

SECTION 331100 - WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes water-distribution piping and related components for combined water service.

1.03 BUY AMERICAN REQUIREMENTS

- A. Provide certificates to show that all products meet the following requirements.
 - 1. American Iron and Steel (AIS)
 - 2. Build America, Buy America Act
- B. See Supplementary Conditions for details.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Training Certificate for Heat Fusion of HDPE Pipe. This shall be in accordance with ASTM F2620 and the Plastic Pipe Institute PPI TR-33. Training shall comply with the Recommended Minimum Training Guidelines for PE Pipe Butt Fusion Joining Operators for Municipal and Industrial Projects- PPI -TN-42.

1.05 DEFINITIONS

- A. Water Main: Exterior water piping that supplies water to services and fire hydrants.
- B. Water Service: Exterior domestic-water piping that connects structures to the water main.

1.06 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports.
 - 1. Hydrostatic pressure test results.
 - 2. Disinfection and biological test results.
 - 3. Joint fusion procedures and records. Copies of the data logger information and drawing showing locations shall be submitted to the inspector for review and recordation purposes before final approval of the job. Each weld/fusion on the pipe and fittings during Construction is to be labeled and marked with a contrasting permanent color marker detailing: Company name, fusion technician's initials or stamp in the bead, date of the fusion and construction project number, and joint number to correspond with the fusion data log record and picture of fusion.

1.07 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For water valves and hydrants to include in emergency, operation, and maintenance manuals.

1.08 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with requirements of CBY water utility. Include tapping of water mains and backflow prevention.
 - 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
 - 3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- D. NSF/ANSI Compliance: Comply with NSF/ANSI 61 for materials for water mains, service piping and specialties for domestic water.
- E. Lead-Free: All materials that come into contact with potable water shall have a low lead content, not containing more than 0.2 percent lead when used with respect to solder and flux and not have more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings and fixtures.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends and flange faces.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
 - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- E. Protect flanges, fittings, and specialties from moisture and dirt.

1.10 PROJECT CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt service to facilities occupied by the CBY or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated if the water service disruption lasts for more than 10 hours:

1.11 COORDINATION

- A. Coordinate connection to water main with CBY.

PART 2 - PRODUCTS

2.01 PE PIPE AND FITTINGS

- A. PE, Pipe: AWWA C906, DR No. 11; with PE compound of PE4710 high density polyethylene meeting ASTM D 3350 cell classification 345464C and shall be listed in the name of the pipe manufacturer in PPI (Plastic Pipe Institute) TR-4 with a standard grade HDB rating of 1600 psi at 73 degrees. Permanent identification of piping shall be provided by co-extruding multiple equally spaced color strips into the pipe outside surface or by solid colored pipe shell. Blue for potable water.
- B. PE, Fittings: Shall be butt fused unless transitioning to Ductile Iron.
 - 1. Molded Fittings shall be manufactured and tested in accordance with ASTM D 3261 and shall be marked
 - 2. Fabricated Fittings shall be made by heat fusion joining specially machined shapes out from pipe, polyethylene sheet stock or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe. Fabricated fittings shall be tested in accordance with AWWA C906.
 - 3. Polyethylene Flange Adapters. Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serration) to promote gasketless sealing, or restrain the gasket against blowout.
 - 4. Back-up Rings & Flange Bolts. Flange adapters shall be fitted with back-up rings that are pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 3 or higher.
 - 5. MJ Adapter. MJ Adapter 4" through 16" may be provided with option Stainless Steel Stiffner upon request.

2.02 DUCTILE IRON PIPE

- A. Push-On-Joint, Ductile-Iron Pipe: AWWA C151, Class 50, with push-on-joint bell and plain spigot end unless flanged ends are indicated. Cement lining shall conform to AWWA C104.
 - 1. Gaskets: AWWA C111, nitrile rubber, US Pipe Field LOK 350 or equivalent.
- B. Mechanical Joint Ductile Iron Fittings: AWWA C153, ductile-iron standard pattern. The fittings shall have a minimum rating of 150 PSI working pressure but be capable of withstanding three times the rated water working pressure as per AWWA C110 and C153. Interior of fittings, cement mortar lined per AWWA C104.

1. Glands, Gaskets, and Bolts: AWWA C111, ductile-iron glands, nitrile rubber gaskets, and steel bolts.
 2. Restrained Joint: Provide field installed wedge action joint restraint for all AWWA C110 and C153 mechanical joint fittings (Meg A Lug by EBAA Iron or approved equal).
- C. For DIP through HDD casings use US Pipe TR Flex or equal.

2.03 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
1. Fittings: Brass flared type. Flared fittings for use with flared copper tube for cold water applications with a maximum water pressure of 175 psig, manufactured to the requirements of ANSI/ASME B16.26, "Cast Copper Alloy Fittings for Flared Copper Tubes."
- B. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
 2. Copper Flange Adapters: ASME B16.24 copper alloy, solder-joint × flange type, Class 150, raised-face unless otherwise indicated. Provide EPDM gaskets, NSF/ANSI 61 certified, full-face 1/8-inch thick, and Type 304 or 316 stainless steel bolts and nuts in accordance with AWWA C111.

2.04 POLYETHYLENE ENCASEMENT

- A. Encasement for Underground Ductile Iron Piping:
1. Standards: AWWA C105/A21.5.
 2. Form: Tube.
 3. Material: Linear Low Density Polyethylene (LLDPE) film of 8-mil minimum thickness.
 4. Color: Black.

2.05 GATE VALVES

- A. AWWA, Cast-Iron Gate Valves:
1. Nonrising-Stem, Resilient-Seated Gate Valves: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and 2-inch stem nut.
 - a. Standard: AWWA C509.
 - b. Minimum Pressure Rating: 200 psig.
 - c. End Connections: Mechanical joint.
 - d. Interior Coating: Epoxy-lined, complying with AWWA C550.
 - e. Equipped with name or symbol, size, year of manufacture, and working pressure cast into body.
- B. Bronze Gate Valves:
1. Nonrising-Stem Gate Valves: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.
 - a. Standard: MSS SP-80.

b. End Connections: Threaded or Flanged dependent on size

2.06 GATE VALVE ACCESSORIES AND SPECIALTIES

- A. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.
 - 1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

2.07 SERVICE LINE CHECK VALVES

- A. AWWA Check Valves: Bronze horizontal swing-check renewable seat, Y-pattern.
 - 1. Standard: MSS SP-80.
 - 2. Pressure Rating: 175 psig.

2.08 CORPORATION VALVES

- A. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.
 - 1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
 - 2. Corporation Stop: The corporation stop shall comply with AWWA C800 and consist of a bronze body cast to a ground-key plug valve. The corporation stop shall be designed to provide fully closed to fully open operation with one quarter turn. Corporation stops shall be manufactured by Ford Meter Corporation.
 - a. Copper water service branch tail section shall consist of a threaded female flare fitting nut which provides connection to a threaded tail and which is suitable for use with the copper service piping.

2.09 WATER SERVICE METERS

- A. Water Meters 2" and Smaller - Displacement Type:
 - 1. Manufacturer: ~~Subject to compliance with requirements by utility company, as indicated on Drawings or engineer approved alternative.~~
 - a. Badger Meter
 - a.b. Engineer Approved "or-equal"
 - 2. Source Limitations: Obtain water meters ~~—displacement type,~~ from single manufacturer.
 - 3. Standard: AWWA C700.
 - 4. Pressure Rating: 150 psig working pressure.
 - 5. Body Design: Nutating disc; totalization meter.
 - 6. Registration: Flow in **gal.** as required by utility company.
 - 7. Case: Lead-Free Bronze Alloy.
 - 8. End Connections: Threaded.
- B. Water Meters 3" and Larger- Turbine Type
 - 1. Similar to 2" with the following changes.
 - a. Body Design: Direct-Coupled Turbine with Integral Strainer and inlet/outlet straightening vanes; totalization meter.

b. End Connections: Flanged.

2.10 FIRE HYDRANTS

- A. Dry-Barrel Fire Hydrants:
 - 1. Manufacturer: Mueller Co.
 - 2. Description: Mueller Super Centurion 250 with one NPS 4-1/2-inch front-facing outlet and two NPS 2-1/2-inch side outlets, 5-1/4-inch main valve, drain valve, and NPS 6 flanged-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast or ductile iron body, compression-type valve opening against pressure and closing with pressure.
 - a. Standard: AWWA C502.
 - b. Pressure Rating: 250 psig.
 - c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
 - d. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
 - e. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
 - f. Exterior Finish: Factory painted, yellow alkyd-gloss enamel paint.

2.11 BOLLARDS

- A. Schedule 40 Steel Pipe: Paint shall be yellow alkyd-gloss enamel.

2.12 BALL MARKERS

- A. Electronic Ball Marker shall contain a passive-tuned antenna, molded inside a plastic disk. Shell of marker must be impervious to minerals, chemicals, and temperature extremes. 3M Scotchmark 1403-XR Electronic Ball Marker for water utilities and 1404 XR Electronic Ball Marker for wastewater utilities, or equal, compatible with 3M marker locator.
 - 1. Ball Marker Colors: Blue: Water systems.

2.13 RE-CIRC CHECK VALVE

- A. In-line rubber duckbill type check valve with flanged joint, NSF-61 approved. Proco Series 700 ProFlex, or equal. Rated for 125 psig.

2.14 TRACER WIRE

- A. #12 stranded copper Type UL HMWPE (High Molecular Weight Polyethylene). Daylight ends of the trace wire at each hydrant.

PART 3 - EXECUTION

3.01 EARTHWORK

- A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping except at fire hydrants.
- D. Underground Water-Service Piping:
 - 1. Soft copper tube, ASTM B 88, Type K copper, pressure-seal fittings; and pressure-sealed joints.
 - 2. Ductile-iron, push-on-joint pipe, mechanical-joint fittings, and ductile-iron-pipe appurtenances.
- E. Aboveground Water-Service Piping Inside Homes: Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings.
- F. Underground Main Piping: Ductile-iron, push-on-joint pipe, mechanical-joint fittings, and ductile-iron-pipe appurtenances. Or Butt-Fused HDPE.

3.03 VALVE APPLICATIONS

- A. General Application: Use mechanical-joint-end valves for underground installation. Use mechanical by flanged-end valves for installation at fire hydrants only.

3.04 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with utility company for isolation of water main at connection points.
- B. Install ductile-iron, water piping according to AWWA C600 and AWWA M41.
 - 1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.
- C. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
- D. Bury piping with minimum depth of cover over top as shown in Standard Drawings or as shown in Project Drawings.
- E. Install underground piping with restrained joints. At horizontal and vertical changes in direction, use mechanical fittings with restraint.

3.05 JOINT CONSTRUCTION

- A. Make pipe joints according to the following:
 - 1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
 - 2. HDPE- Joints between plain end pipes and fittings shall be made by butt fusion. External and internal beads shall not be removed from the pipe.

3.06 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
 - 1. Field-lock gaskets.
 - 2. Concrete thrust blocks.
 - 3. Set-screw mechanical retainer glands.
 - 4. Bolted flanged joints only at fire hydrants.

3.07 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. Corporation Valves/Pitorifices: Install each underground curb valve with head pointed up.

3.08 WATER METER INSTALLATION

- A. Install water meters, piping, and specialties according to manufacturer's instructions.

3.09 FIRE HYDRANT INSTALLATION

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints, and support in upright position.
- B. AWWA Fire Hydrants: Comply with AWWA M17.

3.10 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect water-distribution piping to the CBY's water main. Install fittings and valves shown in drawings.

3.11 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than 150 psig for two hours. Test in accordance with ANSI/AWWA C600 [for Ductile Iron Piping and ANSI/AWWA C906](#).
- C. Prepare reports of testing activities and submit to Engineer of Record.

3.12 IDENTIFICATION

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."

3.13 CLEANING AND DISINFECTING

- A. Clean and disinfect water-distribution piping as follows:
 - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. Use purging and disinfecting procedure described in AWWA C651.
- B. Prepare reports of purging and disinfecting activities and submit to Engineer of Record.
- C. Disposal of flushing water shall be the responsibility of the Contractor. Removal of this water shall not cause damage to property or inhibit the flow of vehicular traffic in or around the work area. The Contractor is responsible for obtaining ADEC permit if required.
- D. Contractor is required to provide backflow prevention during flushing and disinfection process to protect existing water mains from becoming contaminated.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Water Main: Measurement will be along the horizontal projection of the pipe from center to center of angle points.
- B. Fire Hydrants: Hydrants shall be measured on a per each basis in place including all material and installation from water main.
- C. Gate Valves: Gate valves shall be measured on a per each basis in place.
- D. Water Services: Shall be measured on a per each basis. Estimated lengths and sizes are shown on the drawings.
- E. Pump house will not be measured since this is a lump sum item.

4.02 BASIS OF PAYMENT

- A. Payment for Water Distribution items by the Contractor shall include furnishing all necessary material, personnel, equipment, transportation, excavation, bedding, and backfill up to existing grade, and supplies to perform the work as shown and specified. Bollards shall be subsidiary to the fire hydrant pay item. Excess soil material shall be hauled from the site, and this shall be subsidiary.
- B. Payment for pipe and fittings installed and other buried assemblies or work, will not be paid until trench excavation, bedding, backfill, and all testing are finished and the work is complete in place.
- ~~C. Tracer wire shall be subsidiary to HDPE water main. Payment for Contractor Furnished Water Main will not be paid until the pipe is furnished, transported, insulated, and installed.~~
- ~~D.C.~~ Payment for water services includes service saddles, corporation stops or valves, copper tubing or ductile iron as specified in service schedule, penetrations into the building, and all appurtenances inside the building. Improvements on the property that are removed such as but not limited to walkways, planters, and fences, shall be restored subsidiary to this pay item. Seeding and driveway improvements shall be paid for under respective bid items.

E.D. Payment for piping includes subbase and base course to rebuild the road. However, asphalt, and gravel resurfacing are separate pay items.

F.E. Payment for the pump house shall include work shown on civil, structural, mechanical, electrical and control sheets.

Pay Item No.	Pay Item	Pay Unit
331100-1	6" HDPE Water Main	Linear Foot
331100-2	10" HDPE Water Main	Linear Foot
331100-3	6" Ductile Iron Water Main	Linear Foot
331100-4	10" Ductile Iron Water Main	Linear Foot
331100-5	3" Recirculation Line	Linear Foot
331100-6	Fire Hydrants	Each
331100-7	6" Gate Valves	Each
331100-8	10" Gate Valves	Each
331100-9	Water Services	Each
331100-10	Pump House	Lump Sum
<u>331100-11</u>	<u>4" Recirculation Line</u>	<u>Linear Foot</u>

END OF SECTION

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