

SECTION 33 10 00**WATER UTILITIES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies materials and procedures for construction of underground water distribution for domestic and/or fire supply systems outside the building that are complete and ready for operation. This includes piping, structures, appurtenances and all other incidentals.
- B. Contractor shall relocate existing water main as indicated on the drawings. When the relocated water main passes under the new storm drainage pipe encase the water main in concrete as indicated on the drawings.
- C. Contractor shall relocate existing water service pipes as indicated on the drawings.

1.2 RELATED WORK

- A. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 00, EARTHWORK.
- B. Concrete: 32 05 23, Cement and Concrete for Exterior Improvements
- C. Submittals: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- D. Erosion and Sediment Control: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

1.3 DEFINITIONS

- A. Water distribution system: Pipelines and appurtenances which are part of the distribution system outside the building for potable water and fire supply.
- B. Water service line: Pipeline from main line to 5 feet outside of building.

1.4 ABBREVIATIONS

- A. PVC: Polyvinyl chloride plastic.
- B. DI: Ductile iron pipe.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

- B. Protect stored piping from moisture and dirt by elevating above grade. Protect flanges, fittings, and specialties from moisture and dirt.
- C. Store plastic piping protected from direct sunlight and support to prevent sagging and bending.
- D. Cleanliness of Piping and Equipment Systems:
 - 1. Care shall be exercised in the storage and handling of equipment and piping material to be incorporated in the work. Debris arising from cutting, threading and welding of piping shall be removed.
 - 2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.

1.6 COORDINATION

- A. Coordinate work and shut downs with COR.

1.7 QUALITY ASSURANCE:

- A. Products Criteria:
 - 1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.
 - 2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.
- B. Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least three years. Regulatory requirements:
 - 1. Comply with the rules and regulations of the public utility company having jurisdiction over the connection to public water lines and the extension and/or modifications to public utility systems.
 - 2. Comply with the rules and regulations of the Federal, State, and and/or Local Health Department having jurisdiction for potable water-service.
 - 3. Comply with rules and regulations of Federal, State, and/or Local authorities having jurisdiction for fire-suppression water-service piping including materials, hose threads, installation and testing.
- C. Provide certification of factory hydrostatic testing of not less than 500 psi (3.5 MPa) in accordance with AWWA C151. Piping materials shall bear the label, stamp or other markings of the specified testing agency.

D. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the COR prior to installation.

E. Applicable codes:

1. Plumbing Systems: IPC, International Plumbing Code.
2. Fire-service main products shall be listed in the FM Global "Approval Guide" or Underwriters Laboratories (UL) "Fire Protection Equipment Directory".

1.8 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. The latest edition of the publication shall apply.

B. American National Standards Institute (ANSI):

MSS SP-60-2004Connecting Flange Joint Between Tapping Sleeves
and Tapping Valves

MSS SP-108-2002.....Resilient-Seated Cast Iron, Eccentric Plug
Valves

MSS SP-123-1998(R2006)..Non-Ferrous Threaded and Solder-Joint Unions
for Use With Copper Water Tube

C. American Society of Mechanical Engineers (ASME):

A112.1.2-2004.....Air Gaps in Plumbing Systems (for Plumbing
Fixtures and Water-Connected Receptors))

A112.6.3-2001.....Floor Drains

B16.1-2010.....Gray Iron Pipe Flanges and Flanged Fittings,
Class 25, 125, 250

B16.18-2001.....Cast Copper Alloy Solder Joint Pressure
Fittings

B16.22-2001.....Wrought Copper and Copper Alloy Solder Joint
Pressure Fittings

B16.24-2006.....Cast Copper Alloy Pipe Flanges and Flanged
Fittings; Classes 150, 300, 600, 900, 1500 and
2500

B31.....Code for Pressure Piping Standards

D. American Society for Testing and Materials (ASTM):

A36/A36M-08.....Carbon Structural Steel

A48/A48M-08(2008).....Gray Iron Castings

A536-84(2009).....Ductile Iron Castings

A674-10.....Polyethylene Encasement for Ductile Iron Pipe
for Water or Other Liquids

B61-08.....Steam or Valve Bronze Castings

B62-09.....Composition Bronze or Ounce Metal Castings

B88/B88M-09.....Seamless Copper Water Tube

C651-05.....Disinfecting Water Mains

C858-10e1.....Underground Precast Utility Structures

D1785-06.....Poly (Vinyl Chloride) (PVC) Plastic Pipe,
Schedules 40, 80, and 120

D2239-03.....Polyethylene (PE) Plastic Pipe (SIDR-PR) Based
on Controlled Inside Diameter

D2464-06.....Threaded Poly (Vinyl Chloride) PVC Pipe
Fittings, Schedule 80

D2466-06.....Poly (Vinyl Chloride) (PVC) Pipe Fittings,
Schedule 40

D2467-06.....Poly (Vinyl Chloride) (PVC) Plastic Pipe
Fittings, Schedule 80

D2609-02(2008).....Plastic Insert Fittings for Polyethylene (PE)
Plastic Pipe

D3350-10a.....Polyethylene Plastics Pipe and Fittings
Materials

F714-10.....Polyethylene (PE) Plastic Pipe (SDR-PR) Based
on Outside Diameter

F1267-07.....Metal, Expanded, Steel

E. American Water Works Association (AWWA):

B300-10.....Hypochlorites

B301-10.....Liquid Chlorine

C104-08.....Cement-Mortar Lining for Ductile Iron Pipe and
Fittings

C105/A21.5-10.....Polyethylene Encasement for Ductile Iron Pipe
Systems

C110-08.....Ductile Iron and Gray-Iron Fittings

C111/A21.11-07.....Rubber-Gasket Joints for Ductile Iron Pressure
Pipe and Fittings

C115/A21.11-11.....Flanged Ductile Iron Pipe with Ductile Iron or
Gray-Iron Threaded Flanges

C151/A21.51-09.....Ductile Iron Pipe, Centrifugally Cast

C153/A21.53-11.....Ductile Iron Compact Fittings for Water Service

C502-05.....Dry-Barrel Fire Hydrants

C503-05.....Wet-Barrel Fire Hydrants

C504-10.....Rubber-Seated Butterfly Valves

C508-09.....Swing-Check Valves for Waterworks Service, 2-
In. Through 24-In. (50-mm Through 600-mm) NPS

C509-09.....Resilient-Seated Gate Valves for Water Supply
Service

C510-07.....Double Check Valve Backflow Prevention Assembly

C511-07.....Reduced-Pressure Principle Backflow Prevention
Assembly

C512-07.....Air Release, Air/Vacuum and Combination Air
Valves

C550-05.....Protective Interior Coatings for Valves and
Hydrants

C600-10.....Installation of Ductile Iron Mains and Their
Appurtenances

C605-11.....Underground Installation of Polyvinyl Chloride
(PVC) Pressure Pipe and Fittings for Water

C606-11.....Grooved and Shouldered Joints

- C651-05.....Disinfecting Water Mains
- C700-09.....Cold-Water Meters, "Displacement Type," Bronze Main Case
- C800-05.....Underground Service Line Valves and Fittings
- C900-09.....Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution
- C906-07.....Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 64 In. (1,600 mm), for Water Distribution and Transmission
- C907-04.....Injection-Molded PVC Pressure Fittings, 4 Inch through 12 Inch (100 mm through 300 mm), for Water Distribution
- M23-2nd Ed.....PVC Pipe, Design and Installation
- M44-2nd Ed.....Distribution Valves: Selection, Installation, Field Testing and Maintenance
- F. National Fire Protection Association (NFPA):
 - NFPA 24-2010 Ed.....Installation of Private Fire Service Mains and Their Appurtenances
 - NFPA 1963-2009 Ed.....Fire Hose Connections
- G. NSF International (NSF):
 - NSF/ANSI 14 (2013).....Plastics Piping System Components and Related Materials
 - NSF/ANSI 61-2012.....Drinking Water System Components - Health Effects
 - NSF/ANSI 372-2011.....Drinking Water System Components - Lead Content
- H. American Welding Society (AWS):
 - A5.8/A5.8M-2004Filler Metals for Brazing and Braze Welding
- I. American Society of Safety Engineers (ASSE):
 - 1003-2009Water Pressure Reducing Valves

- 1015-2009.....Double Check Backflow Prevention Assemblies and
Double Check Fire Protection Backflow
Prevention Assemblies
- 1020-2004.....Pressure Vacuum Breaker Assembly
- 1047-2009.....Performance Requirements for Reduced Pressure
Detector Fire Protection Backflow Prevention
Assemblies
- 1048-2009.....Performance Requirements for Double Check
Detector Fire Protection Backflow Prevention
Assemblies
- 1060-2006.....Performance Requirements for Outdoor Enclosures
for Fluid Conveying Components

J. Underwriters' Laboratories (UL):

- 246.....Hydrants for Fire-Protection Service
- 262.....Gate Valves for Fire-Protection Service
- 312.....Check Valves for Fire-Protection Service
- 405.....Fire Department Connection Devices
- 753.....Alarm Accessories for Automatic Water-Supply
Control Valves for Fire Protection Service
- 789.....Indicator Posts for Fire-Protection Service
- 1091.....Butterfly Valves for Fire-Protection Service
- 1285.....Pipe and Couplings, Polyvinyl Chloride (PVC),
and Oriented Polyvinyl Chloride (PVC0) for
Underground Fire Service

1.9 WARRANTY

A. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting therefrom within a period of two years from final acceptance. Further, the Contractor will furnish all manufacturers' and supplier's written guarantees and warranties covering materials and equipment furnished under this Contract.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Material or equipment containing a weighted average of greater than 0.25 percent lead shall not be used in any potable water system intended for human consumption, and shall be certified in accordance with NSF/ANSI 61 or NSF 372.
- B. Plastic pipe, fittings, and solvent cement shall meet NSF/ANSI 14 and shall be NSF listed for the service intended.

2.2 FACTORY-ASSEMBLED PRODUCTS

- A. Standardization of components shall be maximized to reduce spare part requirements. The contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

2.3 SAFETY GUARDS

- A. All equipment shall have moving parts protected to prevent personal injury.

2.4 LIFTING ATTACHMENTS

- A. Equipment shall be provided with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered, without bending or distortion of shape, such as rapid lowering and braking of load.

2.5 DUCTILE IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated
Pipe shall be Class 52 minimum, double cement lined.
 - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 2. Glands, Gaskets, and Bolts:
 - a. AWWA C111, ductile- or gray-iron glands and rubber gaskets.
 - b. All bolts required to connect buried pipe shall be Type 304 stainless steel or fluorocarbon coated, high strength corrosion resistant low alloy steel.
- B. Cement Mortar Internal Lining: Cement mortar lining and bituminous seal coat as per AWWA C104.
- C. Exterior Pipe Coating: The exterior of pipe shall have the standard asphaltic coating.

- D. To insure electrical conductivity, bronze wedges or jumpers shall be installed at each joint.

2.6 POLYVINYL CHLORIDE PIPE AND FITTINGS

- A. PVC, AWWA Pipe: AWWA C900, Class 200, with bell end with gasket, and with spigot end.
1. Comply with UL 1285 for fire-service mains if indicated.
 2. Polyvinyl chloride pipe and accessories to be used for potable water shall be certified as suitable by the NSF or other testing agency and shall be marked with the seal of the agency.
 3. Pipe shall bear the manufacturer's name, DR rating and pressure rating.
 4. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- iron standard pattern.
 - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and bolts. All clamping bolts and nuts shall be Type 304 stainless steel or fluorocarbon coated, high strength corrosion resistant low alloy steel.
 5. Restrained Joints
 - a. Restrained polyvinyl chloride pipe joints shall be made by restraining the pipe on each side of the fitting for the length of pipe shown or specified and suitable for a test pressure of 170 psi.
 - b. Restrained PVC pipe connecting to ductile iron mechanical joint fittings and valves shall be a ductile iron clamp, EBAA Iron Sales Megalug Retainer Gland, Series 2000 PV, or approved equal.
 - c. Restrained bell joint PVC pipe shall be a ductile iron split clamping ring and back-up ring, EBAA Iron Sales Retainers, Series 1500 PV or 6500, or approved equal.
 - d. All clamping bolts and nuts shall be Type 304 stainless steel or fluorocarbon coated, high strength corrosion resistant low alloy steel.

2.7 COPPER TUBE AND FITTINGS

- A. Soft Copper Tubing: ASTM B88, Type K water tube, annealed temper.
- B. Hard Copper Tubing: ASTM B88, Type K water tube, drawn temper.
- C. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper alloy, solder joint pressure fittings.
- D. Brazing Alloy: AWS A5.8/A5.8M, Classification BCuP.

2.8 WARNING TAPE

- A. Warning tape shall be standard, 4 mil. Polyethylene, 3 inch (76 mm) wide tape, detectable type, blue with black letters and imprinted with "CAUTION BURIED WATER LINE BELOW".

PART 3 - EXECUTION**3.1 PIPING APPLICATIONS**

- A. Use pipe, fittings, and joining methods for piping systems according to the following applications.
1. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
 2. Do not use flanges or unions for underground piping.
- B. Underground water-service piping NPS 3/4 to NPS 3 (DN 20 to DN 80) shall be:
1. Soft copper tube with copper, pressure-seal fittings; and pressure-sealed joints.
- C. Underground water-service piping NPS 4 to NPS 12 (DN 100 to DN 300): Shall match existing piping being re-located and shall be one of the following.
1. Ductile iron, mechanical-joint pipe; ductile iron, mechanical-joint fittings.
 2. PVC, AWWA Class 200 pipe; mechanical-joint, ductile iron fittings; and gasketed joints.
- D. Underground Fire-Service-Main Piping NPS 4 to NPS 12 (DN 100 to DN 300) shall be:
1. Ductile iron, mechanical-joint pipe; ductile iron, mechanical-joint fittings; and mechanical joints.
- E. Underground Combined Water-Service and Fire-Service-Main Piping NPS 6 to NPS 12 (DN 150 to DN 300) shall be the following:
1. Ductile iron, mechanical-joint pipe; Ductile Iron, mechanical-joint fittings; and mechanical joints.

3.2 DUCTILE IRON PIPE

- A. Install Ductile Iron, water-service piping according to AWWA C600 and AWWA M41-3rd Edition.
- B. Pipe shall be sound and clean before laying. When laying is not in progress, the open ends of the pipe shall be closed by watertight plug or other approved means.

C. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Bevel cut ends of pipe to be used with bell to conform to the manufactured spigot end. Cement lining shall be undamaged.

D. Pipe shall be laid with bell ends looking ahead.

3.3 PVC PIPE

A. PVC piping shall be installed in strict accordance with the manufacturer's instructions and AWWA C605. Place selected (bedding) material and thoroughly compacted to one foot above the top of the pipe.

B. Install Copper Tracer Wire, No. 14 AWG solid, single conductor, insulated. Install in the trench with piping to allow location of the pipe with electronic detectors. The wire shall not be spiraled around the pipe nor taped to the pipe. Wire connections are to be made by stripping the insulation from the wire and soldering with rosin core solder per ASTM 828. Solder joints shall be wrapped with rubber tape and electrical tape. At least every 1000 feet (300 m) provide a 5 pound (2.3 kg) magnesium anode attached to the main tracer wire by solder. The solder joint shall be wrapped with rubber tape and with electrical tape. An anode shall also be attached at the end of each line.

3.4 COPPER PIPE

A. Copper piping shall be installed in accordance with the Copper Development Association's Copper Tube Handbook and manufacturer's recommendations.

B. Copper piping shall be bedded in 6 inches (150 mm) of sand.

3.5 ANCHORAGE INSTALLATION

A. Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include: locking mechanical joints and mechanical retainer glands (EBAA Iron Works or approved equal).

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile Iron, Water-Service Piping: According to AWWA C600.
2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
3. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

- D. Relocated pipe: Restrain pipe joints a minimum of two pipe lengths (40-feet) on each side of new fittings with mechanical retainer glands (EBAA Iron Works or approved equal).

3.6 FIELD QUALITY CONTROL

- A. Conduct piping tests before joints are covered and after concrete has hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Perform hydrostatic tests at not less than one-and-one-half times working pressure for two hours.
1. Increase pressure in 50-psi (350-kPa) increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psi (0 kPa). Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

3.7 IDENTIFICATION

- A. Install continuous underground warning tape 12 inches (300 mm) directly over piping.

3.8 CLEANING

- A. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
- B. Use purging and disinfecting procedure prescribed by local utility provider or other authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
1. Fill the water system with a water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
 2. Drain the system of the previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow system to stand for 3 hours.
 3. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 4. Submit water samples in sterile bottles to authorities having jurisdiction. Two sample sets taken 24-hour apart shall be satisfactory for human consumption. Repeat procedure if biological examination shows evidence of contamination. Prepare reports of purging and disinfecting activities.

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