30.62	$9.10	$14.69	$0.00	$54.41
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FIELD ENG.INST/ROD-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$18.84	$4.80	$4.10	$0.00	$27.74
FIELD ENG.PARTY CHIEF:BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$21.33	$4.80	$4.10	$0.00	$30.23
FIELD ENG.SURVEY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$22.33	$4.80	$4.10	$0.00	$31.23
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 7*	07/03/2022	$46.41	$12.25	$13.69	$0.00	$72.35
	01/01/2023	$47.01	$12.50	$13.96	$0.00	$73.47
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING*ELECTRICIANS LOCAL 7*	07/03/2022	$46.41	$12.25	$13.69	$0.00	$72.35
	01/01/2023	$47.01	$12.50	$13.96	$0.00	$73.47
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$38.21	$12.47	$14.50	$0.00	$65.18
	12/01/2022	$39.09	$12.47	$14.50	$0.00	$66.06
	06/01/2023	$40.04	$12.47	$14.50	$0.00	$67.01
	12/01/2023	$40.99	$12.47	$14.50	$0.00	$67.96

Apprentice - *OPERATING ENGINEERS - Local 98 Class 3*

Effective Date - 06/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$22.93	$12.47	$14.50	$0.00	$49.90
2	70	$26.75	$12.47	$14.50	$0.00	$53.72
3	80	$30.57	$12.47	$14.50	$0.00	$57.54
4	90	$34.39	$12.47	$14.50	$0.00	$61.36

Effective Date - 12/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.45	$12.47	$14.50	$0.00	$50.42
2	70	$27.36	$12.47	$14.50	$0.00	$54.33
3	80	$31.27	$12.47	$14.50	$0.00	$58.24
4	90	$35.18	$12.47	$14.50	$0.00	$62.15

Notes:

Steps 1-2 are 1000 hrs.; Steps 3-4 are 2000 hrs.

Apprentice to Journeyworker Ratio:1:6

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FLAGGER & SIGNALER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)* For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2021	$24.50	$9.10	$14.69	$0.00	$48.29
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE III*	03/01/2022	$39.22	$7.16	$18.15	$0.00	$64.53

Apprentice - *FLOORCOVERER - Local 2168 Zone III*

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.61	$7.16	$1.40	$0.00	$28.17
2	55	$21.57	$7.16	$1.40	$0.00	$30.13
3	60	$23.53	$7.16	$13.95	$0.00	$44.64
4	65	$25.49	$7.16	$13.95	$0.00	$46.60
5	70	$27.45	$7.16	$15.35	$0.00	$49.96
6	75	$29.42	$7.16	$15.35	$0.00	$51.93
7	80	$31.38	$7.16	$16.75	$0.00	$55.29
8	85	$33.34	$7.16	$16.75	$0.00	$57.25

Notes: Steps are 750 hrs.
% After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
Step 1&2 $26.21/ 3&4 $31.49/ 5&6 $49.96/ 7&8 $55.29

Apprentice to Journeyworker Ratio:1:1

FORK LIFT *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2022	$38.43	$12.47	$14.50	$0.00	$65.40
	12/01/2022	$39.31	$12.47	$14.50	$0.00	$66.28
	06/01/2023	$40.26	$12.47	$14.50	$0.00	$67.23
	12/01/2023	$41.21	$12.47	$14.50	$0.00	$68.18
GENERATORS/LIGHTING PLANTS *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2022	$34.98	$12.47	$14.50	$0.00	$61.95
	12/01/2022	$35.86	$12.47	$14.50	$0.00	$62.83
	06/01/2023	$36.81	$12.47	$14.50	$0.00	$63.78
	12/01/2023	$37.76	$12.47	$14.50	$0.00	$64.73
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 1333*	06/01/2020	$39.18	$10.80	$10.45	$0.00	$60.43

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *GLAZIER - Local 1333*

Effective Date - 06/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.59	$10.80	$1.80	$0.00	$32.19
2	56	$22.04	$10.80	$1.80	$0.00	$34.64
3	63	$24.49	$10.80	$2.45	$0.00	$37.74
4	69	$26.94	$10.80	$2.45	$0.00	$40.19
5	75	$29.39	$10.80	$3.15	$0.00	$43.34
6	81	$31.83	$10.80	$3.15	$0.00	$45.78
7	88	$34.28	$10.80	$10.45	$0.00	$55.53
8	94	$36.73	$10.80	$10.45	$0.00	$57.98

Notes:

Apprentice to Journeyworker Ratio:1:3

GRADER/TRENCHING MACHINE/DERRICK *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$38.74	$12.47	$14.50	$0.00	$65.71
	12/01/2022	$39.62	$12.47	$14.50	$0.00	$66.59
	06/01/2023	$40.57	$12.47	$14.50	$0.00	$67.54
	12/01/2023	$41.52	$12.47	$14.50	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 63*	01/01/2022	$39.29	$10.64	$17.33	$2.02	$69.28
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 7*	07/03/2022	$46.41	$12.25	$13.69	$0.00	$72.35
	01/01/2023	$47.01	$12.50	$13.96	$0.00	$73.47
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 63*	01/01/2022	$39.29	$10.64	$17.33	$2.02	$69.28
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION*	03/17/2022	$44.71	$9.55	$17.10	$0.00	$71.36
	09/17/2022	$45.71	$9.55	$17.10	$0.00	$72.36
	03/17/2023	$46.96	$9.55	$17.10	$0.00	$73.61
	09/17/2023	$47.96	$9.55	$17.10	$0.00	$74.61
	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION*	03/17/2022	$44.71	$9.55	$17.10	$0.00	$71.36
	09/17/2022	$45.71	$9.55	$17.10	$0.00	$72.36
	03/17/2023	$46.96	$9.55	$17.10	$0.00	$73.61
	09/17/2023	$47.96	$9.55	$17.10	$0.00	$74.61
	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2021	$31.12	$9.10	$14.69	$0.00	$54.91
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)*	09/01/2021	$41.60	$13.80	$17.14	$0.00	$72.54
	09/01/2022	$44.05	$13.80	$17.14	$0.00	$74.99

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

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.80	$13.80	$12.42	$0.00	$47.02
2	60	$24.96	$13.80	$13.36	$0.00	$52.12
3	70	$29.12	$13.80	$14.31	$0.00	$57.23
4	80	$33.28	$13.80	$15.25	$0.00	$62.33

Effective Date - 09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.03	$13.80	$12.42	$0.00	$48.25
2	60	$26.43	$13.80	$13.36	$0.00	$53.59
3	70	$30.84	$13.80	$14.31	$0.00	$58.95
4	80	$35.24	$13.80	$15.25	$0.00	$64.29

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 12*	07/01/2019	$31.55	$6.75	$19.66	$0.00	$57.96

Apprentice - *IRONWORKER - Local 12*

Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.93	$6.75	$3.50	$0.00	$29.18
2	70	$22.09	$6.75	$14.64	$0.00	$43.48
3	80	$25.24	$6.75	$16.22	$0.00	$48.21
4	90	$28.40	$6.75	$17.82	$0.00	$52.97

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.73	$9.10	$13.62	$0.00	$52.45
	12/01/2022	$30.54	$9.10	$13.62	$0.00	$53.26
	06/01/2023	$31.36	$9.10	$13.62	$0.00	$54.08
	12/01/2023	$32.17	$9.10	$13.62	$0.00	$54.89
	06/01/2024	$32.99	$9.10	$13.62	$0.00	$55.71
	12/01/2024	$33.80	$9.10	$13.62	$0.00	$56.52

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.48	$9.10	$13.62	$0.00	$52.20
	12/01/2022	$30.29	$9.10	$13.62	$0.00	$53.01
	06/01/2023	$31.11	$9.10	$13.62	$0.00	$53.83
	12/01/2023	$31.92	$9.10	$13.62	$0.00	$54.64
	06/01/2024	$32.74	$9.10	$13.62	$0.00	$55.46
	12/01/2024	$33.55	$9.10	$13.62	$0.00	$56.27

Apprentice - *LABORER - Zone 4 Building and Site*

Effective Date - 06/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$17.69	$9.10	$13.62	$0.00	$40.41
2	70	$20.64	$9.10	$13.62	$0.00	$43.36
3	80	$23.58	$9.10	$13.62	$0.00	$46.30
4	90	$26.53	$9.10	$13.62	$0.00	$49.25

Effective Date - 12/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.17	$9.10	$13.62	$0.00	$40.89
2	70	$21.20	$9.10	$13.62	$0.00	$43.92
3	80	$24.23	$9.10	$13.62	$0.00	$46.95
4	90	$27.26	$9.10	$13.62	$0.00	$49.98

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2021	$30.37	$9.10	$14.69	$0.00	$54.16

Apprentice - *LABORER (Heavy and Highway) - Zone 4*

Effective Date - 12/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.22	$9.10	$14.69	$0.00	$42.01
2	70	$21.26	$9.10	$14.69	$0.00	$45.05
3	80	$24.30	$9.10	$14.69	$0.00	$48.09
4	90	$27.33	$9.10	$14.69	$0.00	$51.12

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.48	$9.10	$13.62	$0.00	$52.20
	12/01/2022	$30.29	$9.10	$13.62	$0.00	$53.01
	06/01/2023	$31.11	$9.10	$13.62	$0.00	$53.83
	12/01/2023	$31.92	$9.10	$13.62	$0.00	$54.64
	06/01/2024	$32.74	$9.10	$13.62	$0.00	$55.46
	12/01/2024	$33.55	$9.10	$13.62	$0.00	$56.27
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.48	$9.10	$13.62	$0.00	$52.20
	12/01/2022	$30.29	$9.10	$13.62	$0.00	$53.01
	06/01/2023	$31.11	$9.10	$13.62	$0.00	$53.83
	12/01/2023	$31.92	$9.10	$13.62	$0.00	$54.64
	06/01/2024	$32.74	$9.10	$13.62	$0.00	$55.46
	12/01/2024	$33.55	$9.10	$13.62	$0.00	$56.27
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.55	$9.10	$13.91	$0.00	$52.56
	12/01/2022	$30.36	$9.10	$13.91	$0.00	$53.37
	06/01/2023	$31.18	$9.10	$13.91	$0.00	$54.19
	12/01/2023	$31.99	$9.10	$13.91	$0.00	$55.00
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$31.48	$9.10	$13.62	$0.00	$54.20
	12/01/2022	$32.29	$9.10	$13.62	$0.00	$55.01
	06/01/2023	$33.11	$9.10	$13.62	$0.00	$55.83
	12/01/2023	$33.92	$9.10	$13.62	$0.00	$56.64
	06/01/2024	$34.74	$9.10	$13.62	$0.00	$57.46
	12/01/2024	$35.55	$9.10	$13.62	$0.00	$58.27
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2021	$30.62	$9.10	$14.69	$0.00	$54.41
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.48	$9.10	$13.62	$0.00	$52.20
	12/01/2022	$30.29	$9.10	$13.62	$0.00	$53.01
	06/01/2023	$31.11	$9.10	$13.62	$0.00	$53.83
	12/01/2023	$31.92	$9.10	$13.62	$0.00	$54.64
	06/01/2024	$32.74	$9.10	$13.62	$0.00	$55.46
	12/01/2024	$33.55	$9.10	$13.62	$0.00	$56.27
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.48	$9.10	$13.62	$0.00	$52.20
	12/01/2022	$30.29	$9.10	$13.62	$0.00	$53.01
	06/01/2023	$31.11	$9.10	$13.62	$0.00	$53.83
	12/01/2023	$31.92	$9.10	$13.62	$0.00	$54.64
	06/01/2024	$32.74	$9.10	$13.62	$0.00	$55.46
	12/01/2024	$33.55	$9.10	$13.62	$0.00	$56.27
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LASER BEAM OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.73	$9.10	$13.62	$0.00	$52.45
	12/01/2022	$30.54	$9.10	$13.62	$0.00	$53.26
	06/01/2023	$31.36	$9.10	$13.62	$0.00	$54.08
	12/01/2023	$32.17	$9.10	$13.62	$0.00	$54.89
	06/01/2024	$32.99	$9.10	$13.62	$0.00	$55.71
	12/01/2024	$33.80	$9.10	$13.62	$0.00	$56.52
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2021	$30.62	$9.10	$14.69	$0.00	$54.41
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE*	02/01/2022	$37.17	$11.39	$19.53	$0.00	$68.09

Apprentice - *MARBLE-TILE FINISHER-Local 3 Marble/Tile (Spr/Pitt)*

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.59	$11.39	$19.53	$0.00	$49.51
2	60	$22.30	$11.39	$19.53	$0.00	$53.22
3	70	$26.02	$11.39	$19.53	$0.00	$56.94
4	80	$29.74	$11.39	$19.53	$0.00	$60.66
5	90	$33.45	$11.39	$19.53	$0.00	$64.37

Notes:

Apprentice to Journeyworker Ratio:1:5

MARBLE MASON/TILE LAYER(SP/PT)SeeBrick *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE*						
See "BRICK/STONE/ARTIFICIAL MASONRY(INCL.MASONRY WATERPROOFING)"						
MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$38.74	$12.47	$14.50	$0.00	$65.71
	12/01/2022	$39.62	$12.47	$14.50	$0.00	$66.59
	06/01/2023	$40.57	$12.47	$14.50	$0.00	$67.54
	12/01/2023	$41.52	$12.47	$14.50	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANIC/WELDER/BOOM TRUCK *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$38.21	$12.47	$14.50	$0.00	$65.18
	12/01/2022	$39.09	$12.47	$14.50	$0.00	$66.06
	06/01/2023	$40.04	$12.47	$14.50	$0.00	$67.01
	12/01/2023	$40.99	$12.47	$14.50	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 3) *MILLWRIGHTS LOCAL 1121 - Zone 3*	01/03/2022	$38.91	$8.58	$21.57	$0.00	$69.06
	01/02/2023	$40.16	$8.58	$21.57	$0.00	$70.31

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 3*

Effective Date - 01/03/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$21.40	$8.58	$5.72	$0.00	$35.70
2	65	$25.29	$8.58	$17.93	$0.00	$51.80
3	75	$29.18	$8.58	$18.98	$0.00	$56.74
4	85	$33.07	$8.58	$20.01	$0.00	$61.66

Effective Date - 01/02/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.09	$8.58	$5.72	$0.00	$36.39
2	65	$26.10	$8.58	$17.93	$0.00	$52.61
3	75	$30.12	$8.58	$18.98	$0.00	$57.68
4	85	$34.14	$8.58	$20.01	$0.00	$62.73

Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 $5.72, Step 2 $6.66)
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:4

MORTAR MIXER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.73	$9.10	$13.62	$0.00	$52.45
	12/01/2022	$30.54	$9.10	$13.62	$0.00	$53.26
	06/01/2023	$31.36	$9.10	$13.62	$0.00	$54.08
	12/01/2023	$32.17	$9.10	$13.62	$0.00	$54.89
	06/01/2024	$32.99	$9.10	$13.62	$0.00	$55.71
	12/01/2024	$33.80	$9.10	$13.62	$0.00	$56.52
For apprentice rates see "Apprentice- LABORER"						
OILER *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$33.90	$12.47	$14.50	$0.00	$60.87
	12/01/2022	$34.78	$12.47	$14.50	$0.00	$61.75
	06/01/2023	$35.73	$12.47	$14.50	$0.00	$62.70
	12/01/2023	$36.68	$12.47	$14.50	$0.00	$63.65
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS VI *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$31.92	$12.47	$14.50	$0.00	$58.89
	12/01/2022	$32.80	$12.47	$14.50	$0.00	$59.77
	06/01/2023	$33.75	$12.47	$14.50	$0.00	$60.72
	12/01/2023	$34.70	$12.47	$14.50	$0.00	$61.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 3*	07/01/2022	$54.86	$8.65	$23.05	$0.00	$86.56
	01/01/2023	$56.06	$8.65	$23.05	$0.00	$87.76
	07/01/2023	$57.26	$8.65	$23.05	$0.00	$88.96
	01/01/2024	$58.46	$8.65	$23.05	$0.00	$90.16
	07/01/2024	$59.66	$8.65	$23.05	$0.00	$91.36
	01/01/2025	$60.86	$8.65	$23.05	$0.00	$92.56

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.43	$8.65	$0.00	$0.00	$36.08
2	55	$30.17	$8.65	$6.27	$0.00	$45.09
3	60	$32.92	$8.65	$6.84	$0.00	$48.41
4	65	$35.66	$8.65	$7.41	$0.00	$51.72
5	70	$38.40	$8.65	$19.63	$0.00	$66.68
6	75	$41.15	$8.65	$20.20	$0.00	$70.00
7	80	$43.89	$8.65	$20.77	$0.00	$73.31
8	90	$49.37	$8.65	$21.91	$0.00	$79.93

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.03	$8.65	$0.00	$0.00	$36.68
2	55	$30.83	$8.65	$6.27	$0.00	$45.75
3	60	$33.64	$8.65	$6.84	$0.00	$49.13
4	65	$36.44	$8.65	$7.41	$0.00	$52.50
5	70	$39.24	$8.65	$19.63	$0.00	$67.52
6	75	$42.05	$8.65	$20.20	$0.00	$70.90
7	80	$44.85	$8.65	$20.77	$0.00	$74.27
8	90	$50.45	$8.65	$21.91	$0.00	$81.01

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 3*	07/01/2022	$37.83	$8.65	$19.15	$0.00	$65.63
	01/01/2023	$38.93	$8.65	$19.15	$0.00	$66.73
	07/01/2023	$39.98	$8.65	$19.15	$0.00	$67.78
	01/01/2024	$41.08	$8.65	$19.15	$0.00	$68.88
	07/01/2024	$42.13	$8.65	$19.15	$0.00	$69.93
	01/01/2025	$43.23	$8.65	$19.15	$0.00	$71.03

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 3 - Spray/Sandblast - New*

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.92	$8.65	$0.00	$0.00	$27.57
2	55	$20.81	$8.65	$4.13	$0.00	$33.59
3	60	$22.70	$8.65	$4.50	$0.00	$35.85
4	65	$24.59	$8.65	$4.88	$0.00	$38.12
5	70	$26.48	$8.65	$16.90	$0.00	$52.03
6	75	$28.37	$8.65	$17.28	$0.00	$54.30
7	80	$30.26	$8.65	$17.65	$0.00	$56.56
8	90	$34.05	$8.65	$18.40	$0.00	$61.10

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.47	$8.65	$0.00	$0.00	$28.12
2	55	$21.41	$8.65	$4.13	$0.00	$34.19
3	60	$23.36	$8.65	$4.50	$0.00	$36.51
4	65	$25.30	$8.65	$4.88	$0.00	$38.83
5	70	$27.25	$8.65	$16.90	$0.00	$52.80
6	75	$29.20	$8.65	$17.28	$0.00	$55.13
7	80	$31.14	$8.65	$17.65	$0.00	$57.44
8	90	$35.04	$8.65	$18.40	$0.00	$62.09

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 3*	07/01/2022	$35.15	$8.65	$19.15	$0.00	$62.95
	01/01/2023	$36.25	$8.65	$19.15	$0.00	$64.05
	07/01/2023	$37.30	$8.65	$19.15	$0.00	$65.10
	01/01/2024	$38.40	$8.65	$19.15	$0.00	$66.20
	07/01/2024	$39.45	$8.65	$19.15	$0.00	$67.25
	01/01/2025	$40.55	$8.65	$19.15	$0.00	$68.35

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 3 - Spray/Sandblast - Repaint*

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.58	$8.65	$0.00	$0.00	$26.23
2	55	$19.33	$8.65	$4.13	$0.00	$32.11
3	60	$21.09	$8.65	$4.50	$0.00	$34.24
4	65	$22.85	$8.65	$4.88	$0.00	$36.38
5	70	$24.61	$8.65	$16.90	$0.00	$50.16
6	75	$26.36	$8.65	$17.28	$0.00	$52.29
7	80	$28.12	$8.65	$17.65	$0.00	$54.42
8	90	$31.64	$8.65	$1,171.75	$0.00	$1,212.04

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.13	$8.65	$0.00	$0.00	$26.78
2	55	$19.94	$8.65	$4.13	$0.00	$32.72
3	60	$21.75	$8.65	$4.50	$0.00	$34.90
4	65	$23.56	$8.65	$4.88	$0.00	$37.09
5	70	$25.38	$8.65	$16.90	$0.00	$50.93
6	75	$27.19	$8.65	$17.28	$0.00	$53.12
7	80	$29.00	$8.65	$17.65	$0.00	$55.30
8	90	$32.63	$8.65	$18.40	$0.00	$59.68

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *	07/01/2022	$36.43	$8.65	$19.15	$0.00	$64.23
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 3*	01/01/2023	$37.53	$8.65	$19.15	$0.00	$65.33
	07/01/2023	$38.58	$8.65	$19.15	$0.00	$66.38
	01/01/2024	$39.68	$8.65	$19.15	$0.00	$67.48
	07/01/2024	$40.73	$8.65	$19.15	$0.00	$68.53
	01/01/2025	$41.83	$8.65	$19.15	$0.00	$69.63

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 3 - BRUSH NEW*

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.22	$8.65	$0.00	$0.00	$26.87
2	55	$20.04	$8.65	$4.13	$0.00	$32.82
3	60	$21.86	$8.65	$4.50	$0.00	$35.01
4	65	$23.68	$8.65	$4.88	$0.00	$37.21
5	70	$25.50	$8.65	$16.90	$0.00	$51.05
6	75	$27.32	$8.65	$17.28	$0.00	$53.25
7	80	$29.14	$8.65	$17.65	$0.00	$55.44
8	90	$32.79	$8.65	$18.40	$0.00	$59.84

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.77	$8.65	$0.00	$0.00	$27.42
2	55	$20.64	$8.65	$4.13	$0.00	$33.42
3	60	$22.52	$8.65	$4.50	$0.00	$35.67
4	65	$24.39	$8.65	$4.88	$0.00	$37.92
5	70	$26.27	$8.65	$16.90	$0.00	$51.82
6	75	$28.15	$8.65	$17.28	$0.00	$54.08
7	80	$30.02	$8.65	$17.65	$0.00	$56.32
8	90	$33.78	$8.65	$18.40	$0.00	$60.83

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 3*	07/01/2022	$33.75	$8.65	$19.15	$0.00	$61.55
	01/01/2023	$34.85	$8.65	$19.15	$0.00	$62.65
	07/01/2023	$35.90	$8.65	$19.15	$0.00	$63.70
	01/01/2024	$37.00	$8.65	$19.15	$0.00	$64.80
	07/01/2024	$38.05	$8.65	$19.15	$0.00	$65.85
	01/01/2025	$39.15	$8.65	$19.15	$0.00	$66.95

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 3 - BRUSH REPAINT*

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$16.88	$8.65	$0.00	$0.00	$25.53
2	55	$18.56	$8.65	$4.13	$0.00	$31.34
3	60	$20.25	$8.65	$4.50	$0.00	$33.40
4	65	$21.94	$8.65	$4.88	$0.00	$35.47
5	70	$23.63	$8.65	$16.90	$0.00	$49.18
6	75	$25.31	$8.65	$17.28	$0.00	$51.24
7	80	$27.00	$8.65	$17.65	$0.00	$53.30
8	90	$30.38	$8.65	$18.40	$0.00	$57.43

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.43	$8.65	$0.00	$0.00	$26.08
2	55	$19.17	$8.65	$4.13	$0.00	$31.95
3	60	$20.91	$8.65	$4.50	$0.00	$34.06
4	65	$22.65	$8.65	$4.88	$0.00	$36.18
5	70	$24.40	$8.65	$16.90	$0.00	$49.95
6	75	$26.14	$8.65	$17.28	$0.00	$52.07
7	80	$27.88	$8.65	$17.65	$0.00	$54.18
8	90	$31.37	$8.65	$18.40	$0.00	$58.42

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)* For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2021	$30.37	$9.10	$14.69	$0.00	$54.16
PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$35.78	$13.41	$16.01	$0.00	$65.20
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$43.53	$9.40	$23.12	$0.00	$76.05
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$43.53	$9.40	$23.12	$0.00	$76.05

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PILE DRIVER - Local 56 Zone 3*

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	0	$0.00	$0.00	$0.00	$0.00	$0.00

Notes: Apprentice wages shall be no less than the following Steps;
(Same as set in Zone 1)
1$57.06/2$61.96/3$66.87/4$69.32/5$71.78/6$71.78/7$76.68/8$76.68

Apprentice to Journeyworker Ratio:1:5

PIPELAYER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.73	$9.10	$13.62	$0.00	$52.45
	12/01/2022	$30.54	$9.10	$13.62	$0.00	$53.26
	06/01/2023	$31.36	$9.10	$13.62	$0.00	$54.08
	12/01/2023	$32.17	$9.10	$13.62	$0.00	$54.89
	06/01/2024	$32.99	$9.10	$13.62	$0.00	$55.71
	12/01/2024	$33.80	$9.10	$13.62	$0.00	$56.52
For apprentice rates see "Apprentice- LABORER"						
PIPELAYER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2021	$30.62	$9.10	$14.69	$0.00	$54.41
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PLUMBER & PIPEFITTER *PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION*	03/17/2022	$44.71	$9.55	$17.10	$0.00	$71.36
	09/17/2022	$45.71	$9.55	$17.10	$0.00	$72.36
	03/17/2023	$46.96	$9.55	$17.10	$0.00	$73.61
	09/17/2023	$47.96	$9.55	$17.10	$0.00	$74.61
	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PLUMBER/PIPEFITTER - Local 104 Western*

Effective Date - 03/17/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$20.12	$9.55	$10.10	$0.00	$39.77
2	50	$22.36	$9.55	$10.10	$0.00	$42.01
3	55	$24.59	$9.55	$10.10	$0.00	$44.24
4	60	$26.83	$9.55	$10.10	$0.00	$46.48
5	65	$29.06	$9.55	$10.10	$0.00	$48.71
6	70	$31.30	$9.55	$10.10	$0.00	$50.95
7	75	$33.53	$9.55	$10.10	$0.00	$53.18
8	80	$35.77	$9.55	$10.10	$0.00	$55.42
9	80	$35.77	$9.55	$17.10	$0.00	$62.42
10	80	$35.77	$9.55	$17.10	$0.00	$62.42

Effective Date - 09/17/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$20.57	$9.55	$10.10	$0.00	$40.22
2	50	$22.86	$9.55	$10.10	$0.00	$42.51
3	55	$25.14	$9.55	$10.10	$0.00	$44.79
4	60	$27.43	$9.55	$10.10	$0.00	$47.08
5	65	$29.71	$9.55	$10.10	$0.00	$49.36
6	70	$32.00	$9.55	$10.10	$0.00	$51.65
7	75	$34.28	$9.55	$10.10	$0.00	$53.93
8	80	$36.57	$9.55	$10.10	$0.00	$56.22
9	80	$36.57	$9.55	$17.10	$0.00	$63.22
10	80	$36.57	$9.55	$17.10	$0.00	$63.22

Notes: **1:1,2:5,3:9,4:12

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION*	03/17/2022	$44.71	$9.55	$17.10	$0.00	$71.36
	09/17/2022	$45.71	$9.55	$17.10	$0.00	$72.36
	03/17/2023	$46.96	$9.55	$17.10	$0.00	$73.61
	09/17/2023	$47.96	$9.55	$17.10	$0.00	$74.61
	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2021	$30.62	$9.10	$14.69	$0.00	$54.41
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWDERMAN & BLASTER *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$30.48	$9.10	$13.62	$0.00	$53.20
	12/01/2022	$31.29	$9.10	$13.62	$0.00	$54.01
	06/01/2023	$32.11	$9.10	$13.62	$0.00	$54.83
	12/01/2023	$32.92	$9.10	$13.62	$0.00	$55.64
	06/01/2024	$33.74	$9.10	$13.62	$0.00	$56.46
	12/01/2024	$34.55	$9.10	$13.62	$0.00	$57.27
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2021	$31.37	$9.10	$14.69	$0.00	$55.16
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$38.74	$12.47	$14.50	$0.00	$65.71
	12/01/2022	$39.62	$12.47	$14.50	$0.00	$66.59
	06/01/2023	$40.57	$12.47	$14.50	$0.00	$67.54
	12/01/2023	$41.52	$12.47	$14.50	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$38.21	$12.47	$14.50	$0.00	$65.18
	12/01/2022	$39.09	$12.47	$14.50	$0.00	$66.06
	06/01/2023	$40.04	$12.47	$14.50	$0.00	$67.01
	12/01/2023	$40.99	$12.47	$14.50	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS 404 - Construction Service (Northampton)*	05/01/2020	$22.44	$11.07	$6.50	$0.00	$40.01
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 4 (BUILDING & SITE)*	06/01/2022	$29.73	$9.10	$13.62	$0.00	$52.45
	12/01/2022	$30.54	$9.10	$13.62	$0.00	$53.26
	06/01/2023	$31.36	$9.10	$13.62	$0.00	$54.08
	12/01/2023	$32.17	$9.10	$13.62	$0.00	$54.89
	06/01/2024	$32.99	$9.10	$13.62	$0.00	$55.71
	12/01/2024	$33.80	$9.10	$13.62	$0.00	$56.52
For apprentice rates see "Apprentice- LABORER"						
ROLLER OPERATOR *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$37.60	$12.47	$14.50	$0.00	$64.57
	12/01/2022	$38.48	$12.47	$14.50	$0.00	$65.45
	06/01/2023	$39.43	$12.47	$14.50	$0.00	$66.40
	12/01/2023	$40.38	$12.47	$14.50	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Coal tar pitch) *ROOFERS LOCAL 248*	07/16/2021	$34.66	$12.28	$16.73	$0.00	$63.67
For apprentice rates see "Apprentice- ROOFER"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 248*	07/16/2021	$34.16	$12.28	$16.23	$0.00	$62.67

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 248*

Effective Date - 07/16/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.50	$12.28	$0.00	$0.00	$32.78
2	65	$22.20	$12.28	$16.23	$0.00	$50.71
3	70	$23.91	$12.28	$16.23	$0.00	$52.42
4	75	$25.62	$12.28	$16.23	$0.00	$54.13
5	80	$27.33	$12.28	$16.23	$0.00	$55.84
6	85	$29.04	$12.28	$16.23	$0.00	$57.55
7	90	$30.74	$12.28	$16.23	$0.00	$59.25
8	95	$32.45	$12.28	$16.23	$0.00	$60.96

Notes:

Steps are 750 hrs.Roofer(Tear Off)1:1; Same as above

Apprentice to Journeyworker Ratio:1:3

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 248*	07/16/2021	$34.66	$12.28	$16.73	$0.00	$63.67
For apprentice rates see "Apprentice- ROOFER"						
SCRAPER *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$38.21	$12.47	$14.50	$0.00	$65.18
	12/01/2022	$39.09	$12.47	$14.50	$0.00	$66.06
	06/01/2023	$40.04	$12.47	$14.50	$0.00	$67.01
	12/01/2023	$40.99	$12.47	$14.50	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
SELF-POWERED ROLLERS AND COMPACTORS (TAMPERS) *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$37.60	$12.47	$14.50	$0.00	$64.57
	12/01/2022	$38.48	$12.47	$14.50	$0.00	$65.45
	06/01/2023	$39.43	$12.47	$14.50	$0.00	$66.40
	12/01/2023	$40.38	$12.47	$14.50	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
SELF-PROPELLED POWER BROOM *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$34.98	$12.47	$14.50	$0.00	$61.95
	12/01/2022	$35.86	$12.47	$14.50	$0.00	$62.83
	06/01/2023	$36.81	$12.47	$14.50	$0.00	$63.78
	12/01/2023	$37.76	$12.47	$14.50	$0.00	$64.73
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 63*	01/01/2022	$39.29	$10.64	$17.33	$2.02	$69.28

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 63*

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$17.68	$4.79	$4.67	$0.81	$27.95
2	50	$19.65	$5.32	$5.19	$0.90	$31.06
3	55	$21.61	$5.85	$9.33	$1.10	$37.89
4	60	$23.57	$6.38	$9.33	$1.18	$40.46
5	65	$25.54	$6.92	$9.33	$1.25	$43.04
6	70	$27.50	$7.45	$9.33	$1.33	$45.61
7	75	$29.47	$7.98	$9.33	$1.40	$48.18
8	80	$31.43	$8.51	$16.29	$1.69	$57.92
9	85	$33.40	$9.04	$16.29	$1.76	$60.49
10	90	$35.36	$9.58	$16.29	$1.84	$63.07

Notes:

Apprentice to Journeyworker Ratio:1:3

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.24	$13.41	$16.01	$0.00	$65.66
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.53	$13.41	$16.01	$0.00	$65.95
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 669*	04/01/2021	$43.14	$10.55	$16.41	$0.00	$70.10

Apprentice - *SPRINKLER FITTER - Local 669*

Effective Date - 04/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$19.41	$7.75	$0.00	$0.00	$27.16
2	50	$21.57	$7.75	$0.00	$0.00	$29.32
3	55	$23.73	$10.55	$8.15	$0.00	$42.43
4	60	$25.88	$10.55	$8.15	$0.00	$44.58
5	65	$28.04	$10.55	$8.40	$0.00	$46.99
6	70	$30.20	$10.55	$8.40	$0.00	$49.15
7	75	$32.36	$10.55	$8.40	$0.00	$51.31
8	80	$34.51	$10.55	$8.40	$0.00	$53.46
9	85	$36.67	$10.55	$8.40	$0.00	$55.62
10	90	$38.83	$10.55	$8.40	$0.00	$57.78

Notes:

Apprentice to Journeyworker Ratio:1:1

TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 7*	07/03/2022	$46.41	$12.25	$13.69	$0.00	$72.35
	01/01/2023	$47.01	$12.50	$13.96	$0.00	$73.47

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 7*

Effective Date - 07/03/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$18.56	$7.35	$0.56	$0.00	$26.47
2	45	$20.88	$7.35	$0.63	$0.00	$28.86
3	50	$23.21	$12.25	$7.20	$0.00	$42.66
4	55	$25.53	$12.25	$7.27	$0.00	$45.05
5	65	$30.17	$12.25	$9.14	$0.00	$51.56
6	70	$32.49	$12.25	$10.37	$0.00	$55.11

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$18.80	$7.35	$0.56	$0.00	$26.71
2	45	$21.15	$7.35	$0.63	$0.00	$29.13
3	50	$23.51	$12.25	$7.20	$0.00	$42.96
4	55	$25.86	$12.25	$7.27	$0.00	$45.38
5	65	$30.56	$12.25	$9.14	$0.00	$51.95
6	70	$32.91	$12.25	$10.37	$0.00	$55.53

Notes:
Steps are 800 hours

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS
BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE
02/01/2022 $56.09 $11.39 $22.34 $0.00 $89.82

Apprentice - *TERRAZZO FINISHER-Local 3 Marble/Tile (Spr/Ptt)*

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.05	$11.39	$22.34	$0.00	$61.78
2	60	$33.65	$11.39	$22.34	$0.00	$67.38
3	70	$39.26	$11.39	$22.34	$0.00	$72.99
4	80	$44.87	$11.39	$22.34	$0.00	$78.60
5	90	$50.48	$11.39	$22.34	$0.00	$84.21

Notes:

Apprentice to Journeyworker Ratio:1:5

TERRAZZO MECHANIC
BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE
02/01/2022 $57.17 $11.39 $22.31 $0.00 $90.87

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TERRAZZO MECH - Local 3 Marble/Tile (Spr/Pitt)*

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.59	$11.39	$22.31	$0.00	$62.29
2	60	$34.30	$11.39	$22.31	$0.00	$68.00
3	70	$40.02	$11.39	$22.31	$0.00	$73.72
4	80	$45.74	$11.39	$22.31	$0.00	$79.44
5	90	$51.45	$11.39	$22.31	$0.00	$85.15

Notes:

Apprentice to Journeyworker Ratio:1:5

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$42.58	$9.10	$17.72	$0.00	$69.40
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$41.30	$9.10	$17.72	$0.00	$68.12
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$41.18	$9.10	$17.72	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
TRACTORS *OPERATING ENGINEERS LOCAL 98*	06/01/2022	$37.60	$12.47	$14.50	$0.00	$64.57
	12/01/2022	$38.48	$12.47	$14.50	$0.00	$65.45
	06/01/2023	$39.43	$12.47	$14.50	$0.00	$66.40
	12/01/2023	$40.38	$12.47	$14.50	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.82	$13.41	$16.01	$0.00	$66.24
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	12/01/2021	$53.41	$9.10	$18.17	$0.00	$80.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	12/01/2021	$55.41	$9.10	$18.17	$0.00	$82.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	12/01/2021	$45.48	$9.10	$18.17	$0.00	$72.75
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	12/01/2021	$47.48	$9.10	$18.17	$0.00	$74.75
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.24	$13.41	$16.01	$0.00	$65.66
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 4 (HEAVY & HIGHWAY)*	12/01/2021	$30.62	$9.10	$14.69	$0.00	$54.41
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WATER METER INSTALLER *PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION*	03/17/2022	$44.71	$9.55	$17.10	$0.00	$71.36
	09/17/2022	$45.71	$9.55	$17.10	$0.00	$72.36
	03/17/2023	$46.96	$9.55	$17.10	$0.00	$73.61
	09/17/2023	$47.96	$9.55	$17.10	$0.00	$74.61
	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86

For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"

Additional Apprentice Information:

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

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

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

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

APPENDIX I

RESERVED

APPENDIX J

INSTRUCTIONS TO BIDDERS

Town of Cheshire
Instructions to Bidders
Depot Street, Railroad Street and Mill Hill Road, Water Line Replacement – July 2022

Article 1. General

1.1 Each General Bidder (the "Bidder") by making a bid represents that:

1. The Bidder has read and understands the Contract Documents and the bid is made in accordance therewith.
2. The Bidder has visited the site and is familiar with the local conditions under which the work has to be performed.

1.2 Failure to examine the Contract Documents and site will not relieve any Bidder from any obligations under the bid as submitted.

Article 2. Requests for Interpretation

2.1 Bidders shall promptly notify the Town of Cheshire of any ambiguity, inconsistency, or error which they may discover upon examination of the Contract Documents, the site and local conditions.

2.2 Bidders requiring clarification or interpretation of the Contract Documents shall make written request to the Project Engineer at staff@berkshireengineering.com. Questions must be received at least 48 hours prior to the opening of the bids excluding holidays and weekends.

2.3 Interpretation, correction, or changes in the Contract Documents will be made by Addendum which will become part of the contract documents. The Town will not be held accountable for any oral instruction.

2.4 Addenda will be faxed or emailed to every individual or firm on record as having taken a set of Contract Documents.

Article 3. MBE Participation

3.1 Bidders are advised that the minority employee percentage rate to be applied to this project will be no less than 5% in each class.

Article 4. Preparation and Submission of Bids

4.1 Bids shall be submitted on the bid sheet.

4.2 All entries on the bid sheet shall be in typewriter or ink.

4.3 Any quantities provided on bid forms or elsewhere in Contract Documents are estimates only and are provided only as a basis for comparison of bids. The Town of Cheshire does not guarantee them to be even approximately correct. The Contractor shall have no claim for additional compensation, or refuse to perform the work called for, by reason of the actual quantities being greater or lesser by any amount than those called for in the proposal.

4.4 Where so indicated on the bid sheet, sums shall be expressed in both words and figures. In the event of a discrepancy between the bid sum expressed in words with the one expressed in figures, the figures shall control.

4.5 All proposals which contain abnormally high or abnormally low prices, for any class of work, or those which contain unbalanced bidding in any form or manner may be rejected as informal.

4.6 Bid deposits shall be submitted in the amount specified in the invitation for bids. They shall be made payable to the Town of Cheshire and shall be either in the form of certified check, treasurer's check or cashier's check issued by a responsible bank or trust company or a bid bond issued by a surety licensed to do business in the Commonwealth of Massachusetts; and shall be conditioned upon the faithful performance by the principal of the agreements contained in the bid.

4.7 Bid deposits of the three (3) lowest responsible and eligible bidders shall be retained until the execution and delivery of the Owner/Contractor agreement.

4.8 The Bid, including the bid deposit shall be enclosed in a sealed envelope with the following plainly marked on the outside:

- **GENERAL BID FOR:**
  Town of Cheshire
  Depot Street, Railroad Street and Mill Hill Road, Water Line Replacement – July 2022

- **Bidder's Name, Business Address, Phone Number, email address**

4.9 Be advised that all employees working on Massachusetts Public Works Construction Sites must have current 10 hour OSHA approved safety and health training in accordance with Chapter 306 of the Acts of 2004.

Article 5. Alternates

5.1 Each Bidder shall acknowledge Alternates on the Bid sheet.

Article 6. Withdrawal of Bids

6.1 Any bid may be withdrawn prior to the time and date of the bid opening. Withdrawals must be confirmed in writing. Withdrawals may be submitted by facsimile.

6.2 No bids may be withdrawn within thirty (30) days after the opening of the bids, Saturdays, Sundays, and Legal U.S. Holidays excluded.

Article 7. Contract Award

7.1 The Town of Cheshire will award the contract to the lowest eligible and responsible bidder within sixty (60) days after the opening of the bids, Saturdays, Sundays, and Legal U.S. Holidays excluded.

7.2 The Town of Cheshire reserves the right to waive any informalities in or to reject any or all bids if it is in the public interest to do so.

7.3 Subsequent to the award and within five (5) business days, Saturdays, Sundays, and Legal U.S. Holidays excluded, after the prescribed forms are presented for signature, the successful bidder shall execute and deliver to the Town of Cheshire, the contract in the form included in the Contract documents.

7.4 In the event that the Town receives low bids in the identical amount from two or more responsive and responsible bidders, the Town shall select a bidder by a blind selection process. The low bidders who are under consideration will be invited to attend and observe the selection process.

Article 8. Taxes

8.1 The bidder shall not include in this bid any tax imposed upon the sale or rental of tangible personal property in this Commonwealth, such as any and all building materials, supplies, services and equipment required to complete the work.

8.2 The Town of Cheshire is exempt from payment of the Massachusetts Sales Tax. The bidder shall not include any sales tax on its' bid.

Article 9. Applicable Laws

9.1 The successful bidder will ensure that all work and procedures performed in conjunction with the completion of this project are done so in accordance with applicable laws, regulations and requirements. Applicable regulations, specifications, guidelines and laws promulgated and adopted by various authorities and agencies include but are not limited to the following:

1. OSHA
2. Massachusetts plumbing, electrical, sanitary, building, and fire code
3. Commonwealth of Massachusetts MGL Chapter 30, Section 39M
4. Massachusetts Wetlands Protection Act
5. Executive Order 481 – (Undocumented Workers)
6. American Water Works Association - AWWA

END OF SECTION

APPENDIX K

SPECIAL PROVISIONS

Town of Cheshire, MA
Special Provisions
Depot Street, Railroad Street and Mill Hill Road, Water Line Replacement – July 2022

Description:

a. The work shall be performed according to a schedule to be determined by the contractor and the Town of Cheshire Water Superintendent.
b. No machines or equipment are to be activated prior to 7:00 a.m. nor shall any work extend beyond 4:30 p.m., Monday through Friday, unless otherwise agreed upon by the Town of Cheshire Water Superintendent.
c. Work is to be performed in accordance with all applicable codes, regulations, and laws.
d. Prior to commencing work, the contractor shall review all aspects of the project with the Town of Cheshire Water Superintendent. The Town of Cheshire shall locate the existing water mains.
e. The contractor shall supply all piping materials necessary for a complete installation. All pipe, fittings and adaptors are to be supplied with Mega-Lug compatible glands, bolts, and gaskets where required. Contractor shall fuse appropriate connections at ends of HDPE lines to allow for connection by the Town.
f. The contractor shall supply and install appropriate trace wire for installation along the length of the borings.
g. The Town of Cheshire shall supply all water necessary to complete the work as required.
h. The contractor shall provide all mechanical, plumbing, or other trades as necessary to complete fusing or pipes, caps, ports, ends, etc. The Town of Cheshire shall assist the contractor with moving the length of pipe for fusing activities using the Town of Cheshire front end loader or other suitable equipment. The Town of Cheshire reserves the right to inspect length of new water line during the fusing process.
i. The contractor shall pressure test the length of new water line upon its installation. The contractor shall also be responsible for flushing, chlorination, and bacteria testing of the length of new water line.
j. The contractor shall pull the length of new water line into place to the satisfaction of the Town of Cheshire Water Superintendent. The contractor shall provide and install an HDPE to Ductile Iron adaptor at each terminal end of the HDPE line, cap both ends of the new water line and provide a 2.5-inch stub with NST threads on each end.
k. Upon completion of pulling operations and final testing to satisfactory requirements, the contractor shall backfill around both ends of the new water line to existing grade. The contractor shall mark the location of each termination point of new water line with a stake at existing grade.
l. The Town of Cheshire shall provide an area in which the contractor can dispose of any materials and debris collected in conjunction with the execution of work under this contract. The disposal area shall be located within Town limits.
m. The contractor shall maintain the appropriate documents required for compliance with the funding agency (i.e., Massachusetts Weekly Certified Payroll Report Form).
n. The Town of Cheshire shall connect the new water line to the existing system as directed by the Town of Cheshire Water Superintendent.

APPENDIX L

PROJECT PLANS

CHESHIRE WATER DEPARTMENT
DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
CHESHIRE, MASSACHUSETTS

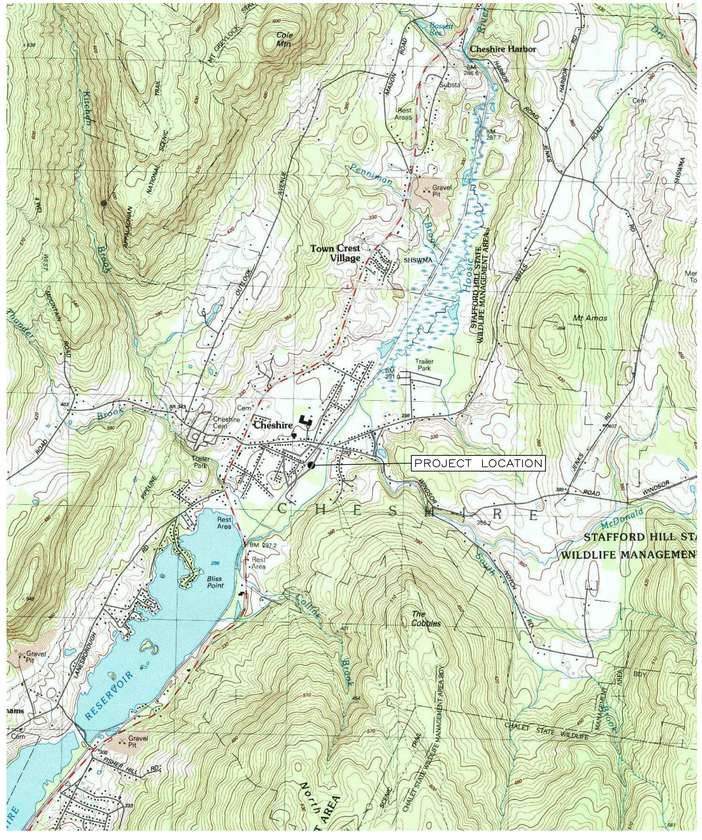
JULY 2022

CHESHIRE WATER DEPARTMENT
WATER LINE CONSTRUCTION PLANS

SEPTEMBER through NOVEMBER 2022 Construction

CONTACT PERSON:
Travis Delratez, Water Superintendent
413-441-7979

INDEX	
SHEET NO.	TITLE
1	COVER SHEET
2	NOTES & LEGEND (S.2)
3	WATER MAIN PLAN – DEPOT STREET (S.3)
4	WATER MAIN PLAN – MILL HILL ROAD (S.4)
5	WATER MAIN PLAN – RAILROAD STREET (WEST) (S.5)
6	WATER MAIN DETAILS (S.7)
7	ROADWAY, HYDRANT & UTILITY CROSSING DETAILS (S.8)



PROJECT LOCUS MAP

SCALE = 1:25000

WATER DEPARTMENT

RICK GURNEY, COMMISSIONER
STEPHEN LAFOGG, COMMISSIONER
MICHAEL BIAGINI SR, COMMISSIONER
TRAVIS DELRATEZ, SUPERINTENDENT

CHESHIRE MASS. TOWN HALL & LIBRARY – 1896 INCORPORATED MARCH 14, 1793

Berkshire Engineering, Inc.

DESIGN ENGINEER:
BERKSHIRE ENGINEERING, INC.
LEE, MA
413-243-4122

COMPLETE SET 7 SHEETS

LEGEND

- EXISTING CONTOURS
- PROPOSED WATER MAIN
- APPROXIMATE PROPERTY LINE
- BORDERING VEGETATED WETLAND
- 100' BUFFER ZONE
- FLOODPLAIN ELEVATION
- SILTFENCE/LIMIT OF WORK LINE
- EXISTING WATER MAIN OR SERVICE
- EXISTING WATER MAIN OR SERVICE TO BE ABANDONED
- PROPOSED WATER SERVICE
- EXISTING OVER HEAD WIRE
- EXISTING SEWER LINE
- EXISTING ELECTRIC
- EXISTING TELEPHONE
- EXISTING DRAINAGE
- EXISTING FENCE
- EXISTING STONE WALL
- EXISTING TREE LINE
- PROPOSED TREE LINE
- SURVEY CONTROL POINT
- TEMPORARY BENCHMARK
- IRON PIPE
- BOUND FOUND
- BOLLARD
- SIGN
- LAMP POST
- UTILITY POLE
- UTILITY ANCHOR
- EXISTING WELL LOCATION
- EXISTING HYDRANT
- NEW HYDRANT
- EXISTING WATER SHUT OFF
- NEW GATE VALVE/CURB STOP
- NEW CORPORATION STOP
- SEWER MANHOLE
- SEWER CLEAN OUT
- DRAINAGE MANHOLE
- CATCH BASIN
- CURB INLET
- GAS VALVE
- GAS MANHOLE
- ELECTRICAL BOX
- ELECTRICAL TRANSFORMER
- DRILL HOLE
- PERC TEST LOCATION
- TEST PIT LOCATION
- WETLAND FLAGGING STATION
- TREE
- TREE STUMP
- BUSH / SHRUB
- HEDGE ROW
- RANDOM FILL
- SELECT FILL (SEE NOTES)

ABBREVIATIONS

ASPH=ASPHALT
BND=BOUND
CB = CATCH BASIN
CBCI = CURB INLET
CONC=CONCRETE
CPP=CORRUGATED POLYETHYLENE PIPE
DMH = DRAINAGE MANHOLE
DYCL = DOUBLE YELLOW CENTER LINE
E = EASTING, EAST
EHH = ELECTRICAL HAND HOLE
ELEC = ELECTRICAL
ELEV, EL = ELEVATION
EMH = ELECTRICAL MANHOLE
GRAN=GRANITE
HDCP = HANDICAP
HH = HAND HOLE
INV. = INVERT
IP=IRON PIPE
LP = LAMP POST
MB=MAILBOX
N = NORTHING, NORTH
NE = NORTHEAST
NW = NORTHWEST
PVC = POLYVINYL CHLORIDE
PWW = PAVED WATERWAY
RCP = REINFORCED CONCRETE PIPE
S = SOUTH
SE = SOUTHEAST
SW = SOUTHWEST / SIDEWALK
SMH = SEWER MANHOLE
SDCL = SINGLE DASHED CENTER LINE
SWEL = SINGLE WHITE EDGE LINE
SYEL = SINGLE YELLOW EDGE LINE
TBM = TEMPORARY BENCHMARK
TMH = TELEPHONE MANHOLE
TRANS = TRANSFORMER/TRANSITION
UP = UTILITY POLE
VCP = VITRIFIED CLAY PIPE
W = WEST
WCR = WHEELCHAIR RAMP

CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL CALL DIG-SAFE AS REQUIRED PRIOR TO ANY EXCAVATION OR DISTURBANCE ASSOCIATED WITH THIS PROJECT. A COPY OF THE DIG-SAFE PROJECT REFERENCE NUMBER(S) SHALL BE PROVIDED TO THE OWNER PRIOR TO EXCAVATION OR DISTURBANCE.
2. LOCATIONS OF EXISTING PIPES, CONDUITS, UTILITIES, FOUNDATIONS AND OTHER UNDERGROUND OBJECTS ARE NOT WARRANTED TO BE CORRECT OR COMPLETE AND THE CONTRACTOR SHALL HAVE NO CLAIM ON THAT ACCOUNT SHOULD THEY BE OTHER THAN SHOWN.
3. TEST PITS TO LOCATE EXISTING UTILITIES MAY BE ORDERED BY THE ENGINEER.
4. STONE WALLS, FENCES, MAIL BOXES, SIGNS, CURBS, LIGHT POLES, ETC, SHALL BE REMOVED AND REPLACED AS NECESSARY TO PERFORM THE WORK. UNLESS OTHERWISE INDICATED, ALL SUCH WORK SHALL BE INCIDENTAL TO CONSTRUCTION OF THE PROJECT.
5. ALL PAVEMENT DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED IN ACCORDANCE WITH THE SPECIFICATIONS AND AS SHOWN ON THE DRAWINGS.
6. ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND PAYMENT LIMITS SHALL BE RESTORED AT NO ADDITIONAL COST TO THE OWNER.
7. CONCRETE CRADLES OR ARCHES SHALL BE CONSTRUCTED WHERE SHOWN ON THE DRAWINGS OR WHERE DIRECTED BY THE ENGINEER. UNLESS OTHERWISE INDICATED CONCRETE USED FOR PIPE ANCHOR BLOCKS, BACKING, PIPE CRADLES, ARCHES AND FILL SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI AT 28 DAYS.
8. THE CONTRACTOR SHALL NOT STORE ANY APPARATUS MATERIALS, SUPPLIES, OR EQUIPMENT ON DRAINAGE STRUCTURES OR WITHIN 100' OF JURISDICTIONAL WETLAND AREAS OR OTHER RESOURCE AREAS.
9. WATER TRENCHES MAY BE EXCAVATED WIDER THAN THE "LIMIT OF EXCAVATION AND PAYMENT FOR EARTH EXCAVATION" ABOVE THE "LINE OF NARROW TRENCH LIMIT" ANY SUCH EXCAVATION SHALL BE AT THE CONTRACTOR'S EXPENSE AND SHALL NOT BE MEASURED FOR PAYMENT.
10. BELOW THE "LINE OF NARROW TRENCH LIMIT", THE TRENCH SHOULD NOT BE EXCAVATED BEYOND THE TRENCH WIDTH "W". IF MATERIAL IS LOOSENED OR REMOVED BEYOND THE ABOVE MENTIONED LIMITS, THE CONTRACTOR WILL BE REQUIRED TO PROVIDE AND PLACE CRUSHED STONE FOR THE FULL WIDTH OF THE TRENCH AT NO ADDITIONAL COST TO THE OWNER.
11. THE CONTRACTOR SHALL COMPLETE ALL LAYOUTS, SURVEYS, ETC. REQUIRED FOR CONSTRUCTION OF THE PROJECT AS SHOWN AND AS SPECIFIED.
12. APPROVED JOINT RESTRAINT METHODS SHALL BE PROVIDED FOR WATER MAINS WHERE ANY BENDS, TEES, PLUGS, OR WYES ARE INSTALLED. CONCRETE THRUST BLOCKS, ANCHOR BLOCKS AND TIE RODS MAY BE USED FOR 6" AND 8" PIPE WHERE JOINT RESTRAINT IS NOT FEASIBLE FOR THRUST BLOCK AND PROVIDING MINIMUM BLOCK BEARING AREAS. SEE DETAILS AND SPECIFICATIONS.
13. NEW WATER MAINS AND SERVICES SHALL BE INSTALLED AT THE SPECIFIED MINIMUM DEPTH FROM FINISH GRADE TO TOP OF PIPE AS SHOWN ON THE DRAWINGS. WHERE NECESSARY, NEW WATER MAINS SHALL BE INSTALLED AT A GREATER DEPTH TO CLEAR OBSTACLES SHOWN ON THE DRAWINGS AT NO ADDITIONAL COST TO THE OWNER. MINIMUM CLEARANCES TO TO UTILITIES AS SHOWN ON THE DRAWINGS OR IDENTIFIED IN THE FIELD SHALL BE MAINTAINED.
14. EXISTING SERVICES SHALL NOT BE CONNECTED TO THE PROPOSED WATER MAIN UNTIL THAT MAIN HAS PASSED PRESSURE TEST AND DISINFECTION REQUIREMENTS AND HAS BEEN APPROVED BY THE ENGINEER AND WATER DEPARTMENT SUPERINTENDENT.
15. EXISTING WATER MAINS OR SERVICES SHALL NOT BE ABANDONED WITHOUT APPROVAL OF THE WATER DEPARTMENT SUPERINTENDENT. WATER SERVICE TO ANY USER SHALL NOT BE INTERRUPTED WITHOUT APPROVAL OF THE WATER DEPARTMENT SUPERINTENDENT.
16. ALL EXISTING HYDRANTS SHOWN AS BEING REMOVED FROM SERVICE SHALL BE CAREFULLY REMOVED AND DELIVERED TO AN AREA DESIGNATED BY THE WATER DEPARTMENT SUPERINTENDENT. THE ENTIRE HYDRANT ASSEMBLY INCLUDING SHUTOFF VALVE IS TO BE REMOVED FROM THE EXISTING MAIN AND DELIVERED TO THE TOWN DESIGNATED AREA.
17. EXISTING HYDRANTS SHALL REMAIN IN SERVICE UNTIL THE NEW HYDRANTS HAVE BEEN PLACED INTO SERVICE AND APPROVED FOR USE BY THE WATER DEPARTMENT SUPERINTENDENT OR HIS DESIGNEE.
18. ANY HYDRANT WHICH IS NOT IN SERVICE SHALL BE COVERED WITH A SECURELY FASTENED BURLAP BAG.
19. VALVE BOXES ON MAINS TO BE ABANDONED SHALL BE REMOVED BY THE CONTRACTOR AND DELIVERED TO A LOCATION DETERMINED BY THE WATER DEPARTMENT SUPERINTENDENT.
20. PROPOSED WATER MAIN TO BE INSTALLED IN LOCATION SHOWN ON PLANS UNLESS ANOTHER LOCATION IS PROPOSED BY THE CONTRACTOR AND AGREED TO BY THE WATER DEPARTMENT SUPERINTENDENT. WHEN REQUIRED, TEMPORARY WATER MAIN SHALL BE INSTALLED. ALL SERVICE CONNECTIONS SHALL BE TRANSFERRED TO THE NEW WATER MAIN AS REQUIRED.
21. THE LOCATIONS OF PIPES, CAPS, REDUCERS, BENDS, AND OTHER FITTINGS AT POINTS OF CONNECTIONS TO EXISTING MAINS IS APPROXIMATE. CONTRACTOR SHALL DIG A TEST PIT AT EACH LOCATION TO DETERMINE DIAMETER AND MATERIAL OF THE EXISTING PIPE AND LOCATION POINT OF CONNECTION.
22. THE CONTRACTOR SHALL NOT OPERATE ANY VALVES. ANY OPERATION OF VALVES SHALL BE COORDINATED WITH THE WATER DEPARTMENT SUPERINTENDENT. THE CONTRACTOR IS RESPONSIBLE TO NOTIFY IN WRITING A MINIMUM OF 48 HOURS IN ADVANCE BUT NOT GREATER THAN 72 HOURS IN ADVANCE, ANY SYSTEM USER THAT WILL BE WITHOUT WATER DUE TO A SHUTDOWN.
23. SOME WATER AND SEWER SERVICES AND MAINS MAY NOT BE SHOWN ON THE DRAWINGS. THE OWNER WILL MARK THE LOCATION OF SUCH LINES IN THE FIELD PROVIDED THE CONTRACTOR PROVIDES A MINIMUM OF 24 HOURS ADVANCE NOTICE.
24. INLET PROTECTION SHALL BE PROVIDED ON ALL EXISTING CATCH BASINS FOR THE DURATION OF THE PROJECT. INLET PROTECTION SHALL BE REMOVED BY THE CONTRACTOR UPON NOTICE BY THE HIGHWAY DEPARTMENT SUPERINTENDENT.
25. EROSION CONTROLS SHALL BE LOCATED, PLACED AND MAINTAINED AS REQUIRED TO PREVENT SEDIMENTATION FROM LEAVING THE WORK AREA.
26. ALL PROPOSED PAVING SHALL MATCH GRADE AT THE ROADWAY INTERSECTIONS, SIDEWALKS, STAIRWAYS AND BUILDING ENTRANCES.
27. EXISTING UTILITY, EDGE OF PAVEMENT, UTILITY POLE LOCATION, EDGE OF PAVEMENT AND SIDEWALK, AND LOCATIONS OF ABOVE GROUND STRUCTURES FROM FIELD MAPPING BY BERKSHIRE ENGINEERING, INC AND TOWN OF CHESHIRE GIS MAPPING.
28. ELEVATIONS ARE BASED ON USGS BENCHMARK.
29. PROPERTY LINE INFORMATION PROVIDED BY TOWN OF CHESHIRE.
30. ALL STREET EXCAVATIONS SHALL BE COMPLETELY CLOSED AT THE END OF EACH WORKING DAY BY BACKFILLING OR COVERING WITH STEEL PLATES.
31. EXISTING SEWER AND WATER MAIN LOCATIONS AND DEPTHS ARE FROM FIELD OBSERVATIONS AND INFORMATION PROVIDED BY THE TOWN OF CHESHIRE.
33. THE WATER MAIN SHALL BE INSTALLED BENEATH ALL DRAIN LINES UNLESS OTHERWISE DIRECTED BY THE WATER DEPARTMENT SUPERINTENDENT.
34. CORPORATION AND CURB STOPS SHALL BE A MINIMUM OF ONE (1) INCH. FOR SERVICES GREATER THAN ONE (1) INCH DIAMETER, THE SIZE TO BE INSTALLED SHALL BE DETERMINED BY THE WATER DEPARTMENT SUPERINTENDENT.
35. ALL CONNECTIONS TO EXISTING WATER MAINS SHALL BE COMPLETED USING SOLID SLEEVES. FLEXIBLE COUPLINGS SHALL NOT BE ALLOWED.
36. ALL NON-MECHANICAL JOINTS SHALL RECEIVE A MINIMUM OF TWO BRONZE WEDGES PER CONNECTION TO MAINTAIN CONTINUITY WHEN TRACING PIPING.
37. ANY PAVEMENT MARKINGS DISTURBED THROUGH THE CONDUCT OF THE WORK SHALL BE REPAINTED UPON COMPLETION OF WORK IN ANY AREA OR SECTION OF THE PROJECT.
38. ALL CURB RODS TO BE ⅝" STAINLESS STEEL (½" NOT ACCEPTABLE).
39. TWO BRONZE WEDGES REQUIRED PER NON-MECHANICAL OR PUSH ON STYLE PIPE CONNECTION TO ENSURE ELECTRICAL CONTINUITY.
40. ALL IRON OR STEEL PIPING AND FITTINGS ARE TO BE ENCASED IN POLYETHYLENE ENCASEMENT PER PROJECT SPECIFICATIONS.
40. ALL VALVE BOXES TO BE BY BIBBY-STE-CROX MANUFACTURER, OR OTHER APPROVED PROVIDER
41. ANY SEWER LATERALS BROKEN DURING WATER LINE INSTALLATION ARE TO BE REPAIRED AND ARE TO HAVE FERNCO STRONG BACKS INSTALLED.
42. ALL PIPE JOINTS SHALL BE INSTALLED AS PER MANUFACTURER SPECIFICATION.
43. WHERE NEW PLASTIC METER PITS SHOWN, TOWN OF CHESHIRE SHALL PROVIDE METER PITS DURING INSTALLATION OF SERVICES. CONTRACTOR SHALL PROVIDE SERVICE LINE INTO AND OUT OF PIT AND TOWN OF CHESHIRE SHALL INSTALL METERS. THIS WORK SHALL BE PERFORMED IN CONJUNCTION WITH THE INSTALLATION OF SERVICE LINES.

Berkshire Engineering, Inc.
80 RUN WAY
LEE, MASSACHUSETTS 01238
PHONE (413) 243-4122
FAX 877.335.7282
www.berkshireengineering.com
CIVIL & ENVIRONMENTAL ENGINEERS
LAND CONSULTANTS

REV	DESCRIPTION	DR'N	CK'D	DATE

WATER MAIN INSTALL PLAN
PREPARED FOR: TOWN OF CHESHIRE
80 CHURCH STREET, CHESHIRE, MA 01225

DRAWING TITLE

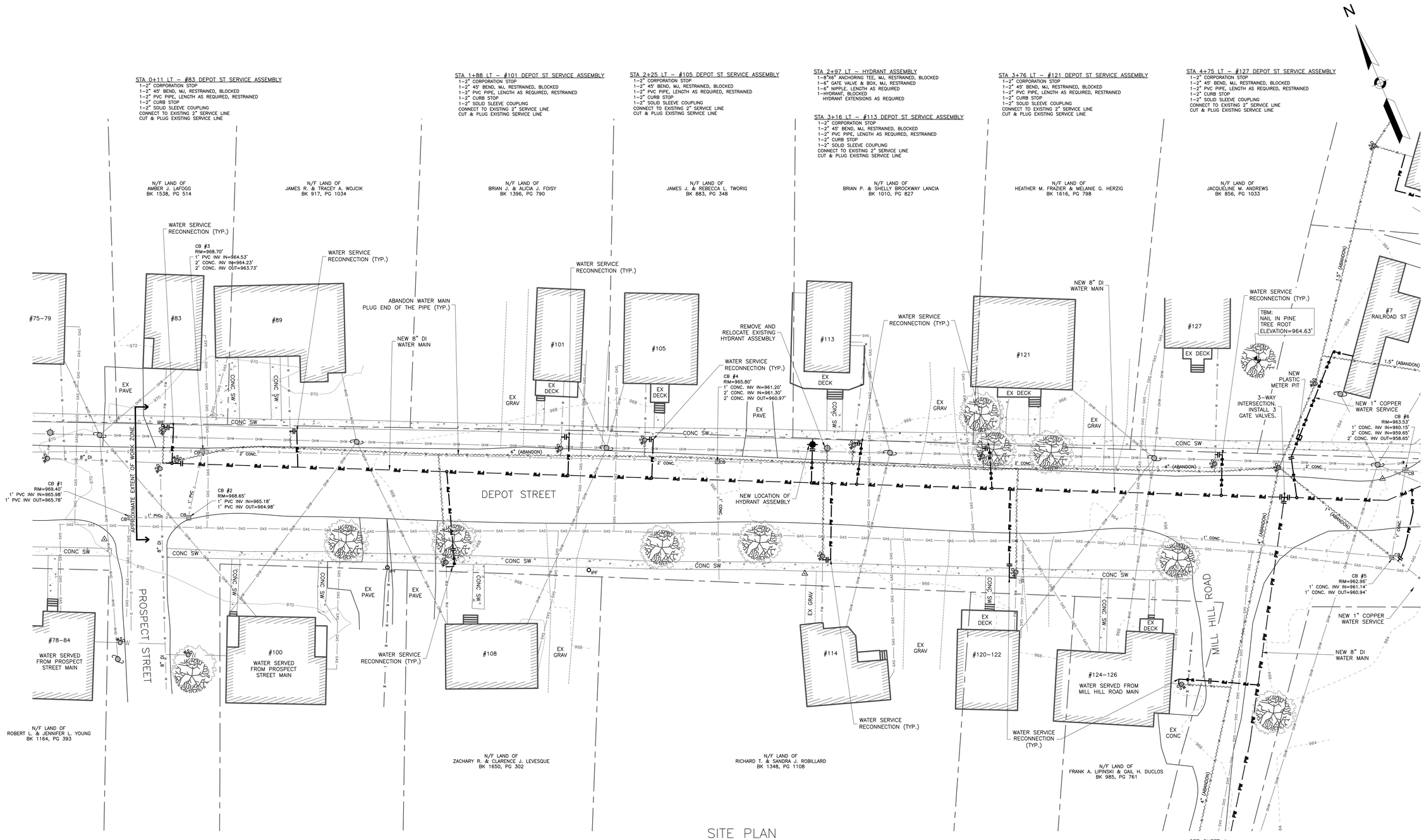
WATER MAIN IMPROVEMENTS - LEGEND & NOTES
FOR DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
CHESHIRE, MASSACHUSETTS 01225

DATE DRAWN:	07/10/2022
DRAWN BY:	SHN
APPROVED BY	MSK
SCALE:	VARIES

PROJECT DESCRIPTION:

WATER MAIN INSTALL PLAN
AT DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
FOR
TOWN OF CHESHIRE
CHESHIRE, MA 01225

DRAWING NUMBER	SHEET
19-02-02 CWD	S.2



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REV	DESCRIPTION	DR'N CK'D.	DATE

WATER MAIN INSTALL PLAN
PREPARED FOR: TOWN OF CHESHIRE
80 CHURCH STREET, CHESHIRE, MA 01225

DRAWING TITLE

WATER MAIN IMPROVEMENTS - DEPOT STREET PLAN
FOR DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
CHESHIRE, MASSACHUSETTS 01225

DATE DRAWN:	07/10/2022
DRAWN BY:	SHN
APPROVED BY	MSK
SCALE:	VARIES

PROJECT DESCRIPTION:

WATER MAIN INSTALL PLAN
AT DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
FOR
TOWN OF CHESHIRE
CHESHIRE, MA 01225

DRAWING NUMBER	SHEET
19–02–02 CWD	S.3

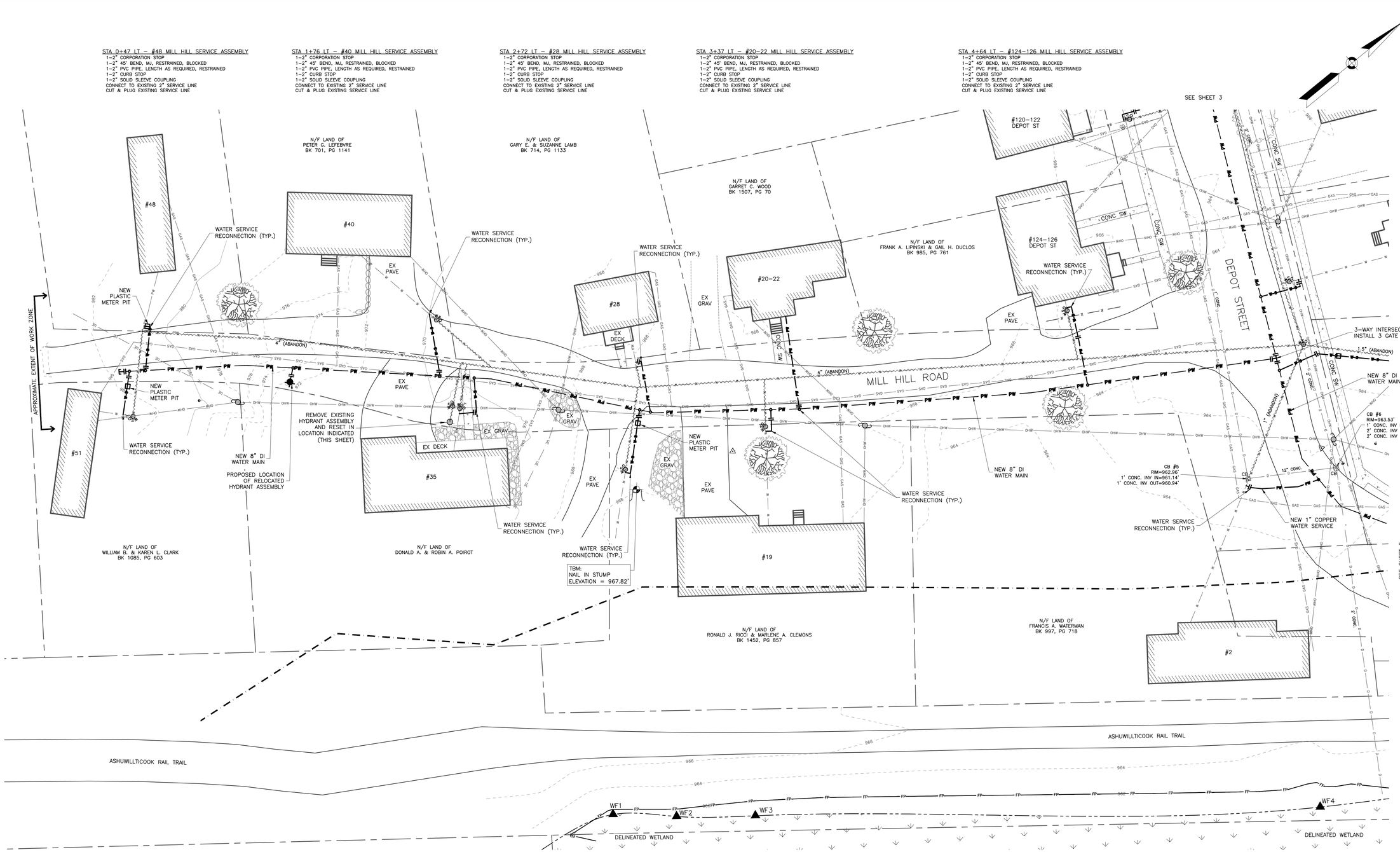
STA 0+47 LT – #48 MILL HILL SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE

STA 1+76 LT – #40 MILL HILL SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE

STA 2+72 LT – #28 MILL HILL SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE

STA 3+37 LT – #20–22 MILL HILL SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE

STA 4+64 LT – #124–126 MILL HILL SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE



SITE PLAN

20 0 20 40 60

SCALE: 1" = 20'

STA 0+35 RT – MILL HILL ASSEMBLY
1–8" GATE VALVE & BOX, MJ, RESTRAINED
1–8" STUB

STA 0+42 RT – #51 MILL HILL SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE

STA 1+14 RT – HYDRANT ASSEMBLY
1–8"X6" ANCHORING TEE, MJ, RESTRAINED, BLOCKED
1–6" GATE VALVE & BOX, MJ, RESTRAINED
1–6" NIPPLE, LENGTH AS REQUIRED
1–HYDRANT, BLOCKED
HYDRANT EXTENSIONS AS REQUIRED

STA 1+88 RT – #35 MILL HILL SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE

STA 3+24 RT – #19 MILL HILL SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE

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REV	DESCRIPTION	DR'N	CK'D	DATE

WATER MAIN INSTALL PLAN
PREPARED FOR: TOWN OF CHESHIRE
80 CHURCH STREET, CHESHIRE, MA 01225

DRAWING TITLE

WATER MAIN IMPROVEMENTS - MILL HILL ROAD PLAN
FOR DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
CHESHIRE, MASSACHUSETTS 01225

DATE DRAWN:	07/10/2022
DRAWN BY:	SHN
APPROVED BY	MSK
SCALE:	VARIES

PROJECT DESCRIPTION:

WATER MAIN INSTALL PLAN
AT DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
FOR
TOWN OF CHESHIRE
CHESHIRE, MA 01225

DRAWING NUMBER	SHEET
19–02–02 CWD	S.4

STA 5+07 LT – #7 RAILROAD ST SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE

STA 7+10 LT – #17–25 RAILROAD ST SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE

STA 7+19 RT – HYDRANT ASSEMBLY
1–8"X6" ANCHORING TEE, MJ, RESTRAINED, BLOCKED
1–6" GATE VALVE & BOX, MJ, RESTRAINED
1–6" NIPPLE, LENGTH AS REQUIRED
1–HYDRANT, BLOCKED
HYDRANT EXTENSIONS AS REQUIRED

STA 8+24 LT – #41 RAILROAD ST SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE

N

WATER SERVICE RECONNECTION (TYP.)
SEE SHEET 3
NEW 8" DI WATER MAIN
#124–126 DEPOT ST
#127 DEPOT ST
N/F LAND OF JACQUELINE M. ANDREWS BK 856, PG 1033
TBM: NAIL IN PINE TREE ROOT ELEVATION = 964.63'
CONC SW
EX CONC
3–WAY INTERSECTION. INSTALL 3 EA. 8" GATE VALVES.
MILL HILL ROAD
NEW 1" COPPER WATER SERVICE
WATER SERVICE RECONNECTION (TYP.)
1.5" (ABANDON)
2" CONC
SEE SHEET 4
#7
#17
#25
EX DECK
EX PAVE
CB #6
RIM=963.53'
1" CONC. INV IN=960.15'
2" CONC. INV IN=959.65'
2" CONC. INV OUT=958.65'
NEW PLASTIC METER PIT
PROPOSED HYDRANT ASSEMBLY (TYP.)
N/F LAND OF THOMAS & ELIZABETH A. SIMKEN BK 1586, PG 468
#41
N/F LAND OF VALLEY REALTY CO BK 1571, PG 911
EX GRAV
WATER SERVICE TO REMAIN
3" CONCRETE CULVERT
NEW 8" DI WATER MAIN
NEW 1" COPPER WATER SERVICE
CB #5
RIM=962.96'
1" CONC. INV IN=961.14'
1" CONC. INV OUT=960.94'
CB
CONC SW
100' BUFFER ZONE
RAILROAD STREET
WATER SERVICE RECONNECTION (TYP.)
INSTALL 8" DI WATER MAIN
CB #7
RIM=962.64'
1" CONC. INV OUT=958.64'
FIELD VERIFY LOCATION OF 8" GATE VALVE. CONNECT PROPOSED 8" MAIN TO EXISTING GATE VALVE. COORDINATE WITH CHESHIRE WATER DEPT.
APPROX. LOC. 8" MAIN TO REMAIN
12" CONC
PROJECT LIMIT
DM #1
RIM=963.04'
1" CONC. INV IN=957.84'
3" CONC. INV IN=956.48'
1" CONC. INV OUT=957.62'
3" CONC. INV OUT=956.40'
N/F LAND OF FRANCIS A. WATERMAN BK 997, PG 718
#2
#6
N/F LAND OF CHARLES A. LEWIS
WATER SERVICE RECONNECTION (TYP.)
NEW 8" DI WATER MAIN
TBM: NAIL IN MAPLE TREE ROOT ELEVATION = 962.10'
100' BUFFER ZONE
ASHUWILLTICOOK RAIL TRAIL
DELINEATED WETLAND
WF4
WF5
WF6
WF7
WF8
WF9
WF10
WF11
WF12
WF13
WF14

SITE PLAN

20 0 20 40 60
SCALE: 1" = 20'

STA 5+07 RT – #2 RAILROAD ST SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE

STA 6+38 RT – #6 RAILROAD ST SERVICE ASSEMBLY
1–2" CORPORATION STOP
1–2" 45° BEND, MJ, RESTRAINED, BLOCKED
1–2" PVC PIPE, LENGTH AS REQUIRED, RESTRAINED
1–2" CURB STOP
1–2" SOLID SLEEVE COUPLING
CONNECT TO EXISTING 2" SERVICE LINE
CUT & PLUG EXISTING SERVICE LINE

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REV	DESCRIPTION	DR'N	CK'D	DATE

WATER MAIN IMPROVEMENTS - RAILROAD STREET PLAN (WEST)
FOR DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
CHESHIRE, MASSACHUSETTS 01225

DRAWING TITLE

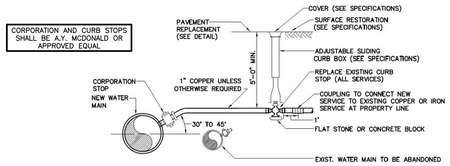
WATER MAIN INSTALL PLAN
PREPARED FOR: TOWN OF CHESHIRE
80 CHURCH STREET, CHESHIRE, MA 01225

DATE DRAWN:	07/10/2022
DRAWN BY:	SHN
APPROVED BY	MSK
SCALE:	VARIES

PROJECT DESCRIPTION:

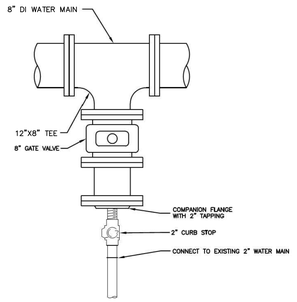
WATER MAIN INSTALL PLAN
AT DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
FOR
TOWN OF CHESHIRE
CHESHIRE, MA 01225

DRAWING NUMBER	SHEET
19–02–02 CWD	S.5

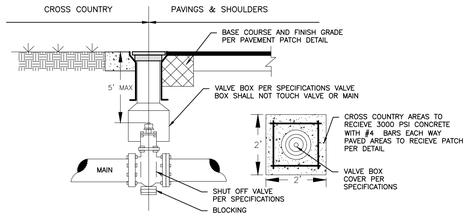


NOTES:
1. PROVIDE SADDLE FOR ALL AC AND PVC MAINS AND ALL 2" STOPS
2. VALVE BOX RISERS SHALL BE INSTALLED AROUND CURB BOXES IN PAVED AREAS.

1/7/10 **WATER SERVICE CONNECTION SECTION VIEW**
NTS

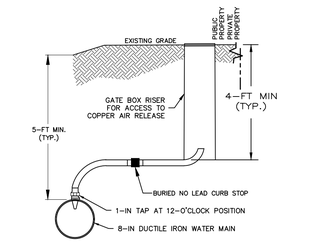


2/7/10 **WATER SERVICE CONNECTION PLAN VIEW**
NTS



1. D.I. MAY BE USED AS VALVE BOX EXTENSION
2. VALVE OPERATING NUT MUST BE EXTENDED TO WITHIN 5' OF SURFACE WITH MANUFACTURES APPROVED EXTENSION KIT
3. PRECAST CONCRETE ENCASEMENT MAY BE USED OUTSIDE OF PAVED AREAS

3/7/10 **VALVE BOX DETAIL**
NTS



NOTE: WATER MAIN BLOW-OFF MUST CONSIST OF 1" TAP LOCATED AT 12 O'CLOCK POSITION IN WATER MAIN TO USE AS A RELEASE FOR TRAPPED AIR. BLOW-OFF SHALL BE LOCATED AT THE HIGHEST ELEVATION IN 8" PIPING IN THE WORK AREA. BLOW-OFF MAY BE INSTALLED DURING TEMPORARY SUPPLY CONDITION IF PREFERRED BY CONTRACTOR, PROVIDED THAT ALL COMPONENTS ASSOCIATED WITH WATER MAIN BLOW-OFF REMAIN INTACT UPON ADOPTION OF FINAL CONNECTION LAYOUT.

4/7/10 **WATER MAIN BLOW-OFF DETAIL**
NTS

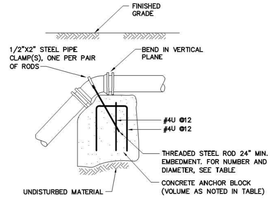
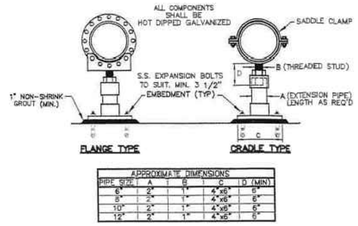


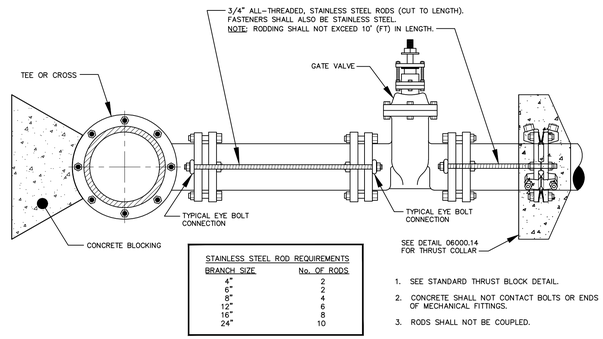
Table Of Dimensions For Anchor Blocks		NO. AND SIZE OF THREADED RODS	
BEND SIZE	Volume	NO.	DIAM.
6"-22.5°	0.6 C.Y.	2	1/2"
6"-45°	1.0 C.Y.	2	1/2"
8"-22.5°	1.0 C.Y.	2	1/2"
8"-45°	1.8 C.Y.	2	3/4"
12"-22.5°	2.5 C.Y.	2	3/4"
12" 45°	4.0 C.Y.	4	3/4"

5/7/10 **ANCHOR BLOCK DETAIL**
NTS



APPROXIMATE DIMENSIONS				
PIPE SIZE	A	B	C	D (MIN)
6"	2"	1"	4'-10"	6"
8"	2"	1"	4'-10"	6"
10"	2"	1"	4'-10"	6"
12"	2"	1"	4'-10"	6"

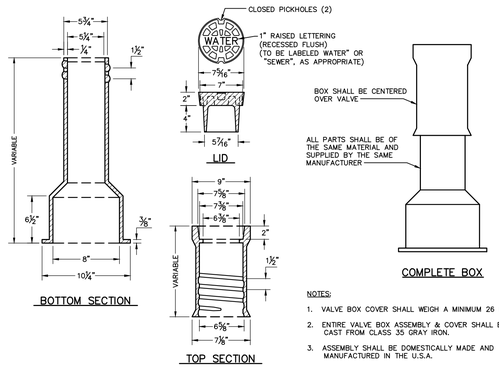
6/7/10 **ADJUSTABLE PIPE SUPPORT DETAIL**
NTS



STAINLESS STEEL ROD REQUIREMENTS	
BRANCH SIZE	No. OF RODS
4"	2
6"	2
8"	4
12"	6
16"	8
24"	10

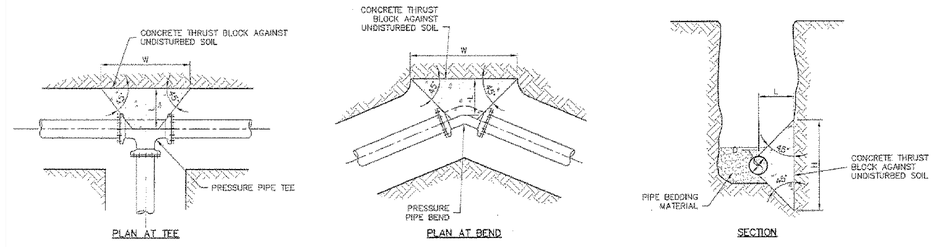
1. SEE STANDARD THRUST BLOCK DETAIL.
2. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL FITTINGS.
3. RODS SHALL NOT BE COUPLED.

7/7/10 **VALVE RESTRAINT DETAIL**
NTS



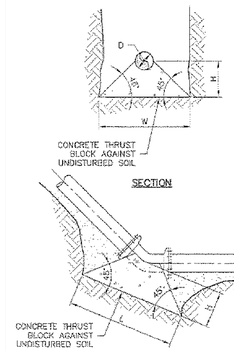
NOTES:
1. VALVE BOX COVER SHALL WEIGH A MINIMUM 26 lbs.
2. ENTIRE VALVE BOX ASSEMBLY & COVER SHALL BE CAST FROM CLASS 35 GRAY IRON.
3. ASSEMBLY SHALL BE DOMESTICALLY MADE AND MANUFACTURED IN THE U.S.A.

8/7/10 **VALVE BOX ASSEMBLY DETAIL**
NTS



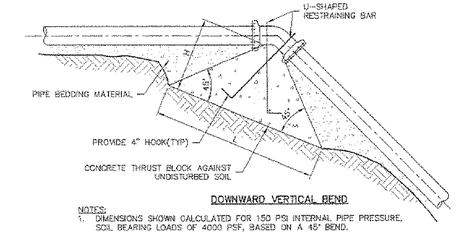
9/7/10 **CONCRETE THRUST BLOCK FOR HORIZONTAL BENDS AND TEES**
NTS

UPWARD VERTICAL BENDS				
D	BEARING AREA (SQ.FT)	"H" FT	"W" FT	"L" FT
6	0.41	2.0	4.0	2.0
8	0.71	2.6	5.2	2.0
10	1.06	3.2	6.4	2.0
12	1.50	3.8	7.6	2.0



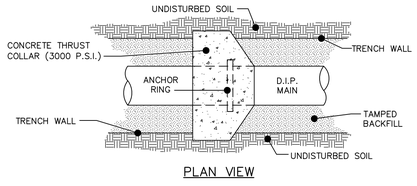
DOWNWARD VERTICAL BENDS						
D	VOLUME (CU.FT)	BEARING AREA (S.F.)	"H"	"W"	"L" *	REBAR DIA.	REBAR SPACING	REBAR LENGTH
4"	47	5	33"	72"	60"	#4	15"	
6"	71	8	41"	91"	60"	#5	18"	
12"	100	10	46"	108"	60"	#6	24"	
16"	174	18	64"	142"	60"	#7	29"	

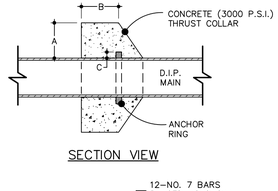
* "L" IS ASSUMED TO BE THE WIDTH OF THE TRENCH



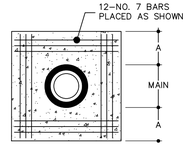
NOTES:
1. DIMENSIONS SHOWN CALCULATED FOR 150 PSI INTERNAL PIPE PRESSURE, SOIL BEARING LOADS OF 4000 PSF, BASED ON A 45° BEND.
2. CONCRETE THRUST BLOCKS SHALL BE CONSTRUCTED OF CONCRETE MATERIAL POURED AGAINST UNDISTURSED SOIL.
3. DIMENSIONS L, W, & H MAY BE ADJUSTED TO MEET FIELD CONDITIONS, PROVIDED THE BEARING AREA AND VOLUME REMAIN UNCHANGED.
4. RESTRAINING BARS SHALL BE ASTM A615 GRADE 60 REINFORCING STEEL.
5. THE PORTION OF THE RESTRAINING BARS EXPOSED TO SOIL SHALL BE COATED WITH TWO COATS OF BITUMASTIC MATERIAL.
6. POLYETHYLENE SHEETING SHALL BE PLACED OVER MJ FITTINGS TO PREVENT DIRECT CONTACT BETWEEN CONCRETE AND THE FITTING.

10/7/10 **CONCRETE THRUST BLOCK FOR VERTICAL BENDS**
NTS





SCHEDULE			
PIPE DIAMETER	CONCRETE THRUST COLLAR	ANCHOR RING	RINGS REQUIRED
	A	B	C	
6", 8", 12"	1'-0"	1'-0"	2"	ONE



11/7/10 **THRUST COLLAR DETAIL**
NTS

Berkshire Engineering, Inc.
80 RUN WAY
LEE, MASSACHUSETTS 01238
PHONE (413) 243-4122
FAX 877.335.7282
www.berkshireengineering.com
CIVIL & ENVIRONMENTAL ENGINEERS
LAND CONSULTANTS

REV	DESCRIPTION	DR'N	CK'D.	DATE

WATER MAIN INSTALL PLAN
PREPARED FOR: TOWN OF CHESHIRE
80 CHURCH STREET, CHESHIRE, MA 01225

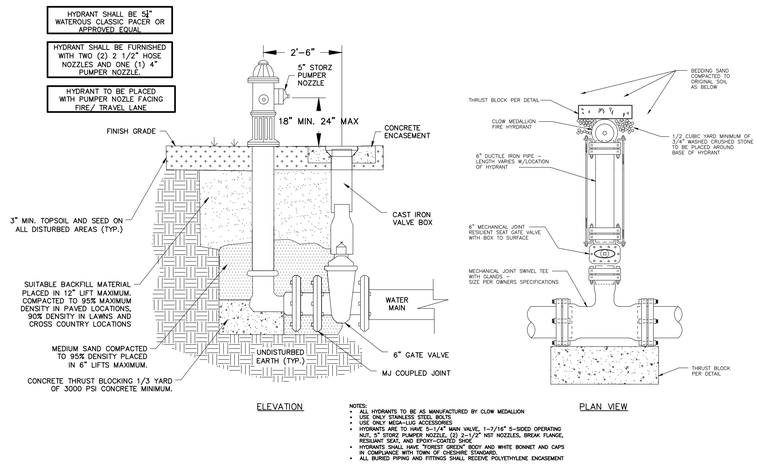
DRAWING TITLE: DETAILS

WATER MAIN IMPROVEMENTS - WATER LINE AND ROADWAY DETAILS
FOR DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
CHESHIRE, MASSACHUSETTS 01225

DATE DRAWN:	07/10/2022
DRAWN BY:	SHN
APPROVED BY	MSK
SCALE:	VARIES

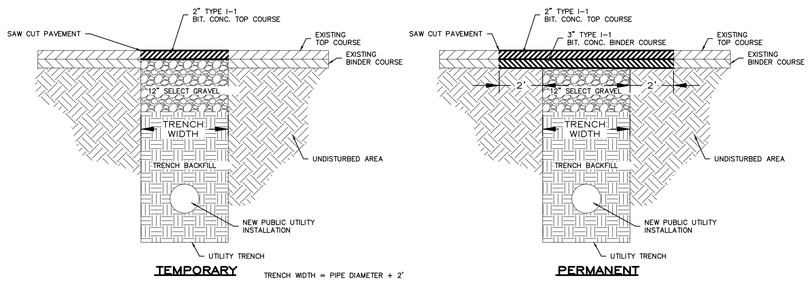
PROJECT DESCRIPTION:
WATER MAIN INSTALL PLAN AT DEPOT STREET, RAILROAD STREET & MILL HILL ROAD FOR TOWN OF CHESHIRE CHESHIRE, MA 01225

DRAWING NUMBER	SHEET
19-02-02 CWD	S.7



NOTES:
- ALL HYDRANTS TO BE AS MANUFACTURED BY CLOW MEDALLION
- USE ONLY STAINLESS STEEL BOLTS
- USE ONLY MEGA-LUG ACCESSORIES
- HYDRANTS ARE TO HAVE 5-1/4" MAIN VALVE, 1-7/16" 5-SIDED OPERATING NUT, 5" STORZ PUMPER NOZZLE, (2) 2-1/2" NST NOZZLES, BREAK FLANGE, AND 6" MJ SHOE INLET CONNECTION.
- HYDRANTS SHALL HAVE "FOREST GREEN" BODY AND WHITE BONNET AND CAPS IN COMPLIANCE WITH TOWN OF CHESHIRE STANDARD.
- ALL BURIED PIPING AND FITTINGS SHALL RECEIVE POLYETHYLENE ENCASEMENT

1 / 8/10 **HYDRANT INSTALLATION DETAILS**
NTS

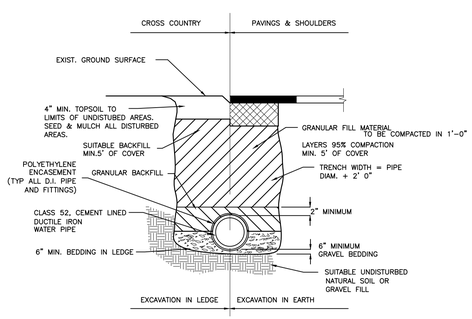


TRENCH WIDTH = PIPE DIAMETER + 2'

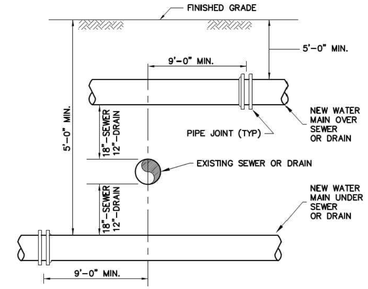
TEMPORARY TRENCH PATCH WIDTH = TRENCH WIDTH
PERMANENT TRENCH PATCH WIDTH = TRENCH WIDTH + 4'

EXISTING EDGE OF PAVEMENT ALONG TRENCH PATCH SHALL BE SAW CUT AND COATED WITH RS-1 EMULSIFIED ASPHALT OR APPROVED EQUAL BEFORE NEW PAVEMENT IS PLACED.

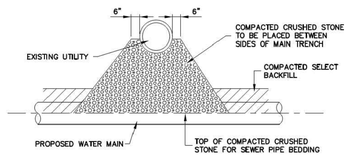
2 / 8/10 **PAVEMENT TRENCH PATCHING DETAILS**
NTS



3 / 8/10 **WATER TRENCH DETAIL**
NTS



4 / 8/10 **SEWER OR DRAIN CROSSING DETAIL**
NTS



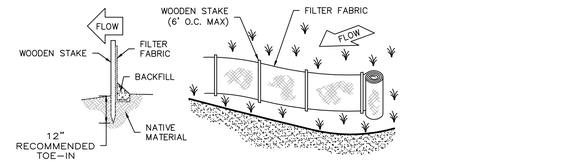
5 / 8/10 **UTILITY CROSSING DETAIL**
NTS

SIZE (IN.)	HORIZ. BENDS	MINIMUM RESTRAINED LENGTH, FT, MIN.
6"	45°	14'
8"	45°	19'
12"	45°	27'
12"	11¼°	7'
TEES		
8"x6"		28'
12"x6"		70'
12"x8"		51'
12"x10"		28'
REDUCER		
8"x6"		28'
12"x4"		83'
12"x6"		70'
12"x8"		51'
12"x10"		28'
CAP		
4"		35'
6"		51'
8"		66'
10"		81'
12"		96'

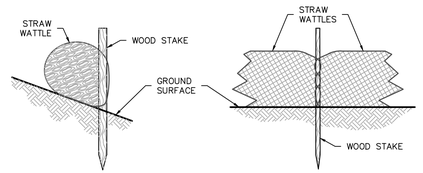
* PROJECT SPECIFIC DESIGN CONDITIONS

** MINIMUM RESTRAINED LENGTH BASED ON DIPRA, "THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE", SIXTH EDITION, 2006
FOLLOWING CONDITIONS APPLY:
PIPE IS NOT POLYWRAPPED
SOIL DESIGNATION: COHESIVE-GRANULAR
DESIGN PRESSURE: 150psi
LAYING CONDITIONS: TYPE 2
DEPTH OF COVER: 5.0'
SAFETY FACTOR: 2

6 / 8/10 **MINIMUM RESTRAINED LENGTHS OF DI PIPE**
NTS

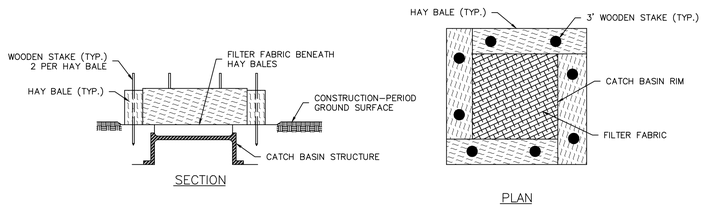


7 / 8/10 **SILT FENCE INSTALLATION DETAIL**
NTS

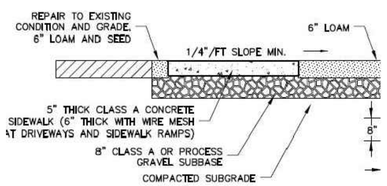


8 / 8/10 **STRAW WATTLE INSTALLATION DETAIL**
NTS

ALL EROSION CONTROLS TO REMAIN IN PLACE THROUGHOUT ADJACENT SITE WORK. INSPECTIONS OF EROSION CONTROLS ARE TO BE PERFORMED REGULARLY, AND MAINTENANCE OF EROSION CONTROLS IS TO BE PERFORMED AS NEEDED, DEPENDENT ON CONSTRUCTION-RELATED ACTIVITIES AND STORM EVENTS.



9 / 8/10 **INLET PROTECTION DETAIL**
NTS



10 / 8/10 **CONCRETE SIDEWALK REPAIR DETAIL**
NTS

Berkshire Engineering, inc.
80 RUN WAY
LEE, MASSACHUSETTS 01238
PHONE (413) 243-4122
FAX 877.335.7282
www.berkshireengineering.com
CIVIL & ENVIRONMENTAL ENGINEERS
LAND CONSULTANTS

REV	DESCRIPTION	DR'N	CK'D	DATE

DRAWING TITLE

WATER MAIN INSTALL PLAN
PREPARED FOR: TOWN OF CHESHIRE
80 CHURCH STREET, CHESHIRE, MA 01225

WATER MAIN IMPROVEMENTS - WATER LINE AND ROADWAY DETAILS
FOR DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
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DATE DRAWN:	07/10/2022
DRAWN BY:	SHN
APPROVED BY	MSK
SCALE:	VARIES

PROJECT DESCRIPTION:

WATER MAIN INSTALL PLAN
AT DEPOT STREET, RAILROAD STREET & MILL HILL ROAD
FOR
TOWN OF CHESHIRE
CHESHIRE, MA 01225

DRAWING NUMBER	SHEET
19-02-02 CWD	S.8