

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
- B. Section 02665 - Water Service Connections

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM), Annual Book Standards.
 - 1. ASTM D 2122, Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
 - 2. ASTM F 477, Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- B. 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. AWWA C651, Standard for Disinfecting Water Mains.
10. AWWA C900, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. DEVELOPER/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 GENERAL

All water distribution piping mains shall be new unused ductile iron pipe only. All materials used and come into contact with drinking water during its distribution shall not adversely affect drinking water quality and public health and must be certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61).

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.
- C. Ductile iron pipe for minor creek crossings shall be connected with restrained joints.
- D. Ball-Joint Pipe- Major Creek and River Crossings
 - 1. Shall be manufactured for river crossing applications.
 - 2. Joints shall be boltless.
 - 3. Joints shall be restrained.
 - 4. Joint shall provide up to 15° deflection.

2.03 Cul – de – Sacs

See Standard Detail W-24.

2.04 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.
- D. Gaskets for PVC pipe shall be duct tip transition type compatible with type of pipe used.

2.05 RESTRAINED JOINTS-DIP

- A. Push-on application-Restrained joints shall be “Fast-Grip Gasket” by ACIPCO or “Field-Lok Gasket” by U. S. Pipe.
- B. Mechanical joint restraints shall be “Mega-Lug 1100 Series” by EBBA Iron Sales, MJ-Field-Lok by U.S. Pipe or approved equal.

- C. Joint preparation and installation shall be in accordance with manufacturer's recommendations.

2.06 GATE VALVES

- A. Shall conform to requirements of AWWA C509 for resilient seated gate valves, iron body, with bonded epoxy coating conforming to AWWA C550.
- B. Shall be designed for 250 psi working pressure and 500 psi hydrostatic test pressure.
- C. Accepted manufacturers are Mueller, M&H, American Flow Control, and U.S. Pipe and Foundry Co.
- D. Shall be of iron body, bonded epoxy, and shall have non-rising bronze stem, and shall be wrench operated.
- E. Valves shall open by turning counter-clockwise, and operating nuts shall be standard two inches square.
- F. Suitable stem guides shall be provided, where required.
- G. Shall be furnished with mechanical joint suitable for connection to pipe into which it will be installed for buried service.
- H. Small Gate Valves: Valves smaller than 3 inches shall conform to level of quality and manufacturing standards established for valves 3 inches and larger by respective AWWA Standards.
- I. Gate valves shall be installed at a maximum spacing of 1000 linear feet, and at a minimum of 3 valves per 3-way tees intersections, and at a minimum of 4 valves per 4-way crosses or intersections. Additional valves may be required at the TOWN's discretion.

2.07 PRESSURE REDUCING VALVES

- A. Pressure Reducing Valves and vaults shall be designed and sized by the DEVELOPER's engineer, and reviewed by the TOWN. Pressure Reducing Valves shall be as manufactured by CLA-VAL. Some installation may require high and low flow set-ups.
- B. All Reducing Valves and vaults shall be installed with the TOWN's most current SCADA and telemetry.
- C. Precast vaults for each pressure reducing valve must be supplied and installed. The vault must be sized for each application so as to allow ample working room in the vault. Contractor is to provide shop drawings of the proposed units for approval by TOWN and ENGINEER at the Preconstruction Conference.

2.08 AIR RELEASE VALVES

- A. Shall be cast iron body with stainless steel (ASTM A240) float and synthetic seat equal to Crispin PL 10, Type N. Valves shall be installed in a doghouse manhole as per the TOWN's standard detail W-12.
- B. Orifice size shall be as follows:

MAXIMUM OPERATING PRESSURE (PSI)						
	50	100	150	200	250	300
ORIFICE	$\frac{5}{16}$ "	$\frac{5}{16}$ "	$\frac{1}{4}$ "	$\frac{3}{16}$ "	$\frac{5}{32}$ "	$\frac{1}{8}$ "

For general use a $\frac{3}{16}$ " orifice will be adequate. However, DEVELOPER/ CONTRACTOR is to verify actual size with TOWN prior to installation.

2.09 AIR/VACUUM VALVES

- A. Shall be cast iron body with stainless steel (ASTM A240) trim and float equal to Crispin UL20 or approved equivalent. Valves shall be installed as per the TOWN's standard detail W-13.
- B. Orifice size shall be 2" diameter.
- C. Internal parts shall be stainless steel (ASTM A240) or bronze.

2.10 VALVE MARKERS

- A. Shall be furnished with each gate valve and air release/vacuum valve installed as indicated on the drawings, with exception of fire hydrant valves.
- B. Along DOT right-of-way, marker shall be three-sided, flexible post as per *USA Blue Book* the RHINO Tri-View Flex marking post, color blue, 66", catalogue no. 70450.
- C. Label Decal shall be white with blue text, 2-7/8" X 14", reading WARNING WATER VALVE. Decal shall also bear the name, TOWN OF BRASELTON-PHONE NUMBER 706-654-3915.

2.11 VALVE BOXES AND COVERS

- A. Shall be provided with valves.
- B. Shall be of adjustable screw type, of length required with a minimum 6" of adjustment allowed, and installed as shown on standard details.

- C. Shaft shall be 5 inch diameter with base to be minimum of 8 inch diameter by 9-inch height inside.
- D. Base size and extension piece shall be as required for each individual size of valve and depth.
- E. All valve boxes shall be installed with a "Debris Cap". This device shall be manufactured by SW Services, Inc., Phoenix, Arizona, or approved equal.
- F. In Lieu of the above standard valve box and debris cap, the Valve box shall be American Flow Control "Trench Adaptor". The box shall be an assembled unit composed of valve box, extension stem, and a self-centering alignment ring. Valve box shall be adjustable for variable depths.

2.12 TAPPING VALVES

- A. Tapping sleeve shall be FORD Style FTSS or approved equal, all stainless tapping sleeve, with removable bolts and 360° gasket.
- B. Tapping machines and competent supervision shall be provided for making of taps. All taps shall be made in the presence of the TOWN OF BRASELTON representative.
- C. Tapping sleeves shall be properly sized to fit existing pipe and shall be of split sleeve type with ends suitable for connection into pipeline into which it will be installed.
- D. Largest tap allowed shall be "size on size". The new water main may be increased in size beyond the installed tapping sleeve and valve.
- E. Valves furnished with sleeves shall conform to requirements herein above for gate valves, except for modifications required to permit use of full size cutter through valves.
- F. Outlet of valves shall be mechanical joint for joining with water mains.
- G. After tap is completed, the "cut out" section of pipe or "coupon" shall be tagged, labeled as to date and location, and submitted to Town Inspector.
- H. Tapping sleeves shall be pressure tested immediately after installation as per the testing requirements of this section.

2.13 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".
- B. Detection wire shall be size #12 AWG solid copper, installed the entire length of the piping. All splices shall be made with waterproof connectors. For each joint of pipe, wire shall be looped around pipe a minimum of three (3) times and properly connected to

fittings and valves so line can be relocated with a pipe finder after burial. All splices shall be connected with waterproof connectors

2.14 SAMPLE STATION

- A. Sampling station shall be Eclipse No. 88 by Kupferle Foundry, St. Louis, MO.
- B. A minimum of one (1) sample station is required per development. Show sample station on plans at the further most point in the proposed water system from the point of connection to the Town's water system. Additional sampling stations may be required depending on size and location of the development.

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. Depth may be greater than 48 inches, if approved by the Town.
- 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. Curbing must be installed prior to installing any waterlines.
 - 2. Trenches must be dry. Pipe and appurtenances shall be installed only when trench conditions are suitable
 - 3. Proper implements, tools, and facilities shall be provided by DEVELOPER/CONTRACTOR for safe and convenient performance of the work.
 - 4. Where water mains parallel or cross sanitary sewers, a minimum horizontal separation of ten (10') feet and minimum vertical separations of 18" must be provided. At crossings, one full length of water pipe must be located so that both joints are as far from the sewer as possible.

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 TOWN, 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 against direction of flow.
 - 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 upgrade.

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 DETECTION OF NON-FERROUS PIPE

See part 2.13.

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.
 1. 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 restrained joints in accordance with Part 2 and reaction blocking.
- B. Concrete reaction blocking shall conform to 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 compliment concrete blocking and restrained joints if approved by the TOWN.
- G. Steel rods or clamps shall be galvanized or bituminous coated.

3.08 CONNECTION TO EXISTING MAINS

- A. NO CONNECTIONS TO EXISTING WATERMAINS SHALL BE MADE WITHOUT THE PRESENCE OF TOWN OF BRASELTON PERSONNEL.
- B. DEVELOPER/CONTRACTOR shall coordinate with the TOWN OF BRASELTON regarding connections to existing mains.
- B. Connection to existing mains shall be made at such time as to minimize disruption of water service to public.

- C. Connections to existing mains shall be made using proper fittings and specials to suit actual conditions.
- D. Existing pipes, which are cut or damaged by DEVELOPER/CONTRACTOR, shall be repaired, reconnected, and returned to service in equal or better condition.

3.09 STREAM and UTILITY CROSSINGS

- A. Pipe shall be placed beneath streambeds or ditches, around, over, or under sewers, culverts, gas mains, telephone ducts, water mains, or other structures.
 - 1. Do not pass pipe through any drainage pipe, culvert, sewer, or manhole.
 - 2. Provide minimum of 48 inches under streambeds or ditches, unless approved by Engineer in writing.
 - 3. Provide minimum of 6 inch earth or sand cushion between proposed water line and any other utility or structure or as indicated on drawings.
- B. Where water lines are installed below free flowing streams, the DEVELOPER is responsible for adequate pipeline design of each crossing on a case by case basis subject to the TOWN's review. The Developer's Engineer shall consider the soils, creek flow, pressure, topography, thrust restraint, construction techniques allowed, etc. in order to design and specify appropriate layout and pipe joints.
- C. The DEVELOPER shall be responsible for all and any necessary permitting by the all authorities having jurisdiction for stream crossings or crossing of state waters including but not limited to EPD, County, and the Army Corps of Engineers.

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 be less than 200 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 TOWN.
- 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:

$$L = \frac{S \times D \times (P^{0.5})}{133,200}$$

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 TOWN.

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.
- B. Procedure
 - 1. Flush line prior to disinfection. Flushing shall produce minimum velocity of 2.5 feet per second in pipe.
 - 2. Disinfect pipe using liquid chlorine or hypochlorite to produce a dosage of 50 mg/l for a 24 hour contact period.
 - 3. Open and close valves several times during disinfection period.

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 less than 1.0 mg/l.
 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. The heavily chlorinated water shall not be discharged to a creek, storm sewer, or sanitary sewer without first being dechlorinated.
 6. DEVELOPER/CONTRACTOR shall have sample analyzed by a certified laboratory.
- D. Repeat disinfection procedures until bacteriological analysis results are acceptable to the TOWN OF BRASELTON.

END OF SECTION