

**PART 1 GENERAL**

## 1.1 SCOPE

- A. This Section consists of furnishing and installing water pipe and fittings normally used for water distribution systems.
- B. Reference Section 3800 “Trenching and Backfill” and the General Conditions, specifically, but not limited to, Articles E.8, E.9, E.10, H.3, H.4, H.5 and H.6.

**PART 2 PRODUCTS**

## 2.1 GENERAL:

- A. Contractor shall furnish materials certification for all required materials.
- B. All material shall be new and of U.S. manufacture including valves, pipe, fittings and etc. unless approved prior to installation through the submittal process.

## 2.2 BEDDING AND BACKFILL MATERIAL:

- A. Bedding and backfill materials shall conform to Section 2300.

## 2.3 PIPE:

- A. All pipe materials for watermains shall be ductile iron pipe unless approved otherwise and shall further conform to Section 2600..

## 2.4 THRUST BLOCKS:

- A. Thrust blocks, for pressure lines, shall be made of cast-in-place redi-mix with a 28-day compressive strength of 3500 psi. Thrust blocks shall further conform to Section 2000 and Standard Detail Nos. 5000-1, 5000-2 and/or 5000-3 (for vertical TB).
- B. Precast blocks **SHALL NOT** be accepted in place of cast-in-place thrust blocks.

## 2.5 BACKFLOW PREVENTERS:

- A. No system shall be allowed that may in the opinion of the Engineer be cause for a cross connection of the Owner's water supply system.
- B. Backflow preventer(s) shall be installed as specified and in accordance with the Cities Cross-Connection Ordinance as supervised by the Public Works' Water Division Inspector. The inspector can be reached and scheduled by calling 503.982.5380.

**2.6 WATER METER:**

- A. Water meters shall be the type supplied by the City Water Department.

**2.7 VALVES:**

- A. Eccentric Plug Valves (EPV), gate valves, ball valves, air relief /vacuum valves, and etc. shall comply with Section 5050.

**PART 3 EXECUTION****3.1 HANDLING AND STORAGE:**

- A. All material (pipes, fittings, and etc.) shall be handled with care to avoid damage. Material shall not be dropped, bumped, or allowed to impact on itself.
- B. The Contractor shall provide safe storage for material until it has been incorporated into the work. The interior of all pipe, couplings, rings, fittings, and other accessories shall be kept free from dirt and other foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing and high water. The Contractor at no expense to the Owner shall replace damaged materials.
- C. While cleaning pipe and fittings, wire brush if necessary and wipe clean, dry and free from oil, dirt, grease, and other foreign matter before the pipe is laid. If pipe is exposed to debris to a detriment to the water system in the opinion of the Engineer pipe shall be swabbed with a chlorine solution as directed by the Engineer.
- D. All pipes and fittings shall be carefully inspected before being laid and no cracked, broken, or defective pipe or fitting shall be used in the work.

**3.2 TRENCH EXCAVATION, BACKFILL, AND BEDDING:**

- A. Trench excavation shall conform to Section 3800 of these Specifications.

**3.3 PIPE ALIGNMENT AND GRADE:**

- A. All pipe shall be laid to and maintained at the lines and grades required by the Plans. All fittings and valves shall be installed at the required locations with joints centered, spigots home, and plumb.
- B. Every fourth section of pipe 10-foot and over shall be checked for depth of cover or every 50-foot for pipe sections under 10-foot.
- C. When a section or sections are found to be out of alignment or grade they shall be removed and placed at the correct alignment and/or grade. If fill is required to readjust use 1-inch minus aggregate thoroughly compacted to the satisfaction of the Engineer.

- D. Maximum deviation from true line or grade, as established by the Engineer, shall not exceed 1/2-inch for line and grade.
- E. In the course of laying pipe if a conflict occurs with a crossing utility which can not be relocated dive the water main under the utility unless approved by the Engineer to avoid high points allowing for air entrapment. Ensure deflection vertically to be in accordance with the manufacturer's recommendations and approved by the Engineer.

### 3.4 PIPE INSTALLATION:

- A. Installation of ductile iron pipe shall conform to AWWA C 600 and as further noted herein.
- B. Prior to excavation Contractor shall call for utility locating services of all existing utilities. Care shall be exercised during excavation to avoid damage to existing structures and utilities.
- C. Obstructions encountered shall be handled in accordance with Article E(8) of the General Conditions, except they conflict with 3.3(D) and/or 3.14.
- D. Under no circumstance shall pipe be place in standing water.

### 3.5 VALVES, FITTINGS, PLUGS AND CAPS:

- A. Valves, fittings, plugs, and caps shall be set and joined to the pipe in the manner specified. Valves 12-inches and larger shall be provided with special support such as crushed rock or concrete pads so that the pipe does not support the weight of the valve. Adjacent pipe shall be supported so as to prevent stress on the valve.
- B. Valves shall not be used to bring misalign pipe into alignment during installation.
- C. All dead ends on new mains shall be equipped with blow-off assemblies and shall be closed with plugs or caps suitably restrained to withstand test pressure. Blow-off assemblies preceding the plugs or caps shall be restrained, and as shown in Standard Detail No. 5000-5.
- D. Valve installation shall otherwise conform to Section 5050.

### 3.6 SERVICE LINES:

- A. Service lines shall be installed in a work-man-like manner and in accordance with the Standard Detail No. 5000-4.
- B. Take care to ensure that copper Type K tubing is not bent or crinkled in a fashion to reduce flow and/or cause a leak.

### 3.7 BACKFLOW PREVENTION:

- A. Backflow preventer(s) shall be installed and approved as specified in sub-section 2.5.
- B. A copy of the ordinance can be obtained from Mr. Larry Arendt of the Wastewater Treatment

Plant at 503.982.5283.

3.8 MAXIMUM ALLOWABLE JOINT DEFLECTION:

- A. Maximum allowable joint deflection shall be no more than allowed by the manufacturer's recommendation or in accordance with AWWA C 600, Table-4; which ever is more stringent.

3.9 VALVE BOXES, METER BOXES AND VAULTS:

- A. Valve boxes, meter boxes and vaults shall be installed so as not to transmit shock or stress to the valve. The box cover shall be flush with finished surface of the area in which it is installed. Valve operating nut shall be accessible and centered in the opening of the box.

3.10 CUTTING OF PIPE:

- A. The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or cement lining and so as to leave a smooth end at right angles to the axis of the pipe.
- B. All interior lining or exterior coating disturbed by cutting of the pipe shall be field dressed to the satisfaction of the Engineer.

3.11 THRUST BLOCKING:

- A. Thrust blocks shall be constructed upon and against firm, consolidated native soils.
- B. Wrap fittings with black plastic to protect coverage of joints and bolts on pipe for future maintenance.
- C. Construct thrust blocks with 3500-psi redi-mix concrete that conforms to Section 2000 of these Specifications.

3.12 SERVICE TAPS:

- A. Service Hot-Taps shall be performed by City Water Department for all live mains.
- B. Corporation stops shall be installed after pipe installation. All service taps on lines larger than 4-inches in diameter shall be direct tap. Four-inch lines shall be tapped with an all brass saddle.
- C. Taps shall be placed at the ten and/or two o'clock position on pipe vertices and a brass corporation installed.
- D. Torque requirements shall be as recommended by the manufacturer for the pipe Class being tapped.

**3.13 FLUSHING:**

- A. Foreign material left in pipelines during installation often results in valve-or-hydrant-seat leakage during pressure tests. Every effort shall be made to keep line clean during installation. Thorough flushing shall be accomplished prior to a pressure test. Flushing shall be accomplished by partially opening and closing valves and hydrants several times under expected line pressure, with flow velocities of 3 to 5-fps to adequately flush foreign material out of the valves and hydrants.

**3.14 WATER METER:**

- A. All water meter(s) shall be installed by City Water Division personnel.

**3.15 CROSSING OF SEWER LINES:**

- A. Sewer lines shall not be in the water main zone as defined in Standard Detail No.5000-6. Encase water mains crossing under or within sewers as specified.

**3.16 BLOWOFF ASSEMBLY:**

- A. Blowoffs shall be constructed in locations shown on Plans and as shown in Standard Detail No. 5000-5.

**3.17 MEASUREMENT AND PAYMENT:**

- A. **PIPE:** Pipe will be measured and paid for on a lineal foot basis, to the nearest 0.1-foot, for the types and sizes listed in the bid schedule. No reduction in length will be made for valves and fittings.
- B. **FITTINGS:** Fittings (corporations, angle meter valves, saddles) shall be incidental to unit price for pipe at a lineal foot for each diameter unless specifically listed separately.
- C. **THRUST BLOCKS:** Thrust blocks will be measured and paid for at the unit price per each listed in the bid schedule.
- D. **VALVE AND METER BOXES AND VAULTS:** Valve boxes, meter boxes and vaults shall be measured and paid at the unit price per each for each type listed in the bid schedule.
- E. **SERVICE LINES:** Service lines shall be measured and paid at the unit price to the nearest 0.1-lineal foot for each diameter as listed in the bid schedule.
- F. **REDUCED PRESSURE BACKFLOW PREVENTER (RPBP):** RPBP's shall be paid at the unit price for each as listed in the bid schedule.
- G. **VALVES:** Valves (gate, ball, swing check, double check, EPV, Air/vacuum, and etc.) shall be measured and paid at the unit price for each unless not specified in the bid schedule then they shall be incidental to the work of the pipe main.

**PART 4 TESTING**

## 4.1 HYDROSTATIC TESTING:

## A. PRESSURIZATION.

1. After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of 150-psi. Each valve section of pipe shall be slowly filled with potable water, and the specified test pressure shall be applied by means of a pump connected to the pipe. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. The test system shall be allowed ten minutes to stabilize prior to moving to the next step.
2. Hydrostatic test shall be of at least a 2-hr duration.
3. Test pressure shall not vary by more than 5.0-psi for the duration of the test.

## B. AIR REMOVAL.

1. Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air vents are not located at all high points, corporation cocks shall be installed at such points so that air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be left in place for disinfection sampling points or removed and plugged as directed by the Engineer.

## C. FIELD EXAMINATION.

1. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until satisfactory results are obtained.

## D. LEAKAGE DEFINED.

1. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled.
2. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

## E. ALLOWABLE LEAKAGE.

1. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

In inch-pound units,

$$L = \frac{SD(P)^{0.5}}{133,200}$$

L = allowable leakage, in gallons per hour\*

S = length of pipe tested, in feet

D = nominal diameter of pipe, in inches

P = average test pressure during leakage test, in pounds per square inch (gauge)

*\*L is in gph and as test is a 2-hr duration total results from field test must be divided by time (hrs) to compare to max allowable to formula. Each hour shall be evaluated separately.*

- F. When testing against closed metal-seated valves, and additional leakage per closed valve of 0.0078 gal/hr/in. on nominal valve size shall be allowed.
- G. When hydrants are in the test section, the test shall be made against the main valve in the hydrant.

#### 4.2 ACCEPTANCE OF INSTALLATION:

- A. Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified in subsection 4.1, repairs or replacement shall be accomplished in accordance with the specifications. All visible leaks are to be repaired regardless of the amount of leakage.

#### 4.3 DISINFECTION:

- A. Disinfection shall be accomplished in accordance with Section 5100 of these Specifications.

END OF SECTION