

REVISION		
DATE	NO.	DESCRIPTION
12/14/07	A	SUBMIT TO DOT FOR REVIEW
01/07/08	B	RESUBMIT TO DOT FOR REVIEW
01/21/08	C	REVISED AS PER DOT REVISIONS
02/11/08	D	RESUBMIT TO DOT FOR REVIEW
03/13/12	E	RESUBMIT TO DOT FOR REVIEW



STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	BRST-074-1(51)	57	119

RW. 7-24-12

SECTION 02660

WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. WORK covered by this Section consists of furnishing and installing water distribution pipes and appurtenances, including, but not limited to, reaction blocking, testing, and disinfection.

1.02 RELATED WORK

- A. Section 02225 - Earthwork for Utilities

1.03 REFERENCES

The latest version of the following referenced standards shall be used.

- A. American Society for Testing and Materials (ASTM), Annual Book Standards.
 1. N/A
 2. ASTM F 477, Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- A. American Water Works Association (AWWA) Standards.
 1. AWWA C104, Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 2. AWWA C110, Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and other Liquids.
 3. AWWA C111, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 4. AWWA C151, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or other Liquids.
 5. AWWA C153, Standard for Ductile-Iron Compact Fittings, 3 in. through 24 in. and 54 in. through 64 in., for Water Service.
 6. AWWA C509, Standard for Resilient - Seated Gate Valves for Water Supply Service.
 7. AWWA C550, Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.
 8. AWWA C600, Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.
 9. N/A
 10. AWWA C651, Standard for Disinfecting Water Mains.
 11. N/A
- C. Minimum Standards for Public Water Systems, Georgia Environmental Protection Division

1.04 DELIVERY, STORAGE, AND HANDLING

- A. CONTRACTOR shall be responsible for safe unloading, storage and care of material furnished by or to him until it has been incorporated into work.
- B. Unload pipe, fittings, or valves by lifting with hoists or skidding to avoid damage.
 1. Pipe shall not be unloaded by rolling or dropping off trucks.
 2. Pipe handled on skidways shall not be skidded or rolled against pipe already on ground.
- C. Unload material at site of work, near place where it will be placed in trench.
 1. Materials shall be placed for least interference with traffic.
 2. Provide signs, lights, and barricades as necessary to protect public.
- D. Handle material carefully to prevent breakage and to avoid damage to coatings and linings.
 1. Keep interior of pipe, fittings, and valves, free of dirt or foreign matter at all times.
 2. Do not place materials in drainage ways or ditches.

PART 2 PRODUCTS

2.01 N/A

2.02 DUCTILE IRON PIPE

- A. Shall conform to latest requirements of AWWA C151.
- B. Shall be cement mortar lined in accordance with AWWA C104 standard thickness.
 1. Unless otherwise specified, pipe shall have push-on compression type joints conforming to AWWA C111 or AWWA C153 (Latest Editions).
 2. Minimum pressure class shall be 350 psi.

SECTION 02660 WATER DISTRIBUTION SYSTEMS (CONT'D)

2.03 CAST AND DUCTILE IRON FITTINGS

- A. Fittings for ductile iron pipe and PVC pipe shall be cast or ductile iron and shall conform to requirements of AWWA C110 or AWWA C153 and shall be cement mortar lined in accordance with AWWA C104 standard thickness.
- B. Joints shall conform to AWWA C111.
- C. Fittings shall be mechanical joint unless otherwise specified on Drawings.

2.04 DETECTION TAPE AND WIRE

- A. Detector marking tape shall be non-metallic and shall be installed minimum 2 feet above the pipe. Tape shall be highly visible and minimum 2 inches wide. Lettering shall read "Caution: Buried Water Line".

PART 3 EXECUTION

3.01 ALIGNMENT AND GRADES

- A. Depth of Pipes
 1. Shall be 48 inches measured from finished grade to top of pipe unless otherwise specified.
 2. Where obstructions are encountered, depth may be greater than 48 inches.
- B. Valves
 1. Shall be installed with stems vertical.
- C. Pipe Curvatures
 1. Maximum horizontal or vertical permissible deflection at joint shall be 5 degrees.

3.02 INSTALLING PIPE

- A. General
 1. In accordance with Section 7.2.0.g of Minimum Standards for Public Water Systems, all water line installation shall be conducted in compliance with all applicable requirements of state DOT, municipality and/or county road departments, and railroads.
 2. Curbing must be installed prior to installing any waterlines.
 3. Trenches must be dry. Pipe and appurtenances shall be installed only when trench conditions are suitable
 4. Proper implements, tools, and facilities shall be provided by CONTRACTOR for safe and convenient performance of the work.
 5. Separation of Water and Sewer Mains
 - a) Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer, storm sewer or sewer manhole. The distance shall be measured edge-to-edge. When local conditions prevent a horizontal separation of 10 feet, the water main may be laid closer to a sewer (on a case-by-case basis, must be approved by the CITY) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. It is advised that the sewer be constructed of materials and with joints that are equivalent to water main standards of construction and be pressure tested to assure water-tightness prior to backfilling.
 - b) Water mains crossing house sewers, storm sewers or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. At the crossings, one full length of water pipe shall be located so that both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required. When local conditions prevent a vertical separation of 18 inches, the sewer passing over or under water mains shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water-tightness prior to backfilling. When water mains cross under sewers, additional measures shall be taken by providing a vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main, adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking the water mains; that the length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer; and, both the sewer and the water main shall be constructed of water pipe materials and subjected to hydrostatic tests, as prescribed in this document. Encasement of the water pipe in concrete shall also be considered.

SECTION 02660 WATER DISTRIBUTION SYSTEMS (CONT'D)

3.02 INSTALLING PIPE (CON'D)

- B. Installation
 1. Lower pipe, fittings, valves, and hydrants carefully into trench piece by piece by means of derrick, ropes, or other suitable tools or equipment.
 2. Prevent damage to water main materials and protective coatings and linings.
 3. Do not drop or dump water line materials into trench.
 4. Carefully examine pipe and fittings for cracks and other defects while suspended above trench immediately before installation in final position.
 - a) Defective pipe or fittings shall be clearly marked and shall be removed from site.
 - 5. Clean bell and spigot ends of each piece of pipe thoroughly before pipe is laid.
 6. Prevent foreign material from entering pipe while it is being placed in line.
 - a) Provide protective covering for ends of pipe until connection is made to adjacent pipe, if necessary.
 - b) No debris, tools, clothing, or other materials shall be placed in pipe during laying operations.
 7. As each length of pipe is placed in trench, spigot end shall be centered in bell and pipe forced home and brought to correct line and grade.
 - a) Pipe shall be secured in place with approved backfill material tamped around it.
 - b) Precautions shall be taken to prevent dirt from entering joint space.
 8. Open ends of pipe shall be closed by watertight plug, or other means approved by the CITY, at times when pipe laying is not in progress.
 - a) If water is in trench, plug shall remain in place until trench is pumped completely dry. Water shall not be allowed to run into pipe at any time during construction.
 9. Lay pipe with bell ends facing in direction of laying.
 - a) Where pipe is laid on grade of 10 percent or greater, laying shall start at bottom and shall proceed upward with bell ends of pipe up grade.

3.03 CUTTING PIPE

Cut pipe for inserting valves, fittings, or closure pieces in neat manner without damage to pipe or lining and so as to leave smooth end at right angles to axis of pipe.

3.04 N/A

3.05 JOINTING

- A. Jointing of pipe, fittings, and valves shall be made in strict compliance with manufacturer's printed instructions.
- B. Mechanical Joints
 1. Thoroughly clean outside of spigot and inside of bell prior to installation.
 2. Clean gasket.
 3. Tighten nuts with torque limiting wrench.
 4. Nuts spaced 180 degrees apart shall be tightened alternately in order to produce equal pressure.
- C. Push-On Joints
 1. Furnish and install adapters if required to join bells and spigots of different sizes.
 2. Thoroughly clean inside of bell and outside of spigot end prior to installation.
 3. Insert and lubricate gasket using lubricant furnished or recommended by pipe manufacturer.
 4. Spigot end of pipe shall be entered into socket with care used to keep joint from contacting ground.
 5. Complete joint by forcing plain end to bottom of socket with forked tool or jack-type tool.

3.06 SETTING VALVES AND FITTINGS

- A. Valves, fittings, plugs, and caps shall be set and joined to pipe in manner specified above for cleaning, laying and joining pipe.
- B. Valves shall be set plumb and a valve box shall be provided for every valve.
 1. Valve box shall not transmit shock or stress to valves and shall be centered and plumb over wrench nut of valve, with box cover flush with surface of finished pavement or such other level as may be directed.
 2. FOR INSTALLATION WHERE THERE ARE ROADSIDE DITCHES, VALVES AND VALVE BOXES SHALL BE PLACED ON THE BACK SIDE OF THE DITCH AT LEAST FIVE (5) FEET FROM THE CENTERLINE OF THE DITCH.
- C. Backfill around valves shall be carefully tamped in 6 inch layers for full depth of trench with valve box in place.
- D. Provide concrete pad at surface as indicated on STANDARD DETAILS.

3.07 ANCHORAGE

- A. Plugs, caps, tees, bends, and valves, unless otherwise specified, shall be provided with reaction blocking. Concrete reaction blocking shall conform with these specifications and the applicable standard details.
- B. Concrete reaction blocking shall conform with these specifications and the applicable standard details.
- C. Reaction blocking shall be concrete, having a compressive strength of not less than 3,000 psi after 28 days. "Sackcrete" shall not be used.
- D. Blocking shall be placed between solid, unexcavated earth and fitting to be anchored; area of bearing on pipe and on ground in each instance shall be that shown on DRAWINGS.
- E. Blocking shall, unless otherwise shown or directed, be so placed that pipe and fitting joints will be accessible for repair.
- F. Metal harness of tie rods or clamps of adequate strength to prevent movement may be used to complement concrete blocking if approved by the CITY.
- G. Steel rods or clamps shall be galvanized or bituminous coated.

SECTION 02660 WATER DISTRIBUTION SYSTEMS (CONT'D)

3.08 CONNECTION TO EXISTING MAINS

- A. NO CONNECTIONS TO EXISTING WATER MAINS SHALL BE MADE WITHOUT THE PRESENCE OF CITY PERSONNEL.
- B. CONTRACTOR shall coordinate with the CITY regarding connections to existing mains.
- C. Connection to existing mains shall be made at such time as to minimize disruption of water service to public.
- D. Connections to existing mains shall be made using proper fittings and specials to suit actual conditions.
- E. Existing pipes, which are cut or damaged by CONTRACTOR, shall be repaired, reconnected, and returned to service in equal or better condition.

3.09 N/A

3.10 HYDROSTATIC TESTS

- A. Pressure and leakage tests will be required on each section of line between valves and shall be conducted in accordance with AWWA C600 and or C605.
- B. General Procedure
 1. Furnish and install corporation stops at high points on line to release air as line is filled with water.
 2. Furnish suitable pump, connections, and necessary apparatus including means for accurately measuring water introduced into line during testing.
 3. Test pressure shall not be less than 1.25 times the stated working pressure of the pipeline measured at the highest elevation along the test section. Test pressure shall not less than 150 psi or 1.5 times the stated working pressure at the lowest elevation (whichever is greater) of the test section. The test pressure shall not exceed the thrust restraint design pressures or 1.5 times the pressure rating of the pipe or joint, whichever is less as specified by the manufacturer.
 - a) Test pressures shall be as directed by the CITY.
 - b) Test shall be conducted for a minimum of 2 hours.
 - c) Pressure shall not vary by more than 5 psi during test.
 4. Testing Allowance.
 - a) The testing allowance is the maximum amount of water that may be added into the pipeline section during hydrostatic testing in order to maintain ±5 psi of the test pressure.
 - b) The maximum allowable makeup water shall be based on the following formula:

$$L = \frac{S \times D \times (P \times 0.5)}{148,000}$$
 Where L is the testing allowance of makeup water in gallons per hour; S is the test length in feet, D is the pipe diameter in inches and P is the average test pressure in pounds per square inch.
 - c) No pipe installation shall be accepted if the amount of make up water required exceeds the amount determined in the formula above.
 5. Locate, remove, and replace any defective pipe, valves, fittings, or hydrants.
 6. Repeat tests until results are satisfactory to the CITY.

3.11 DISINFECTION

- A. Pipe, fittings, valves, and appurtenances which have been exposed to contamination by construction shall be thoroughly cleaned, chlorinated, drained, and flushed in accordance with AWWA Specification C651, the Continuous Feed Method and EPD Minimum Standards for Public Water Systems.
- B. Procedure
 1. Flush line prior to disinfection. Flushing shall produce minimum velocity of 2.5 feet per second in pipe.
 2. The "tablet method" of disinfection consists of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water when installation is complete. In accordance with EPD Minimum Standards for Public Water Systems, the tablet method is not allowed.
 3. For the Continuous Feed Method, water entering the new main shall receive a dose of chlorine fed at a constant rate so that the water will have a concentration not less than 25 mg/L free chlorine. This shall be done within 10-feet of the beginning of the main. This heavily chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants shall be operated to ensure disinfection of the appurtenances. At the end of the 24-hour period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L free chlorine. Re-chlorination is required if required results are not obtained on all samples.
 4. After 24 hour retention period, flush chlorinated water from line until chlorine concentration of water leaving main is no higher than that generally prevailing in existing system or that is acceptable for domestic use
 5. Disposal of the heavily chlorinated water shall be in accordance with AWWA Standard C651. The environment to which this water will be discharged shall be inspected. If there is any question that the water will damage the environment, a reducing agent shall be used to neutralize the chlorine.
 6. In accordance with AWWA C651, cross connection / backflow prevention measures shall be taken before and during disinfection of constructed water mains to prevent backflow into active portions of the distribution system or into sections that have already been disinfected but not yet placed into service.
 7. CONTRACTOR shall have sample analyzed by a certified laboratory.
- C. Repeat disinfection procedures until bacteriological analysis results are acceptable to the CITY.

END OF SECTION