Revisions made to the original MasterSpec text are made solely by the Licensee and are not endorsed by, or representative of the opinions of, Deltek or The American Institute of Architects (AIA). Neither AIA nor Deltek are liable in any way for such revisions or for the use of this Section by any end user. A qualified design professional should review and edit the document to suit project requirements.

SECTION 331415 - SITE WATER DISTRIBUTION PIPING

1. GENERAL
   * + 1. SUMMARY
          1. Section Includes:

PE pipe and fittings.

PVC pipe and fittings.

Fiberglass pipe and fittings.

Piping joining materials.

Encasement for piping.

Water meter boxes.

Backflow preventers.

Concrete vaults.

Alarm devices.

* + - * 1. Related Requirements:

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

Section 031000 "Concrete Forming and Accessories."

Section 032000 "Concrete Reinforcing."

Section 211000 "Water-Based Fire-Suppression Systems."

Section 221216 "Facility Elevated, Potable-Water Storage Tanks."

Section 221219 "Facility Ground-Mounted, Potable-Water Storage Tanks."

Section 221223.11 "Facility Indoor Potable-Water Storage Tanks."

Section 315000 "Excavation Support and Protection."

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project. Include only essential definitions or acronyms not well understood by the affected industry or trade.

* + - * 1. CDA: Copper Development Association.
        2. EPDM: Ethylene-propylene-diene terpolymer rubber.
        3. PA: Polyamide (nylon) plastic.
        4. PE: Polyethylene plastic.
        5. PP: Polypropylene plastic.
      1. ACTION SUBMITTALS

Action submittals are submittals requiring responsive action and return of reviewed documents to Contractor.

* + - * 1. Product Data: For each type of product.
        2. Shop Drawings:

Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

Retain subparagraph below if equipment includes wiring.

Include diagrams for power, signal, and control wiring for alarms.

* + - 1. INFORMATIONAL SUBMITTALS

Informational submittals are submittals that require review by Architect, but they do not require Architect's responsive action and return of reviewed documents to Contractor, provided submittals comply with requirements. If rejected, submittals with responsive action must be returned to Contractor.

Retain "Coordination Drawings" Paragraph below where coordination is required for installation of products and materials by separate installers. Preparation of coordination drawings requires participation of each trade involved; coordinate with other Sections specifying products and materials to be included. See Section 013100 "Project Management and Coordination."

* + - * 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 Submittals:

Retain "Field quality-control reports" Subparagraph below if Contractor is responsible for field quality-control testing and inspecting.

Field quality-control reports.

* + - 1. CLOSEOUT SUBMITTALS
         1. Operation and Maintenance Data: For each type of product indicated.
      2. DELIVERY, STORAGE, AND HANDLING
         1. Preparation for Transport: Prepare piping, valves, meters, backflow prevention devices, and fire hydrants according to the following:

Ensure that piping, valves, meters, backflow prevention devices, and fire hydrants are dry and internally protected against rust and corrosion.

Protect threaded ends and flange faces against damage.

Set piping, valves, meters, backflow prevention devices, and fire hydrants in best position for handling and to prevent rattling.

* + - * 1. During Storage: Use precautions for piping, valves, meters, backflow prevention devices, and 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 products if size requires handling by crane or lift. Rig products 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 Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service in accordance with requirements indicated:

Notify [**Architect**] [**Construction Manager**] [**Owner**] no fewer than [**two**] <**Insert number**> days in advance of proposed interruption of service.

Do not proceed with interruption of water-distribution service without [**Architect's**] [**Construction Manager's**] [**Owner's**] written permission.

* + - 1. COORDINATION

Revise 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.
        2. Content includes water-distribution piping and related components outside the building for [**domestic water service**] [**fire-suppression water service**] [**combined domestic water service and fire-suppression water service**] [**and terminated 5 ft.** **from building**] [**and service entrance piping to a point 1 ft.** **above finished floor**] [**and service entrance piping to a point 1 ft.** **inside finished wall**]. Terminate water-service piping with appropriate fitting for extension by [**Division 21**] [**Division 22**] [**Divisions 21 and 22**].

1. PRODUCTS
   * + 1. PERFORMANCE REQUIREMENTS

Retain paragraphs below to suit Project or delete if not applicable.

* + - * 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
        2. Comply with standards of authorities having jurisdiction for domestic water-service piping, including materials, installation, testing, and disinfection.
        3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
        4. Piping materials to bear label, stamp, or other markings of specified testing agency.
        5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
        6. Comply with ASTM F645 for selection, design, and installation of thermoplastic water piping.
        7. Comply with FM Approvals' "Approval Guide" and/or UL's "Fire Protection Equipment Directory" for fire-suppression water-service products.
        8. Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

The U.S. Safe Drinking Water Act (SDWA) has required national compliance with less than or equal to 0.25 percent weighted average lead content at wetted surfaces for pipe, fittings, and devices intended to convey or dispense water for human consumption since January 2014. The IPC and the UPC have the same requirements. Items in compliance with NSF 61/NSF 372 also meet this requirement. Some manufacturers choose to meet this requirement through independent testing and have "Certified Lead Free" products, which may or may not have NSF 61/NSF 372 certification.

* + - * 1. All piping and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61/NSF 372 or are certified in compliance with NSF 61/NSF 372 by an ANSI-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.
      1. PIPING MATERIALS
         1. Comply with requirements in "Piping Applications" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and service sizes.
         2. Potable-water piping and components comply with NSF 14, NSF 61, and NSF 372.[ **Include marking "NSF-pw" on piping.**]
      2. PE PIPE AND FITTINGS
         1. PE, ASTM Pipe: ASTM D2239, SIDR No. 5.3, 7, or 9; with PE compound number required to give pressure rating not less than [**160 psig**] [**200 psig**].

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

Molded PE Fittings: ASTM D3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.

* + - * 1. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than [**160 psig**] [**200 psig**].

PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than [**160 psig**] [**200 psig**].

Retain "PE, Fire-Service Pipe" Paragraph below for fire-suppression water service. FM Global is approved in NPS 2 to NPS 24 (DN 50 to DN 600).

* + - * 1. PE, Fire-Service Pipe: ASTM F714, AWWA C906, or equivalent for PE water pipe; FM Global approved, with minimum thickness equivalent to FM Global [**Class 150**] [**and**] [**Class 200**].

Molded PE Fittings: ASTM D3350, PE resin, socket- or butt-fusion type, and made to match PE pipe dimensions and class.

* + - 1. PVC PIPE AND FITTINGS
         1. PVC, Schedule 40 Pipe: ASTM D1785.

PVC, Schedule 40 Socket Fittings: ASTM D2466.

* + - * 1. PVC, Schedule 80 Pipe: ASTM D1785.

PVC, Schedule 80 Socket Fittings: ASTM D2467.

PVC, Schedule 80 Threaded Fittings: ASTM D2464.

Retain "UL 1285" option in "PVC Pipe" Paragraph below for fire-suppression water service.

* + - * 1. PVC Pipe: [**AWWA C900**] [**UL 1285**], [**Class 150**] [**and**] [**Class 200**], with bell end with gasket, and with spigot end.

Retain first subparagraph below for fire-suppression water service.

Comply with UL 1285 for fire-suppression water service.

PVC Fabricated Fittings: AWWA C900, [**Class 150**] [**and**] [**Class 200**], with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

* + - 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. Other names for this product include Glass Reinforced Plastic (GRP) pipe and Fiberglass-Reinforced Plastic (FRP) pipe.

* + - * 1. RTRP Pipe: AWWA C950, [**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 FM Global approval if used for fire-service mains.**]

Retain "Fittings, RTRF, AWWA C950" or "Fittings" Paragraph below. Verify size availability.

* + - * 1. Fittings, RTRF, AWWA C950: Similar to pipe in material, pressure class, and joining method.
        2. Fittings: Compatible with pipe size, pressure class, and joining method.
      1. PIPING JOINING MATERIALS
         1. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series.
         2. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.
         3. Gaskets for Ferrous Piping and Copper-Alloy Tubing: ASME B16.21, asbestos free.
         4. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.
      2. ENCASEMENT FOR PIPING

Authorities having jurisdiction may not permit direct burial of fire-suppression water-service piping. If allowed by authorities having jurisdiction, consider installing piping in PVC conduit.

* + - * 1. Standards: ASTM A674 or AWWA C105/A21.5.
        2. Form: [**Sheet**] [**or**] [**tube**].
        3. Material: [**Linear low-density PE film of 0.008-inch** **minimum thickness**] [**or**] [**high-density, cross-laminated PE film of 0.004-inch** **minimum thickness**].
        4. Color: [**Black**] [**or**] [**natural**] <**Insert color**>.
      1. WATER METER BOXES
         1. Water Meter Boxes:

Retain one of three subparagraphs below.

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.

Retain "Option" Subparagraph below if permitted.

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

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.

Retain "Water Meter Boxes" Subparagraph below in walks or unpaved areas away from traffic; do not use in roadways.

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

* + - 1. BACKFLOW PREVENTERS

Copy "Backflow Preventer Test Kits" Paragraph below and edit for each type of backflow preventer test kit required.

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

Retain "Basis-of-Design Product" Subparagraph and list of manufacturers below to identify a specific product or a comparable product from manufacturers listed.

Basis-of-Design Product: Subject to compliance with requirements, provide **Zurn Industries, LLC; TG-5** or comparable product by one of the following:

<**Insert manufacturer's name**>

Source Limitations: Obtain backflow preventer test kits from single manufacturer.

* + - 1. CONCRETE VAULTS

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

* + - * 1. Concrete Vault - Precast, Reinforced Concrete: Designed for A-16 load designation in accordance with ASTM C857 and made in accordance with ASTM C858.

Ladder: ASTM A36/A36M, steel or PE-encased steel steps.

Manhole:

Retain one of first two subparagraphs below.

ASTM A48/A48M Class No. 35A minimum tensile strength, gray-iron traffic frame and cover; 24-inch minimum diameter unless otherwise indicated.

ASTM A536, Grade 60-40-18, ductile-iron traffic frame and cover: 24-inch minimum diameter unless otherwise indicated.

Drain: ASME A112.6.3, 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. ALARM DEVICES
         1. Alarm Devices: UL 753 and FM Global approved, of types and sizes to mate and match piping and equipment.

Devices in "Water-Flow Indicators," "Supervisory Switches," and "Pressure Switches" paragraphs below are usually located inside the building and are specified in Section 211000 "Water-Based Fire-Suppression Systems." Verify requirements with authorities having jurisdiction.

Devices in "Water-Flow Indicators" Paragraph 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 SPDT 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 "Supervisory Switches" Paragraph below mount on stem of OS&Y gate valves and on indicator posts.

* + - * 1. Supervisory Switches: SPDT; designed to signal valve in other than fully open position.

Devices in "Pressure Switches" Paragraph below mount on barrel of dry-barrel fire hydrants.

* + - * 1. Pressure Switches: SPDT; designed to signal increase in pressure.

1. EXECUTION
   * + 1. EARTHWORK
          1. Comply with excavating, trenching, and backfilling requirements in Section 312000 "Earth Moving."
       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.

Retain piping applications in this article. Coordinate with materials specified in Part 2.

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

Retain "any of" option in first 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**> to be[ **any of**] the following:

Water-service piping materials listed in subparagraphs below are for potable water. They may be unsuitable 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, RTRP, AWWA pipe, [**Class 150**] [**Class 200**] [**Class 250**]; RTRF, AWWA pipe; and bonded joints.

Fiberglass, RTRP, AWWA pipe [**Class 150**] [**Class 200**] [**Class 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 water-service piping [**NPS 4 to NPS 8**] <**Insert pipe size range**> to 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 (DN 100 and DN 150): NPS 6 PVC, AWWA Class 150 pipe; PVC, AWWA Class 150 [**fabricated**] [**or**] [**molded**] fittings; and gasketed joints.

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

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

Retain or delete "Water Meter Box Water-Service Piping" Paragraph below to suit Project.

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

Retain "any of" option in first 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**> to be[ **any of**] the following:

Water-service piping materials listed in subparagraphs below are for potable-water service. They may be unsuitable 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, RTRP, AWWA pipe [**Class 150**] [**Class 200**] [**Class 250**]; RTRF, AWWA pipe; and bonded joints.

Retain "any of" option in first 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**> to 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, RTRP, AWWA pipe [**Class 150**] [**Class 200**] [**Class 250**]; RTRF, AWWA pipe; 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**> to be[ **any of**] the following:

Fire-service-main piping materials listed in subparagraphs below are for fire-protection water service. They may be unsuitable for potable-water service.

Retain one or more of five 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**] [**Class 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, FM Global approved RTRP, [**Class 150**] [**Class 200**]; RTRF; and gasketed joints.

* + - * 1. Aboveground[ **and vault**] fire-service-main piping [**NPS 4 to NPS 12**] <**Insert pipe size range**> to be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

Retain "any of" option in first 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**> to 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**] [**Class 200**] pipe listed for fire-protection service; PVC fabricated or molded fittings of same class as pipe; and gasketed joints.

Fiberglass, AWWA, FM Global approved RTRP, [**Class 150**] [**Class 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**> to be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.
      1. VALVE APPLICATIONS
         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/FM Global, 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 "Underground Valves, NPS 3 (DN 80) and Larger" or "Underground Valves, NPS 4 (DN 100) and Larger, for Indicator Posts" Subparagraph below.

Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast-iron, nonrising-stem, [**metal**] [**resilient**] [**high-pressure, resilient**]-seated gate valves with valve box.

Underground Valves, NPS 4 (DN 100) and Larger, for Indicator Posts: UL/FM Global, cast-iron, nonrising-stem gate valves with indicator post.

Use the following for valves in vaults and aboveground:

Gate Valves, NPS 2 (DN 50) and Smaller: Bronze, [**nonrising**] [**rising**] stem.

Gate Valves, NPS 3 (DN 80) and Larger: [**AWWA, cast iron, OS&Y rising stem, metal seated**] [**AWWA, cast iron, OS&Y rising stem, resilient seated**] [**UL/FM Global, cast iron, OS&Y rising stem**].

Check Valves: [**AWWA C508**] [**UL/FM Global**], 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 SYSTEMS - COMMON REQUIREMENTS
         1. Comply with Section 330500 "Common Work Results for Utilities" for piping-system common requirements.

Retain paragraph below when nonmetallic pipe is included in Project.

* + - * 1. Provide a continuous bare copper or aluminum tracer wire not less than 0.10 inch in diameter in sufficient length over each separate run of nonmetallic pipe.
      1. INSTALLATION OF PIPING
         1. Water-Main Connection:

Retain one of two subparagraphs below. Retain first subparagraph if tap is made by utility company; retain second if tap is made by Contractor.

Arrange with utility company for tap of size and in location indicated in water main.

Tap water main in accordance with requirements of water utility company and of size and in location indicated.

Retain first paragraph 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 in accordance with MSS SP-60.

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. Install valve with stem pointing up and with valve box.

Retain first paragraph 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 in accordance with ASTM A674 or AWWA C105/A21.5.

Install copper tube and fittings in accordance with CDA's "Copper Tube Handbook."

* + - * 1. Install ductile-iron, water-service piping in accordance with AWWA C600 and AWWA M41.

Delete subparagraph below if not required.

Install PE corrosion-protection encasement in accordance with ASTM A674 or AWWA C105/A21.5.

* + - * 1. Install PE pipe in accordance with ASTM D2774 and ASTM F645.
        2. Install PVC, AWWA pipe in accordance with ASTM F645 and AWWA M23.
        3. Install fiberglass AWWA pipe in accordance with AWWA M45.

Revise first paragraph 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**> of cover over top.

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

In Loose Gravelly Soil and Rock: With at least [**12 inches**] <**Insert dimension**> of 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**] [**and**] [**fire-suppression water-service**] piping and connect to water-supply source and building [**water-piping**] [**and**] [**fire-suppression piping**] systems at outside face of building wall in locations and pipe sizes indicated.

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

* + - * 1. Sleeves are specified in [**Section 210500 "Common Work Results for Fire Suppression"**] [**and**] [**Section 220500 "Common Work Results for Plumbing."**]
        2. Mechanical sleeve seals are specified in [**Section 210500 "Common Work Results for Fire Suppression"**] [**and**] [**Section 220500 "Common Work Results for Plumbing."**]

Retain first paragraph below for piping that penetrates an exterior concrete wall or concrete slab.

* + - * 1. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in [**Section 210500 "Common Work Results for Fire Suppression"**] [**and**] [**Section 220500 "Common Work Results for Plumbing."**]

Retain and revise 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. Comply with Section 211000 "Water-Based Fire-Suppression Systems" for fire-suppression-water piping inside the building.
        3. Comply with 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 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment"**] [**and**] [**Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."**]
        2. Comply with requirements for hangers, supports, and anchor devices specified in [**Section 210529 "Hangers and Supports for Fire-Suppression Piping and Equipment"**] [**and**] [**Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."**]
        3. Install the following pipe attachments:

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

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

Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 ft. 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 SP-58, 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 SP-58, 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. Comply with Section 330500 "Common Work Results for Utilities" for basic piping joint construction.
         2. 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 and AWWA M41.

Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

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

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

PVC Piping Gasketed Joints: Use joining materials in accordance with AWWA C900. Construct joints with elastomeric seals and lubricant in accordance with ASTM D2774 or ASTM D3139 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:

Dielectric [**nipples**] [**unions**] for [**NPS 2**] <**Insert pipe size**> and smaller.

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

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

* + - 1. INSTALLATION OF ANCHORAGE

Delete this article if anchorages are not required.

* + - * 1. Anchorage: 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: In accordance with AWWA C600.

Gasketed-Joint, PVC Water-Service Piping: In accordance with AWWA M23.

Bonded-Joint Fiberglass, Water-Service Piping: In accordance with AWWA M45.

Fire-Service-Main Piping: In accordance with NFPA 24.

* + - * 1. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.
      1. INSTALLATION OF VALVES
         1. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
         2. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.
         3. UL-Listed or FM Global-Approved Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
         4. UL-Listed or FM Global-Approved Valves Other Than Gate Valves: Comply with NFPA 24.
         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. Install aboveground with shutoff valve on inlet.
         9. Comply with requirements for concrete piers in Section 033000 "Cast-in-Place Concrete" for support of valves and piping not direct buried.
      2. INSTALLATION OF DETECTOR-CHECK VALVES
         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. Comply with requirements of concrete piers in Section 033000 "Cast-in-Place Concrete."
      3. INSTALLATION OF WATER METERS

Delete this article if utility company provides water meters.

* + - * 1. Install water meters, piping, and specialties in accordance with utility company's written instructions.
        2. Water Meters:

Retain one or more of three subparagraphs below.

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.

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.

Install detector-type water meters in meter vault in accordance with AWWA M6. Include shutoff valves on water meter inlets and outlets and full-size valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

* + - * 1. Support water meters and piping NPS 3 and larger on concrete piers. Comply with requirements for concrete piers in Section 033000 "Cast-in-Place Concrete."
      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 in accordance with utility company's written instructions.
      1. INSTALLATION OF VACUUM BREAKER ASSEMBLIES
         1. Install pressure vacuum breaker assemblies of type, size, and capacity indicated. Include valves and test cocks. Install in accordance with 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. INSTALLATION OF BACKFLOW PREVENTERS

Backflow preventers should not be installed in vaults or enclosures. If required by Project, provide a floor drain or direct discharge out of the vault or enclosure of sufficient size to dispose of the relief valve discharge in a safe manner.

* + - * 1. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install in accordance with 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. INSTALLATION OF WATER METER BOXES
         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. INSTALLATION OF CONCRETE VAULTS
         1. Install precast concrete vaults in accordance with ASTM C891.
      3. INSTALLATION OF PROTECTIVE ENCLOSURES
         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. INSTALLATION OF FIRE HYDRANTS
         1. 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.
         4. UL/FM Global Fire Hydrants: Comply with NFPA 24.
      5. INSTALLATION OF FLUSHING HYDRANTS
         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. INSTALLATION OF FIRE DEPARTMENT CONNECTIONS
         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**] <**Insert arrangement**> each fire department connection. Pipe bollards are specified in Section 055000 "Metal Fabrications."
      7. INSTALLATION OF ALARM DEVICES

Delete this article if fire-suppression water service is not being installed.

Delete this article if alarm devices are specified in Section 211000 "Water-Based Fire-Suppression Systems."

* + - * 1. Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.

Retain "Supervisory Switches" or "Locking and Sealing" Paragraph below as required by authorities having jurisdiction.

* + - * 1. 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.

* + - * 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.
        3. Connect alarm devices to building fire-alarm system. Wiring and fire-alarm devices are specified in [**Section 284600 "Fire Detection and Alarm."**] [**Section 284614 "Single- and Multiple-Station Alarms."**] [**Section 284600 "Fire Detection and Alarm" and Section 284614 "Single- and Multiple-Station Alarms."**]
      1. CONNECTIONS

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

* + - * 1. See Section 330500 "Common Work Results for Utilities" for piping connections to valves and equipment.
        2. 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**>.
        3. Connect water-distribution piping to interior [**domestic water**] [**and**] [**fire-suppression**] piping.
        4. Connect waste piping from concrete vault drains to [**sanitary sewerage system. See Section 333115 "Site Sanitary Sewerage Piping" for connection to sanitary-sewer**] [**storm-drainage system. See Section 334400 "Storm Utility Drainage Piping" for connection to storm-sewer**] piping.
        5. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
        6. Connect wiring in accordance with 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 one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one 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. Underground warning tapes are specified in Section 312000 "Earth Moving."

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. See Section 330500 "Common Work Results for Utilities" for identifying devices.
      1. CLEANING

Revise 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 first 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 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

Delete last subparagraph above and retain subparagraph 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 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 three 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 331415