

## SECTION 02713

### WATER LINES

#### PART 1 - GENERAL

##### 1.01 RELATED WORK

- A. Section 02221 - Trenching, Backfilling, and Compacting

##### 1.02 QUALITY ASSURANCE

- A. Install, test, and disinfect water lines in accordance with regulations issued by the Tennessee Department of Environment and Conservation, Division of Water Supply.
- B. The **HALLSDALE-POWELL UTILITY DISTRICT** insists upon approving the manufacturer of all materials and all materials shall be made in the United States unless otherwise approved by the **HALLSDALE-POWELL UTILITY DISTRICT**.

##### 1.03 REFERENCES

- A. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
- B. AWWA C104 - Cement-Mortar Lining for Cast-Iron and Ductile Iron Pipe and Fittings for water.
- C. AWWA C110 - Gray-Iron and Ductile-Iron Fittings, 3 in. through 48 inch for water and other liquids.
- D. AWWA C111 - Rubber Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe Fittings.
- E. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
- F. AWWA C151 - Ductile-Iron Pipe Centrifugally Cast, in Metal Molds or Sand-Lined Molds, for water or other liquids.
- G. AWWA C702 - Cold-water Meters - Compound Type.
- H. ASTM B88 - Seamless Copper Water Tube.

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- I. AWWA C900 - Poly(Vinyl Chloride)(PVC) Pressure Pipe for water (ANSI/AWWA C900).

#### 1.04 SUBMITTALS

- A. Make submittals as specified in Section 01340.
- B. Submit product data for valves, pipe, hydrants, service assemblies, and fittings.
- C. Submit certification signed by manufacturer and Contractor that pipe and fittings meet specification requirements.
- D. Submit disinfection test results certified by a state-approved laboratory.

#### 1.05 PRODUCT DELIVER, STORAGE, AND HANDLING

- A. Store PVC pipe under cover to protect from ultraviolet light.
- B. Immediately prior to lowering pipe or fittings into the trench, clean interior of dirt and foreign material, and swab joints with a solution of approved bactericide.
- C. Carefully examine each pipe and fitting for cracks and other defects while suspended above the trench immediately before installation.

#### 1.06 JOB CONDITIONS

- A. Whenever pipe laying is not actively in progress, open ends of all installed pipe and fittings shall be fitted with a water-tight plug secured to close the opening.
- B. Pipe SEPARATION requirements from sanitary sewers. The new water main will be located so that the proper horizontal and vertical separation from the existing and any proposed storm and sanitary sewers. If the required separations can not be maintained, the sanitary sewer shall be constructed (or removed and replaced) with materials and joints that are equivalent to water mains standards of construction. This section of sanitary sewer shall be pressure tested to assure water tightness prior to backfilling. The following minimum separation requirements shall be met:
  - 1. Where the water main is to be installed parallels a sewer line. Water mains shall be laid at least 10 feet horizontally from any sewer or sewer manhole. The

horizontal distance shall be measured from edge to edge. In the event field conditions reveal that a horizontal separation of 10 feet cannot be obtained, the water main shall be laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer so that the bottom of the water main is at least 18 inches above the top of the sewer pipe.

2. Whenever the water main crosses a storm sewer, sanitary sewer main or sanitary sewer lateral, a minimum vertical distance of 18 inches shall be provided between the bottom of the water main and the top of the sewer pipe. If the water main can not pass over the sewer and maintain the 18 inches of separation, the sewer shall be constructed to water main standards as described above. If the water main crosses below a sewer pipe, the water and sanitary main shall have: 1) a vertical separation of 18 inches between the bottom of the sewer and the top of the water main, 2) that a full length of water pipe must be installed so both joints will be equidistant and as far as possible from the sewer line, 3) the sanitary sewer shall be constructed to water main standards as described above with the sewer pipe being structural supported to prevent excessive deflection and the pipes coming in contact.

## **PART 2 - PRODUCTS**

### **2.01 PIPE AND FITTINGS**

- A. PVC Pipe: ASTM D2241, SDR 21 (4"-12"), Class 200; and SDR 17 (2") Class 250 with elastomeric gasketed joints, 20 foot laying length. Integral thickened bell at annular recess designed, sized and shaped so that gasket is locked in place against displacement. The District will insist on approving the manufacturer on all pipe and fittings.
- B. PVC Pipe: AWWA C900, Class 200, DR14, and Ultra-Blue ASTM F1483, Class 200 with elastomeric gasketed joints, 20 foot laying length. Integral thickened bell at annular recess designed, sized and shaped so that the gasket is locked in place against displacement.
- C. Ductile Iron and Fitting:
  1. Pipe: AWWA C151, Pressure Class 250, unless otherwise noted.
  2. Fittings: Ductile Iron, AWWA C110, Pressure Rating 250 psi, made in the United States with no slots. Ductile iron fitting shall be used for all kinds of

pipe.

3. Joints: AWWA C111, mechanical joint with ductile iron glands or push-on joint with plain gaskets of neoprene or viton.
  4. Lining: Cement mortar, AWWA C104, for pipe and fittings.
  5. All water pipe over 12" in diameter shall be ductile iron.
- D. All pipe, fittings, and jointing compound shall be NSF approved and shall be appropriately marked or labeled.
- E. Curvature or deflection shall not exceed that shown on the standard detail in **Standard Drawings**.

#### 2.02 GATE VALVES AND BOX (3"-12")

- A. Gate valves shall be iron body, bronze trim, resilient wedge design, non-rising stem, turning counterclockwise to open. Valves shall meet the requirements of AWWA C509. Valves shall be furnished with a standard operating nut. Valves shall operate smoothly through the entire lift. Internal and external iron surfaces of the valve shall be coated with fusion bonded epoxy meeting the requirements of AWWA C550. Valves shall be by Mueller or M&H
- B. Valves boxes shall be standard design cast-iron with cover Mueller No. H-10360. Boxes shall have an inside diameter of not less than 5 1/4 inches. Boxes shall be 2 piece coal tar coated, screw and adjustable type, consisting of a cover marked WATER, and upper telescoping section, and a lower section. Where necessary to provide extra depth provide cast iron extension pieces as required.

#### 2.03 TAPPING VALVE AND SLEEVE

- A. Valve shall meet the applicable requirements specified in Article 2.02.
- B. Tapping sleeves shall consist of a mechanical joint tapping sleeve and a valve with a mechanical joint outlet – Smith-Blair or approved equal.

#### 2.04 BUTTERFLY VALVES (WITH UNDERGROUND OPERATOR)- 12" or Larger With Prior Approval

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- A. All butterfly valves shall be of the rubber-seated tight-closing type. They shall meet or exceed performance requirements for water application of Specification C504. All valves shall be Mueller Lineseal III butterfly valves.
- B. Both valve ends shall be mechanical-joint per AWWA Specification C111. Accessories (Bolts, glands and gaskets) shall be supplied by the valve manufacturer.
- C. All valves must use full AWWA C504 Class 150B valve shaft diameter and Full Class 150B underground-service-operator torque rating throughout entire travel.
- D. Valve body shall be high-strength cast iron ASTM A126 Class B with 18-8 Type 304 stainless steel body seat. Valve vane shall be high-strength cast iron ASTM A48 Class 40, having rubber seat mechanically secured with an integral 18-8 stainless steel clamp ring and 18-8 stainless steel nylon locked screws. Rubber seat shall be a full-circle 360 degree seat not penetrated by the valve shaft.
- E. Valve shaft shall be one piece, extending full size through the entire valve and operator. Valve shaft shall have 304 stainless steel journals rotating in reinforced teflon bearings. Valve shall have permanently-set two-way thrust bearing. Packing shall be "triple-seal" rubber designed for permanent duty in underground service.
- F. Valve operator shall be of the traveling-nut type, sealed, gasketed, and lubricated for underground service. It shall be capable of withstanding an overload input torque of 450 ft. lbs. at full-open or closed position without damage to the valve or valve operator. It shall be designed to resist submergence in water to twenty feet (25') head pressure.

#### 2.05 BUTTERFLY VALVE BOXES

- A. Valve boxes shall be reinforced concrete similar to the type specified by the Nashville Water and Sewer Department. Outside dimensions shall be 19-1/4" x 17". Valve boxes shall be installed with the length of the box perpendicular to the water lines. Inside dimensions shall be 13-1/4" x 11". Height of the box shall vary from 12" to 18". Each valve box shall be supported by four (4) concrete footing blocks, each having dimensions of 12" x 12" x 1-1/2" thick.
- B. Valve box frame and covers shall be Cast Iron No. 8006 as manufactured by John Bouchard & Sons Co. or approved equal.

#### 2.06 THRUST BLOCKS

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- A. Concrete for thrust blocks (Type B) shall meet the requirements of Section 03300. Concrete for thrust blocks shall be mechanically mixed unless specific approval is obtained from the HPUD.
- B. Thrust blocking shall be provided at all bends of 11-1/4 degrees or greater, and at all tees, wyes, plugs, and dead end valves. Blocking shall be poured against undisturbed earth, be a minimum of 12 inches thick, and constructed so that the pipe and fitting joints will be accessible for repairs. If adequate support against undisturbed ground cannot be obtained, metal harness anchorages consisting of joint clamps or tie rod and clamp systems shall be installed to provide the necessary thrust resistance. See **Standard Drawings** for recommended thrust block sizes. Actual blocks may change depending on the quality of the soil condition

## 2.07 FIRE HYDRANT

- A. Fire hydrants where the system can provide greater than 500 gpm @ 20 psi shall be designed for 150 PSI working pressure. Valve opening shall be 4-1/2 inches. Hydrant shall be equipped with two 2-1/2 inch nozzles, with National Standard threads. Hydrant shall be of the break-flange type. Hydrant shall be furnished with auxiliary gate valve and box.
- B. Fire hydrants where the system cannot provide greater than 500 gpm and greater than 20 psi shall be the same as in A above except for a 3" inlet connection utilizing a 3" foot valve to a 2 1/8" flush type hydrant with only one 2 1/2 inch nozzle.
- C. Hydrants shall be by Mueller or M&H equivalent to KUB standard hydrants and shall be an open right type.

## 2.08 TRACER WIRE

- A. A No. 12 AWG (insulated) copper wire shall be installed over all water mains. A 2 inch wide metallic foil sandwiched between 2 layers of plastic, blue color labeled "Caution - Water Line Below" shall be laid in the trench one foot above the top of the pipe.

## 2.09 CASING PIPE

- A. For major roadway and all railroad crossings, water pipe shall be installed in a casing

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pipe. Casing pipe shall be black steel pipe with minimum wall thickness as shown in Section 02235.

## 2.10 AIR RELEASE ASSEMBLIES

- A. Furnish in 2" nominal diameter for 8" mains and smaller and in 3" nominal diameter for 10"-24" mains.
- B. Air release assemblies shall consist of:
  - 1. Double strap, stainless steel service clamp with neoprene gasket.
  - 2. Galvanized steel pipe of the nominal diameter required by the main size.
  - 3. Red Brass Corporation stop.
  - 4. Globe or gate valve.
  - 5. Combination air release valve by Apco or equal.
- C. Combination air release valves consisting of:
  - 1. An air and vacuum valve coupled with an air release valve.
  - 2. Cast iron body, stainless for use in mains having a working pressure of 200 psi.
- D. Install in a pre-cast concrete pipe, or vault 30" deep with an 20" long cast iron frame and cover.
- E. Place crushed stone from 6" below the globe valve to 12" below the bottom of the main.

## 2.11 BLOW-OFF HYDRANTS

- A. Blow-off hydrants shall be post type with one 2-1/2" threaded brass nozzle by Mueller, or equal.
- B. Blow-off Hydrants:
  - 1. Supply a main line valve and a reducer before installing a 2' minimum length of

2" pipe for a 4" main or larger main.

2. So designed that, when it is installed, no excavation is required to remove the main.
3. Cast markings shall include the manufacturer's name, size of the main valve, year of manufacturer, and the direction of opening.

#### 2.12 BLOW-OFF ASSEMBLY

- A. Blow-off assemblies shall include a main line valve fittings, and pipe as shown on the detail in **Standard Drawings**, or an equal installation as approved by the **HALLSDALE-POWELL UTILITY DISTRICT**. No brass bodies will be allowed, iron only.

#### 2.13 CONCRETE ENCASEMENT

- A. Concrete encasement shall be installed where indicated on the drawings. Concrete and reinforcing steel shall be as specified in the cast-in-place concrete section. All pipe which is to be encased shall be suitably supported and blocked in proper position and shall be anchored against flotation.

### **PART 3 - EXECUTION**

#### 3.01 INSTALLATION

- A. Trenching and backfilling shall meet the requirements of Section 02221.
- B. During pipe installation Contractor shall take every precaution to prevent foreign material from entering the pipe. If the pipe laying crew cannot install the pipe or fittings without foreign material in it, the Contractor shall place a heavy, tightly woven canvas bag over each end before lowering it into the trench.
- C. Jointing procedures, including cleaning of ends of pipe, shall be in accordance with the manufacturer's recommendations. Pipe shall be laid with the bells pointing in the direction of laying.
- D. Any pipe joint laid on a final slope of greater than or equal to 20 percent will use an additional restrained joint fitting.

- E. Field cutting of pipe shall be done according to the manufacturer's recommendations. Cut end shall be smooth and at right angles to the axis of the pipe. Field cuts shall be filed or trimmed to resemble the spigot end of the pipe as manufactured. Depth marks shall be placed on the pipe to assure pipe is inserted to the full depth when joint is made.
- F. Thrust blocking shall be provided at all bends of 1 1/4 or greater and tees and valves. Blocking shall be poured against undisturbed earth, be a minimum of 12 inches thick, and constructed so that the pipe and fitting joints will be accessible for repairs.
- G. Metallic wire shall be installed in the trench above the pipe. In all cases install a blue marking tape +/- 2" width one foot above pipe in the trench as backfilling occurs.
- H. Valve boxes shall be set accurately to the grade of the street or finished ground surface.
- I. Minimum cover of 36 inches shall be provided over the top of pipe, except that 48 inches shall be provided under streets and driveways.
- J. Connections to existing lines and connection of service lines shall be coordinated with the **HALLSDALE-POWELL UTILITY DISTRICT**.
- K. All intersections will be built with ductile iron pipe regardless of line material being used (i.e. all hydrants, short nipples between valves, fittings, hydrants, etc. shall/will be ductile iron pipe. All intersections will be rodded together or employ a restrained-joint gland, but not a retainer gland, and will be so constructed to allow placement as a unit. Concrete thrust blocking may be required but does not replace restrained joint construction.

### 3.02 CLEAN-UP PROCEDURES AND REQUIREMENTS

- A. The Contractor shall not, without the permission of the **HALLSDALE-POWELL UTILITY DISTRICT** remove from the line of work any earth until the excavation has been refilled and surfaced.
- B. As soon as the backfilling of any excavation is completed and when in areas of existing development, the Contractor must at once begin the removal of all surplus dirt except that actually necessary to provide for the settlement of the filling unless otherwise provided in the special specifications. He shall also remove all the pipe and other

material placed or left on the street by him except material needed for the replacement of paving, and the street shall be opened up and made passable for traffic. Following the above work, the repairing and complete restoration of the street surfaces, bridges, crossings, and all places affected by the work shall be done as promptly as possible.

- C. All excavated material shall be cleared from adjacent street surfaces, gutters, sidewalks, parkways, railroads, grass plots, yards, etc., and the whole work shall be left in tidy and acceptable conditions. Contractor will be required to regrass lawns or neutral grounds where trenches are excavated in these locations or where Contractor has damaged lawns or neutral grounds by his operations.
  
- D. The **HALLSDALE-POWELL UTILITY DISTRICT** shall be sole authority in determining the time in which rough and final clean-up shall be prosecuted. Rough clean-up shall consist of removal of rocks larger than 1 foot in any dimension, grading of excess backfill material over pipeline or removal of said material, opening of any drainage device, restoration of any street or roadway to a condition so that traffic may safely and conveniently use the street or roadway, restoration of pedestrian ways to a condition where the pedestrians may safely and conveniently use same. Rough clean-up shall, in general, be prosecuted no later than 1 day after pipe laying and backfilling or no farther behind pipe laying operations than 800 feet; whichever time limit is shortest shall govern. Final clean-up consisting of pavement replacement, sidewalk replacement, removal of rocks, hand raking with seeding, strawing, etc., of lawns and neutral grounds, adjusting grade of ground over pipeline, property repairs, and other items, shall, in general, be prosecuted no later than 2 weeks after pipe has been laid and backfilled.

### 3.03 FIELD TESTS

- A. All newly laid water lines shall be tested before being placed in service. Trenches may be backfilled as the pipe is laid, or where practicable and at the option of the Contractor, trenches or bell holes may be left open for visual inspection during tests. Prior to making tests, all air shall be expelled from the pipe. Contractor shall install taps at high points of the line for purpose of expelling air if necessary.
  
- B. Pressure Test: A two-hour test shall be made in accordance with AWWA C600-latest revision on the pipe line between valves or temporary plugs at a test pressure of at least 200 psi, for at least two hours minimum except that the pressure rating of the pipe shall not be exceeded. Any open trench or bell holes over dry joints may be backfilled following this test. Where trenches have been backfilled prior to making the tests, any

leaks evident at the surface shall be uncovered. All leaking joints disclosed by this test shall be remade and retested. All pipe, fittings, valves, and other materials found defective under this test shall be removed and replaced at the Contractor's expense.

- C. Leakage Test: A leakage test shall be made on the water line concurrently with the pressure test between valves or temporary plugs at a constant test pressure of 200 pounds per square inch. The test shall be run in accordance with AWWA C600 except as modified below. Leakage in the test system shall be measured through a meter or approved measuring device. The allowable leakage shall be not greater than 5 psi or 0.50 gallons per hour per 5,000 feet of pipe for a minimum of two hours of testing period. Should tests disclose leakage greater than the allowable amounts, the Contractor, at his expense, shall locate and repair defective joints until the leakage is within the specified allowance.

### 3.04 DISINFECTING WATER LINES

- A. Disinfecting of the completed lines shall be done in accordance with AWWA C651-latest revision and in a manner approved by the Tennessee Department of Environment and Conservation, Division of Water Supply. All new water distribution piping, including repaired portions of or extensions to existing systems, shall be thoroughly disinfected before being placed in service, by the use of chlorine or chlorine compounds in such amounts as to produce a concentration of at least 25 ppm at the end of 24 hours and followed by through flushing. At least two consecutive samples, obtained 24-hours apart, must be certified bacteriologically satisfactory by a state-approved laboratory before the system can be placed in service.
- B. Prior to chlorination, the main shall be flushed as thoroughly as possible with the water pressure and outlets available. Flushing shall be done after the pressure test are made. After flushing, all valves shall be carefully inspected to see that the entire operating mechanism is in good condition.
- C. Following disinfection, all treated water shall be thoroughly flushed from the newly laid pipeline at its extremities until the replacement water throughout its length shall, upon test, be proved comparable to the quality of water served the public from the existing water supply system and approved by the Tennessee Department of Environment and Conservation, Division of Water Supply. This quality of water delivered by the new main should continue for a period of at least two full days as demonstrated by laboratory

examination of samples taken from a tap located and installed in such a way as to prevent outside contamination. Samples shall not be taken from an unsterilized hose or from a fire hydrant.

- D. Should the initial treatment fail to result in the condition specified in the preceding paragraph, the sterilizing procedure shall be repeated until such results are obtained. The Contractor is responsible for obtaining the approval of the Tennessee Department of Environment and Conservation, Division of Water Supply for the work performed under this contract.

**END OF SECTION**