

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. 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

- A. PVC: Polyvinyl chloride plastic.
- B. DI: Ductile iron pipe.
- C. WOG: Water, Oil and Gas.
- D. Cu: Copper.

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 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 public utility company having jurisdiction over the connection to public water lines and the extension and/or modifications to public utility systems.

- 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. Welding NA
- 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

- 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 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.
- C. Copper tubing, Type k, soft annealed.

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. 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) 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.
- E. Cement Mortar Internal Lining: NA
- F. Exterior Pipe Coating: NA

2.6 POLYVINYL CHLORIDE PIPE AND FITTINGS NA**2.7 PE PIPE AND FITTINGS NA****2.8 COPPER TUBE AND FITTINGS**

- A. Soft Copper Tubing: ASTM B88, Type K annealed temper.
- B. Fittings: ASME B16.18, cast copper alloy solder joint pressure fittings.
- C. Brazing Alloy: AWS A5.8/A5.8M, Classification BCuP.
- D. Bronze Flanges: ASME B16.24, Class 150, with solder joint ends to match piping.
- E. 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

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.

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

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

- 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

- //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.

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.
- 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.

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.

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.
- 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

- 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.
 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.
- 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

- 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.

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.

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.

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.

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.

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 //.
 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

- 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

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:
 - 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.
 - 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:

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.

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) // 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

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.

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. 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.

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:

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.
- 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.
- 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:
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.
- 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:
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.
- 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:

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.
- 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:
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:
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.
 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.
- 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

- 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

- 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.

--- E N D ---