

WATER MAIN INSTALLATION INSTRUCTIONS

These are the specifications for installation of water main, services and hydrants and all appurtenances thereof for Maine Water Company.

SECTION 1 - DESCRIPTION OF WORK:

- 1.1 The work to be done consists of trenching, laying water main, services, hydrants and other necessary appurtenances, backfilling the trench, and properly completing the work of water main construction at locations called for in accordance with plans approved by and at a time required by The Maine Water Company (hereinafter called the Company). All work shall be completed in accordance with the Company's Material Specifications and Installation Instructions.

SECTION 2 – DESIGN CRITERIA:

- 2.1 **Pressure** – All water mains, including those not designed to provide fire protection, shall be reviewed by the Company based on demands and pressure requirements. The system shall be designed to maintain a minimum pressure of 35 psi at ground level at all points in the distribution system under all conditions of flow.
- 2.2 **Diameter** – The minimum size of water main for providing fire protection and serving hydrants shall be eight-inch diameter. Larger size mains will be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified in section 2.1.
- 2.3 **Fire Protection** – When fire protection is to be provided, system design should be such that fire flow and facilities are in accordance with requirements of the State Insurance Services Office.
- 2.4 **Small Mains** – Any departure from minimum requirements shall be justified by hydraulic analysis and future water used and can be considered only in special circumstances.
- 2.5 **Hydrants** – Water mains not designed to carry fire flows shall not have fire hydrants connected to them.
- 2.6 **Dead Ends** – In order to provide increased reliability of service and reduce headloss, dead ends shall be minimized by making appropriate tie-ins whenever practical. Where dead end mains occur, they shall be provided with a fire hydrant if flow and pressure are sufficient or with an approved flushing hydrant or blow-off for flushing purposes. Flushing devices should be sized to provide flows that will create a velocity of at least 5.0 feet per second in the water main being flushed. No flushing device shall be directly connected to any sewer.

- 2.7 **Service Line** – All service lines shall be a minimum of 1-inch in diameter. The service line diameter, including the customer owned portion, shall be reviewed by the Company based on demands and pressure requirements.

SECTION 3 - DUTIES OF THE COMPANY:

A Water Main Extension Agreement between the Company and the Contractor/Developer shall clearly identify the scope of work and associated cost estimate for such work. The Company will furnish and perform the following services unless otherwise clearly indicated in the Agreement.

- 3.1 The Company will locate for the Contractor terminal points or connection points of the work and will also locate for the Contractor any of its facilities lying in close proximity to the work which would in any way be a hazard to the Contractor's operations.
- 3.2 The Company will review all required Contractor submittals of plans, specifications, and materials specifications.
- 3.3 The Company will provide on-site inspection and approval of materials and installation procedures and techniques. The Company will perform all valve operation.
- 3.4 The Company will operate all valves that may be found desirable or necessary to be used for any purpose.
- 3.5 The Company will observe all pressure testing and disinfecting operations in accordance with AWWA standards. See sections 11 and 12.
- 3.6 The Company will observe all bacteriological sampling on water from the completed new mains and appurtenances.

SECTION 4 - DUTIES OF THE CONTRACTOR:

The Contractor/Developer will:

- 4.1 Submit for Company approval a set of plans showing plan and profile of the proposed main, right-of-way boundaries, other utilities, limits of paving (existing and/or proposed), ledge profile or test borings and any other physical or topographic feature relevant to the installation and maintenance of the water main. All plans must be submitted to the Company electronically in AutoCAD and PDF format as well as in hard copy form unless otherwise specifically requested by the Company.
- 4.2 Install the water mains so as to supply the Company, upon completion, with a satisfactory, watertight pipeline, laid to the proper grade and alignment as shown on the plans and in accordance with the Material Specifications and Installation Instructions. Submit an electronic copy and a hard copy of "as built" drawings upon completion of the job.

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- 4.3 For water mains and appurtenances to be owned and maintained by the Company, the Contractor/Developer shall turn said water mains and appurtenances over to the Company free and clear of liens, damage claims or law suits. In addition, the Contractor shall provide the Company with easements for all water mains and appurtenances that will be within the public right-of-way of newly constructed streets and roadways. Said easements shall be granted to the Company prior to the acceptance of said streets by the authority having jurisdiction and shall be in the form specified by the Company.
- 4.4 Obtain all street opening permits from cities or towns, as may be applicable, covering any pipelines and appurtenances to be laid in the public way. Coordinate with the Company to obtain MDOT street opening permit. Contractor shall be responsible for fees levied by any of these agencies which are applicable to the work covered this specification.
- 4.5 Establish line and grade for the pipeline and associated right-of-way boundaries where the pipeline is to be installed outside of a public way.
- 4.6 Purchase all pipe, fittings, valves, gaskets and piping appurtenances in accordance with the Company's "Purchasing Standards for Waterworks Material", or coordinate material purchase through Maine Water.
- 4.7 Furnish all fuel, gasoline, oil, etc., for the operation of his equipment, all tools and equipment, dynamite, and all labor and supervision necessary for the handling of the material, excavation, laying, backfilling, and cleaning the site as required. Contractor will make whatever arrangements are necessary for the disposal of excess spoil, and will be solely responsible therefore.
- 4.8 Record a minimum of two (2) lateral measurement "swing ties", as close to 90 degrees opposed as practical, prior to backfilling pipeline from permanent fixtures such as house corners, telephone poles, fire hydrants, catch basins, manholes etc. to all valves, fittings, couplings, tees etc. for purposes of future location. Permanent fixtures shall be identified such as house numbers or description, pole numbers etc. Also, include information on the subsurface conditions including pavement and road base thickness, soil types and depth to bedrock. These ties must be incorporated into the "as-built" drawings and submitted to the Company prior to final project acceptance.
- 4.9 Furnish all borrow material (sand, gravel, etc.) to bed pipe and completely backfill trench in accordance with Section 9. All water mains must be provided with 5 ½ feet of cover over the top of pipe prior to November 15.
- 4.10 Shall guarantee the workmanship of the pipeline and appurtenances for one (1) year from the date of acceptance by the Company and any charges incurred during that year shall be billed to the Contractor/Developer.

SECTION 5 - MATERIALS:

- 5.1 See "Purchasing Standards for Waterworks Material" for materials generally associated with water main installation. Additional materials that may be required will be evaluated on a case by case basis as the need arises.
- 5.2 Materials that do not meet the Company's standards will not be accepted without Company approval.

SECTION 6 - EXCAVATION:

6.1 PERMITS AND REPAVING

The Contractor/Developer shall make application and pay for all necessary street or highway opening permits necessary for the pursuit of the work as determined by him. The MDOT road opening permit must be coordinated through the Company; however the Contractor is responsible for all fees associated with the permit and this work. The Contractor shall make no opening until the appropriate permit has been obtained, and when such opening shall be made it shall be done in strict accordance with the terms of the permit. The Contractor shall pre-mark the area of excavation and contact Dig-Safe a minimum of 3-business days prior to the scheduled excavation. The Contractor shall also contact all utilities that are not members of Dig-Safe with the same minimum 3-business day notice.

6.2 CUTTING OF PAVEMENT

Pavement shall be cut by a method approved by the authority having jurisdiction.

6.3 RIGHT-OF-WAY

For water mains to be owned and maintained by the Company, a minimum 30 foot right-of-way, centered over the water main(s), shall be included in the easement transferring ownership of said water main(s) to the Company and obtained by the Contractor/Developer prior to installation of said water main.

6.4 TRENCHING

The trench shall be dug so that the pipe can be laid to the alignment and depth required and shall be excavated in advance only to the extent necessary for the proper pursuit of the work. The trench shall be kept dewatered, such that no drainage water shall enter the open end of the pipe and said open end of the pipe shall be temporarily plugged off at night and over the weekends, or whenever the work is suspended, or in cases where unstable material could cause a cave-in to enter into the exposed end of the pipe. The trench width shall be in accordance with the Company's "Typical Trench Detail", permitting whatever method of shoring shall be used. The bottom of the trench shall be smooth and even and should be as nearly undisturbed as possible. Provide a minimum of

6-inch of bedding material between the trench bottom and the pipe invert to provide a minimum 6-inch clearance between the invert and any ledge or boulders. All bedding material placed under and around the pipe shall be compacted by mechanical means, as approved by the Company, so as to give it a solid base, precluding future settlement. When the bottom of the trench at subgrade is found to be unstable or to include cinders, refuse, vegetable, organic or any such undesirable material, such materials shall be removed and replaced with suitable material (3/4-inch crushed stone or approved gravel) prior to the pipe being placed. Such replacement material shall be placed in maximum 12-inch lifts and compacted by approved mechanical means.

6.5 BLASTING

Blasting for excavation shall be done at the sole discretion of the Contractor. Damage caused to existing water mains and services by blasting shall be repaired by the Company and paid for by the Contractor/Developer.

6.6 METHOD OF EXCAVATING

Excavating may be done by any acceptable and approved method of excavation, by machine or otherwise as may be desired by the Contractor. Excavation adjacent to nearby water mains or service laterals shall be done by hand to protect these from damage.

6.7 INTERRUPTION OF SERVICE

When as the result of the Contractors scheduled work, the Company must shut down part of its system affecting its customers or fire protection, the Contractor shall provide the Company with a minimum 72 hours notice prior to conducting such work. The Contractor or his agents shall operate no valve, hydrant or other facility of The Maine Water Company. The Company will, upon 72 hours advance notice, furnish men and equipment for such activity as necessary, at the Contractor's cost, as outlined in the Agreement.

SECTION 7 - PIPE INSTALLATION:

7.1 GENERAL INSTALLATION

All products and materials listed below shall be placed, supported and installed in strict accordance with the manufacturer's instructions and as directed by the Company:

- i. Push-on joint pipe
- ii. Mechanical joint pipe
- iii. Fittings
- iv. Couplings
- v. Restrained joint devices

Pipe Cleanliness: Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing, or other material shall be placed in the pipe at any time.

Temporary Pipe Plugs: At times when work is not in progress, the open end of the pipe shall be closed by means of a watertight plug or other means acceptable to the Company. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe floatation should the trench fill with water.

7.2 ALIGNMENT AND GRADE

Pipelines, fittings, valves and other accessories shall be laid to the alignment, grade and location as shown on the plans as approved by the Company. All valve stems shall be plumb with the vertical plane and all fittings, likewise shall be oriented such that their centerlines shall be at the proper grade and alignment. The main shall be provided with a minimum 5 ½ feet of cover from finish grade as measured to the top of pipe. Any deviation from line and/or grade caused by the encountering of obstructions such as other utilities shall be done so only after the approval of the Company. Pipe grade may vary in location see MWC superintendent for more information.

7.3 UTILITY SEPARATION

Water service pipes shall be laid at least 10 feet horizontally (measured edge to edge) from any sanitary sewer pipe, storm drain pipe, sewer or drainage structure, underground cable or conduit.

When local conditions, (e.g. permanent structures) prevent a horizontal separation of 10 feet, water pipe may be laid closer to the infrastructure provided that:

The bottom of the water pipe is at least 18 inches above the top of the pipe or conduit and minimum of 5 feet (measured edge to edge) is horizontally provided.

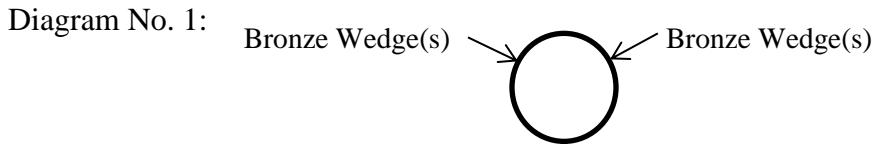
7.4 HANDLING OF MATERIAL INTO TRENCH

Proper implements, tools and facilities, satisfactory to the Company, shall be provided and used by the Contractor for the safe and convenient handling of all materials. Pipe fittings and accessories shall be carefully lowered into the trench, piece by piece, by means of crane, slings and other suitable tools and equipment, in a manner such as to prevent damage to the materials or to its protective coatings and linings. No chain or slings shall be passed through any pipe, valve, or fittings. Under no circumstances shall piping materials be dropped or dumped into the trench.

7.5 POLYETHYLENE ENCASEMENT AND BRONZE WEDGES

All ductile iron pipe, fitting and joints shall have polyethylene encasement to AWWA standards. See material standards.

All ductile iron pipe shall have a minimum of two bronze wedges per joint on 3-inch through 12-inch pipe and four per joint on larger diameters. Each wedge shall be driven into the opening between the plain end and the bell until snug to promote pipe connectivity. When four wedges are used, they are inserted side by side, in pairs. See diagram below for suggested bronze wedge locations. For more information contact MWC.



7.6 THRUST RESTRAINT REQUIREMENTS

Thrust restraint shall be provided as needed see MWC detail sheets and local MWC superintendent.

SECTION 8 – SERVICE LINE:

- 8.1 The minimum service line diameter is 1-inch. All 1-inch diameter service line connections from the corporation main valve to the curb stop valve shall only be type “K” copper, unless approved in advance by the Company. 2-inch diameter customer service pipes may be plastic or copper material.

Copper service pipe shall be type "K", soft seamless copper tubing with no soldered joints underground.

Plastic pipe may be used on the customer side of the curb valve, if approved by the Company in advance. Plastic pipe shall be PE 3608 polyethylene copper tubing size (CTS) rated for 200 psi working pressure with this information and the NSF seal appearing on the pipe, in accordance with AWWA C901-02.

All plastic polyethylene pipe installation requires use of stainless steel inserts at compression fittings. Nonmetallic pipe must be paralleled by a metallic tracer wire grounded to metal at the curb stop valve and interior plumbing for ease of locating. Said wire shall be 12AWG stranded copper with an HMW-PE jacket.

Customer service lines that are required to be greater than 2-inches in diameter shall be increased by 2-inch increments and the material shall be ductile iron or continuously fused HDPE with tracer wire. 2-inch diameter pipe shall be installed with a tapping saddle, corporation and gate valve.

- 8.2 Valve box top extensions with cover are required over curb boxes, when curb stop valves are located in a traveled way, i.e. driveway, sidewalk, road, etc.
- 8.3 Direct service connections to polyethylene encased ductile iron pipe shall be made by

applying two or three wraps of polyethylene adhesive tape completely around the pipe to cover the area where the tapping machine and chain will be mounted. After the tapping machine is mounted, the corporation stop is installed directly through the tape and polyethylene. After the tap the entire circumferential area must be inspected for damage and repaired, as necessary.

Direct service connections to all pipe materials, excluding ductile iron and cast iron, require use of a bolt-on mechanical style tapping saddles.

Domestic water service lines shall not be tapped from a fire protection/sprinkler service line, but shall be a separate connection at the distribution main. It is possible under unusual circumstances and with prior approval from the Water Company to tap a fire service line for domestic service. This connection would have to be made outside of the building with an appropriate valve configuration so that Water Company personnel can shut off the service lines independently.

- 8.4 The Company must be contacted with a minimum 72 hour advanced notice of the connection to Company owned water pipe and service line installation. If MWC personnel do not witness the connection and service line installation prior to backfilling, MWC will require passing pressure testing results. MWC reserves the right to conduct the pressure testing with Company personnel and charge the project at the Company jobbing rates.

SECTION 9 - BACKFILLING:

- 9.1 All backfill material to be placed in maximum 12-inch lifts and compacted to 95% proctor under and around pipe. Compaction densities from the top of pipe to the top of the trench shall also be 95% proctor unless otherwise specified by authorities having jurisdiction. Do not place frozen materials in backfill or place backfill (and pipes) upon frozen material. Remove all frozen material or allow thawing and then compacting prior to placing new backfill material. No backfill will be permitting with rocks larger than 6-inch.

9.2 BACKFILLING PIPE TRENCH

Start backfilling and proceed until complete as soon as practicable after the pipes have been placed, and structures such as thrust blocks have had sufficient time to cure.

The Contractor shall be required to backfill the entire trench as part of the scope of work. Upon testing of pipe, if such deficiencies as leaking joints exist, the Contractor shall excavate, expose and repair leaking joints and then backfill the trench to the original specifications - all at his own expense.

- a) Material Placement: Do not place stone or rock fragment larger than 2-inch in backfilling under and around the pipe (bedding) nor drop large masses of backfill material into the trench in such a manner as to endanger the pipeline. Wet material by sprinkling when necessary to ensure proper compaction by tamping or

rolling, etc. However, no compaction shall be done when material is too wet as determined by the Company. At such times, suspend the work until previously placed materials have dried out.

b) Tamping and Rolling: Before compaction, deposit and spread material in uniform parallel layers not exceeding 12-inch thickness prior to compaction. Before the next layer is placed, uniformly tamp by mechanical means to obtain a thoroughly compacted mass of the specified density. Additional care shall be taken to ensure all material under the pipe and close to the trench sidewalls is thoroughly compacted. When the trench width and depth to which backfill has been placed make it feasible, and it can be done effectively without damage to the pipe, backfill may be compacted by use of vibratory rollers or other approved methods.

9.3 BACKFILL MATERIAL

Backfill material used from bottom of trench to 1 foot above top of pipe shall be a well-graded gravel or sand material with maximum stone or rock fragment size of 2-inch. This material shall be similar to an MDOT Type A aggregate. Backfill material used from 1 foot above the top of pipe to the top of trench (bottom of base) shall be similar to an MDOT Type D aggregate with maximum stone or rock fragment size of 6-inch or common borrow with a maximum rock fragment size of 12-inch out of paved areas, unless otherwise specified by authorities having jurisdiction. In no case shall materials containing organic or vegetable matter, refuse, cinders or similar friable materials be used as backfill. Exclude pieces of bituminous pavement from backfill unless use is expressly permitted.

SECTION 10 - FILLING AND TESTING:

10.1 The Company will operate all valves and facilities necessary to fill and flush the water main(s) and appurtenances. The Company requires a minimum 72 hours advance notice be given prior to such work.

SECTION 11 - PRESSURE AND LEAKAGE TESTING

11.1 The Company will observe all pressure and leakage testing in accordance with AWWA standards and bill the Contractor on a time and materials basis or as indicated in the Agreement. The Company requires a minimum 72 hours advance notice be given prior to such work. The Contractor must conduct all pressure and leakage testing with certified individuals in accordance with Company's standards and specifications and the following information is included for such purposes. The Contractor shall provide all necessary tools, equipment, and materials to conduct all required testing.

11.2 The pressure and leakage test shall be conducted as follows:

- 11.2.1 A pressure test pump shall be connected to the new main at the testing point. The pressure will be slowly increased to 150 psig and allowed to stabilize (+/- 2.5 psig) for a minimum of 1 hour to stabilize.
- 11.2.2 A reservoir of potable water shall be connected to the test pump and the initial level of water recorded.
- 11.2.3 The pump pressure shall be maintained at 150 psig for a minimum of 1 hour with all makeup water withdrawn from the reservoir.
- 11.2.4 After one hour, the water level in the reservoir will be measured and the volume of water drawn down from the reservoir calculated and compared with the following allowable leakage:
- 11.2.5 Allowable Leakage (gph) = Pipe Length (ft) X Diameter (in) / 10,900

If any test discloses leakage greater than that specified above, the Contractor, at his own expense, shall locate the leak and make repairs as necessary until the leakage is within the specified allowance. Written certification of leakage and pressure testing shall be submitted to the Company upon completion.

SECTION 12 - DISINFECTION:

- 12.1 The Company will observe all disinfecting procedures of water mains and appurtenances in accordance with AWWA standards and bill the Contractor on a direct time and materials basis as indicated in the Agreement. The Company requires a minimum 72 hours advance notice be given prior to such work. The Contractor must conduct all disinfecting procedures using certified individuals in accordance with Company's standards and specifications and the following information is included for such purposes. The Contractor shall provide all necessary tools, equipment, and materials to conduct all required testing.

Upon satisfactory completion of the pressure and leakage test, all new water mains, hydrants, and branches 2-inch and larger in diameter shall be flushed and disinfected prior to being placed in service in accordance with AWWA continuous feed method.

- 12.2 The Contractor shall hire experienced individuals to chlorinate the new main and appurtenances in accordance with the continuous feed method specified in Section 5.2 of AWWA Standard C651 (latest revision), using a 5% to 15% sodium hypochlorite solution or properly mixed concentration of calcium hypochlorite solution.
 - 12.2.1 The chlorinated solution shall be injected into the new main between 10 and 20 feet of the connection to the existing main with potable water at a minimum concentration of 25 ppm and a target of 50 ppm free chlorine. Company personnel will operate all valves required to set disinfecting flow rates, etc. The Contractor will be charged on a direct time and materials basis for such work. The Company

requires a minimum 72 hours advance notice for this purpose. All discharge and flushing locations shall be monitored to ensure a minimum concentration of 25 ppm free chlorine throughout the new main including hydrants, branches longer than 10 feet, and services larger than 2-inch diameter.

12.2.2 After a 24 hour detention period, the new main, hydrants, branches and large services shall be flushed (valve operation by the Company) until all heavy chlorinated water has been removed.

12.2.3 The Contractor shall be responsible for dechlorinating and properly disposing of all flushing water as well as providing hose and equipment that may be necessary to dechlorinate and prevent erosion. The discharge of water to the environment with chlorine concentrations greater than the ambient distribution system chlorine residual is prohibited. The highly chlorinated water must be dechlorinated in accordance with AWWA C655-09 or the latest revision thereof and satisfactory to MWC before discharge to the environment.

SECTION 13 - BACTERIOLOGICAL SAMPLING AND TESTING:

13.1 After the final flushing, and with a minimum 72 hours advance notice, the Company will observe bacteriological sampling on the completed new mains and appurtenances; and all additional tests required as the result of improper disinfection will warrant additional Contractor/Developer expense.

13.2 Written certification of passing bacteriological testing must be submitted to the Company for our records once completed.

SECTION 14 – PROJECT ACCEPTANCE:

14.1 The new main(s) shall not be activated and placed into service until successful pressure, leakage and bacteriological testing and completion of the "Project Acceptance" certificate.

14.2 The Company reserves the right to refuse service if the terms and conditions of these Standards and Specifications are not met.