

SECTION 33 10 00**WATER UTILITIES**

SPEC WRITER NOTES:

1. Delete between //____// if not applicable to project. Also, delete any other items applicable in the section and renumber the paragraphs.
2. References to pressure in this section are gauge pressure unless otherwise noted.
3. The "Safe Drinking Water Act" (SDWA) was originally passed into law in 1974. It was amended several times. The "Reduction of Lead in Drinking Water Act" was passed in January 2011 and amends the SDWA to the new lead free standard to include NSF 61 and NSF 372.

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. Fire Protection System connection: Section 21 12 00, FIRE-SUPPRESSION STANDPIPES.
- D. General plumbing: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- E. Submittals: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- F. Metering: Section 25 10 10, ADVANCED UTILITY METERING SYSTEM.
- G. 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

SPEC WRITER NOTE: Retain abbreviations that remain after this section has been edited.

- 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 connection to water main with Public Utility company.
- B. Coordinate water service lines 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.

SPEC WRITER NOTE: Retain and edit paragraphs B through D to be project specific. Delete unused paragraphs.

- 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 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/or // Local Health Department // Department of Environmental Quality// 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.
- 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 Resident Engineer 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

SPEC WRITER NOTE: Based on project design for local conditions, delete references not applicable for project.

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

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 (PVCO) 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 // one year // 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

SPEC WRITER NOTE: Delete sections not applicable to project.

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. 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.

SPEC WRITER NOTE: Select appropriate pipe for project. If the project has various types of pipes, locations of different pipes must be shown on Drawings. Delete paragraphs not used.

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. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated, 350 psi (2400 kPa).
 - 1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 2. Gaskets: AWWA C111, rubber.
- C. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, round-grooved ends.
 - 1. Grooved-End, Ductile-Iron Pipe Appurtenances: ASTM A47, malleable-iron castings or ASTM A536, ductile-iron castings with dimensions matching pipe, 350 psi (3400 kPa).
 - 2. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions, Include ferrous housing sections, gasket suitable for water, and bolts and nuts.
 - 3. Gaskets: AWWA C111.
- D. Flanged Ductile Iron Pipe: AWWA C115/A21.11, with factory applied screwed long hub flanges.
 - 1. Flanges: ASME B16.1 for // 125 psi (850 kPa) // or // 250 psi (1725 kPa) // pressure ratings, as necessary.
 - 2. Wall Sleeve Castings, size and types shown on the drawings, shall be hot dipped galvanized per ASTM A123.
 - 3. Pipe and fittings exposed to view in the finished work are to be painted in accordance with Section 09 91 00, PAINTING. Pipe shall be

shop primed with one coat of rust inhibitive primer. Final paint color shall match the final wall color.

SPEC WRITER NOTE: If cement lined pipe is to be used, keep paragraph E. If pipe is to be coated on outside keep paragraph F.

- E. Cement Mortar Internal Lining: Cement mortar lining and bituminous seal coat as per AWWA C104.
- F. Exterior Pipe Coating: The exterior of pipe shall have the standard asphaltic coating.

2.6 POLYVINYL CHLORIDE PIPE AND FITTINGS

- A. PVC, Schedule 40 Pipe: ASTM D1785.
 - 1. PVC, Schedule 40 Socket Fittings: ASTM D2466.
- B. PVC, Schedule 80 Pipe: ASTM D1785.
 - 1. PVC, Schedule 80 Socket Fittings: ASTM D2467.
 - 2. PVC, Schedule 80 Threaded Fittings: ASTM D2464.
- C. PVC, AWWA Pipe: AWWA C900, // Class 150 // and // Class 200 // , with bell end with gasket, and with spigot end.
 - 1. Comply with UL 1285 for fire-service mains if indicated.
 - 2. PVC Fabricated Fittings: AWWA C900, // Class 150 // and // Class 200 // , with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
 - 3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
 - 4. Push-on-Joint, Ductile-Iron Fittings: // AWWA C110, ductile- or gray-iron standard pattern // or // AWWA C153, ductile-iron compact pattern//.
 - a. Gaskets: AWWA C111, rubber.
 - 5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.7 PE PIPE AND FITTINGS

- A. PE, ASTM Pipe: ASTM D2239, SIDR No. 5.3, 7, or 9; with PE compound number required to give pressure rating not less than // 160 psi (1100 kPa) // 200 psi (1380 kPa) // .
 - 1. Insert Fittings for PE Pipe: ASTM D2609, made of PA, PP, or PVC with serrated male insert ends matching inside of pipe. Include bands or crimp rings.

2. Molded PE Fittings: ASTM D3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.
- B. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than // 160 psi (1100 kPa) // 200 psi (1380 kPa) //.
1. PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than // 160 psi (1100 kPa) // 200 psi (1380 kPa) //.
- C. PE, Fire-Service Pipe: ASTM F714, AWWA C906, or equivalent for PE water pipe; FMG approved, with minimum thickness equivalent to FMG // Class 150 // and // Class 200 //.
1. Molded PE Fittings: ASTM D3350, PE resin, socket-or butt-fusion type, made to match PE pipe dimensions and class.

SPEC WRITER NOTE: Select appropriate pipe for project. If the project has various types of pipes, locations of different pipes must be shown on Drawings. Delete paragraphs not used.

2.8 COPPER TUBE AND FITTINGS

- A. Soft Copper Tubing: // ASTM B88, Type K // ASTM B88, Type A // and // ASTM B88, Type L // ASTM B88, Type B // water tube, annealed temper.
- B. Hard Copper Tubing: // ASTM B88, Type K // ASTM B88, Type A// and // ASTM B88, Type L // ASTM B88, Type B // 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.
- E. Bronze Flanges: // ASME B16.24, Class 150, with solder joint ends. // ASME B16.24, Class 300 flanges if required to match piping. //
- F. Copper Unions: ANSI MSS SP-123, cast copper alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

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. Aboveground and pit operation: Furnish valves with hand wheels.
5. End connections shall // be mechanical joint // be push on // match main line pipe //.

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: // Cast // or // Ductile Iron // or // Stainless-Steel //, 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.

C. Swing Check Valves:

1. Valves smaller than 2 inches (25 mm): ASTM B61, resilient seat, bronze body and bonnet, pressure rating of 200 psi (1380 kPa). Ends to match main line piping.
2. Valves 2 inches (25 mm) or larger: AWWA 508, resilient seat valve with iron body and bonnet, pressure rating of 200 psi (1380 kPa).
3. Coating: AWWA C550, fusion epoxy coated.

D. Detector Check Valves

SPEC WRITER NOTE: Select Paragraph 1 or 2 below.

1. Galvanized cast iron body, bolted cover with air-bleed device for access to internal parts, and flanged ends. Include one-piece bronze disc with bronze bushings, pivot, and replaceable seat. Include threaded bypass taps in inlet and outlet for bypass meter connection.

Set valve to allow minimal water flow through bypass meter when major water flow is required.

- a. Standards: UL 312 and FMG approved, 175 psi (1207 kPa).
 - b. Water Meter: AWWA C700, disc type, at least one-fourth size of detector check valve. Include meter, bypass piping, gate valves, check valve, and connections to detector check valve.
2. Iron body, corrosion-resistant clapper ring and seat ring material, flanged ends, with connections for bypass and installation of water meter.
- a. Standards: UL 312 and FMG approved, 175 psi (1207 kPa).

E. Butterfly Valves

1. Rubber-Seated Butterfly Valve: AWWA C504.
- a. Provide rubber seated butterfly valve // cast // or // ductile iron body // , // wafer // wafer or flanged // flanged //, minimum pressure of 150 psi (1035 kPa).
2. UL Butterfly Valve: UL 1091 and FMG approved.
- a. Provide metal on resilient material seating butterfly valves that are UL 1091 and FMG approved, // cast // or // ductile iron body // , // wafer // wafer or flanged // flanged // minimum pressure of 175 psi (1207 kPa).

F. Plug Valves: ANSI MSS SP-108, resilient-seated eccentric plug valve, minimum pressure of 175 psi (1207 kPa).

G. Corporation Valves and Curb Valves

SPEC WRITER NOTE: Retain first paragraph and subparagraphs below for tapping connections NPS 2 (DN 50) and smaller.

1. Service-Saddle Assemblies: AWWA C800.
- a. Service Saddle: Copper alloy with seal and threaded outlet for corporation valve.
 - b. Corporation Valve: Bronze body and ground-key plug, with threaded inlet and outlet matching service piping material.
- SPEC WRITER NOTE: Retain subparagraph below if utility company requires multiple connections.
- c. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.

2. Curb Valves: AWWA C800, bronze body, ground-key plug or ball, wide tee head, with inlet and outlet matching service piping material, minimum pressure of 200 psi (1375 kPa).
3. Service Boxes for Curb Valves: AWWA M44, cast iron telescoping top section; plug shall include lettering "WATER"; bottom section with base that fits over curb valve.
4. Shutoff Rods: Steel, tee-handle with one pointed end. Stem length shall extend 2 feet (600 mm) above top of valve box for operation of deepest buried valve, with slotted end matching curb valve.

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

I. Water Meter: SECTION 25 10 10, ADVANCED UTILITY METERING SYSTEM.

- //1. Water Meter will be furnished and set by Water Service Utility //.
- //2. Water Meter will be furnished by Water Service Utility and installed by Contractor //.
- //3. Furnish and install meter approved by the Water Service Utility. Forward approval of meter to VA Contracting Officer Representative //.

J. Pressure Reducing Valves

SPEC WRITER NOTE: Enter necessary design requirements.

1. Pressure reducing valve: ASSE 1003 with pressure of 150 psi (1035 kPa).
 - a. Size: // Insert NPS (DN) //
 - b. Design flow rate: // Insert gpm (L/s) //
 - c. Design inlet pressure: // Insert psi (kPa) //
 - d. Design outlet pressure setting: // Insert psi (kPa) //
2. Body: Bronze // with chrome-plated finish // for NPS 2 (DN 50) and smaller.
3. Body: Cast iron // with interior lining complying with AWWA C550 or other that is FDA approved // for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).
4. End connections: Threaded for NPS 2 (DN 50) and smaller.
5. End connections: Flanged for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).

K. Water Control Valves

SPEC WRITER NOTE: Enter necessary design requirements.

1. Valve to be pilot operation, diaphragm-type, single-seated, pressure rating should be 150 psi (1035 kPa) minimum. Include small pilot

control valve, restrictor device, specialty fittings and sensor piping.

- a. Size: // Insert NPS (DN) //
- b. Pattern: // Angle // Glove // -valve design
- c. Trim: Stainless steel
- d. Design flow rate: // Insert gpm (L/s) //
- e. Design inlet pressure: // Insert psi (kPa) //
- f. Design outlet pressure setting: // Insert psi (kPa) //
2. Body shall be // cast // or // ductile iron // with AWWA C550 epoxy coating // or // stainless steel //.
3. End connections: Threaded for NPS 2 (DN 50) and smaller.
4. End connections: Flanged for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).
5. Interior coating: AWWA C550.

L. Relief Valves

SPEC WRITER NOTE: Select type of valve to be used and enter design requirements.

- //1. Air-Release Valve: AWWA C512, Hydromechanical device to automatically release accumulated air. //
- //2. Air/Vacuum Valve: AWWA C512, Direct-acting, float-operated, hydromechanical device with large orifice to automatically release accumulated air or to admit air during filling of piping. //
- //3. Combination Air Valve: AWWA C512, Float-operated, hydromechanical device to automatically release accumulated air or to admit air during filling of piping. //
1. Pressure Rating: // 300 psi (2070 kPa) //
2. Body material: // Cast iron // Insert material //
3. Trim material: // Stainless steel // brass// or // bronze //
4. Water inlet size: // Insert NPS (DN) //
5. Air outlet size: // Insert NPS (DN) //
6. Orifice size: // Insert inch (mm) //
7. Design air-release capacity: // Insert cfm (L/s) // at // Insert psi (kPa) //

M. Pressure Vacuum Breaker Assembly

1. ASSE 1020 Vacuum breaker assembly for use in continuous-pressure applications.
2. Pressure loss: // 12 psi (83 kPa) // maximum, through middle 1/3 of flow range.
3. Size: // Insert NPS (DN) //

4. Design flow rate: // Insert gpm (L/s) //
5. Selected unit flow range limits: // Insert gpm (L/s) //
6. Pressure loss at design flow rate: // Insert psi (kPa) //
7. Accessories: Ball valves on inlet and outlet.

N. Backflow Preventer

1. Backflow Preventer shall not be located in any area containing fumes that are toxic, poisonous or corrosive.
2. Direct connections between potable water piping and sewer connected wastes shall not exist under any condition with or without backflow protection.
3. Backflow Preventer shall be accessed and have clearances for the required testing, maintenance and repair. Access and clearances shall maintain a minimum of 1 foot (305 mm) between the lowest portion of the assembly and grade, floor or platform. Installations elevated more than 5 feet (1524 mm) above the floor or grade shall be provided with a permanent platform capable of supporting a tester or maintenance person.

SPEC WRITER NOTE: Copy and edit paragraph and subparagraphs below for each type of reduced-pressure-principle backflow Preventer required.

O. Reduced-Pressure-Principle Backflow Preventer: AWWA C511 for continuous-pressure applications.

1. Pressure loss: 15 psi (100 kPa) maximum, through middle 1/3 of flow range.
2. Size: // Insert NPS (DN) //
3. Design flow rate: // Insert gpm (L/s) //
4. Selected unit flow range limits: // Insert gpm (L/s) //
5. Pressure loss at design flow rate: // Insert psi (kPa) // for NPS 2 (DN 50) and smaller; // Insert psi (kPa) // for NPS 2-1/2 (DN 65) and larger.
6. Body:
 - a. Bronze: NPS 2 (DN 50) and smaller, // cast iron with interior lining complying with AWWA C550 // .
 - b. Steel with interior lining complying with AWWA C550 // stainless steel // for NPS 2-1/2 (DN 65) or larger.
7. End connections:
 - a. Threaded for NPS 2 (DN 50) and smaller.
 - b. // Flanged // Insert type // for NPS 2-1/2 (DN 65) and larger.

8. Configuration: Designed for // horizontal, straight through // vertical inlet, horizontal center section and vertical outlet // vertical // Insert configuration // flow.
9. Valves:
- a. Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller.
 - b. Resilient seated gate type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.
10. Air-gap fitting: ASME A112.1.2, matching backflow Preventer connection.

SPEC WRITER NOTE: Copy and edit paragraph and subparagraphs below for each type of double-check, backflow-prevention assembly required.

- P. Double-Check, Backflow-Prevention Assemblies: // ASSE 1015 // or // AWWA C510 // for continuous-pressure applications, unless otherwise indicated.
1. Pressure loss: // 5 psi (35 kPa) // Insert pressure // maximum, through middle 1/3 of flow range.
 2. Size: // Insert NPS (DN) //
 3. Design flow rate: // Insert gpm (L/s) //
 4. Selected unit flow range limits: // Insert gpm (L/s) //
 5. Pressure loss at design flow rate:
 - a. // Inset psi (kPa) // for NPS 2 (DN 50) and smaller.
 - b. // Inset psi (kPa) // for NPS 2-1/2 (DN 65) and larger.
 6. Body:
 - a. Bronze for NPS 2 (DN 50) and smaller.
 - b. // Cast iron with interior lining complying with AWWA C550 // Steel with interior lining complying with AWWA C550 // Stainless steel // for NPS 2-1/2 (DN 65) or larger.
 7. End connections:
 - a. Threaded for DN 50 (NPS 2) and smaller.
 - b. // Flanged // Insert type // for NPS 2-1/2 (DN 65) and larger.
 8. Configuration: Designed for // horizontal, straight through // vertical inlet, horizontal center section and vertical outlet // vertical // Insert configuration // flow.
 9. Valves:
 - a. Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller.

- b. OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

SPEC WRITER NOTE: Copy and edit paragraph and subparagraphs below for each type of reduced-pressure-detector, fire-protection backflow Preventer assembly required.

Q. Reduced-Pressure-Detector, Fire-Protection Backflow Preventer

Assemblies: ASSE 1047 and UL listed or FMG approved for continuous-pressure applications.

1. Pressure loss: // 12 psi (83 kPa) // Insert pressure // maximum, through middle 1/3 of flow range
2. Size: // Insert NPS (DN)//
3. Design flow rate: // Insert gpm (L/s)//
4. Selected unit flow range limits: // Insert gpm (L/s)//
5. Pressure loss at design flow rate: // Inset psi (kPa)//
6. Body: // Cast iron with interior lining complying with AWWA C550 // Steel with interior lining complying with AWWA C550 // Stainless steel //
7. End connections: Flanged
8. Configuration: Designed for // horizontal, straight through // vertical inlet, horizontal center section and vertical outlet // vertical // Insert configuration // flow.
9. Accessories:
 - a. Valves: UL 262, FMG approved, OS&Y gate type with flanged ends on inlet and outlet.
 - b. Air-gap fitting: ASME A112.1.2, matching backflow Preventer connection.
 - c. Bypass with displacement-type water meter, shutoff valves and reduced-pressure backflow Preventer.

SPEC WRITER NOTE: Copy and edit paragraph and subparagraphs below for each type of double-check, detector-assembly backflow Preventer required.

R. Double-Check, Detector-Assembly Backflow Preventers: ASSE 1048 and UL listed or FMG approved for continuous-pressure applications.

1. Pressure loss: // 5 psi (35 kPa) // Insert pressure // maximum, through middle 1/3 of flow range
2. Size: // Insert NPS (DN) //
3. Design flow rate: // Insert gpm (L/s) //

4. Selected unit flow range limits: // Insert gpm (L/s) //
5. Pressure loss at design flow rate: // Inset psi (kPa) //
6. Body: // Cast iron with interior lining complying with AWWA C550 //
Steel with interior lining complying with AWWA C550 // Stainless
steel //
7. End connections: Flanged
8. Configuration: Designed for // horizontal, straight through //
vertical inlet, horizontal center section and vertical outlet //
vertical // Insert configuration // flow
9. Accessories
 - a. Valves: UL 262, FMG approved, OS&Y gate type with flanged ends on
inlet and outlet.
 - b. Bypass with displacement-type water meter, shutoff valves and
reduced-pressure Backflow Preventer.

SPEC WRITER NOTE: Copy and edit paragraph
below for each type of backflow Preventer
test kit required.

S. Backflow Preventer Test Kits

1. Provide factory calibrated test kit with gauges, fittings, hoses and
carrying case with test-procedure instructions.

2.10 WATER METER BOXES

SPEC WRITER NOTE: Select one of the
paragraphs in this section.

- A. Cast iron body and cover for disc-type water meter, with lettering
"WATER METER" in cover; and with slotted, open-bottom base section of
length to fit over service piping.

SPEC WRITER NOTE: Delete subparagraph
below if not permitted.

1. Base section may be cast iron, PVC, PE, or other pipe.

- B. Cast iron body and double cover for disc-type water meter, with
lettering "WATER METER" in top cover; and with separate inner cover; air
space between covers; and slotted, open-bottom base section of length to
fit over service piping.

SPEC WRITER NOTE: Use meter box in
paragraph below in walks or unpaved areas
away from traffic; do not use in
roadways.

- C. Polymer-concrete body and cover for disc-type water meter, with
lettering "WATER METER" in cover; and with slotted, open-bottom base
section of length to fit over service piping, vertical and lateral

design loadings of 15,000 lb minimum over 10 by 10 inches (6800 kg minimum over 254 mm by 254 mm) square.

2.11 CONCRETE VAULTS

SPEC WRITER NOTE: Retain this Article if vaults are required and are not specified in other sections. Retain paragraph A3 or A4.

- A. Precast, reinforced-concrete vault: ASTM C858, designed for AASHTO H20-44 load designation.
1. Ladder: ASTM A36, steel or polyethylene-encased steel steps.
 2. Drain: ASME A112.6.3, cast iron floor drain with outlet. Include body anchor flange, light-duty cast iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.
 3. Manhole Frame and Cover: ASTM A48, Class No. 35A minimum tensile strength, 24 inch (610 mm) minimum diameter, unless otherwise indicated.
 4. Manhole Frame and Cover: ASTM A536, Grade 60-40-18, ductile iron, 24 inch (610 mm) minimum diameter, unless otherwise indicated.

2.12 PROTECTIVE ENCLOSURES

- A. Freeze-Protection Enclosures: Designed to protect aboveground water piping, equipment, or specialties from freezing and damage, with heat source to maintain minimum internal temperature of 40 deg F (4 deg C) when external temperatures reach as low as minus 34 deg F (minus 36 deg C) meeting the requirements of ASSE 1060.

SPEC WRITER NOTE: Retain project specific subparagraphs below.

1. Class I, for equipment or devices other than pressure or atmospheric vacuum breakers.
2. Class I-V, for pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.

SPEC WRITER NOTE: Retain subparagraphs and associated subparagraphs below with either "Class" Subparagraph retained above. Edit to make project specific.

3. Reinforced //-aluminum// or // -fiberglass // Insert // housing with dimensions indicated, but not less than those required for access and service of protected unit. Include a drain opening for units with drain connection; access doors with locking devices; insulation

inside housing; and anchoring devices for attaching the housing to the concrete base.

SPEC WRITER NOTE: Features in subparagraph below will require additional temperature data; insert here or on Drawings.

4. Include an electric heating cable or heater with self-limiting temperature control.

B. Weather-Resistant Enclosures: Un-insulated enclosure designed to protect aboveground water piping, equipment, or specialties from weather and damage meeting the requirements of ASSE 1060.

SPEC WRITER NOTE: Retain project specific subparagraphs below.

1. Class III, for equipment or devices other than pressure or atmospheric vacuum breakers.
2. Class III-V, for pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.

SPEC WRITER NOTE: Retain subparagraph and associated subparagraphs below with either "Class" Subparagraph retained above. Edit to suit Project.

3. Provide reinforced // -aluminum // or // -fiberglass // Insert // housing with dimensions indicated, but not less than those required for access and service of protected unit. Include a drain opening for units with drain connection; access doors with locking devices; insulation inside housing; and anchoring devices for attaching the housing to the concrete base.

C. Expanded-Metal Enclosures: ASTM F1267; designed to protect aboveground water piping, equipment, or specialties from damage; expanded metal side and top panels, of weight and with reinforcement of same metal at edges as required for rigidity.

1. Type // I, expanded // II, expanded and flattened //.
2. Class // 1, uncoated carbon steel // 2, hot-dip, zinc-coated carbon steel // 3, corrosion-resisting steel //.

SPEC WRITER NOTE: Retain subparagraph below if retaining Class 1 in subparagraph above.

3. Provide a finish of the manufacturer's enamel paint. Size enclosure to match the dimensions indicated, but not less than those required for access and service of the protected unit. Include a locking device and lugs or devices necessary for securing enclosure to base.

D. Enclosure Bases: // 4 inch (100 mm) // 6 inch (150 mm) // minimum thickness precast concrete, extending at least 6 inches (150 mm) beyond edges of enclosure housings. Include openings for piping.

2.13 FLUSHING HYDRANTS

SPEC WRITER NOTE: Select type of flushing hydrant to be provided. Verify NPS thread and color with local fire department.

- A. Post-Type Flushing Hydrants: Non-freeze and drainable, of length required for shutoff valve installation below frost line.
1. Pressure Rating: 150 psi (1035 kPa) minimum
 2. Outlet: One, with horizontal discharge
 3. Hose Thread: // NPS 2-1/2 (DN 65) // Insert NPS (Insert DN) // , with NFPA 1963 external hose thread for use by local fire department, and with cast iron cap with brass chain
 4. Barrel: // Cast iron // or // steel pipe // with breakaway feature
 5. Valve: Bronze body with // bronze-ball // or // plunger closure // , and automatic draining
 6. Security: Locking device for padlock
 7. Exterior Finish: Red alkyd-gloss enamel paint.
 8. Inlet: NPS 2 (DN 50) minimum
 9. Operating Wrench: One for each unit
- B. Ground-Type Flushing Hydrants: Non-freeze and drainable, of length required for shutoff valve installation below frost line.
1. Pressure Rating: 150 psi (1035 kPa) minimum
 2. Outlet: One, with // vertical// // angle // discharge
 3. Hose Thread: NPS 2-1/2 (DN 65), with NFPA 1963 external hose thread for use by local fire department, and with cast iron cap with brass chain
 4. Barrel: // Cast iron // or // steel pipe //
 5. Valve: Bronze body with // bronze-ball // or // plunger closure // , and automatic draining
 6. Inlet: NPS 2 (DN 50) minimum
 7. Hydrant Box: Cast iron with cover, for ground mounting
 8. Operating Wrench: One for each unit
- C. Post-Type Sampling Station: Non-freeze and drainable, of length required for shutoff valve installation below frost line.
1. Pressure Rating: 100 psi (690 kPa) minimum
 2. Sampling Outlet: One unthreaded nozzle with handle

3. Valve: Bronze body with // bronze-ball // or // plunger closure // .
Include operating handle.
4. Drain: Tubing with separate manual vacuum pump
5. Inlet: NPS 3/4 (DN 20) minimum
6. Housing: Weatherproof material with locking device. Include anchor device
7. Operating Wrench: One for each unit

SPEC WRITER NOTE: Verify with local fire department or facility engineer type of fire hydrant to use.

2.14 FIRE HYDRANTS

- A. All hydrants shall have removable interiors capable of replacement without digging up the hydrant and be packable under pressure. Threaded joints or spindles shall be bronze and upper and lower barrels shall be of equal diameter. Upper barrel shall be of sufficient length to permit setting hydrant with barrel flange not more than 4 inches (100 mm) above finished grade. All fire hydrants shall have 6 inch (150 mm) bottom connection. Provide // Insert number // of hydrant wrenches not less than 14 inches (350 mm) long. Pressure Rating: // 150 psi (1035 kPa) minimum // 250 psi (1725 kPa) //. Hydrant valve shall open by turning operating nut to left or counterclockwise. Exterior finish shall be red alkyd-gloss enamel paint, unless otherwise indicated. Outlet threads shall meet NFPA 1963, with external hose thread used by local fire department. Include cast iron caps with steel chains and Pentagon, 1-1/2 inch (38 mm) point to flat operating and cap nuts.

B. Dry-Barrel Fire Hydrants:

SPEC WRITER NOTE: Retain subparagraph and associated subparagraphs below for AWWA dry-barrel fire hydrants.

1. AWWA C502, freestanding, one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, 5-1/4 inch (133 mm) main valve, drain valve, and NPS 6 (DN 150) mechanical-joint inlet; interior coating according to AWWA C550; cast iron body, compression-type valve opening against pressure and closing.

SPEC WRITER NOTE: Retain subparagraph below for UL/FMG, dry-barrel fire hydrants.

2. UL 246, freestanding, one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, 5-1/4 inch (133 mm) main valve, drain valve, and NPS 6

(DN 150) mechanical-joint inlet; cast iron body, compression-type valve opening against pressure and closing.

C. Wet-Barrel Fire Hydrants:

SPEC WRITER NOTE: Retain subparagraph below for wet-barrel fire hydrants.

1. AWWA C503, freestanding, with one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, NPS 6 (DN 150) threaded or flanged inlet, and base section with NPS 6 (DN 150) mechanical-joint inlet; interior coating according to AWWA C550.

SPEC WRITER NOTE: Retain subparagraph below for UL/FMG, wet-barrel fire hydrants.

2. UL 246, freestanding, one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, NPS 6 (DN 150) threaded or flanged inlet, and base section with NPS 6 (DN 150) mechanical-joint inlet.

2.15 FIRE DEPARTMENT CONNECTIONS

SPEC WRITER NOTE: The A/E shall verify in writing the responding Fire Department has a pumper truck with a minimum rating of 1000 gpm (3785 l/m) at 150 psi (1035 kPa).

- 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.

SPEC WRITER NOTE: Copy and edit paragraph and subparagraphs below for each type of fire department connection required.

- 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.

SPEC WRITER NOTE: Select sub-paragraph with correct number and type of connections. Coordinate with local Fire Department.

1. Connections: Two NPS 2-1/2 (DN 65) inlets and one // NPS 4 (DN 100) // NPS 6 (DN 150) // outlet

2. Connections: // Three // Four // NPS 2-1/2 (DN 65) inlets and one NPS 6 (DN 150) outlet
3. Connections: Six NPS 2-1/2 (DN 65) inlets and one // NPS 6 (DN 150) // NPS 8 (DN 200) // outlet
4. Inlet Alignment: // Inline, horizontal // Square //
5. Finish Including Sleeve: // Polished chrome-plated // Rough chrome-plated // Polished bronze //
6. Escutcheon Plate Marking: // "AUTO SPKR" // & // "STANDPIPE" //

2.16 ALARM DEVICES

- A. Alarm Devices-General: UL 753 and FMG approved, of types and sizes to mate and match piping and equipment.
- B. Water-Flow Indicators: Vane-type water-flow detector, rated for 250-psi (1725-kPa) working pressure; designed for horizontal or vertical installation; 2 single-pole, double-throw circuit switches to provide isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal when cover is removed.
- C. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.
- D. Pressure Switches: Single pole, double throw; designed to signal increase in pressure.

2.17 DISINFECTION CHLORINE

- A. Liquid chlorine: AWWA B301.
- B. Sodium Hypochlorite: AWWA B300 with 5 percent to 15 percent available chlorine.
- C. Calcium hypochlorite: AWWA B300 supplied in granular form of 5 g. tablets, and shall contain 65 percent chlorine by weight.

2.18 WARNING TAPE

SPEC WRITER NOTE: Use non-detectable type warning tape in cemeteries only.

- A. Warning tape shall be standard, 4 mil. Polyethylene, 3 inch (76 mm) wide tape, // detectable // non-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.

SPEC WRITER NOTE: Retain "any of" option in paragraph below to allow Contractor to select piping materials from those retained.

B. Underground water-service piping // NPS 3/4 to NPS 3 (DN 20 to DN 80) // Insert pipe size range // shall be // any of // the following:

SPEC WRITER NOTES:

1. Water-service piping materials listed in subparagraphs below are for potable water. They may not be suitable for fire-service mains.

2. Retain one or more of the subparagraphs below.

1. Soft copper tube with // wrought-copper, solder-joint fittings; and brazed // copper, pressure-seal fittings; and pressure-sealed // joints.
2. PE, ASTM pipe; // insert fittings for PE pipe; and clamped // molded PE fittings; and heat-fusion // joints.
3. PVC, Schedule // 40 pipe, // 80 pipe, // socket fittings; and solvent-cemented joints.

SPEC WRITER NOTE: Retain "any of" option in paragraph below to allow Contractor to select piping materials from those retained.

C. Underground water-service piping // NPS 4 to NPS 8 (DN 100 to DN 200) // Insert pipe size range // shall be // any of // the following:

SPEC WRITER NOTE: Retain one or more of seven subparagraphs below.

1. Soft copper tube with wrought-copper, solder-joint fittings; and brazed joints.

2. Ductile iron, // push-on-joint pipe; ductile iron, push-on-joint fittings; and gasketed // mechanical-joint pipe; ductile iron, mechanical-joint fittings; and mechanical // grooved-end pipe; ductile iron-pipe appurtenances; and grooved // joints.
3. PE, AWWA pipe; PE, AWWA fittings; and heat-fusion joints.
4. PVC, Schedule // 40 pipe; // Schedule 80 // socket fittings; and solvent-cemented joints.
5. PVC, AWWA Class 150 pipe for NPS 4 and NPS 6 (DN 100 and DN 150): NPS 6 (DN 150) PVC, AWWA Class 150 pipe; PVC, AWWA Class 150 // fabricated // or // molded // fittings; and gasketed joints.
6. PVC, AWWA Class 200 pipe for NPS 8 (DN 200): // PVC, AWWA Class 200 fabricated // push-on-joint, ductile iron // mechanical-joint, ductile iron // fittings; and gasketed joints.

SPEC WRITER NOTE: Retain or delete paragraph below to suit Project.

- D. Water Meter Box Water-Service Piping // NPS 3/4 to NPS 2 (DN 20 to DN 50) // Insert pipe size range // shall be same as underground water-service piping.

SPEC WRITER NOTE: Retain "any of" option in paragraph below to allow Contractor to select piping materials from those retained.

- E. Aboveground // and Vault // Water-Service Piping // NPS 3/4 to NPS 3 (DN 20 to DN 80) // Insert pipe size range // shall be // any of // the following:

SPEC WRITER NOTES:

1. Water-service piping materials listed in subparagraphs below are for potable-water service. They may not be suitable for fire-service mains.
 2. Retain one or more of three subparagraphs below.
1. Hard copper tube with // wrought-copper, solder-joint fittings; and brazed // copper, pressure-seal fittings; and pressure-sealed // joints.
 2. PVC, Schedule 80 pipe; // socket fittings; and solvent-cemented // threaded fittings; and threaded // joints.

SPEC WRITER NOTE: Retain "any of" option in paragraph below to allow Contractor to

select piping materials from those retained.

F. Aboveground // and vault // water-service piping // NPS 4 to NPS 8 (DN 100 to DN 200) // Insert pipe size range // shall be // any of // the following:

SPEC WRITER NOTE: Retain one or more of four subparagraphs below.

1. Hard copper tube, with wrought-copper, solder-joint fittings; and brazed joints.
2. Ductile iron, grooved-end pipe; ductile iron, grooved-end appurtenances; and grooved joints.
3. PVC, Schedule 80 with // socket fittings; and solvent-cemented // threaded fittings; and threaded // joints.

SPEC WRITER NOTE: Retain "any of" option in first paragraph below to allow Contractor to select piping materials from those retained.

G. Underground Fire-Service-Main Piping // NPS 4 to NPS 12 (DN 100 to DN 300) // Insert pipe size range // shall be // any of // the following:

SPEC WRITER NOTE: Fire-service-main piping materials listed in subparagraphs below are for fire-protection water service. They may not be suitable for potable-water service.

Retain one or more of subparagraphs below.

1. Ductile iron, // push-on-joint pipe; ductile iron, push-on-joint fittings; and gasketed // mechanical-joint pipe; ductile iron, mechanical-joint fittings; and mechanical // grooved-end pipe; ductile iron-pipe appurtenances; and grooved // joints.
2. PE, Class // 150 // 200 //, fire-service pipe; molded PE fittings; and heat-fusion joints.
3. PVC, AWWA Class // 150 // 200 // pipe listed for fire-protection service; PVC Class 150 fabricated or molded fittings; and gasketed joints.

H. Aboveground // and Vault// Fire-Service-Main Piping // NPS 4 to NPS 12 (DN 100 to DN 300) // Insert pipe size range // shall be ductile iron, grooved-end pipe; ductile iron-pipe appurtenances; and grooved joints.

SPEC WRITER NOTE: Retain "any of" option in paragraph below to allow Contractor to select piping materials from those retained.

- I. Underground Combined Water-Service and Fire-Service-Main Piping // NPS 6 to NPS 12 (DN 150 to DN 300) // Insert pipe size range // shall be // any of // the following:

SPEC WRITER NOTE: Retain one or more of three subparagraphs below.

1. Ductile iron, // push-on-joint pipe; Ductile Iron, push-on-joint fittings; and gasketed // mechanical-joint pipe; Ductile Iron, mechanical-joint fittings; and mechanical // grooved-end pipe; Ductile Iron-pipe appurtenances; and grooved // joints.
2. PVC, AWWA Class // 150 // 200 // pipe listed for fire-protection service; PVC fabricated or molded fittings of same Class as pipe; and gasketed joints.

- J. Aboveground // and Vault // Combined Water Service and Fire-Service-Main Piping // NPS 6 to NPS 12 (DN 150 to DN 300) // Insert pipe size range // shall be ductile iron, grooved-end pipe; ductile iron-pipe appurtenances; and grooved joints.

3.2 VALVE APPLICATIONS

- A. Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. 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:

SPEC WRITER NOTE: Retain one of first two subparagraphs below. If more than one item is selected, show locations on Drawings.

1. Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, non-rising-stem, // metal // resilient // high-pressure, 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, metal seated // AWWA, cast iron, OS&Y rising stem, resilient seated // UL/FMG, cast iron, OS&Y rising stem // .

c. Check Valves: // AWWA C508 // UL/FMG //, swing type.

3.3 DUCTILE IRON PIPE

A. Install Ductile Iron, water-service piping according to AWWA C600 and AWWA M41-3rd Edition.

SPEC WRITER NOTE: Delete subparagraph below if not required.

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.

SPEC WRITER NOTE: Select paragraph B or C below.

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.

C. Magnetic markers may be used in lieu of copper tracer wire to aid in future pipe location. Generally, install markers on 20 foot (6 m) centers. If pipe is in a congested piping area, install on 10 foot (3 m) centers. Prepare as-built drawing indicating exact location of magnetic markers.

3.5 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.

3.6 ANCHORAGE INSTALLATION

SPEC WRITER NOTE: Delete this Article if anchorages are not required.

- A. Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include: // concrete thrust blocks, // locking mechanical joints, // set-screw mechanical retainer glands, // bolted flanged joints, // heat-fused joints, // pipe clamps and tie rods, // Insert devices //.
- 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.

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. MSS Valves: Install as component of connected piping system.
- D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.
- E. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves. // Install full-size valved bypass. //
- F. Relief Valves: Install aboveground with shutoff valve on inlet.
- G. 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

- A. Install in vault or aboveground and for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.

- B. Support detector check valves, meters, shutoff valves, and piping on brick or concrete piers.

3.9 WATER METER INSTALLATION

SPEC WRITER NOTE: Delete this Article if utility company provides water meters.

- A. Install water meters, piping, and specialties according to utility company's written instructions.

SPEC WRITER NOTE: Retain one or more of three paragraphs below.

- B. Install // displacement // turbine // -type water meters, NPS 2 (DN 50) and smaller, in meter boxes with shutoff valves on water meter inlets. Include valves on water meter outlets and valved bypass around meters unless prohibited by authorities having jurisdiction.
- C. Install // compound // turbine // -type water meters, NPS 3 (DN 80) and larger, in meter vaults. Include shutoff valves on water meter inlets and outlets and valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.
- D. Install detector-type water meters in meter vault according to AWWA M6. Include shutoff valves on water meter inlets and outlets and full-size valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

3.10 ROUGHING-IN FOR WATER METERS

SPEC WRITER NOTE: Retain this Article only if Contractor is to rough-in for water meters to be installed by utility company.

- A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

3.11 WATER METER BOX INSTALLATION

- A. Install water meter boxes in paved areas flush with surface.
- B. Install water meter boxes in grass or earth areas with top // 2 inches (50 mm) // Insert dimension // above surface.

3.12 VACUUM BREAKER ASSEMBLY INSTALLATION

- A. Install pressure vacuum breaker assemblies of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install pressure vacuum breaker assemblies in vault or other space subject to flooding.

3.13 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow Preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install backflow Preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow Preventers.

SPEC WRITER NOTE: Revise or delete paragraph below to suit Project.

- D. Support NPS 2-1/2 (DN 65) and larger backflow Preventers, valves, and piping near floor and on brick or concrete piers.

3.14 CONCRETE VAULT INSTALLATION

- A. Install precast concrete vaults according to ASTM C891.

3.15 PROTECTIVE ENCLOSURE INSTALLATION

- A. Install concrete base level and with top approximately // 2 inches (50 mm) // Insert measurement // above grade.
- B. Install protective enclosure over valves and equipment and anchor protective enclosure to concrete base.

3.16 FLUSHING HYDRANT INSTALLATION

- A. Install post-type flushing hydrants with valve below frost line and provide for drainage. Support in upright position. Include separate gate valve or curb valve and restrained joints in supply piping.
- B. Install ground-type flushing hydrants with valve below frost line and provide for drainage. Install hydrant box flush with grade. Include separate gate valve or curb valve and restrained joints in supply piping.
- C. Install sampling stations with valve below frost line and provide for drainage. Attach weather-resistant housing and support in upright position. Include separate curb valve in supply piping.

3.17 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 // on three sides of // Describe arrangement // each fire department connection.

3.18 FIRE HYDRANT INSTALLATION

- A. Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

- B. Install Wet-Barrel Fire Hydrants with valve below frost line. Provide for drainage.

3.19 CONNECTIONS

SPEC WRITER NOTE: Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

- 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.

3.20 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.

3.21 IDENTIFICATION

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

SPEC WRITER NOTE: Delete paragraph below if metallic water-service piping without electrically insulated fittings will be used.

3.22 CLEANING

SPEC WRITER NOTE: Edit this Article as required to suit authorities having jurisdiction.

- 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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