

SECTION 02510 – WATER SYSTEM DISTRIBUTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: Water distribution piping includes:

- A. Supply and installation of all distribution piping as noted on the Drawings and in accordance with Portland Water District specifications.
- B. Verifying location of existing utilities prior to construction.
- C. Supply and installation of all valving, and accessories.
- D. Supply and installation of new hydrants, as noted on the Drawings.
- E. Flushing, testing and disinfection.
- F. Repair of water piping damaged during construction.

1.02 RELATED WORK:

- A. Lateral Earth Support: Section 02250
- B. Earthwork: Section 02300
- C. Erosion and Sedimentation Control: Section 02370

1.03 QUALITY ASSURANCE:

- A. Code Compliance: Comply with State Plumbing Code and local plumbing codes where more stringent. Comply with Maine Department of Human Services, Division of Health Engineering rules.
- B. AWWA Standards: Comply with requirements of Section 4 of AWWA C601, "Preventive Measures During Construction" for cleanliness.
- C. Other Standards: Comply with requirements of the Portland Water District specifications.
- D. Testing: CONTRACTOR shall pay for all flushing, pressure and leakage testing, disinfection, and fire flow testing.

1.04 SUBMITTALS: Submit manufacturer's product data and installation instructions for each product specified for water service piping.

PART 2 - PRODUCTS

2.01 PRESSURE PIPE:

- A. General: Provide fittings and other required piping accessories of same type and class of material as conduit, or of material having equal or superior physical and chemical properties.
- B. Copper Tube: Type K conforming to ASTM B88, with compression fittings.

- C. Ductile Iron Pipe: Push-on joints unless indicated otherwise, centrifugally cast bituminous-coated, cement-lined (AWWA C104), seal-coated and manufactured in accordance with the latest revision of AWWA Standards C150 and C151. Interior shall be seal-coated twice with asphalt to a minimum of 2 mils dry film thickness. Pipe shall be Class 52 unless indicated otherwise. Weight, class, manufacturer's mark, year of production, and "DI" or "Ductile" shall be cast or stamped on the pipe.

2.02 VALVES, FITTING, CLAMPS, ETC.:

- A. General: All products used in the construction that come in contact with drinking water shall meet the National Sanitation Foundation Standard 61 for Drinking Water System Components - Health Effects. The products and/or materials covered include, but are not limited to, protective materials (coatings, linings, liners, etc.), joining and sealing materials (solvent cements, welding materials, gaskets, etc.), and mechanical devices used in transmission/distribution systems, (valves, etc.).
- B. Gate Valves:
 - 1. Gate valves shall be of the resilient wedge gate valve design, meeting or exceeding all requirements of the latest revision of AWWA C509.
 - 2. The wedge shall consist of a ductile iron casting encased in a bonded-in-place nitrile elastomer covering which forms the resilient sealing surfaces.
 - 3. The valves shall be of the nonrising stem design constructed of Grade D or E manganese bronze with sealing accomplished by double "O" rings situated that the "O" ring above the thrust collar can be replaced with the valve under pressure and in the open position, shall open right (clockwise), the stem nut shall be of Grade D or E manganese bronze, designed with a thrust collar integrally cast to the stem, and designed with two (2) synthetic polymer thrust washers that are positioned with one above and one below the thrust collar.
 - 4. All gate valves shall be rated for zero leakage at 200 psi differential working pressure and have a 400 psi hydrostatic test for structural integrity.
 - 5. Valves shall have mechanical joints and shall be furnished with Cor-ten or approved equal bolts and nuts.
 - 6. The internal and external valve body, including the stuffing box, bonnet, and interior of the wedge shall be epoxy coated with 8 mils D.F.T., the preferred method of application being fusion-bonding or electrostatic bonding process.
 - 7. The operating nut shall be two (2) inch-square ductile iron with a countersunk hold down nut made of 316 stainless steel or silicone bronze for tapered stems. Stems of full diameter shall have a stainless steel pin inserted thru the stem.
 - 8. The seal plate and bonnet bolts shall be 316 stainless steel.
 - 9. Valves shall be U.S.P. Metroseal or Waterous Series 500. No substitutes permitted.
- C. Corporation Stops: Sizes 3/4- to 1-inch, shall be an inverted key or a ball valve design with a brass ball that is Teflon coated. Sizes 1-1/2 to 2-inch shall be ball valve design with a brass ball that is Teflon coated. All sizes to have ON-OFF identification mark on the operating nut. Valves shall have full-port opening and shall be supported by 2 seats for water tight shut off in either direction. Body shall be of heavy duty design.
- D. Curb Stops: For sizes 3/4- to 2-inch, the valves shall be a brass ball that is Teflon (or equal) coated and supported by water-tight seats in either direction. Valves shall have full-port opening, shall open with 1/4 turn (90°) with a check or stop, and shall not have a drain. Valve stem shall have two "O" rings and a bronze ring lock which holds the stem solidly in the valve body. Valve body shall be of heavy duty design.

- E. Repair Clamps: Sleeve shall be of full circle design, either one piece or two piece, for pipe sizes 2- to 12-inch. Body shall be 18-8 stainless steel shell. Gasket shall be full length and diameter of the body size, shall form a multiple O-ring sealing barrier for the entire length and circumference, and shall be virgin rubber (ASTM D2000 AA 415). Lugs, sidebar, and lifting bar shall be heavy gauge 18-8 stainless steel. Bolts and nuts shall be Teflon coated 18-8 heavy gauge stainless steel. Armor or bridging plate between sidebars shall be heavy gauge 18-8 stainless steel bonded to the gasket to bridge lug area.
- F. Split Repair Sleeves: Split repair sleeves shall be mechanical joint, shall be AB-CD pattern to permit use of plain rubber and duck-tipped gaskets for various O.D. piping sizes, and shall be provided with a 2-inch F.I.P.T. test port with brass plug. Interior and exterior shall be bituminous coated with a minimum of 4 mils dry film thickness. Side rubber gaskets shall be rectangular to cross-section and fit into grooved channels in the casting. Gaskets shall extend entire length of the sleeve and shall not require cutting or trimming to match MJ end gaskets. All side bolts shall be 316 stainless steel. Mechanical joint with accessories furnished: DI glands, gaskets, Cor-Ten T-bolts and nuts.
- G. Service Saddles: Service saddle shall have "larger sized" body, which shall have minimum diameter of 6 inches and multiple "O" ring type sealing. Saddle body shall be ductile iron with epoxy coating. Sealing gaskets shall be either Buna-N rubber or SBR rubber (ASTM D2000). There shall be two holding bands, U-bolt type, made of 304 stainless steel.
- H. Valve Boxes: Shall be cast iron or ductile free from defects. Interior and exterior of all components shall be bituminous coated with a minimum of 4 mils dry film thickness. Bottom section shall be slide-type with bell-type base. Top section shall be slide-type with top flange. Extensions shall be slide-type with minimum 3-inch belled bottom. Cover shall be 2-inch drop-type cover to fit 7-1/4 inch opening of top section and shall have the word "WATER" clearly cast into the cover.
- I. Service Boxes: Shall be 1-inch Schedule 40 steel pipe with top having 1-inch NPT pipe thread for screw-on cover or coupling, Erie style with 5-6' slide-type riser. Cover shall be heavy duty Quincy type that screws on and shall be tapped with a 1-inch rope thread with solid brass plug with pentagon operating head. Foot shall be heavy duty cast iron design, Ford or equal. Large, heavy duty foot piece shall have an arch that will fit over 2-inch ball-valve curb stops. Rod shall be 24- to 36-inch, self-aligning design, 1/2 inch minimum, 304 stainless steel with integral yoke and brass cotter pin. Rod "wrench-flat" shall have minimum thickness of 1/4-inch tapered to 1/16-inch and width of 5/8-inch or 1/2-inch.
- J. Ductile Iron Fittings: Material shall be ASTM A536-72 mini grade 70-50-05, in accordance with AWWA C110 (latest revision) for fittings larger than 16-inches and C153 (latest revision) for fittings 16-inches and less. Fittings shall be cement lined AWWA C104 (or latest revision). Interior seal coated AWWA C104 with minimum 4 mils dry film thickness. Exterior bituminous coated, 4 mils minimum dry film thickness. Sleeves shall not be cement lined, but shall be bituminous coated inside and outside, 4 mils minimum dry film thickness. Mechanical joint with accessories furnished: DI glands, gaskets, Cor-Ten T-bolts and nuts. Class 350 pressure rating in accordance with AWWA C110 for 3- to 24-inch sizes. Class 250 pressure rating in accordance with AWWA C110 for 30- to 48-inch sizes. The compact fittings must provide adequate space for the MJ joint and accessories to be installed without special tools.
- K. Hydrants: All material used in the production of fire hydrants for ordinary service shall conform to the specifications designated for each material listed in AWWA Standard C502. All hydrants shall be Clow Eddy, American Darling B62-B or U.S. Pipe USMET250, no substitution permitted, and shall incorporate the following:

1. Traffic type at ground line with breakaway feature and shall have segmented flanges but not frangible bolts, break type rod coupling set equal to or below the line of the top flange of the lower barrel, and an approved rubber gasket between the barrels.
2. 6-foot bury with 5-1/2 foot minimum cover or as necessary
3. 6-inch mechanical joint inlet
4. 5-1/4 inch valve opening - valve to open right (clockwise)
5. Two 2-1/2 inch NST hose nozzles, port cover the same as operating nut & w/o chain
6. One 4-1/2 inch NST steamer nozzle, port cover the same as operating nut & w/o chain
7. Operating nut - pentagon shape, ductile iron or bronze, pentagon in shape with dimensions of top 1-13/16 inches tapering to 1-7/8 inches on the bottom
8. 6-inch minimum inside barrel diameter
9. Valve seat and sub-seat shall be bronze to bronze
10. Blocking area on bottom shall be a minimum of 30 sq. in. and a minimum of 20 sq. in. on the back.
11. Drain ring to be plugged prior to installation
12. Hydrant stem shall be 1-inch diameter
13. All buried mechanical joint bolts and nuts shall be Cot-ten or equal
14. All buried flange joint bolts shall be 316 stainless steel or silicone bronze
15. All protective coatings shall be a minimum of 6 mil D.F.T.
16. All surfaces normally exposed to water shall be epoxy coated, all internal and external cast or ductile iron surfaces shall be coated with bituminous coating
17. Coatings for upper exterior barrel shall have surface preparation blast clean SSPC-SP-6; primer of Glidden #5207-White, 2-3 mil D.F.T.; second coat of Glidden #4560-Yellow, 2-3 mil D.F.T.; finish coat of Glidden #4560-Yellow, 2-3 mil D.F.T.; total D.F.T. of all coats a minimum of 6 mil D.F.T.
18. Coatings for bonnet, operating nut, and port cap shall be blast clean surface preparation, SSPC-SP-6; primer of Glidden #5207-White, 2-3 mil D.F.T.; second coat of Glidden #4392-Aluminum, 2-3 mil D.F.T.; finish coat of Glidden #4392-Aluminum, 2-3 mil D.F.T.; total D.F.T. of all coats a minimum of 6 mil D.F.T.

2.03 ACCESSORIES:

- A. General: Provide anchorages for tees, plugs, caps, and bends. After installation, apply a full coat of asphalt or other acceptable corrosion-retarding material to surfaces of rods and clamps.
- B. Clamps, Straps and Washers: Steel, meeting or exceeding all requirements of the latest revision of ANSI/ASTM A506.
- C. Threaded Rod: Steel, meeting or exceeding all requirements of the latest revision of ANSI/ASTM A575.
- D. Rod Couplings: Malleable iron, meeting or exceeding all requirements of the latest revision of ANSI/ASTM A197.

- E. Bolts: Cor-Ten steel as specified, or 316 stainless steel, in accordance with Portland Water District specifications.
- F. Cast Iron Washers: Meeting or exceeding all requirements of the latest revision of ANSI/ASTM A126, Class A.
- G. Thrust Blocks: Shall be 3000 psi concrete, size as shown on Drawings.
- H. Pipe Lubricant: Suitable for use in potable water supply.
- I. Marking Tape: Lineguard III by Tri-Sales, Inc., 2-inch wide, green; detectable with magnetic locators, or approved equal.
- J. Rigid Insulation: Extruded closed-cell rigid foamed polystyrene, 2-inch thickness, width of trench, Styrofoam HI-60, by Dow Chemical, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. General: Install products in compliance with manufacturer's instructions. Prevent introduction of any groundwater or foreign materials into pipe during construction. Provide watertight plug in ends of pipe at all times when construction is not in progress. Coordinate all work with the Portland Water District.
- B. Excavation: Where location of distribution pipe is known, excavate within 2 feet of pipe by hand.
- C. Hydrants: Install as indicated on Drawings. Refer to details on Drawings. Joints to be as specified. Tees for hydrants to be "MJ Hydrant Tees" or approved equal.
- D. Bedding of Pipe: Bed in sand or crushed stone. Refer to trench detail on Drawings.
- E. Cleaning: Clear interior of pipe of dirt and other superfluous material as work progresses. Place plugs in end of uncompleted pipe whenever work stops.
- F. Coordinate connections to existing water mains with the Portland Water District. Provide 48 hours notice prior to such work. The CONTRACTOR is responsible for the cost and all work associated with water service taps and connection to existing mains.
- G. Water Service Piping: Extend water service piping of size indicated to existing water service. Provide new shutoffs as indicated and shown. Bed pipe in sand or crushed stone. See trench detail on Drawings.

3.02 INSULATION:

- A. Install as shown on Drawings.
- B. Provide 2-inch minimum thickness compacted sand layers for sanitary and storm sewer, directly above and below insulation.

3.03 FLUSHING AND TESTING:

- A. General: The CONTRACTOR shall not operate any existing Portland Water District valves for filling, flushing or testing the new main. The District will provide the necessary personnel upon request.

- B. Flushing: The CONTRACTOR shall flush the new main at a minimum velocity of 2.5 feet per second to remove any particulate matter. Provide the following minimum flow in gallons per minute: 4" dia. - 100 GPM; 6" dia. - 220 GPM; 8" dia. - 390 GPM; 12" dia. - 880 GPM. The CONTRACTOR shall be responsible for disposal of all flushing water and providing any necessary hoses or equipment for flushing.
- C. Perform pressure and leakage testing of completed lines. CONTRACTOR shall coordinate all testing with the Portland Water District. Pressurize test pipe to 150 psi and allow to stabilize (+/- 2.5 psi) for a minimum of 15 minutes. Pressure and leakage test shall be conducted at pressure of 150 psi for minimum of two hours. Maximum allowable leakage per 1000 feet of pipeline shall be 0.37 gph for 4-inch diameter pipe and 0.55 gph for 6-inch diameter pipe.
- D. Perform operational testing of valves by opening and closing under water pressure to insure proper operation.

3.04 DISINFECTION:

- A. General: Upon satisfactory completion of the pressure and leak test, all new water mains shall be disinfected before they are placed into service in accordance with AWWA Standard C651, latest revision, and procedures specified herein. Fittings required for final connection to existing water main shall be disinfected by swabbing with a sodium hypochlorite solution immediately prior to final connection.
- B. Disinfection:
 - 1. The CONTRACTOR shall chlorinate the new water main in accordance with the continuous feed method specified in Section 5.2 of AWWA Standard C651, latest revision, using 5 percent to 15 percent sodium hypochlorite solution.
 - 2. The CONTRACTOR may use calcium hypochlorite granules or tablets placed in the new water mains during installation in accordance with Section 5.1 of AWWA Standard C651, latest revision, in addition to the continuous feed method, not as a substitute.
- C. Chlorine Requirement: The new water main shall be chlorinated so that a chlorine residual of not less than 25 parts per million remains in the water after standing 24 hours in the pipe. Chlorine residual at start of the test shall be a minimum of 50 parts per million.
- D. Point of Application: Chlorinating solution point of application shall be within 10 feet of the connection to the existing main through a corporation stop inserted in the water main. Alternate points of application may be used when accepted or directed by the Portland Water District.
- E. Rate of Application: Water from the distribution system, or other source of supply as accepted by the Portland Water District, shall be controlled to flow very slowly into the new water main during application of the chlorine. The rate of chlorine solution flow shall be in such proportion to the rate of water entering the new water main that the dosage applied to the water will be sufficient for a minimum of 50 parts per million unless directed by the Portland Water District.
- F. Retention Period: Treated water shall be retained in the new water main for a minimum of 24 hours. CONTRACTOR shall provide sampling taps at 500 ft. intervals, at all deadends, and at end of all new water mains. Take one sample at each location. Treated water shall contain no less than 25 parts per million of available chlorine.

G. Flushing and Draining:

1. At the end of the retention period, the chlorination water shall be flushed from the main until all heavily chlorinated water has been removed. CONTRACTOR shall arrange for all testing of water. CONTRACTOR shall provide testing at no cost to CONTRACTOR.
2. CONTRACTOR shall coordinate with the Portland Water District to obtain all water required for flushing and draining. CONTRACTOR to provide temporary blow-offs as necessary for flushing and draining.
3. Chlorine residual of water being disposed shall be neutralized by treating with one of the chemicals listed in the table below:

Amount Of Chemicals Required To Neutralize Various
 Residual Chlorine Concentrations In 100,000 Gallons Of Water*

Residual Chlorine Concentration (mg/l)	Sulfur Dioxide	Sodium Bisulfate	Sodium Sulfite	Sodium Thiosulfate
1	0.8	1.2	1.4	1.2
2	1.7	2.5	2.9	2.4
10	8.3	12.5	14.6	12.0
50	41.7	62.6	73.0	60.0

*Except for residual chlorine concentration, all amounts are in pounds

H. Bacteriological Testing: Following disinfection and final flushing, bacteriological testing shall be done as specified in Section 5 of AWWA C651 as follows:

1. After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main. At least one set of samples shall be collected from every 1,200 feet of the new water main, plus one set from the end of the line at least one set from each branch.
2. All samples shall be tested for bacteriological quality in accordance with Standard Methods for the Examination of Water and Wastewater, and shall show the absence of coliform organisms.
3. If the initial disinfection fails to produce satisfactory bacteriological results, the new main shall be reflashed and resampled. If check samples also fail to produce acceptable results, the main shall be rechlorinated by the continuous-feed or slug methods until satisfactory results are obtained.

I. Equipment: Provide water pumps with adequate metering devices. Provide chlorination injection pumps which allow accurate measurement of the disinfection solution being introduced to new water main.

J. Personnel: Submit names of personnel or firm to perform disinfection work.

End of Section