SECTION 221113 - FACILITY WATER DISTRIBUTION PIPING

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			2. SUMMARY
				1. This Section includes water-distribution piping and related components outside the building for [**water service**] [**fire-service mains**] [**combined water service and fire-service mains**].

Utility companies usually provide water meters and bill charges directly or through Contractor to Owner. Contact utility company serving the site for information. Delete paragraph below if water meters are provided by utility company or Contractor. If utility company furnishes water meters, identify the company here and specify what it will do; then edit text to suit Project.

* + - * 1. Utility-furnished products include water meters that will be furnished to the site, ready for installation.
			1. DEFINITIONS

Retain abbreviations that remain after this Section has been edited.

* + - * 1. EPDM: Ethylene propylene diene terpolymer rubber.
				2. LLDPE: Linear, low-density polyethylene plastic.
				3. PA: Polyamide (nylon) plastic.
				4. PE: Polyethylene plastic.
				5. PP: Polypropylene plastic.
				6. PVC: Polyvinyl chloride plastic.
				7. RTRF: Reinforced thermosetting resin (fiberglass) fittings.
				8. RTRP: Reinforced thermosetting resin (fiberglass) pipe.
			1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are submitted and tabbed (for combined submittals).
				4. Product Data: For each type of product indicated.
				5. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

Retain subparagraph below if equipment includes wiring.

Wiring Diagrams: Power, signal, and control wiring for alarms.

Retain first paragraph below if Drawings do not include detailed plans or if Project involves unusual coordination requirements.

* + - * 1. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
				2. Field quality-control test reports.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.
			2. QUALITY ASSURANCE

Retain and edit first paragraph and subparagraphs below to suit Project or delete if not applicable.

* + - * 1. Regulatory Requirements:

Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.

Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

* + - * 1. Piping materials shall bear label, stamp, or other markings of specified testing agency.
				2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 “Standard for Electrical Safety in the Workplace”, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
				3. Comply with ASTM F645 “Standard Guide for Selection, Design, and Installation of Thermoplastic Water-Pressure Piping Systems” for selection, design, and installation of thermoplastic water piping.
				4. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
				5. NFPA Compliance: Comply with NFPA 24 “Standard for the Installation of Private Fire Service Mains and Their Appurtenances” for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

Potable-water piping and components shall comply with NSF 14 “Plastic Piping System Components and Related Materials”, NSF 61 “Drinking Water Systems Components - Health Effects”, and NSF 372 “Drinking Water System Components - Lead Content”.[**Include marking "NSF-pw" on piping.**].

* + - * 1. Regulatory Requirements:

Comply with the State Department of Health Sanitary Code for Cross Connection Control, and the other standards listed in Part 2 of this section.

Where conflicts occur between the referenced standards, the most stringent requirement shall apply.

* + - 1. DELIVERY, STORAGE, AND HANDLING
				1. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

Ensure that valves are dry and internally protected against rust and corrosion.

Protect valves against damage to threaded ends and flange faces.

Set valves in best position for handling. Set valves closed to prevent rattling.

* + - * 1. During Storage: Use precautions for valves, including fire hydrants, according to the following:

Do not remove end protectors unless necessary for inspection; then reinstall for storage.

Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

* + - * 1. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
				2. 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.
				3. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
				4. Protect flanges, fittings, and specialties from moisture and dirt.
				5. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.
			1. PROJECT CONDITIONS

Retain this Article if interruption of existing water-distribution service is required.

* + - * 1. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Director’s Representative or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

Notify [**Architect**] [**Construction Manager**] [**Director’s Representative**] Director’s Representative no fewer than 7 days in advance of proposed interruption of service.

Do not proceed with interruption of water-distribution service without Director’s Representative written permission.

* + - 1. COORDINATION

Edit this Article to suit Project if new water-distribution piping will connect to other on-site water-distribution piping.

* + - * 1. Coordinate connection to water main with utility company.
1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

Verify with authorities having jurisdiction that pressure-seal fittings are approved for underground water distribution.

* + - 1. PIPING MATERIALS

See "Writing Guide" Article in the Evaluations for a discussion of how this Section is organized and the most efficient way to revise this Section. See "Piping Materials and Standards" Article in the Evaluations for a discussion of piping materials covered by referenced standards.

* + - * 1. Comply with requirements in "Piping Application" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
				2. Potable-water piping and components shall comply with NSF 14 “Plastic Piping System Components and Related Materials”, NSF 61 “Drinking Water Systems Components - Health Effects”, and NSF 372 “Drinking Water System Components - Lead Content”.
			1. COPPER TUBE AND FITTINGS
				1. Soft Copper Tube: **ASTM B88, Type K** and **ASTM B88, Type L**, water tube, annealed temper.

Copper, Solder-Joint Fittings: ASME B16.18 “Cast Copper Alloy Solder Joint Pressure Fittings”, cast-copper-alloy or ASME B16.22 “Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings”, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

* + - * 1. Hard Copper Tube: **ASTM B88, Type Kand** **ASTM B88, Type L**, water tube, drawn temper.

Copper, Solder-Joint Fittings: ASME B16.18 “Cast Copper Alloy Solder Joint Pressure Fittings”, cast-copper-alloy or ASME B16.22 “Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings”, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

* + - * 1. Bronze Flanges: ASME B16.24 “Cast Copper Alloy Pipe Flanges, Flanged Fittings, and Valves: Classes 150, 300, 600, 900, 1500 and 2500”, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
				2. Copper Unions:

MSS SP-123 “Non-Ferrous Threaded and Solder-Joint Unions for Use with Copper Water Tube”.

Cast-copper-alloy, hexagonal-stock body.

Ball-and-socket, metal-to-metal seating surfaces.

Solder-joint or threaded ends.

* + - * 1. Copper, Brass or Bronze, Pressure-Seal-Joint Fittings:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=13408) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Apollo Valves; a part of Aalberts Integrated Piping Systems](http://www.specagent.com/Lookup?uid=123457143393).

[Elkhart Products Corporation; a part of Aalberts Integrated Piping Systems](http://www.specagent.com/Lookup?uid=123457143394).

[Mueller Industries, Inc](http://www.specagent.com/Lookup?uid=123457143395).

[NIBCO INC](http://www.specagent.com/Lookup?uid=123457143396).

[Viega LLC](http://www.specagent.com/Lookup?uid=123457143397).

Or equal.

Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end. Sizes NPS 2-1/2 and larger with stainless steel grip ring and EPDM O-ring seal.

Minimum 200-psig working-pressure rating at 250 deg F.

* + - 1. DUCTILE-IRON PIPE AND FITTINGS

Pipe and fittings in paragraph and subparagraphs below are available in NPS 3 to NPS 24 (DN 80 to DN 600).

* + - * 1. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151 “Standard for Ductile-Iron Pipe, Centrifugally Cast”, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

Mechanical-Joint, Ductile-Iron Fittings: AWWA C110 “Standard for Ductile-Iron and Gray-Iron Fittings”, ductile- or gray-iron standard pattern or AWWA C153 “Standard for Ductile-Iron Compact Fittings”, ductile-iron compact pattern.

Glands, Gaskets, and Bolts: AWWA C111 “Standard for Rubber-Gasket Joints for Ductile-iron Pressure Pipe and Fittings”, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

Pipe and fittings in first paragraph and subparagraphs below are available in NPS 3 to NPS 48 (DN 80 to DN 1200).

* + - * 1. Push-on-Joint, Ductile-Iron Pipe: AWWA C151 “Standard for Ductile-Iron Pipe, Centrifugally Cast”, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

Push-on-Joint, Ductile-Iron Fittings: AWWA C110 “Standard for Ductile-Iron and Gray-Iron Fittings”, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

Gaskets: AWWA C111 “Standard for Rubber-Gasket Joints for Ductile-iron Pressure Pipe and Fittings”, rubber.

* + - * 1. Grooved-Joint, Ductile-Iron Pipe: AWWA C151 “Standard for Ductile-Iron Pipe, Centrifugally Cast”, with cut, rounded-grooved ends.

Grooved-End, Ductile-Iron Pipe Appurtenances:

Fittings and couplings in subparagraphs below are available in NPS 4 to NPS 24 (DN 100 to DN 600).

Grooved-End, Ductile-Iron Fittings: ASTM A47/A47M “Standard Specification for Ferritic Malleable Iron Castings”, malleable-iron castings or ASTM A536 “Standard Specification for Ductile Iron Castings”, ductile-iron castings with dimensions matching pipe.

Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606 “Standard for Grooved and Shouldered Joints”, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

Flanges in paragraph below are available in NPS 1 to NPS 96 (DN 25 to DN 2400).

* + - * 1. Flanges: ASME 16.1 “Gray Iron Pipe Flanges and Flanges Fittings Classes 25, 125 and 250”, Class 125, cast iron.
			1. PE PIPE AND FITTINGS
				1. PE, ASTM Pipe: ASTM D2239 “Standard Specification for Polyethylene Plastic Pipe Based on Controlled Inside Diameter”, SIDR No. 5.3, 7, or 9; with PE compound number required to give pressure rating not less than [**160 psig**] [**200 psig**].

Insert Fittings for PE Pipe: ASTM D2609 “Standard Specification for Plastic Insert Fittings for Polyethylene Plastic Pipe”, made of PA, PP, or PVC with serrated male insert ends matching inside of pipe. Include bands or crimp rings.

Molded PE Fittings: ASTM D3350 “Standard Specification for Polyethylene Plastics Pipe and Fitting Materials”, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.

* + - * 1. PE, AWWA Pipe: AWWA C906 “Standard for Polyethylene Pressure Pipe and Fittings , 4 in. Through 65 in., For Waterworks”, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than [**160 psig**] [**200 psig**].

PE, AWWA Fittings: AWWA C906 “Standard for Polyethylene Pressure Pipe and Fittings , 4 in. Through 65 in., For Waterworks”, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than [**160 psig**] [**200 psig**].

Pipe in paragraph below is FMG approved in NPS 2 to NPS 24 (DN 50 to DN 600).

* + - * 1. PE, Fire-Service Pipe: ASTM F714 “Standard Specification for Polyethylene Plastic Pipe Based on Outside Diameter”, AWWA C906 “Standard for Polyethylene Pressure Pipe and Fittings, 4 in. Through 65 in., For Waterworks”, or equivalent for PE water pipe; FMG approved, with minimum thickness equivalent to FMG [**Class 150**] [**and**] [**Class 200**].

Molded PE Fittings: ASTM D3350 “Standard Specification for Polyethylene Plastics Pipe and Fitting Materials”, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.

* + - 1. PVC PIPE AND FITTINGS
				1. PVC, Schedule 40 Pipe: ASTM D1785 “Standard Specification for Poly(Vinyl Chloride) Plastic Pipe, Schedules 40, 80, and 120”.

PVC, Schedule 40 Socket Fittings: ASTM D2466 “Standard Specification for Threaded Poly(Vinyl Chloride) Plastic Pipe Fittings, Schedule 40”.

* + - * 1. PVC, Schedule 80 Pipe: ASTM D1785 “Standard Specification for Poly(Vinyl Chloride) Plastic Pipe, Schedules 40, 80, and 120”.

PVC, Schedule 80 Socket Fittings: ASTM D2467 “Standard Specification for Poly(Vinyl Chloride) Plastic Pipe Fittings, Schedule 80”.

PVC, Schedule 80 Threaded Fittings: ASTM D2464 “Standard Specification for Threaded Poly(Vinyl Chloride) Plastic Pipe Fittings, Schedule 80”.

* + - * 1. PVC, AWWA Pipe: AWWA C900 “Standard for Polyvinyl Chloride Pressure Pipe and Fabricated Fittings, 4 in. Through 12 in., for Water Transmission and Distribution”, [**Class 150**] [**and**] [**Class 200**], with bell end with gasket, and with spigot end.

Comply with UL 1285 “Standard for Pipe and Couplings, Polyvinyl Chloride, and Oriented Polyvinyl Chloride for Underground Fire Service” for fire-service mains if indicated.

PVC Fabricated Fittings: AWWA C900 “Standard for Polyvinyl Chloride Pressure Pipe and Fabricated Fittings, 4 in. Through 12 in., for Water Transmission and Distribution”, [**Class 150**] [**and**] [**Class 200**], with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

PVC Molded Fittings: AWWA C907 “Standard for Injection-Molded Polyvinyl Chloride Pressure Fittings, 4 in. Through 12 in., for Water, Wastewater, and Reclaimed Water Service”, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

Push-on-Joint, Ductile-Iron Fittings: AWWA C110 “Standard for Ductile-Iron and Gray-Iron Fittings”, ductile- or gray-iron standard pattern or AWWA C153 “Standard for Ductile-Iron Compact Fittings”, ductile-iron compact pattern.

Gaskets: AWWA C111 “Standard for Rubber-Gasket Joints for Ductile-iron Pressure Pipe and Fittings”, rubber.

Mechanical-Joint, Ductile-Iron Fittings: AWWA C110 “Standard for Ductile-Iron and Gray-Iron Fittings”, ductile- or gray-iron standard pattern or AWWA C153 “Standard for Ductile-Iron Compact Fittings”, ductile-iron compact pattern.

Glands, Gaskets, and Bolts: AWWA C111 “Standard for Rubber-Gasket Joints for Ductile-iron Pressure Pipe and Fittings”, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

* + - 1. FIBERGLASS PIPE AND FITTINGS

"RTRP" is ASTM and AWWA abbreviation for fiberglass pipe, and "RTRF" is ASTM abbreviation for fiberglass fittings. Piping with ends for other joints is available.

* + - * 1. AWWA RTRP: AWWA C950 “Standard for Fiberglass Pressure Pipe”, [**Class 150**] [**Class 200**] [**and**] [**Class 250**], Type I[**or II**], [**Grade 1, epoxy**] [**or**] [**Grade 2, polyester**], with bell-and-spigot ends [**for bonded**] [**with gasket or seal for gasketed**] joints. Liner is optional, unless otherwise indicated.[**Include FMG approval if used for fire-service mains.**]

RTRF: AWWA C950 “Standard for Fiberglass Pressure Pipe”, similar to pipe in material, pressure class, and joining method.

* + - * 1. UL RTRP: UL 1713 “Standard for Pressure Pipe and Couplings, Glass Fiber-Reinforced, for Underground Fire Service”, [**Class 150**] [**Class 200**] [**and**] [**Class 250**], with bell-and-spigot ends with gasket or seal for gasketed joints. Liner is optional, unless otherwise indicated.

RTRF: Similar to pipe in material, pressure class, and joining method.

* + - 1. SPECIAL PIPE FITTINGS
				1. Ductile-Iron Rigid Expansion Joints:

Description: Three-piece, ductile-iron assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 “Standard for Ductile-Iron and Gray-Iron Fittings” or AWWA C153 “Standard for Ductile-Iron Compact Fittings”. Select and assemble components for expansion indicated. Include AWWA C111 “Standard for Rubber-Gasket Joints for Ductile-iron Pressure Pipe and Fittings”, ductile-iron glands, rubber gaskets, and steel bolts.

Pressure Rating: 250 psig minimum.

Expansion Required: <**Insert inches**>.

* + - * 1. Ductile-Iron Flexible Expansion Joints:

Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 “Standard for Ductile-Iron and Gray-Iron Fittings” or AWWA C153 “Standard for Ductile-Iron Compact Fittings”. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111 “Standard for Rubber-Gasket Joints for Ductile-iron Pressure Pipe and Fittings”, ductile-iron glands, rubber gaskets, and steel bolts.

Pressure Rating: 250 psig minimum.

Offset: <**Insert inches**>.

Expansion Required: <**Insert inches**>.

* + - * 1. Ductile-Iron Deflection Fittings:

Description: Compound, ductile-iron coupling fitting with sleeve and 1 or 2 flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 “Standard for Ductile-Iron and Gray-Iron Fittings” or AWWA C153 “Standard for Ductile-Iron Compact Fittings”. Include AWWA C111 “Standard for Rubber-Gasket Joints for Ductile-iron Pressure Pipe and Fittings”, ductile-iron glands, rubber gaskets, and steel bolts.

Pressure Rating: 250 psig minimum.

* + - 1. JOINING MATERIALS
				1. Brazing Filler Metals: AWS A5.8 “Filler Metals for Brazing & Braze Welding”, BCuP Series.
				2. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.
				3. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
			2. PIPING SPECIALTIES
				1. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
				2. Tubular-Sleeve Pipe Couplings:

Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.

Standard: AWWA C219 “Standard for Bolted, Sleeve-Type Couplings for Plain-End Pipe”.

Center-Sleeve Material: [**Manufacturer's standard**] [**Carbon steel**] [**Stainless steel**] [**Ductile iron**] [**Malleable iron**].

Gasket Material: Natural or synthetic rubber.

Pressure Rating: [**150 psig**] [**200 psig**] <**Insert pressure**> minimum.

Metal Component Finish: Corrosion-resistant coating or material.

* + - * 1. Split-Sleeve Pipe Couplings:

Description: Metal, bolted, split-sleeve-type, reducing or transition coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners.

Standard: AWWA C219 “Standard for Bolted, Sleeve-Type Couplings for Plain-End Pipe”.

Sleeve Material: [**Manufacturer's standard**] [**Carbon steel**] [**Stainless steel**].

Sleeve Dimensions: Of thickness and width required to provide pressure rating.

Gasket Material: O-rings made of EPDM rubber, unless otherwise indicated.

Pressure Rating: [**150 psig**] [**200 psig**] <**Insert pressure**> minimum.

Metal Component Finish: Corrosion-resistant coating or material.

* + - * 1. Flexible Connectors:

Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.

Ferrous-Metal Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1 “Pipe Threads, General Purpose, Inch”, threaded steel pipe nipples or ASME B16.5 “Pipe Flanges & Flanged Fittings”, steel pipe flanges welded to hose.

* + - * 1. Dielectric Fittings:

General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

Unions in first subparagraph below are available in at least NPS 1/2 to NPS 2 (DN 15 to DN 50).

Dielectric Unions:

Description:

Standard: ASSE 1079 “Performance Requirements for Dielectric Pipe Unions”.

Revise pressure rating and temperature in first subparagraph below to suit Project, or insert other options for specific applications.

Pressure Rating: [**125 psig minimum at 180 deg F**] [**150 psig**] [**250 psig**].

End Connections: Solder-joint copper alloy and threaded ferrous.

Flanges in first subparagraph below are available in at least NPS 1-1/2 to NPS 4 (DN 40 to DN 100).

Dielectric Flanges:

Description:

Standard: ASSE 1079 “Performance Requirements for Dielectric Pipe Unions”.

Factory-fabricated, bolted, companion-flange assembly.

Revise pressure rating in first subparagraph below to suit Project, or insert other options for specific applications.

Pressure Rating: [**125 psig minimum at 180 deg F**] [**150 psig**] [**175 psig**] [**300 psig**].

End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

Flanges in first subparagraph below are available in at least NPS 1/2 to NPS 48 (DN 15 to DN 1200).

Dielectric-Flange Insulating Kits:

Description:

Nonconducting materials for field assembly of companion flanges.

Revise pressure rating in first subparagraph below to suit Project, or insert other options for specific applications.

Pressure Rating: [**150 psig**] <**Insert pressure**>.

Gasket: Neoprene or phenolic.

Bolt Sleeves: Phenolic or polyethylene.

Washers: Phenolic with steel backing washers.

Nipples in subparagraph below are available in at least NPS 1/2 to NPS 4 (DN 15 to DN 100).

Dielectric Nipples:

Description:

Standard: IAPMO PS 66 “Interim Guide Criteria for Dielectric Fittings”.

Electroplated steel nipple complying with ASTM F1545 “Standard Specification for Plastic-Lined Ferrous Metal Pipe, Fittings, and Flanges”.

Revise pressure rating and temperature in first subparagraph below to suit Project, or insert other options for specific applications.

Pressure Rating: [**300 psig at 225 deg F**] <**Insert pressure and temperature**>.

End Connections: Male threaded or grooved.

Lining: Inert and noncorrosive, propylene.

* + - 1. CORROSION-PROTECTION PIPING ENCASEMENT
				1. Encasement for Underground Metal Piping:

Standards: ASTM A674 “Standard Practice for Polyethylene Encasement for Ductile Iron Pipe” or AWWA C105 “Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems”.

Form: [**Sheet**] [**Sheet or tube**] [**Tube**].

Retain one of first three subparagraphs below.

Material: LLDPE film of 0.008-inch minimum thickness.

Material: LLDPE film of 0.008-inch minimum thickness, or high-density, crosslaminated PE film of 0.004-inch minimum thickness.

Material: High-density, crosslaminated PE film of 0.004-inch minimum thickness.

Color: [**Black**] [**Natural**] <**Insert color**>.

* + - 1. GATE VALVES
				1. AWWA, Cast-Iron Gate Valves:

Retain any of five subparagraphs and associated subparagraphs below for valve types and pressure ratings required. If more than one pressure zone is required, show pressure ratings of valves on Drawings.

Nonrising-Stem, Metal-Seated Gate Valves:

Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.

Standard: AWWA C500 “Standard for Metal-Seated Gate Valves for Water Supply”.

Minimum Pressure Rating: 200 psig.

End Connections: Mechanical joint.

Interior Coating: Complying with AWWA C550 “Standard for Protective Interior Coatings for Valves and Hydrants.

Nonrising-Stem, Resilient-Seated Gate Valves:

Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.

Standard: AWWA C509 “Standard for Resilient-Seated Gate Valves for Water Supply”.

Minimum Pressure Rating: 200 psig.

End Connections: Mechanical joint.

Interior Coating: Complying with AWWA C550 “Standard for Protective Interior Coatings for Valves and Hydrants”.

Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:

Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.

Standard: AWWA C509 “Standard for Resilient-Seated Gate Valves for Water Supply”.

Minimum Pressure Rating: 250 psig.

End Connections: Push on or mechanical joint.

Interior Coating: Complying with AWWA C550 “Standard for Protective Interior Coatings for Valves and Hydrants”.

OS&Y, Rising-Stem, Metal-Seated Gate Valves:

Description: Cast- or ductile-iron body and bonnet, with cast-iron double disc, bronze disc and seat rings, and bronze stem.

Standard: AWWA C500 “Standard for Metal-Seated Gate Valves for Water Supply.

Minimum Pressure Rating: 200 psig.

End Connections: Flanged.

OS&Y, Rising-Stem, Resilient-Seated Gate Valves:

Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.

Standard: AWWA C509 “Standard for Resilient-Seated Gate Valves for Water Supply”.

Minimum Pressure Rating: 200 psig.

End Connections: Flanged.

Retain UL/FMG, cast-iron gate valves for use with indicator posts and OS&Y gate valves for fire-service piping in vaults if required by authorities having jurisdiction.

* + - * 1. UL/FMG, Cast-Iron Gate Valves:

UL/FMG, Nonrising-Stem Gate Valves.

Description: Iron body and bonnet with flange for indicator post, bronze seating material, and inside screw.

Standards: UL 262 “Standard for Gate Valves for Fire-Protection Service” and FMG approved.

Minimum Pressure Rating: 175 psig.

End Connections: Flanged.

Use supervisory switches with valves in subparagraph and associated subparagraphs below.

OS&Y, Rising-Stem Gate Valves:

Description: Iron body and bonnet and bronze seating material.

Standards: UL 262 “Standard for Gate Valves for Fire-Protection Service” and FMG approved.

Minimum Pressure Rating: 175 psig.

End Connections: Flanged.

* + - * 1. Bronze Gate Valves:

Use supervisory switches with valves in first subparagraph and associated subparagraphs below.

OS&Y, Rising-Stem Gate Valves:

Description: Bronze body and bonnet and bronze stem.

Standards: UL 262 “Standard for Gate Valves for Fire-Protection Service” and FMG approved.

Minimum Pressure Rating: 175 psig.

End Connections: Threaded.

Nonrising-Stem Gate Valves:

Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.

Standard: MSS SP-80 “Bronze Gate, Globe, Angle, and Check Valves”.

* + - 1. GATE VALVE ACCESSORIES AND SPECIALTIES

Retain first paragraph and subparagraphs below for tapping connections larger than NPS 2 (DN 50).

* + - * 1. Tapping-Sleeve Assemblies:

Description: Sleeve and valve compatible with drilling machine.

Standard: MSS SP-60 “Connecting Flange Joints between Tapping Sleeves and Tapping Valves”.

Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.

Valve: AWWA, cast-iron, nonrising-stem, [**metal**] [**resilient**]-seated gate valve with one raised face flange mating tapping-sleeve flange.

* + - * 1. Valve Boxes: Comply with AWWA M44 “Standard for Distribution Valves: Selection, Installation, Field Testing, and Maintenance” for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.

Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

* + - * 1. Indicator Posts: UL 789 “Standard for Indicator Posts for Fire-Protection Service”, 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.
			1. CHECK VALVES

Check valves in paragraph and subparagraphs below are available in NPS 2 (DN 50) and larger.

* + - * 1. AWWA Check Valves:

Description: Swing-check type with resilient seat. Include interior coating according to AWWA C550 “Standard for Protective Interior Coatings for Valves and Hydrants” and ends to match piping.

Standard: AWWA C508 “Standard for Swing-Check Valves for Waterworks Service, 2 in. Through 24 in.”.

Pressure Rating: 175 psig.

Check valves in paragraph and subparagraphs below are available in NPS 2-1/2 (DN 65) and larger.

* + - * 1. UL/FMG, Check Valves:

Description: Swing-check type with pressure rating; rubber-face checks, unless otherwise indicated; and ends matching piping.

Standards: UL 312 “Standard for Safety Check Valves for Fire-Protection Service” and FMG approved.

Pressure Rating: [**175 psig**] [**250 psig**].

* + - 1. DETECTOR CHECK VALVES
				1. Detector Check Valves:

Select one of two "Description" subparagraphs and associated subparagraphs below.

Description: 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.

Standards: UL 312 “Standard for Safety Check Valves for Fire-Protection Service” and FMG approved.

Pressure Rating: 175 psig.

Water Meter: AWWA C700 “Standard for Cold-Water Meters-Displacement Type, Bronze Main Case”, 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.

Valve in subparagraph and associated subparagraphs below is without water meter; add water meter if required.

Description: Iron body, corrosion-resistant clapper ring and seat ring material, flanged ends, with connections for bypass and installation of water meter.

Standards: UL 312 “Standard for Safety Check Valves for Fire-Protection Service” and FMG approved.

Pressure Rating: 175 psig.

* + - 1. BUTTERFLY VALVES
				1. AWWA Butterfly Valves:

Description: Rubber seated.

Standard: AWWA C504 “Standard for Rubber-Seated Butterfly Valves, 3 in. Through 72. In”.

Body: Cast or ductile iron.

Body Type: [**Wafer**] [**Wafer or flanged**] [**Flanged**].

Pressure Rating: 150 psig.

* + - * 1. UL Butterfly Valves:

Description: Metal on resilient material seating.

Standards: UL 1091 “Standard for Safety Butterfly Valves for Fire-Protection Service” and FMG approved.

Body: Cast or ductile iron.

Body Type: [**Wafer**] [**Wafer or flanged**] [**Flanged**].

Pressure Rating: 175 psig.

* + - 1. PLUG VALVES
				1. Plug Valves:

Description: Resilient-seated eccentric.

Standard: MSS SP-108 “Resilient-Seated Cast Iron Eccentric Plug Valves”.

Body: Cast iron.

Pressure Rating: 175-psig minimum CWP.

Seat Material: Suitable for potable-water service.

* + - 1. [**CORPORATION VALVES**] [**AND**] [**CURB VALVES**]
				1. Manufacturers:

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

* + - * 1. Service-Saddle Assemblies: Comply with AWWA C800 “Standard for Underground Service Line Valves and Fittings”. Include saddle and valve compatible with tapping machine.

Service Saddle: Copper alloy with seal and AWWA C800 “Standard for Underground Service Line Valves and Fittings, threaded outlet for corporation valve.

Corporation Valve: Bronze body and ground-key plug, with AWWA C800 “Standard for Underground Service Line Valves and Fittings”, threaded inlet and outlet matching service piping material.

Retain subparagraph below if utility company requires multiple connections.

Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.

* + - * 1. Curb Valves: Comply with AWWA C800 “Standard for Underground Service Line Valves and Fittings”. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.
				2. Service Boxes for Curb Valves: Similar to AWWA M44 “Standard for Distribution Valves: Selection, Installation, Field Testing, and Maintenance” requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.

Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

* + - 1. WATER METERS
				1. Water meters will be furnished by utility company.

If utility company furnishes water meters, identify utility company in Part 1 "Summary" Article and delete all paragraphs and subparagraphs below. If water meters are specified in this Section, delete paragraph above and retain and edit paragraphs and subparagraphs below.

* + - * 1. Manufacturers:

Retain one of first three paragraphs and associated subparagraphs below. Verify type of meter required with utility company and authorities having jurisdiction.

* + - * 1. Displacement-Type Water Meters:

Description: With bronze main case.

Standard: AWWA C700 “Standard for Cold-Water Meters-Displacement Type, Bronze Main Case”.

Registration: Flow in [**gallons**] [**cubic feet**].

* + - * 1. Turbine-Type Water Meters:

Description:

Standard: AWWA C701 “Standard for Cold-Water Meters-Turbine Type, for Customer Service.

Registration: Flow in [**gallons**] [**cubic feet**].

* + - * 1. Compound-Type Water Meters:

Description:

Standard: AWWA C702 “Standard for Cold-Water Meters-Compound Type”.

Registration: Flow in [**gallons**] [**cubic feet**].

* + - * 1. Remote Registration System:

Description: Utility company standard; direct-reading type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.

Standard: AWWA C706 “Standard for Direct-Reading, Remote-Registration Systems for Cold-Water Meters”.

Registration: Flow in [**gallons**] [**cubic feet**].

Retain and edit "Remote Registration System" paragraph and subparagraphs above or below; delete if not required.

* + - * 1. Remote Registration System:

Description: Utility company standard; encoder type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.

Standard: AWWA C707 “Standard for Encoder-Type Remote-Registration Systems for Cold-Water Meters”.

Registration: Flow in [**gallons**] [**cubic feet**].

Retain and edit one of two subparagraphs below.

Data-Acquisition Units: Comply with utility company requirements for type and quantity.

Visible Display Units: Comply with utility company requirements for type and quantity.

* + - 1. DETECTOR-TYPE WATER METERS
				1. Detector-Type Water Meters:

Retain one of first two paragraphs and associated subparagraphs below. Verify type of meter required with utility company and authorities having jurisdiction.

* + - * 1. Description: Main line, proportional meter with second meter on bypass. Register flow in [**gallons**] [**cubic feet**].

Standards: AWWA C703 “Standard for Cold-Water Meters-Fire-Service Type”, UL listed, and FMG approved.

Pressure Rating: 150 psig.

Bypass Meter: [**AWWA C701, turbine**] [**AWWA C702, compound**]-type, bronze case.

Size: At least one-half nominal size of main-line meter.

* + - * 1. Description: Main-line turbine meter with strainer and second meter on bypass. Register flow in [**gallons**] [**cubic feet**].

Standards: AWWA C703 “Standard for Cold-Water Meters-Fire-Service Type”, UL listed, and FMG approved.

Pressure Rating: 175 psig.

Bypass Meter: AWWA C701 “Standard for Cold-Water Meters-Turbine Type, for Customer Service, turbine-type, bronze case.

Size: At least NPS 2.

* + - * 1. Remote Registration System:

Description: Utility company standard; direct-reading type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.

Standard: AWWA C706 “Standard for Direct-Reading, Remote-Registration Systems for Cold-Water Meters”.

Registration: Flow in [**gallons**] [**cubic feet**].

Retain and edit "Remote Registration System" paragraph and subparagraphs above or below; delete if not required.

* + - * 1. Remote Registration System:

Description: Utility company standard; encoder type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.

Standard: AWWA C707 “Standard for Encoder-Type Remote-Registration Systems for Cold-Water Meters”.

Registration: Flow in [**gallons**] [**cubic feet**].

Retain and edit one of two subparagraphs below.

Data-Acquisition Units: Comply with utility company requirements for type and quantity.

Visible Display Units: Comply with utility company requirements for type and quantity.

* + - 1. PRESSURE-REDUCING VALVES

Copy and edit paragraph and subparagraphs below for each type of water regulator required.

Water regulators in paragraph and subparagraphs below are available in NPS 1/2 to NPS 3 (DN 15 to DN 80).

* + - * 1. Water Regulators:

Standard: ASSE 1003 “Performance Requirements for Water Pressure Reducing Valves for Potable Water Distribution Systems.

Pressure Rating: Initial pressure of 150 psig.

Size: <**Insert NPS**>.

Design Flow Rate: <**Insert gpm**>.

Design Inlet Pressure: <**Insert psig**>.

Design Outlet Pressure Setting: <**Insert psig**>.

Body: Bronze[**with chrome-plated finish**] for NPS 2 and smaller; cast iron[**with interior lining complying with AWWA C550 or that is FDA approved**] for NPS 2-1/2 and NPS 3.

Valves for Booster Heater Water Supply: Include integral bypass.

End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

Copy and edit paragraph and subparagraphs below for each type of water control valve required.

Water control valves in paragraph and subparagraphs below are available in NPS 1-1/4 (DN 32) and larger.

* + - * 1. Water Control Valves:

Description: Pilot-operation, diaphragm-type, single-seated main water control valve with AWWA C550 “Standard for Protective Interior Coatings for Valves and Hydrants” or FDA-approved, interior epoxy coating. Include small pilot control valve, restrictor device, specialty fittings, and sensor piping.

Pressure Rating: Initial pressure of 150 psig minimum.

Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless-steel body.

Size: <**Insert NPS**>.

Pattern: [**Angle**] [**Globe**]-valve design.

Trim: Stainless steel.

Design Flow Rate: <**Insert gpm**>.

Design Inlet Pressure: <**Insert psig**>.

Design Outlet Pressure Setting: <**Insert psig**>.

End Connections: Threaded for NPS 2 and smaller; [**flanged**] <**Insert type**> for NPS 2-1/2 and larger.

* + - 1. RELIEF VALVES

Copy and edit paragraph and subparagraphs below for each type of air-release valve required.

* + - * 1. Air-Release Valves:

Description: Hydromechanical device to automatically release accumulated air.

Standard: AWWA C512 “Standard for Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.

Pressure Rating: [**300 psig**] <**Insert pressure**>.

Body Material: [**Cast iron**] <**Insert material**>.

Trim Material: Stainless steel[**, brass, or bronze**].

Water Inlet Size: <**Insert NPS**>.

Air Outlet Size: <**Insert NPS**>.

Orifice Size: <**Insert inch**>.

Design Air-Release Capacity: <**Insert cfm**> at <**Insert psig**> pipeline pressure.

Copy and edit paragraph and subparagraphs below for each type of air/vacuum valve required.

* + - * 1. Air/Vacuum Valves:

Description: Direct-acting, float-operated, hydromechanical device with large orifice to automatically release accumulated air or to admit air during filling of piping.

Standard: AWWA C512 “Standard for Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service”.

Pressure Rating: [**300 psig**] <**Insert pressure**>.

Body Material: [**Cast iron**] <**Insert material**>.

Trim Material: Stainless steel[**, brass, or bronze**].

Inlet and Outlet Size: <**Insert NPS**>.

Orifice Size: <**Insert inch**>.

Design Air Capacity: <**Insert cfm**> at <**Insert psig**> differential pressure.

Copy and edit paragraph and subparagraphs below for each type of combination air valve required.

* + - * 1. Combination Air Valves:

Description: Float-operated, hydromechanical device to automatically release accumulated air or to admit air.

Standard: AWWA C512 “Standard for Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service”.

Pressure Rating: [**300 psig**] <**Insert pressure**>.

Body Material: [**Cast iron**] <**Insert material**>.

Trim Material: Stainless steel[**, brass, or bronze**].

Inlet and Outlet Size: <**Insert NPS**>.

Orifice Size: <**Insert inch**>.

Design Air Capacity: <**Insert cfm**> at <**Insert psig**> differential pressure.

* + - 1. VACUUM BREAKERS

Copy and edit paragraph and subparagraphs below for each type of pressure vacuum breaker assembly required.

Pressure vacuum breaker assemblies in paragraph and subparagraphs below are for moderate to high hazard and are available in NPS 1/2 to NPS 2 (DN 15 to DN 50).

* + - * 1. Pressure Vacuum Breaker Assembly:

Standard: ASSE 1020 “Performance Requirements for Pressure Vacuum Breaker Assemblies”.

Operation: Continuous-pressure applications.

Pressure Loss: [**5 psig**] <**Insert pressure**> maximum, through middle 1/3 of flow range.

Size: <**Insert NPS**>.

Design Flow Rate: <**Insert gpm**>.

Selected Unit Flow Range Limits: <**Insert gpm**>.

Pressure Loss at Design Flow Rate: <**Insert psig**>.

Accessories: Ball valves on inlet and outlet.

* + - 1. BACKFLOW PREVENTERS

Copy and edit paragraph and subparagraphs below for each type of reduced-pressure-principle backflow preventer required.

Reduced-pressure-principle backflow preventers in paragraph and subparagraphs below are for high hazard and are available in NPS 3/4 to NPS 10 (DN 20 to DN 250).

* + - * 1. All backflow preventer types need to be listed as acceptable in the NYS Department of Health Environmental Health Manual.
				2. Reduced-Pressure-Principle Backflow Preventers:

Standard: [**ASSE 1013**] [**or**] [**AWWA C511].**

Operation: Continuous-pressure applications.

Pressure Loss: [**12 psig**] <**Insert pressure**> maximum, through middle 1/3 of flow range.

Size: <**Insert NPS**>.

Design Flow Rate: <**Insert gpm**>.

Selected Unit Flow Range Limits: <**Insert gpm**>.

Pressure Loss at Design Flow Rate: <**Insert psig**> for NPS 2 and smaller; <**Insert psig**> for NPS 2-1/2 and larger.

Body: Bronze for NPS 2 and smaller; [**cast iron with interior lining complying with AWWA C550 or that is FDA approved**] [**steel with interior lining complying with AWWA C550 or that is FDA approved**] [**stainless steel**] for NPS 2-1/2 and larger.

End Connections: Threaded for NPS 2 and smaller; [**flanged**] <**Insert type**> for NPS 2-1/2 and larger.

Configuration: Designed for [**horizontal, straight through**] [**vertical inlet, horizontal center section, and vertical outlet**] [**vertical**] <**Insert configuration**> flow.

Accessories:

Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

Air-Gap Fitting: ASME A112.1.2 “Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-Connected Receptors)”, matching backflow preventer connection.

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

Double-check, backflow-prevention assemblies in paragraph and subparagraphs below are for low hazard and are available in NPS 3/4 to NPS 10 (DN 20 to DN 250).

* + - * 1. Double-Check, Backflow-Prevention Assemblies:

Standard: [**ASSE 1015**] [**or**] [**AWWA C510].**

Operation: Continuous-pressure applications, unless otherwise indicated.

Pressure Loss: [**5 psig**] <**Insert pressure**> maximum, through middle 1/3 of flow range.

Size: <**Insert NPS**>.

Design Flow Rate: <**Insert gpm**>.

Selected Unit Flow Range Limits: <**Insert gpm**>.

Pressure Loss at Design Flow Rate: <**Insert psig**> for NPS 2 and smaller; <**Insert psig**> for NPS 2-1/2 and larger.

Body: Bronze for NPS 2 and smaller; [**cast iron with interior lining complying with AWWA C550 or that is FDA approved**] [**steel with interior lining complying with AWWA C550 or that is FDA approved**] [**stainless steel**] for NPS 2-1/2 and larger.

End Connections: Threaded for NPS 2 and smaller; [**flanged**] <**Insert type**> for NPS 2-1/2 and larger.

Configuration: Designed for [**horizontal, straight through**] <**Insert configuration**> flow.

Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

Copy and edit paragraph and subparagraphs below for each type of reduced-pressure-detector, fire-protection backflow preventer assembly required.

Reduced-pressure-detector, fire-protection backflow preventer assemblies in paragraph and subparagraphs below are for high hazard and are available in NPS 3 to NPS 10 (DN 80 to DN 250).

* + - * 1. Reduced-Pressure-Detector, Fire-Protection Backflow Preventer Assemblies:

Standards: ASSE 1047 “Performance Requirements for Reduced Pressure Detector Backflow Prevention Assemblies” and UL listed or FMG approved.

Operation: Continuous-pressure applications.

Pressure Loss: [**12 psig**] <**Insert pressure**> maximum, through middle 1/3 of flow range.

Size: <**Insert NPS**>.

Design Flow Rate: <**Insert gpm**>.

Selected Unit Flow Range Limits: <**Insert gpm**>.

Pressure Loss at Design Flow Rate: <**Insert psig**>.

Body: [**Cast iron with interior lining complying with AWWA C550 or that is FDA approved**] [**Steel with interior lining complying with AWWA C550 or that is FDA approved**] [**Stainless steel**].

End Connections: Flanged.

Configuration: Designed for [**horizontal, straight through**] [**vertical inlet, horizontal center section, and vertical outlet**] [**vertical**] <**Insert configuration**> flow.

Accessories:

Valves: UL 262 “Standard for Gate Valves for Fire-Protection Service”, FMG-approved, OS&Y gate type with flanged ends on inlet and outlet.

Air-Gap Fitting: ASME A112.1.2 “Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-Connected Receptors)”, matching backflow preventer connection.

Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

Copy and edit paragraph and subparagraphs below for each type of double-check, detector-assembly backflow preventer required.

Double-check, detector-assembly backflow preventers in paragraph and subparagraphs below are for low hazard and are available in NPS 3 to NPS 10 (DN 80 to DN 250).

* + - * 1. Double-Check, Detector-Assembly Backflow Preventers:

Standards: ASSE 1048 “Performance Requirements for Double Check Detector Fire Protection Backflow Prevention Assemblies and UL listed or FMG approved.

Operation: Continuous-pressure applications.

Pressure Loss: [**5 psig**] <**Insert pressure**> maximum, through middle 1/3 of flow range.

Size: <**Insert NPS**>.

Design Flow Rate: <**Insert gpm**>.

Selected Unit Flow Range Limits: <**Insert gpm**>.

Pressure Loss at Design Flow Rate: <**Insert psig**>.

Body: [**Cast iron with interior lining complying with AWWA C550 or that is FDA approved**] [**Steel with interior lining complying with AWWA C550 or that is FDA approved**] [**Stainless steel**].

End Connections: Flanged.

Configuration: Designed for [**horizontal, straight through**] [**vertical inlet, horizontal center section, and vertical outlet**] [**vertical**] <**Insert configuration**> flow.

Accessories:

Valves: UL 262 “Standard for Gate Valves for Fire-Protection Service”, FMG-approved, OS&Y gate type with flanged ends on inlet and outlet.

Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

Copy and edit paragraph and subparagraphs below for each type of backflow preventer test kit required.

Backflow preventer test kits in paragraph and subparagraphs below are suitable for pressure vacuum breakers; reduced-pressure-principle backflow preventers; double-check, backflow-prevention assemblies; and double-check, detector-assembly backflow preventers.

* + - * 1. Backflow Preventer Test Kits:

Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

* + - 1. WATER METER BOXES

Select one of three paragraphs in this Article.

* + - * 1. Description: 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.

Delete subparagraph below if not permitted.

Option: Base section may be cast-iron, PVC, clay, or other pipe.

* + - * 1. Description: 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.

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

* + - * 1. Description: Polymer-concrete body and cover for disc-type water meter, with lettering "WATER" in cover; and with slotted, open-bottom base section of length to fit over service piping. Include vertical and lateral design loadings of 15,000 lb minimum over 10 by 10 inches square.
			1. CONCRETE VAULTS

Retain this Article if vaults are required and are not specified in Section 033000 "Cast-in-Place Concrete."

* + - * 1. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C857 “Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures and made according to ASTM C858 “Standard Specification for Underground Precast Concrete Utility Structures.

Ladder: ASTM A36 “Standard Specification for Carbon Structural Steel”, steel or polyethylene-encased steel steps.

Manhole: ASTM A48 “Standard Specification for Gray Iron Castings” Class No. 35A minimum tensile strength, gray-iron traffic frame and cover.

Dimension: 24-inch minimum diameter, unless otherwise indicated.

Retain "Manhole" subparagraph and associated subparagraph above or below.

Manhole: ASTM A536 “Standard Specification for Ductile Iron Castings”, Grade 60-40-18, ductile-iron traffic frame and cover.

Dimension: 24-inch- minimum diameter, unless otherwise indicated.

Drain: ASME A112.6.3 “Floor and Trench Drains”, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

* + - 1. PROTECTIVE ENCLOSURES
				1. Freeze-Protection Enclosures:

Description: Insulated enclosure 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 when external temperatures reach as low as minus 34 deg F.

Standard: ASSE 1060 “Performance Requirements for Outdoor Enclosures for Fluid Conveying Components”.

Retain one of two subparagraphs below.

Class I: For equipment or devices other than pressure or atmospheric vacuum breakers.

Class I-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.

Retain subparagraphs and associated subparagraphs below with either "Class" subparagraph retained above. Edit to suit Project.

Housing: Reinforced[**-aluminum**] [**or**] [**-fiberglass**] <**Insert housing**> construction.

Size: Of dimensions indicated, but not less than those required for access and service of protected unit.

Drain opening for units with drain connection.

Access doors with locking devices.

Insulation inside housing.

Anchoring devices for attaching housing to concrete base.

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

Electric heating cable or heater with self-limiting temperature control.

Class II and Class II-V freeze-retardant enclosures are also available but are not included in this Section. ASSE 1060 standard is not clear on requirements for these enclosures.

* + - * 1. Weather-Resistant Enclosures:

Description: Uninsulated enclosure designed to protect aboveground water piping, equipment, or specialties from weather and damage.

Standard: ASSE 1060 “Performance Requirements for Outdoor Enclosures for Fluid Conveying Components”.

Retain one of two subparagraphs below.

Class III: For equipment or devices other than pressure or atmospheric vacuum breakers.

Class III-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.

Retain subparagraph and associated subparagraphs below with either "Class" subparagraph retained above. Edit to suit Project.

Housing: Reinforced[**-aluminum**] [**or**] [**-fiberglass**] <**Insert housing**> construction.

Size: Of dimensions indicated, but not less than those required for access and service of protected unit.

Drain opening for units with drain connection.

Access doors with locking devices.

Anchoring devices for attaching housing to concrete base.

* + - * 1. Expanded-Metal Enclosures:

Description: Enclosure designed to protect aboveground water piping, equipment, or specialties from damage.

Material: ASTM F1267 “Standard Specification for Metal, Expanded, Steel”, expanded metal side and top panels, of weight and with reinforcement of same metal at edges as required for rigidity.

Type: Type [**I, expanded**] [**II, expanded and flattened**].

Class: Class[**1, uncoated carbon steel**] [**2, hot-dip, zinc-coated carbon steel**] [**3, corrosion-resisting steel**].

Retain first subparagraph below if retaining Class 1 in subparagraph above.

Finish: Manufacturer's enamel paint.

Size: Of dimensions indicated, but not less than those required for access and service of protected unit.

Locking device.

Lugs or devices for securing enclosure to base.

* + - * 1. Enclosure Bases:

Description: [**4-inch-**] [**6-inch-**] minimum thickness precast concrete, of dimensions required to extend at least 6 inches beyond edges of enclosure housings. Include openings for piping.

* + - 1. FIRE HYDRANTS
				1. Dry-Barrel Fire Hydrants:

Retain subparagraph and associated subparagraphs below for AWWA dry-barrel fire hydrants.

Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550 “Standard for Protective Interior Coatings for Valves and Hydrants”. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.

Standard: AWWA C502 “Standard for Dry-Barrel Fire Hydrants”.

Pressure Rating: [**150 psig minimum**] [**250 psig**].

Retain subparagraph and associated subparagraphs below for UL/FMG, dry-barrel fire hydrants.

Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.

Standards: UL 246 “Standard for Hydrants for Fire-Protection Service”, FMG approved.

Pressure Rating: [**150 psig minimum**] [**250 psig**].

Retain four subparagraphs below with either "Description" subparagraph retained above.

Outlet Threads: NFPA 1963 “Standard for Fire Hose Connections”, with external hose thread used by local fire department. Include cast-iron caps with steel chains.

Edit first two subparagraphs below if required by authorities having jurisdiction.

Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.

Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.

Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

* + - * 1. Wet-Barrel Fire Hydrants:

Retain subparagraph and associated subparagraphs below for AWWA wet-barrel fire hydrants.

Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, NPS 6 threaded or flanged inlet, and base section with NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550 “tandard for Protective Interior Coatings for Valves and Hydrants”.

Standard: AWWA C503 “Standard for Wet-Barrel Fire Hydrants”.

Pressure Rating: 150 psig minimum.

Retain subparagraph and associated subparagraphs below for UL/FMG, wet-barrel fire hydrants.

Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, NPS 6 threaded or flanged inlet, and base section with NPS 6 mechanical-joint inlet.

Standards: UL 246 “Standard for Hydrants for Fire-Protection Service and FMG approved.

Pressure Rating: 150 psig minimum.

Retain four subparagraphs below with either "Description" subparagraph retained above.

Outlet Threads: NFPA 1963 “Standard for Fire Hose Connections”, with external hose thread used by local fire department. Include cast-iron caps with steel chains.

Edit first two subparagraphs below if required by authorities having jurisdiction.

Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.

Direction of Opening: Open hydrant valves by turning operating nut to left or counterclockwise.

Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

* + - 1. FLUSHING HYDRANTS
				1. Post-Type Flushing Hydrants:

Description: Nonfreeze and drainable, of length required for shutoff valve installation below frost line.

Pressure Rating: 150 psig minimum.

Outlet: One, with horizontal discharge.

Hose Thread: NPS 2-1/2, with NFPA 1963 “Standard for Fire Hose Connections” external hose thread for use by local fire department, and with cast-iron cap with brass chain.

Barrel: Cast-iron or steel pipe with breakaway feature.

Valve: Bronze body with bronze-ball or plunger closure, and automatic draining.

Security: Locking device for padlock.

Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

Inlet: NPS 2 minimum.

Operating Wrench: One for each unit.

* + - * 1. Ground-Type Flushing Hydrants:

Description: Nonfreeze and drainable, of length required for shutoff valve installation below frost line.

Pressure Rating: 150 psig minimum.

Outlet: One, with [**vertical**] [**angle**] discharge.

Hose Thread: NPS 2-1/2, with NFPA 1963 “Standard for Fire Hose Connections” external hose thread for use by local fire department, and with cast-iron cap with brass chain.

Barrel: Cast-iron or steel pipe.

Valve: Bronze body with bronze-ball or plunger closure, and automatic draining.

Inlet: NPS 2 minimum.

Hydrant Box: Cast iron with cover, for ground mounting.

Operating Wrench: One for each unit.

* + - * 1. Post-Type Sampling Station:

Description: Nonfreeze and drainable, of length required for shutoff valve installation below frost line.

Pressure Rating: 100 psig minimum.

Sampling Outlet: One unthreaded nozzle with handle.

Valve: Bronze body with bronze-ball or plunger closure. Include operating handle.

Drain: Tubing with separate manual vacuum pump.

Inlet: NPS 3/4 minimum.

Housing: Weatherproof material with locking device. Include anchor device.

Operating Wrench: One for each unit.

* + - 1. FIRE DEPARTMENT CONNECTIONS

Copy and edit paragraph and subparagraphs below for each type of fire department connection required.

* + - * 1. Fire Department Connections:

Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 “Standard for Fire Hose Connections” and matching local fire department hose threads and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch- high brass sleeve; and round escutcheon plate.

Standard: UL 405 “Standard for Fire Department Connection Devices”.

Connections: Two NPS 2-1/2 inlets and one [**NPS 4**] [**NPS 6**] outlet.

Connections: [**Three**] [**Four**] NPS 2-1/2 inlets and one NPS 6 outlet.

Connections: Six NPS 2-1/2 inlets and one [**NPS 6**] [**NPS 8**] outlet.

Inlet Alignment: [**Inline, horizontal**] [**Square**].

Finish Including Sleeve: [**Polished chrome-plated**] [**Rough chrome-plated**] [**Polished bronze**].

Escutcheon Plate Marking: "[**AUTO SPKR**] [**&**] [**STANDPIPE**]."

* + - 1. ALARM DEVICES
				1. Alarm Devices, General: UL 753 “Standard for Alarm Accessories for Automatic Water-Supply Control Valves for Fire Protection Service and FMG approved, of types and sizes to mate and match piping and equipment.

Devices in three paragraphs below are usually located inside the building and are specified in Section 211200 "Fire-Suppression Standpipes," Section 211313 "Wet-Pipe Sprinkler Systems," and Section 211316 "Dry-Pipe Sprinkler Systems." Verify requirements with authorities having jurisdiction.

Devices in paragraph below mount on pipe with vane in water. These devices can be used with wet-barrel fire hydrants.

* + - * 1. Water-Flow Indicators: Vane-type water-flow detector, rated for 250-psig working pressure; designed for horizontal or vertical installation; with 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.

Devices in paragraph below mount on stem of OS&Y gate valves and on indicator posts.

* + - * 1. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.

Devices in paragraph below mount on barrel of dry-barrel fire hydrants.

* + - * 1. Pressure Switches: Single pole, double throw; designed to signal increase in pressure.
1. EXECUTION
	* + 1. EARTHWORK
				1. Refer to Section 312000 "Earth Moving" for excavating, trenching, and backfilling.
			2. PIPING APPLICATIONS

Piping is arbitrarily limited to NPS 8 (DN 200) for water service, NPS 12 (DN 300) for fire-service mains, and NPS 12 (DN 300) for combined water service and fire-service mains.

See Editing Instruction No. 3 in the Evaluations for cautions about selecting products.

Select piping applications from this Article. Coordinate with materials specified in Part 2.

* + - * 1. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
				2. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
				3. Do not use flanges or unions for underground piping.
				4. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

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

* + - * 1. Underground water-service piping [**NPS 3/4 to NPS 3**] <**Insert pipe size range**> shall be[**any of**] the following:

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

Retain one or more of five subparagraphs below.

Soft copper tube, [**ASTM B88, Type K**] [**ASTM B88, Type L**]; [**wrought-copper, solder-joint fittings; and brazed**] [**copper, pressure-seal fittings; and pressure-sealed**] joints.

PE, ASTM pipe; [**insert fittings for PE pipe; and clamped**] [**molded PE fittings; and heat-fusion**] joints.

PVC, Schedule [**40 pipe; PVC, Schedule 40**] [**80 pipe; PVC, Schedule 80**] socket fittings; and solvent-cemented joints.

NPS 1 to NPS 3 fiberglass, AWWA RTRP, Class [**150**] [**200**] [**250**]; RTRF; and bonded joints.

Fiberglass, AWWA RTRP, Class [**150**] [**200**] [**250**]; RTRF; and bonded joints.

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

* + - * 1. Underground water-service piping [**NPS 4 to NPS 8**] <**Insert pipe size range**> shall be[**any of**] the following:

Retain one or more of seven subparagraphs below.

Soft copper tube, [**ASTM B88, Type K**] [**ASTM B88, Type L**]; wrought-copper, solder-joint fittings; and brazed joints.

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.

PE, AWWA pipe; PE, AWWA fittings; and heat-fusion joints.

PVC, Schedule [**40 pipe; PVC, Schedule 40**] [**80 pipe; PVC, Schedule 80**] socket fittings; and solvent-cemented joints.

NPS 4 and NPS 6: NPS 6 PVC, AWWA Class 150 pipe; PVC, AWWA Class 150 [**fabricated**] [**or**] [**molded**] fittings; and gasketed joints.

NPS 8: PVC, AWWA Class 200 pipe; [**PVC, AWWA Class 200 fabricated**] [**push-on-joint, ductile-iron**] [**mechanical-joint, ductile-iron**] fittings; and gasketed joints.

Fiberglass, AWWA RTRP, Class [**150**] [**200**] [**250**]; RTRF; and bonded joints.

Retain or delete paragraph below to suit Project.

* + - * 1. Water Meter Box Water-Service Piping [**NPS 3/4 to NPS 2**] <**Insert pipe size range**> shall be same as underground water-service piping.

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

* + - * 1. Aboveground[**and Vault**] Water-Service Piping [**NPS 3/4 to NPS 3**] <**Insert pipe size range**> shall be[**any of**] the following:

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

Retain one or more of three subparagraphs below.

Hard copper tube, [**ASTM B88, Type K**] [**ASTM B88, Type L**]; [**wrought-copper, solder-joint fittings; and brazed**] [**copper, pressure-seal fittings; and pressure-sealed**] joints.

PVC, Schedule 80 pipe; PVC, Schedule 80 [**socket fittings; and solvent-cemented**] [**threaded fittings; and threaded**] joints.

NPS 1 to NPS 2 fiberglass, AWWA RTRP, Class [**150**] [**200**] [**250**]; RTRF; and bonded joints.

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

* + - * 1. Aboveground [**and vault**]water-service piping [**NPS 4 to NPS 8**] <**Insert pipe size range**> shall be[**any of**] the following:

Retain one or more of four subparagraphs below.

Hard copper tube, [**ASTM B88, Type K**] [**ASTM B88, Type L**]; wrought-copper, solder-joint fittings; and brazed joints.

Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.

PVC, Schedule 80 pipe; PVC, Schedule 80 [**socket fittings; and solvent-cemented**] [**threaded fittings; and threaded**] joints.

Fiberglass, AWWA RTRP, Class [**150**] [**200**] [**250**]; RTRF; and bonded joints.

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

* + - * 1. Underground Fire-Service-Main Piping [**NPS 4 to NPS 12**] <**Insert pipe size range**> shall be[**any of**] the following:

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 six subparagraphs below.

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.

PE, Class [**150**] [**200**], fire-service pipe; molded PE fittings; and heat-fusion joints.

PVC, AWWA Class 150 pipe listed for fire-protection service; PVC Class 150 fabricated or molded fittings; and gasketed joints.

PVC, AWWA Class 200 pipe listed for fire-protection service; PVC Class 200 fabricated fittings; and gasketed joints.

Fiberglass, AWWA, FMG-approved RTRP, Class [**150**] [**200**]; RTRF; and gasketed joints.

Fiberglass, UL RTRP, Class [**150**] [**200**] [**250**]; RTRF; and gasketed joints.

* + - * 1. Aboveground[**and Vault**] Fire-Service-Main Piping [**NPS 4 to NPS 12**] <**Insert pipe size range**> shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

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

* + - * 1. Underground Combined Water-Service and Fire-Service-Main Piping [**NPS 6 to NPS 12**] <**Insert pipe size range**> shall be[**any of**] the following:

Retain one or more of three subparagraphs below.

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.

PVC, AWWA Class [**150**] [**200**] pipe listed for fire-protection service; PVC fabricated or molded fittings of same class as pipe; and gasketed joints.

Fiberglass, AWWA, FMG-approved RTRP, Class [**150**] [**200**]; RTRF; and gasketed joints.

* + - * 1. Aboveground[**and Vault**] Combined Water Service and Fire-Service-Main Piping [**NPS 6 to NPS 12**] <**Insert pipe size range**> shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.
			1. VALVE APPLICATIONS

See Editing Instruction No. 3 in the Evaluations for cautions about selecting products.

* + - * 1. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.
				2. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

Retain one of first two subparagraphs below.

Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, [**metal**] [**resilient**] [**high-pressure, resilient**]-seated gate valves with valve box.

Underground Valves, NPS 4 and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.

Use the following for valves in vaults and aboveground:

Gate Valves, NPS 2 and Smaller: Bronze, [**nonrising**] [**rising**] stem.

Gate Valves, NPS 3 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**].

Check Valves: [**AWWA C508**] [**UL/FMG**], swing type.

Pressure-Reducing Valves: Use for water-service piping in vaults and aboveground to control water pressure.

Relief Valves: Use for water-service piping in vaults and aboveground.

Air-Release Valves: To release accumulated air.

Air/Vacuum Valves: To release or admit large volume of air during filling of piping.

Combination Air Valves: To release or admit air.

Detector Check Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

* + - 1. PIPING INSTALLATION
				1. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

Retain paragraph above if tap is made by utility company; retain paragraph below if tap is made by Contractor.

* + - * 1. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

Retain paragraph and subparagraphs below for tapping of pipe with connections larger than NPS 2 (DN 50).

* + - * 1. Make connections larger than NPS 2 with tapping machine according to the following:

Install tapping sleeve and tapping valve according to MSS SP-60 “Connecting Flange Joints between Tapping Sleeves and Tapping Valves”.

Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.

Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.

Install gate valve onto tapping sleeve. Comply with MSS SP-60 “Connecting Flange Joints between Tapping Sleeves and Tapping Valves”. Install valve with stem pointing up and with valve box.

Retain first paragraph and subparagraphs below for tapping of pipe with connections NPS 2 (DN 50) and smaller.

* + - * 1. Make connections NPS 2 and smaller with drilling machine according to the following:

Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.

Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.

Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.

Install corporation valves into service-saddle assemblies.

Install manifold for multiple taps in water main.

Install curb valve in water-service piping with head pointing up and with service box.

* + - * 1. Comply with NFPA 24 for fire-service-main piping materials and installation.

Delete first subparagraph below if not required.

Install PE corrosion-protection encasement according to ASTM A674 “Standard Practice for Polyethylene Encasement for Ductile Iron Pipe” or AWWA C105 “Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.

Install copper tube and fittings according to CDA's "Copper Tube Handbook."

* + - * 1. Install ductile-iron, water-service piping according to AWWA C600 “Standard for Installation of Ductile-Iron Mains and Their Appurtenances” and AWWA M41 “Standard for Ductile-Iron Pipe and Fittings”.

Delete subparagraph below if not required.

Install PE corrosion-protection encasement according to ASTM A674 “Standard Practice for Polyethylene Encasement for Ductile Iron Pipe or AWWA C105 “Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems”.

* + - * 1. Install PE pipe according to ASTM D2774 “Standard Practice for Underground Installation of Thermoplastic Pressure Piping and ASTM F645 “Standard Guide for Selection, Design, and Installation of Thermoplastic Water-Pressure Piping Systems”.
				2. Install PVC, AWWA pipe according to ASTM F645 “Standard Guide for Selection, Design, and Installation of Thermoplastic Water-Pressure Piping Systems “ and AWWA M23 “Standard for PVC Pipe-Design and Installation”.
				3. Install fiberglass AWWA pipe according to AWWA M45 “Standard for Fiberglass Pipe Design.

Edit first paragraph and subparagraphs below for required minimum depth if known.

* + - * 1. Bury piping with depth of cover over top at least [**30 inches**] <**Insert dimension**>, with top at least [**12 inches**] <**Insert dimension**> below level of maximum frost penetration, and according to the following:

Under Driveways: With at least [**36 inches**] <**Insert dimension**> cover over top.

Under Railroad Tracks: With at least [**48 inches**] <**Insert dimension**> cover over top.

In Loose Gravelly Soil and Rock: With at least [**12 inches**] <**Insert dimension**> additional cover.

* + - * 1. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
				2. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

* + - * 1. Sleeves are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
				2. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Retain and edit first paragraph below for piping with gasketed joints; delete if not required.

* + - * 1. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
				2. See Section 211200 "Fire-Suppression Standpipes," Section 211313 "Wet-Pipe Sprinkler Systems," and Section 211316 "Dry-Pipe Sprinkler Systems" for fire-suppression-water piping inside the building.
				3. See Section 221116 "Domestic Water Piping" for potable-water piping inside the building.
			1. INSTALLATION OF HANGERS AND SUPPORTS

Retain this Article if applicable for aboveground piping and piping in vaults.

Retain first paragraph below for projects in areas that require seismic restraints.

* + - * 1. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
				2. Comply with requirements for hangers, supports, and anchor devices specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
				3. Install the following pipe attachments:

Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.

Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.

Pipe Roller: MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.

Spring hangers to support vertical runs.

Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

On [**PVC**] [**and**] [**fiberglass**] piping, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

* + - * 1. Install hangers for copper tubing with maximum spacing and minimum rod diameters to comply with MSS-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
				2. Install hangers for PVC piping with maximum horizontal spacing and minimum rod diameters to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
				3. Install hangers for fiberglass piping with maximum horizontal spacing and minimum rod diameters to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
				4. Support horizontal piping within [**12 inches**] <**Insert dimension**> of each fitting and coupling.
				5. Support vertical runs of copper tubing to comply with MSS-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
				6. Support vertical runs of [**PVC**] [**fiberglass**] piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
			1. JOINT CONSTRUCTION
				1. Make pipe joints according to the following:

Copper-Tubing, Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools and procedures recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.

Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 “Standard for Installation of Ductile-Iron Mains and Their Appurtenances” and AWWA M41 “Standard for Ductile-Iron Pipe and Fittings”.

Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194 “Standard for Gasketed Joints for Ductile-Iron Pipe and Fittings for Fire Protection Service”.

Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.

PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.

PVC Piping Gasketed Joints: Use joining materials according to AWWA C900 “Standard for Polyvinyl Chloride Pressure Pipe and Fabricated Fittings, 4 in. Through 12 in., for Water Transmission and Distribution. Construct joints with elastomeric seals and lubricant according to ASTM D2774 “Standard Practice for Underground Installation of Thermoplastic Pressure Piping” or ASTM D3139 “Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals and pipe manufacturer's written instructions.

Fiberglass Piping Bonded Joints: Use adhesive and procedure recommended by piping manufacturer.

Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

Dielectric Fittings for [**NPS 2**] <**Insert pipe size**> and Smaller: Use dielectric [**nipples**] [**unions**].

Dielectric Fittings for [**NPS 2-1/2 to NPS 4**] <**Insert pipe size range**>: Use dielectric [**flanges**] [**flange kits**] [**nipples**].

Dielectric Fittings for [**NPS 5**] <**Insert pipe size**> and Larger: Use dielectric flange kits.

* + - 1. ANCHORAGE INSTALLATION

Delete this Article if anchorages are not required.

* + - * 1. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

Retain subparagraphs below for types of anchorages and restrained joints to be permitted.

Concrete thrust blocks.

Locking mechanical joints.

Set-screw mechanical retainer glands.

Bolted flanged joints.

Heat-fused joints.

Pipe clamps and tie rods.

<**Insert devices**>.

* + - * 1. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600 “Standard for Installation of Ductile-Iron Mains and Their Appurtenances.

Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23 “Standard for PVC Pipe-Design and Installation”.

Bonded-Joint Fiberglass, Water-Service Piping: According to AWWA M45 “Standard for Fiberglass Pipe Design.

Fire-Service-Main Piping: According to NFPA 24 “Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

* + - * 1. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.
			1. VALVE INSTALLATION
				1. AWWA Gate Valves: Comply with AWWA C600 “Standard for Installation of Ductile-Iron Mains and Their Appurtenances” and AWWA M44 “Standard for Distribution Valves: Selection, Installation, Field Testing, and Maintenance”. Install each underground valve with stem pointing up and with valve box.
				2. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 “Standard for Installation of Ductile-Iron Mains and Their Appurtenances” and AWWA M44 “Standard for Distribution Valves: Selection, Installation, Field Testing, and Maintenance.
				3. UL/FMG, Gate Valves: Comply with NFPA 24 “Standard for the Installation of Private Fire Service Mains and Their Appurtenances “. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
				4. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24 “Standard for the Installation of Private Fire Service Mains and Their Appurtenances “.
				5. MSS Valves: Install as component of connected piping system.
				6. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.
				7. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves.[**Install full-size valved bypass.**]
				8. Relief Valves: Comply with AWWA C512 “Standard for Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service”. Install aboveground with shutoff valve on inlet.
			2. DETECTOR-CHECK VALVE INSTALLATION
				1. Install in vault or aboveground.
				2. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.
				3. Support detector check valves, meters, shutoff valves, and piping on brick or concrete piers.
			3. WATER METER INSTALLATION

Delete this Article if utility company provides water meters.

* + - * 1. Install water meters, piping, and specialties according to utility company's written instructions.

Retain one or more of three paragraphs below.

* + - * 1. Water Meters: Install [**displacement**] [**turbine**]-type water meters, NPS 2 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.
				2. Water Meters: Install [**compound**] [**turbine**]-type water meters, NPS 3 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.
				3. Water Meters: Install detector-type water meters in meter vault according to AWWA M6 “Standard for Water Meters- Selection, Installation, Testing, and Maintenance”. 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.
			1. ROUGHING-IN FOR WATER METERS

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

* + - * 1. Rough-in piping and specialties for water meter installation according to utility company's written instructions.
			1. VACUUM BREAKER ASSEMBLY INSTALLATION
				1. 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.
				2. Do not install pressure vacuum breaker assemblies in vault or other space subject to flooding.
			2. BACKFLOW PREVENTER INSTALLATION
				1. 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.
				2. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
				3. Do not install bypass piping around backflow preventers.

Revise or delete paragraph below to suit Project.

* + - * 1. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.
			1. WATER METER BOX INSTALLATION
				1. Install water meter boxes in paved areas flush with surface.
				2. Install water meter boxes in grass or earth areas with top [**2 inches**] <**Insert dimension**> above surface.
			2. CONCRETE VAULT INSTALLATION
				1. Install precast concrete vaults according to ASTM C891 “Standard Practice for Installation of Underground Precast Concrete Utility Structures”.
			3. PROTECTIVE ENCLOSURE INSTALLATION
				1. Install concrete base level and with top approximately [**2 inches**] <**Insert measurement**> above grade.
				2. Install protective enclosure over valves and equipment.
				3. Anchor protective enclosure to concrete base.
			4. FIRE HYDRANT INSTALLATION
				1. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
				2. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.
				3. AWWA Fire Hydrants: Comply with AWWA M17 “Standard for Fire Hydrants: Installation, Field Testing, and Maintenance”.
				4. UL/FMG Fire Hydrants: Comply with NFPA 24 “Standard for the Installation of Private Fire Service Mains and Their Appurtenances “.
			5. FLUSHING HYDRANT INSTALLATION
				1. 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.
				2. 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.
				3. 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.
			6. FIRE DEPARTMENT CONNECTION INSTALLATION
				1. Install ball drip valves at each check valve for fire department connection to mains.
				2. Install protective pipe bollards [**on two sides of**] [**on three sides of**] <**Describe arrangement**> each fire department connection. Pipe bollards are specified in Section 055000 "Metal Fabrications."
			7. ALARM DEVICE INSTALLATION

Delete this Article if alarm devices are specified in Section 211200 "Fire-Suppression Standpipes," Section 211313 "Wet-Pipe Sprinkler Systems," or Section 211316 "Dry-Pipe Sprinkler Systems."

* + - * 1. General: Comply with NFPA 24 “Standard for the Installation of Private Fire Service Mains and Their Appurtenances” for devices and methods of valve supervision. Underground valves with valve box do not require supervision.
				2. Supervisory Switches: Supervise valves in open position.

Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.

Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.

Retain paragraph and subparagraphs above or first paragraph and subparagraphs below as required by authorities having jurisdiction.

* + - * 1. Locking and Sealing: Secure unsupervised valves as follows:

Valves: Install chain and padlock on open OS&Y gate valve.

Post Indicators: Install padlock on wrench on indicator post.

* + - * 1. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.
				2. Water-Flow Indicators: Install in water-service piping in vault. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.
			1. CONNECTIONS

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.

* + - * 1. Connect water-distribution piping to [**utility water main**] [**existing water main**] <**Insert piping system**>. Use [**tapping sleeve and tapping valve**] [**service clamp and corporation valve**] <**Insert method**>.
				2. Connect water-distribution piping to interior [**domestic water**] [**and**] [**fire-suppression**] piping.
				3. Connect waste piping from concrete vault drains to [**sanitary sewerage system. See Section 221313 "Facility Sanitary Sewers" for connection to sanitary-sewer**] [**storm-drainage system.**
				4. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
				5. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
			1. FIELD QUALITY CONTROL
				1. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
				2. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

* + - * 1. Prepare reports of testing activities.
			1. IDENTIFICATION
				1. Install continuous underground[**detectable**] warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping.

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

* + - * 1. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel.
			1. CLEANING

Edit this Article as required to suit authorities having jurisdiction.

* + - * 1. Clean and disinfect water-distribution piping as follows:

Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.

Retain subparagraph below for fire-protection-water piping not connected to potable-water supply.

Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 “Standard for the Installation of Private Fire Service Mains and Their Appurtenances” for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

Delete subparagraph above and retain subparagraph and associated subparagraphs below for water-distribution piping connected to potable-water supply.

Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 “Standard for Disinfecting Water Mains or do as follows:

Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.

Retain last subparagraph above or first subparagraph below.

Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.

After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.

Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

* + - * 1. Prepare reports of purging and disinfecting activities.

END OF SECTION 221113