

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.

1.2 RELATED WORK

- A. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 00, EARTH MOVING.
- B. Concrete: Section 03 30 00, CAST IN-PLACE CONCRETE.
- C. General plumbing: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- D. Submittals: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- E. Metering: Section 25 10 10, ADVANCED UTILITY METERING SYSTEM.
- F. 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.
- C. WOG: Water, Oil and Gas.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Ensure that valves are dry and internally protected against rust and corrosion. Protect valves against damage to threaded ends and flange faces.
- B. Use a 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.

- C. 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.
- D. Protect stored piping from moisture and dirt by elevating above grade. Protect flanges, fittings, and specialties from moisture and dirt.
- E. Store plastic piping protected from direct sunlight and support to prevent sagging and bending.
- F. 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 water service lines with existing onsite utilities and with building contractor.

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. Digital electronic devices, software and systems such as controls, instruments or computer work stations shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years.
- C. Regulatory requirements:
 - 1. Comply with the rules and regulations of the Local Health Department having jurisdiction for potable water-service.

- D. 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.
- E. Before any welding is performed, contractor shall submit a certificate certifying that welders comply with the following requirements:
 - 1. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".
 - 2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
 - 3. Certify that each welder has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.
 - 4. All welds shall be stamped according to the provisions of the American Welding Society.
- F. 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.
- G. Applicable codes:
 - 1. Plumbing Systems: IPC, International Plumbing Code.
 - 2. Electrical components, devices and accessories shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.
 - 3. 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.
- B. American National Standards Institute (ANSI):
 - MSS SP-60-2004Connecting Flange Joint Between Tapping Sleeves and Tapping Valves
- C. American Society of Mechanical Engineers (ASME):

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

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

C651-05.....Disinfecting Water Mains

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

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

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

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

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

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
- C509-09.....Resilient-Seated Gate Valves for Water Supply
Service
- 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
- 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
- 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. Underwriters' Laboratories (UL):

246.....Hydrants for Fire-Protection Service

262.....Gate Valves for Fire-Protection Service

405.....Fire Department Connection Devices

789.....Indicator Posts for Fire-Protection 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 one year 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 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. Pump shafts and couplings shall be fully guarded by a sheet steel guard, covering coupling and shaft but not bearings. Material shall be minimum 16-gauge sheet steel; ends shall be braked and drilled and attached to pump base with minimum of four 1/4 inch (6 mm) bolts.

Reinforce guard as necessary to prevent side play forcing guard onto couplings.

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, 350 psi (2400 kPa).
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: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- 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.

2.6 POLYVINYL CHLORIDE PIPE AND FITTINGS

- A. PVC, Schedule 80 Pipe: ASTM D1785.
1. PVC, Schedule 80 Socket Fittings: ASTM D2467.
 2. PVC, Schedule 80 Threaded Fittings: ASTM D2464.

2.7 PE PIPE AND FITTINGS - NOT USED

2.8 COPPER TUBE AND FITTINGS - NOT USED

2.9 VALVES

- A. Gate Valves: AWWA C509, Non-rising Stem, Resilient Seat, 200 psi (1380 kPa).
1. Valves 3 inches (75 mm) and larger: Resilient seat valve with gray- or ductile iron body and bonnet; cast iron or bronze double-disc gate; bronze gate rings; non-rising bronze stem and stem nut.
 2. Interior and exterior coating: AWWA C550, thermo-setting or fusion epoxy.
 3. Underground valve nut: Furnish valves with 2 inch (50 mm) nut for socket wrench operation.
 4. End connections shall be mechanical joint.

B. Gate Valve Accessories and Specialties

1. Tapping-Sleeve Assembly: ANSI MSS SP-60; sleeve and valve to be compatible with the drilling matching.
 - a. Tapping Sleeve: Ductile Iron, two-piece bolted sleeve. Sleeve to match the size and type of pipe material being tapped.
 - b. Valve shall include one raised face flange mating tapping-sleeve flange.
2. Valve Boxes: AWWA M44 with 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.
3. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut. (Provide two wrenches for Project.)
4. Indicator Posts: UL 789, FMG approved, vertical-type, cast iron body with operating wrench, extension rod, and adjustable cast iron barrel of length required for depth of burial of valve.

A. Post-Indicator: NFPA 24 and be fully compatible with the valve and supervisory switches.

2.10 WATER METER BOXES - NOT USED

2.11 CONCRETE VAULTS - NOT USED

2.12 PROTECTIVE ENCLOSURES - NOT USED

2.13 FLUSHING HYDRANTS - NOT USED

2.14 FIRE HYDRANTS

2.15 FIRE DEPARTMENT CONNECTIONS

- A. Fire system base water supply must provide a minimum of 1000 gpm (3785 l/m) at 150 psi (1035 kPa) and 700 gpm (2650 l/m) at 200 psi (1380 kPa) at the Fire Department connection. For hydraulic calculations, the calculated demand shall not fall less than 10 percent below the water supply curve.
- B. Fire Department connections: UL 405, NFPA 1963, freestanding, cast bronze body, thread inlets, and matching local fire department hose threads, threaded bottom outlet, lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18 inch (460 mm) high brass sleeve; round escutcheon plate, meeting the requirements of UL 405.

1. Connections: Two NPS 2-1/2 (DN 65) inlets and one NPS 4 (DN 100) outlet
2. Inlet Alignment: Square
3. Finish Including Sleeve: Rough chrome-plated
4. Escutcheon Plate Marking: "AUTO SPKR"

2.16 ALARM DEVICES - NOT USED

2.17 DISINFECTION CHLORINE - NOT USED

2.18 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.
 3. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- B. Underground water-service piping NPS 3/4 to NPS 3 (DN 20 to DN 80) shall be the following:
1. 3.PVC, Schedule 80 pipe, socket fittings; and solvent-cemented joints.
- C. Underground water-service piping NPS 4 to NPS 8 (DN 100 to DN 200) shall be the following:
- ~~1.~~ Ductile iron, mechanical-joint pipe; ductile iron, mechanical-joint fittings; and
- D. Underground Fire-Service-Main Piping NPS 4 to NPS 12 (DN 100 to DN 300) shall be the following:
1. Ductile iron, mechanical-joint pipe; ductile iron, mechanical-joint fittings; and mechanical joints.

3.2 VALVE APPLICATIONS

- A. Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use UL/FMG, non-rising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 (DN 50) and smaller installation.
- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, non-rising-stem, resilient -seated gate valves with valve box.
 - 2. Underground Valves, NPS 4 (DN 100) and Larger, for Indicator Posts: UL/FMG, cast iron, non-rising-stem gate valves with indicator post.
 - 3. Use the following for valves in vaults and aboveground:
 - a. Gate Valves, NPS 2 (DN 50) and Smaller: Bronze, non-rising rising stem.
 - b. Gate Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, OS&Y rising stem, resilient seated.
 - c. Check Valves: AWWA C508-swing type.

3.3 DUCTILE IRON PIPE

- A. Install Ductile Iron, water-service piping according to AWWA C600 and AWWA M41-3rd Edition.
 - 1. Install PE corrosion-protection encasement according to ASTM A674 or AWWA C105/A21.5.
- 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 push-on bell to conform to the manufactured spigot end. Cement lining shall be undamaged.
- D. Push on joints shall be made in strict accordance with the manufacturer's instruction. Pipe shall be laid with bell ends looking ahead.

3.4 PVC PIPE

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

3.5 COPPER PIPE - NOT USED

3.6 ANCHORAGE INSTALLATION - NOT USED

3.7 VALVE INSTALLATION

- A. AWWA Valves: Install each underground valve with stem pointing up and with valve box.
- B. UL/FMG, Valves: Install each underground valve and valves in vaults with stem pointing up and with vertical cast iron indicator post.
- C. Raise or lower existing valve and curb stop boxes and fire hydrants to finish grade in areas being graded.

3.8 DETECTOR-CHECK VALVE INSTALLATION - NOT USED

3.9 WATER METER INSTALLATION - NOT USED

3.10 ROUGHING-IN FOR WATER METERS - NOT USED

3.11 WATER METER BOX INSTALLATION - NOT USED

3.12 VACUUM BREAKER ASSEMBLY INSTALLATION - NOT USED

3.13 BACKFLOW PREVENTER INSTALLATION - NOT USED

3.14 CONCRETE VAULT INSTALLATION - NOT USED

3.15 FIRE DEPARTMENT CONNECTION INSTALLATION

- A. Install ball drip valves at each check valve for fire department connection to mains.
- B. Install protective pipe bollards on two sides of each fire department connection.

3.16 FIRE HYDRANT INSTALLATION - NOT USED

3.17 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties. Install water service lines to a point of connection within approximately 5 feet (1500 mm) outside of building(s) to which service is to be connected and make connections thereto. If building services have not been installed provide temporary caps and mark for future connection.

3.18 FIELD QUALITY CONTROL

- A. 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. Prior to final acceptance, provide a video record of all piping from the building to the municipal connection to show the lines are free from obstructions, properly sloped and joined.

C. 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.

D. Prepare reports of testing activities.

3.19 IDENTIFICATION

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

3.20 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. Repeat procedure if biological examination shows evidence of contamination.
- C. Prepare reports of purging and disinfecting activities.

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