

SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Mechanical sleeve seals.
 - 3. Sleeves.
 - 4. Escutcheons.
 - 5. Grout.
 - 6. Fire-suppression equipment and piping demolition.
 - 7. Equipment installation requirements common to equipment sections.
 - 8. Painting and finishing.
 - 9. Concrete bases.
 - 10. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. CPVC: Chlorinated polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Mechanical sleeve seals.
2. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes 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.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for fire-suppression installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

- C. Coordinate requirements for access panels and doors for fire-suppression items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 21 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAgl, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining CPVC Plastic Piping: ASTM F 493.

2.4 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. [Available]Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: [EPDM] [NBR] interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 3. Pressure Plates: **Plastic, Carbon steel, Stainless steel.** Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: **Carbon steel with corrosion-resistant coating** of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.

- G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: **Polished chrome-plated and rough brass.**
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: **Polished chrome-plated.**
- E. One-Piece, Stamped-Steel Type: With [set screw] [spring clips] [set screw or spring clips] and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With [concealed] [exposed-rivet] hinge, [set screw] [spring clips] [set screw or spring clips], and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.7 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 FIRE-SUPPRESSION DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

- B. Disconnect, demolish, and remove fire-suppression systems, equipment, and components indicated to be removed.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 21 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.

- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: **One-piece**, cast-brass type with polished chrome-plated finish.
 - g. Bare Piping at Ceiling Penetrations in Finished Spaces: **One-piece, stamped-steel type** and set screw.
 - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with **polished chrome-plated, rough-brass** finish.
 - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with **concealed hinge and set screw or spring clips**.
 - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
 - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with **set screw**.
 - l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
- M. Sleeves are not required for core-drilled holes.
- N. Permanent sleeves are not required for holes formed by removable PE sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 3. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. **Steel Pipe Sleeves:** For pipes smaller than NPS 6 (DN 150).
 - b. **Steel Sheet Sleeves:** For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.

- c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
 - 1) Seal space outside of sleeve fittings with grout.
 - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
 - Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.
 - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
 - R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
 - S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
 - T. Verify final equipment locations for roughing-in.
 - U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- 3.3 PIPING JOINT CONSTRUCTION
- A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.
 - B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

3.4 PAINTING

- A. Painting of fire-suppression systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use **3000-psi (20.7-MPa)**, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Sections "**Cast-in-Place Concrete, Miscellaneous Cast-in-Place Concrete.**"

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor fire-suppression materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.8 GROUTING

- A. Mix and install grout for fire-suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.

- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 210500

SECTION 210517 - SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Stack-sleeve fittings.
 - 3. Sleeve-seal systems.
 - 4. Sleeve-seal fittings.
 - 5. Grout.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

- G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **product indicated on Drawings** or comparable product by one of the following:
1. Smith, Jay R. Mfg. Co.
 2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
- C. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **[product indicated on Drawings] <Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
1. Advance Products & Systems, Inc.
 2. CALPICO, Inc.
 3. Metraflex Company (The).
 4. Pipeline Seal and Insulator, Inc.
 5. Proco Products, Inc.
 6. **<Insert manufacturer's name>**.
- C. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
1. Sealing Elements: **EPDM-rubber** interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 2. Pressure Plates: **Carbon steel Stainless steel**.
 3. Connecting Bolts and Nuts: **Carbon steel, with corrosion-resistant coating**, of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

- A. Manufacturers: Subject to compliance with requirements, **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **product indicated on Drawings** or comparable product by one of the following:
 - 1. Presealed Systems.
- C. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide **1-inch (25-mm)** annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 - 2. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas [**2 inches (50 mm)**] **<Insert dimension>** above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
1. Install fittings that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Division 07 Section "Sheet Metal Flashing and Trim."
 3. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level.
 4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 5. Using grout, seal the space around outside of stack-sleeve fittings.
- B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than **NPS 6 (DN 150)** or as indicated on Drawings: **Cast-iron wall sleeves.**
 - b. Piping **NPS 6 (DN 150)** or as indicated on Drawings: **Cast-iron wall sleeves.**
 - 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller Than **[NPS 6 (DN 150)] <Insert pipe size>: [Cast-iron wall sleeves with sleeve-seal system].**
 - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping **NPS 6 (DN 150)** or as indicated on Drawings and Larger: **Cast-iron wall sleeves with sleeve-seal system.**
 - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than **NPS 6 (DN 150) <Insert pipe size>: Cast-iron wall sleeves with sleeve-seal system.**
 - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping **[NPS 6 (DN 150)]** or as indicated and Larger: **[Cast-iron wall sleeves with sleeve-seal system] [Galvanized-steel wall sleeves with sleeve-seal system] [Galvanized-steel-pipe sleeves with sleeve-seal system] [Galvanized-steel-pipe sleeves] <Insert material>.**

- 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
4. Concrete Slabs above Grade:
- a. Piping Smaller Than **[NPS 6 (DN 150)]** or as indicated: **[Galvanized-steel-pipe sleeves] [PVC-pipe sleeves] [Stack-sleeve fittings] [Sleeve-seal fittings] [Molded-PE or -PP sleeves] [Molded-PVC sleeves] <Insert material>.**
 - b. Piping **[NPS 6 (DN 150)] <Insert pipe size>** and Larger: **[Galvanized-steel-pipe sleeves] [PVC-pipe sleeves] [Stack-sleeve fittings] <Insert material>.**
5. Interior Partitions:
- a. Piping Smaller Than **[NPS 6 (DN 150)]** or as indicated: **Galvanized-steel-pipe sleeves.**
 - b. Piping **[NPS 6 (DN 150)]** or as indicated and Larger: **Galvanized-steel-sheet sleeves.**

END OF SECTION 210517

SECTION 210518 - ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With **polished, chrome-plated** finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- D. Split-Casting Brass Type: With **polished, chrome-plated** finish and with concealed hinge and setscrew.
- E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, [**concealed**] [**and**] [**exposed-rivet**] hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange[**with holes for fasteners**].
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass[**or split-casting brass**] type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type **or split-plate, stamped-steel type with concealed hinge**.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass[**or split-casting brass**] type with polished, chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type[**or split-plate, stamped-steel type with concealed hinge**] [**or split-plate, stamped-steel type with exposed-rivet hinge**].
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass[**or split-casting brass**] type with polished, chrome-plated finish.
 - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type[**or split-plate, stamped-steel type with concealed hinge**].
 - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass **or split-casting brass** type with **polished, chrome-plated** finish.
 - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type **or split-plate, stamped-steel type with concealed hinge**.
 - j. Bare Piping in Equipment Rooms: One-piece, cast-brass **or split-casting brass** type with **polished, chrome-plated** finish.
 - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type **or split-plate, stamped-steel type with concealed hinge**.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 210518

SECTION 211100 - FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes fire-suppression water-service piping and related components outside the building **and service entrance piping through floor into the building.**
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.
- C. Related Sections:
 - 1. Division 21 Section "Fire-Suppression Standpipes" for fire-suppression standpipes inside the building.
 - 2. Division 21 Section "Wet-Pipe Sprinkler Systems" for wet-pipe fire-suppression sprinkler systems inside the building.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. 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.
- D. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:

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 fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with the "Approval Guide," published by FM Global, or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
1. Ensure that valves are dry and internally protected against rust and corrosion.
 2. Protect valves against damage to threaded ends and flange faces.
 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 2. 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.
- C. 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.
- D. 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.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.6 PROJECT CONDITIONS – NOT USED

1.7 COORDINATION

- A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: **ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B)**, water tube, annealed temper.
- B. Hard Copper Tube: **ASTM B 88, Type K (ASTM B 88M, Type A and ASTM B 88, Type L (ASTM B 88M, Type B)**, water tube, drawn temper.
- C. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- D. Copper, Pressure-Seal Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Viega; Plumbing & Heating Systems.
 - 2. Standard: UL 213.
 - 3. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
 - 4. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
- F. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.2 DUCTILE-IRON PIPE AND FITTINGS

- A. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.
- B. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end.
- C. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end.

D. Grooved-End, Ductile-Iron Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Anvil International, Inc.
 - b. Shurjoint Piping Products.
 - c. Star Pipe Products.
 - d. Victaulic Company.
2. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
3. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

E. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

1. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

F. Push-on-Joint, Ductile-Iron Fittings: AWWA C153, ductile-iron compact pattern.

1. Gaskets: AWWA C111, rubber.

G. Flanges: ASME B16.1, Class 125, cast iron.

2.3 PE PIPE AND FITTINGS

- A. PE, Fire-Service Pipe: FM Global approved, with minimum thickness equivalent to **Class 150 and Class 200**.
- B. Molded PE Fittings: FM Global approved; PE butt-fusion type, made to match PE pipe dimensions and class.

2.4 PVC PIPE AND FITTINGS – NOT USED

2.5 FIBERGLASS PIPE AND FITTINGS – NOT USED

2.6 SPECIAL PIPE FITTINGS

A. Ductile-Iron Flexible Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**

- a. EBAA Iron, Inc.
 - b. ROMAC Industries Inc.
 - c. Star Pipe Products.
2. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 3. Pressure Rating: 250 psig (1725 kPa) minimum.

B. Ductile-Iron Deflection Fittings:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. EBAA Iron, Inc.
2. Description: Compound, ductile-iron coupling fitting with sleeve and one or two flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
3. Pressure Rating: 250 psig (1725 kPa) minimum.

2.7 ENCASEMENT FOR PIPING

- A. Standard: ASTM A 674 or AWWA C105.
- B. Material: **Linear low-density PE film of 0.008-inch (0.20-mm) or High-density, cross-laminated PE film of 0.004-inch (0.10-mm)** minimum thickness.
- C. Form: **Sheet or tube.**
- D. Color: **Black or natural.**

2.8 JOINING MATERIALS

- A. Gaskets for Ferrous Piping and Copper-Alloy Tubing: ASME B16.21, asbestos free.
- B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series.
- C. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.

2.9 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Cascade Waterworks Manufacturing.
 - b. Dresser, Inc.; Dresser Piping Specialties.
 - c. Ford Meter Box Company, Inc. (The); Pipe Products Division.
 - d. JCM Industries.
 - e. ROMAC Industries Inc.
 - f. Smith-Blair, Inc.; a Sensus company.
 - g. Viking Johnson.
2. 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.
3. Standard: AWWA C219.
4. Center-Sleeve Material: **Manufacturer's standard.**
5. Gasket Material: Natural or synthetic rubber.
6. Pressure Rating: **150 psig (1035 kPa)** minimum.
7. Metal Component Finish: Corrosion-resistant coating or material.

2.10 CORPORATION VALVES AND CURB VALVES – NOT USED

2.11 GATE VALVES

A. AWWA Gate Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. American AVK Company; Valves & Fittings Division.
 - b. American Cast Iron Pipe Company; American Flow Control Division.
 - c. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - d. American R/D.
 - e. Clow Valve Company; a division of McWane, Inc.
 - f. Crane Co.; Crane Valve Group; Stockham Division.
 - g. East Jordan Iron Works, Inc.
 - h. Kennedy Valve; a division of McWane, Inc.
 - i. M&H Valve Company; a division of McWane, Inc.
 - j. Mueller Co.; Water Products Division.
 - k. NIBCO INC.
 - l. Tyler Pipe; a division of McWane, Inc.; Utilities Division.
 - m. U.S. Pipe.
2. 200-psig (1380-kPa), AWWA, Iron, Nonrising-Stem, Metal-Seated Gate Valves:

- a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.
 - b. Standard: AWWA C500.
 - c. Pressure Rating: 200 psig (1380 kPa).
 - d. End Connections: Mechanical joint.
 - e. Interior Coating: Complying with AWWA C550.
3. 200-psig (1380-kPa), AWWA, Iron, Nonrising-Stem, Resilient-Seated Gate Valves:
 - a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
 - b. Standard: AWWA C509.
 - c. Pressure Rating: 200 psig (1380 kPa).
 - d. End Connections: Mechanical or push-on joint.
 - e. Interior Coating: Complying with AWWA C550.
4. 250-psig (1725-kPa), AWWA, Iron, Nonrising-Stem, Resilient-Seated Gate Valves:
 - a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.
 - b. Standard: AWWA C509.
 - c. Pressure Rating: 250 psig (1725 kPa).
 - d. End Connections: Mechanical or push-on joint.
 - e. Interior Coating: Complying with AWWA C550.
5. 200-psig (1380-kPa), AWWA, Iron, OS&Y, Metal-Seated Gate Valves:
 - a. Description: Cast- or ductile-iron body and bonnet; with cast-iron double disc, bronze disc and seat rings, and bronze stem.
 - b. Standard: AWWA C500.
 - c. Pressure Rating: 200 psig (1380 kPa).
 - d. End Connections: Flanged or grooved.
6. 200-psig (1380-kPa), AWWA, Iron, OS&Y, Resilient-Seated Gate Valves:
 - a. Description: Cast- or ductile-iron body and bonnet; with bronze, gray-iron, or ductile-iron gate; resilient seats; and bronze stem.
 - b. Standard: AWWA C509.
 - c. Pressure Rating: 200 psig (1380 kPa).
 - d. End Connections: Flanged or grooved.
7. 250-psig (1725-kPa), AWWA, Iron, OS&Y, Resilient-Seated Gate Valves:
 - a. Description: Cast- or ductile-iron body and bonnet; with bronze, gray-iron, or ductile-iron gate; resilient seats; and bronze stem.
 - b. Standard: AWWA C509.
 - c. Pressure Rating: 200 psig (1380 kPa).
 - d. End Connections: Flanged or grooved.
8. Class 125, Bronze, Nonrising-Stem Gate Valves:

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- a. Description: Class 125, Type 1; bronze with solid wedge and malleable-iron handwheel.
- b. Standard: MSS SP-80.
- c. Pressure Rating: 200 psig (1380 kPa).
- d. End Connections: Solder joint or threaded.

B. UL-Listed or FM-Approved Gate Valves:

- 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. American AVK Company; Valve & Fittings Division.
 - b. American Cast Iron Pipe Company; American Flow Control Division.
 - c. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - d. Clow Valve Company; a division of McWane, Inc.
 - e. Crane Co.; Crane Valve Group; Jenkins Valves.
 - f. Crane Co.; Crane Valve Group; Stockham Division.
 - g. East Jordan Iron Works, Inc.
 - h. Hammond Valve.
 - i. Kennedy Valve; a division of McWane, Inc.
 - j. M&H Valve Company; a division of McWane, Inc.
 - k. Milwaukee Valve Company.
 - l. Mueller Co.; Water Products Division.
 - m. NIBCO INC.
 - n. Shurjoint Piping Products.
 - o. Troy Valve; a division of Penn-Troy Manufacturing, Inc.
 - p. Tyco Fire & Building Products LP.
 - q. United Brass Works, Inc.
 - r. U.S. Pipe.
 - s. Watts Water Technologies, Inc.
- 2. 175-psig (1200-kPa), UL-Listed or FM-Approved, Iron, Nonrising-Stem Gate Valves:
 - a. Description: Iron body and bonnet, bronze seating material, and inside screw.
 - b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
 - c. Pressure Rating: 175 psig (1200) minimum.
 - d. End Connections: Mechanical or push-on joint.
 - e. Indicator-Post Flange: Include on valves used with indicator posts.
- 3. 250-psig (1725-kPa), UL-Listed or FM-Approved, Iron, Nonrising-Stem Gate Valves:
 - a. Description: Iron body and bonnet, bronze seating material, and inside screw.
 - b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
 - c. Pressure Rating: 250 psig (1725 kPa) minimum.
 - d. End Connections: Mechanical or push-on joint.
 - e. Indicator-Post Flange: Include on valves used with indicator posts.
- 4. 175-psig (1200-kPa), UL-Listed or FM-Approved, Iron, OS&Y, Gate Valves:
 - a. Description: Iron body and bonnet and bronze seating material.

- b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
 - c. Pressure Rating: 175 psig (1200 kPa) minimum.
 - d. End Connections: Flanged or grooved.
5. 250-psig (1725-kPa), UL-Listed or FM-Approved, Iron, OS&Y Gate Valves:
- a. Description: Iron body and bonnet and bronze seating material.
 - b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
 - c. Pressure Rating: 250 psig (1725 kPa) minimum.
 - d. End Connections: Flanged or grooved.
6. UL-Listed or FM-Approved, OS&Y Bronze, Gate Valves:
- a. Manufacturers: Subject to compliance with requirements, **[provide products by one of the following:**
 - 1) Crane Co.; Crane Valve Group; Crane Valves.
 - 2) Crane Co.; Crane Valve Group; Stockham Division.
 - 3) Milwaukee Valve Company.
 - 4) NIBCO INC.
 - 5) United Brass Works, Inc.
 - b. Description: Bronze body and bonnet and bronze stem.
 - c. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
 - d. Pressure Rating: 175 psig (1200 kPa) minimum.
 - e. End Connections: Threaded.

2.12 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

- 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation** or comparable product by one of the following:
 - a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - b. Clow Valve Company; a division of McWane, Inc.
 - c. East Jordan Iron Works, Inc.
 - d. Flowserve.
 - e. Kennedy Valve; a division of McWane, Inc.
 - f. M&H Valve Company; a division of McWane, Inc.
 - g. Mueller Co.; Water Products Division.
 - h. U.S. Pipe.
- 3. Description: Sleeve and valve compatible with drilling machine.
- 4. Standard: MSS SP-60.

5. Tapping Sleeve: Cast-iron, ductile-iron, or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Sleeve shall match size and type of pipe material being tapped and have recessed flange for branch valve.
6. Valve: AWWA, cast-iron, nonrising-stem, [metal] [resilient]-seated gate valve with one raised-face flange mating tapping-sleeve flange.

2.13 BUTTERFLY VALVES

A. AWWA Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. DeZurik/Copes-Vulcan; a unit of SPX Corporation.
 - b. Milliken Valve Company.
 - c. Mosser Valve; a division of Olson Technologies, Inc.
 - d. Mueller Co.; Water Products Division.
 - e. Pratt, Henry Company.
 - f. Val-Matic Valve & Manufacturing Corp.
2. Description: Rubber seated.
3. Standard: AWWA C504.
4. Body Material: Cast or ductile iron.
5. Body Type: **Wafer or flanged.**
6. Pressure Rating: 150 psig (1035 kPa).

B. UL Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **Insert manufacturer's name; product name or designation** or comparable product by one of the following:
 - a. Kennedy Valve; a division of McWane, Inc.
 - b. Milwaukee Valve Company.
 - c. Mueller Co.; Water Products Division.
 - d. NIBCO INC.
 - e. Pratt, Henry Company.
3. Description: Metal on resilient material seating.
4. Standards: UL 1091 and "Approval Guide," published by FM Global, listing.
5. Body Material: Cast or ductile iron.
6. Body Type: **Wafer or flanged.**
7. Pressure Rating: 175 psig (1200 kPa).

2.14 CHECK VALVES

A. AWWA Check Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. American AVK Company; Valves & Fittings Division.
 - b. American Cast Iron Pipe Company; American Flow Control Division.
 - c. APCO Willamette Valve and Primer Corporation.
 - d. Clow Valve Company; a division of McWane, Inc.
 - e. Crane Co.; Crane Valve Group; Crane Valves.
 - f. Crane Co.; Crane Valve Group; Stockham Division.
 - g. Kennedy Valve; a division of McWane, Inc.
 - h. M&H Valve Company; a division of McWane, Inc.
 - i. Mueller Co.; Water Products Division.
 - j. NIBCO INC.
 - k. Watts Water Technologies, Inc.
2. Description: Swing-check type with resilient seat; with interior coating according to AWWA C550 and ends to match piping.
3. Standard: AWWA C508.
4. Pressure Rating: 175 psig (1200 kPa).

B. UL-Listed or FM-Approved Check Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - b. Clow Valve Company; a division of McWane, Inc.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Globe Fire Sprinkler Corporation.
 - e. Kennedy Valve; a division of McWane, Inc.
 - f. Kidde Fire Fighting.
 - g. Matco-Norca.
 - h. Mueller Co.; Water Products Division.
 - i. NIBCO INC.
 - j. Reliable Automatic Sprinkler Co., Inc.
 - k. Tyco Fire & Building Products LP.
 - l. United Brass Works, Inc.
 - m. Victaulic Company.
 - n. Viking Corporation.
 - o. Watts Water Technologies, Inc.
2. Description: Swing-check type with pressure rating, rubber-face checks unless otherwise indicated, and ends matching piping.
3. Standards: UL 312 and "Approval Guide," published by FM Global, listing.
4. Pressure Rating: **175 psig (1200 kPa).**

2.15 DETECTOR CHECK VALVES

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation** or comparable product by one of the following:
 - 1. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.
 - 2. Badger Meter, Inc.
 - 3. FEBCO; SPX Valves & Controls.
 - 4. Globe Fire Sprinkler Corporation.
 - 5. Kennedy Valve; a division of McWane, Inc.
 - 6. Mueller Co.; Hersey Meters Division.
 - 7. Victaulic Company.
 - 8. Viking Corporation.
 - 9. Watts Water Technologies, Inc.
- C. 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.
- D. Standards: UL 312 and "Approval Guide," published by FM Global, listing.
- E. Pressure Rating: 175 psig (1200 kPa).
- F. Water Meter: AWWA C700, disc type, at least one-fourth size of detector check valve. Include meter, bypass piping, gate valves, check valve, and connections to detector check valve.

2.16 WATER METERS

- A. Water meters will be furnished by utility company.
- B. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - 1. AMCO Water Metering Systems.
 - 2. Badger Meter, Inc.
 - 3. Carlon Meter.
 - 4. Hays Fluid Controls.
 - 5. McCrometer.
 - 6. Mueller Co.; Hersey Meters Division.
 - 7. Neptune Technology Group Inc.
 - 8. Sensus Metering Systems.
- C. Displacement-Type Water Meters:
 - 1. Description: With bronze main case.

2. Standard: AWWA C700.
3. Registration: Flow in **gallons (liters)**.

D. Turbine-Type Water Meters:

1. Standard: AWWA C701.
2. Registration: Flow in **gallons (liters)**.

E. Compound-Type Water Meters:

1. Standard: AWWA C702.
2. Registration: Flow in **gallons (liters)**.

F. Remote Registration System:

1. Description: Utility company's standard; direct-reading type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
2. Standard: AWWA C706.
3. Registration: Flow in **gallons (liters)** .

G. Remote Registration System:

1. Description: Utility company's standard; encoder type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
2. Standard: AWWA C707.
3. Registration: Flow in **gallons (liters)**.
4. Data-Acquisition Units: Comply with utility company's requirements for type and quantity.
5. Visible Display Units: Comply with utility company's requirements for type and quantity.

2.17 DETECTOR-TYPE WATER METERS

A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**]:

1. Badger Meter, Inc.
2. Mueller Co.; Hersey Meters Division.
3. Neptune Technology Group Inc.
4. Sensus Metering Systems.

B. AWWA, Detector Check Water Meters:

1. Description: Main line, turbine meter with second meter on bypass.
2. Standard: AWWA C703.
3. Registration: Flow in **gallons (liters)**.
4. Pressure Rating: 150 psig (1035 kPa).

5. Bypass Meter: [AWWA C701, turbine] [AWWA C702, compound]-type, bronze case.
 - a. Size: At least one-half nominal size of main-line meter.

C. Fire-Protection, Detector Check Water Meters:

1. Description: Main-line turbine meter with strainer and second meter on bypass.
2. Standards: UL's "Fire Protection Equipment Directory" listing and "Approval Guide," published by FM Global, listing.
3. Registration: Flow in **gallons (liters)**.
4. Pressure Rating: 175 psig (1200 kPa) minimum.
5. Bypass Meter: AWWA C701, turbine-type, bronze case.
 - a. Size: At least NPS 2 (DN 50).

D. Remote Registration System:

1. Description: Utility company's standard; direct-reading type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
2. Standard: AWWA C706.
3. Registration: Flow in [**gallons (liters)**] [**cubic feet (cubic meters)**].

E. Remote Registration System:

1. Description: Utility company's standard; encoder type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
2. Standard: AWWA C707.
3. Registration: Flow in **gallons (liters)**.
4. Data-Acquisition Units: Comply with utility company's requirements for type and quantity.
5. Visible Display Units: Comply with utility company's requirements for type and quantity.

2.18 PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. Cash Acme; a division of The Reliance Worldwide Corporation.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Honeywell Water Controls.
 - d. Watts Water Technologies, Inc.

- e. Zurn Plumbing Products Group; Wilkins Water Control Products Division.

2.19 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation** or comparable product by one of the following:
 - a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. FEBCO; SPX Valves & Controls.
 - d. Flomatic Corporation.
 - e. Watts Water Technologies, Inc.
 - f. Zurn Plumbing Products Group; Wilkins Water Control Products Division.
3. Standard: **ASSE 1013 or AWWA C511.**
4. Operation: Continuous-pressure applications.
5. Pressure Loss: **12 psig (83 kPa)** maximum, through middle one-third of flow range.
6. Size: **<Insert NPS (DN)>.**
7. Design Flow Rate: **<Insert gpm (L/s)>.**
8. Selected Unit Flow Range Limits: **<Insert gpm (L/s)>.**
9. Pressure Loss at Design Flow Rate: **<Insert psig (kPa)>** for NPS 2 (DN 50) and smaller; **<Insert psig (kPa)>** for NPS 2-1/2 (DN 65) and larger.
10. Body Material: Bronze for NPS 2 (DN 50) 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 (DN 65) and larger.
11. End Connections: Threaded for NPS 2 (DN 50) and smaller; **[flanged] <Insert type>** for NPS 2-1/2 (DN 65) and larger.
12. Configuration: Designed for **[horizontal, straight through] [vertical inlet, horizontal center section, and vertical outlet] [vertical] <Insert configuration>** flow.
13. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.

B. Double-Check, Backflow-Prevention Assemblies:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation** or comparable product by one of the following:
 - a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.

- b. Conbraco Industries, Inc.; Apollo Valves.
 - c. FEBCO; SPX Valves & Controls.
 - d. Flomatic Corporation.
 - e. Watts Water Technologies, Inc.
 - f. Zurn Plumbing Products Group; Wilkins Water Control Products Division.
- 3. Standard: **ASSE 1015 or AWWA C510**.
 - 4. Operation: Continuous-pressure applications unless otherwise indicated.
 - 5. Pressure Loss: [**5 psig (35 kPa)**] <Insert value> maximum, through middle one-third of flow range.
 - 6. Size: <Insert NPS (DN)>.
 - 7. Design Flow Rate: <Insert gpm (L/s)>.
 - 8. Selected Unit Flow Range Limits: <Insert gpm (L/s)>.
 - 9. Pressure Loss at Design Flow Rate: <Insert psig (kPa)> for NPS 2 (DN 50) and smaller; <Insert psig (kPa)> for NPS 2-1/2 (DN 65) and larger.
 - 10. Body Material: Bronze for NPS 2 (DN 50) 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 (DN 65) and larger.
 - 11. End Connections: Threaded for NPS 2 (DN 50) and smaller; [**flanged**] <Insert type> for NPS 2-1/2 (DN 65) and larger.
 - 12. Configuration: Designed for [**horizontal, straight through**] <Insert configuration> flow.
 - 13. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

C. Reduced-Pressure-Detector, Fire-Protection Backflow Preventer Assemblies:

- 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation** or comparable product by one of the following:
 - a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. FEBCO; SPX Valves & Controls.
 - d. Watts Water Technologies, Inc.
 - e. Zurn Plumbing Products Group; Wilkins Water Control Products Division.
- 3. Standards: ASSE 1047 and UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
- 4. Operation: Continuous-pressure applications.
- 5. Pressure Loss: [**12 psig (83 kPa)**] <Insert value> maximum, through middle one-third of flow range.
- 6. Size: <Insert NPS (DN)>.
- 7. Design Flow Rate: <Insert gpm (L/s)>.
- 8. Selected Unit Flow Range Limits: <Insert gpm (L/s)>.
- 9. Pressure Loss at Design Flow Rate: <Insert psig (kPa)>.

10. Body Material: **[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].**
 11. End Connections: Flanged.
 12. Configuration: Designed for **[horizontal, straight through] [vertical inlet, horizontal center section, and vertical outlet] [vertical] <Insert configuration> flow.**
 13. Accessories:
 - a. Valves: UL 262, "Approval Guide," published by FM Global, listing; OS&Y gate type with flanged ends on inlet and outlet.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.
 - c. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.
- D. Double-Check, Detector-Assembly Backflow Preventers:
1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation**> or comparable product by one of the following:
 - a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. FEBCO; SPX Valves & Controls.
 - d. Watts Water Technologies, Inc.
 - e. Zurn Plumbing Products Group; Wilkins Water Control Products Division.
 3. Standards: ASSE 1048 and UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 4. Operation: Continuous-pressure applications.
 5. Pressure Loss: **[5 psig (35 kPa)] <Insert value> maximum, through middle one-third of flow range.**
 6. Size: **<Insert NPS (DN)>.**
 7. Design Flow Rate: **<Insert gpm (L/s)>.**
 8. Selected Unit Flow Range Limits: **<Insert gpm (L/s)>.**
 9. Pressure Loss at Design Flow Rate: **<Insert psig (kPa)>.**
 10. Body Material: **[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].**
 11. End Connections: Flanged.
 12. Configuration: Designed for **[horizontal, straight through] [vertical inlet, horizontal center section, and vertical outlet] [vertical] <Insert configuration> flow.**
 13. Accessories:
 - a. Valves: UL 262, "Approval Guide," published by FM Global, listing, approved; OS&Y gate type with flanged ends on inlet and outlet.
 - b. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.
- E. Backflow Preventer Test Kits:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. FEBCO; SPX Valves & Controls.
 - c. Flomatic Corporation.
 - d. Watts Water Technologies, Inc.
 - e. Zurn Plumbing Products Group; Wilkins Water Control Products Division.
2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.20 WATER METER BOXES

- A. Description: Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" on cover; and with slotted, open-bottom base section of length to fit over service piping.
 1. Option: Base section may be cast-iron, PVC, clay, or other pipe.
- B. Description: Cast-iron body and double cover for disc-type water meter, with lettering "WATER METER" on top cover; and with separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.
- C. Description: Polymer-concrete body and cover for disc-type water meter, with lettering "WATER" on 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 (6 800 kg minimum over 254 by 254 mm) square.

2.21 CONCRETE VAULTS – NOT USED

2.22 PROTECTIVE ENCLOSURES – NOT USED

2.23 FIRE HYDRANTS – NOT USED

2.24 FIRE-DEPARTMENT CONNECTIONS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **product indicated on Drawings:**
 1. Elkhart Brass Mfg. Company, Inc.
 2. Fire-End & Croker Corporation.

3. Guardian Fire Equipment, Inc.
4. Kidde Fire Fighting.
5. Potter Roemer.
6. Reliable Automatic Sprinkler Co., Inc.

- C. Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 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- (460-mm-) high brass sleeve; and round escutcheon plate.
- D. Standard: UL 405.
- E. Connections: Two NPS 2-1/2 (DN 65) inlets and one **[NPS 4 (DN 100)] [NPS 6 (DN 150)]** outlet.
- F. Connections: **[Three] [Four]** NPS 2-1/2 (DN 65) inlets and one NPS 6 (DN 150) outlet.
- G. Connections: Six NPS 2-1/2 (DN 65) inlets and one **[NPS 6 (DN 150)] [NPS 8 (DN 200)]** outlet.
- H. Inlet Alignment: **[Inline, horizontal] [Square]**.
- I. Finish Including Sleeve: **[Polished chrome plated] [Rough chrome plated] [Polished bronze]**.
- J. Escutcheon Plate Marking: "**[AUTO SPKR] [&] [STANDPIPE]**."

2.25 ALARM DEVICES

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

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with excavating, trenching, and backfilling requirements in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with water utility company for tap of size and in location indicated in water main.
- B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- C. Make connections larger than NPS 2 (DN 50) with tapping machine according to the following:
 - 1. Install tapping sleeve and tapping valve according to MSS SP-60.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
 - 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- D. Make connections NPS 2 (DN 50) and smaller with drilling machine according to the following:
 - 1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company's standards.
 - 2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
 - 3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
 - 4. Install corporation valves into service-saddle assemblies.
 - 5. Install manifold for multiple taps in water main.
 - 6. Install curb valve in water-service piping with head pointing up and with service box.
- E. Comply with NFPA 24 for fire-service-main piping materials and installation.
- F. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
 - 1. Install encasement for tubing according to ASTM A 674 or AWWA C105.
- G. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
 - 1. Install encasement for piping according to ASTM A 674 or AWWA C105.
- H. Install PE pipe according to ASTM D 2774 and ASTM F 645.

- I. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.
- J. Install fiberglass AWWA pipe according to AWWA M45.
- K. Bury piping with depth of cover over top at least **[30 inches (750 mm)]** <Insert dimension>, with top at least **[12 inches (300 mm)]** <Insert dimension> below level of maximum frost penetration, and according to the following:
 - 1. Under Driveways: With at least **[36 inches (910 mm)]** <Insert dimension> of cover over top.
 - 2. Under Railroad Tracks: With at least **[48 inches (1220 mm)]** <Insert dimension> of cover over top.
 - 3. In Loose Gravelly Soil and Rock: With at least **[12 inches (300 mm)]** <Insert dimension> of additional cover.
- L. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- M. Extend fire-suppression water-service piping and connect to water-supply source and building fire-suppression water-service piping systems at locations and pipe sizes indicated.
 - 1. Terminate fire-suppression water-service piping at building **[floor slab]** **[wall]** until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building's fire-suppression water-service piping systems when those systems are installed.
- N. 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.
- O. Comply with requirements in Division 21 Sections for fire-suppression-water piping inside the building.
- P. Comply with requirements in Division 22 Section "Domestic Water Piping" for potable-water piping inside the building.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

3.3 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.

- B. Install unions adjacent to each valve in tubing NPS 2 (DN 50) and smaller.
- C. Install flanges, flange adaptors, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- D. Ream ends of tubes and remove burrs.
- E. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.
- F. Copper-Tubing, Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.
- G. Copper-Tubing, Pressure-Sealed Joints: Use proprietary crimping tool and procedure recommended by copper, pressure-seal-fitting manufacturer.
- H. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
- I. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts.
- J. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.
- K. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
- L. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139.
- M. Fiberglass Piping Bonded Joints: Use adhesive and procedure recommended by piping manufacturer.
- N. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.
- O. Do not use flanges or unions for underground piping.

3.4 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
 - 1. Concrete thrust blocks.
 - 2. Locking mechanical joints.
 - 3. Set-screw mechanical retainer glands.
 - 4. Bolted flanged joints.
 - 5. Heat-fused joints.
 - 6. Pipe clamps and tie rods.

7. <Insert devices>.

- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches in fire-suppression water-service piping according to NFPA 24 and the following:
 - 1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
 - 2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
 - 3. Bonded-Joint Fiberglass, Water-Service Piping: According to AWWA M45.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.5 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.
- C. UL-Listed or FM-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.
- D. UL-Listed or FM-Approved Valves Other Than Gate Valves: Comply with NFPA 24.
- E. MSS Valves: Install as component of connected piping system.
- F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.
- G. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves.[**Install full-size valved bypass.**]
- H. Support valves and piping, not direct buried, on concrete piers. Comply with requirements for concrete piers in Division 03 Section "[**Cast-in-Place Concrete**] [**Miscellaneous Cast-in-Place Concrete**]."

3.6 DETECTOR CHECK VALVE INSTALLATION

- A. Install in vault or aboveground.
- B. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.
- C. Support detector check valves and piping on concrete piers. Comply with requirements for concrete piers in Division 03 Section "[**Cast-in-Place Concrete**] [**Miscellaneous Cast-in-Place Concrete**]."

3.7 WATER METER INSTALLATION

- A. Install water meters, piping, and specialties according to utility company's written instructions.
- B. Water Meters: Install [**displacement**] [**turbine**]-type water meters NPS 2 (DN 50) and smaller in meter boxes with shutoff valves on water meter inlets. Include valves on water meter outlets, and include valved bypass around meters unless prohibited by authorities having jurisdiction.
- C. Water Meters: Install [**compound**] [**turbine**]-type water meters NPS 3 (DN 80) and larger in meter vaults. Include shutoff valves on water meter inlets and outlets, and include valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.
- D. Water Meters: Install detector-type water meters in meter vault according to AWWA M6. Include shutoff valves on water meter inlets and outlets, and include full-size valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.
- E. Support water meters and piping NPS 3 (DN 80) and larger on concrete piers. Comply with requirements for concrete piers in Division 03 Section "[**Cast-in-Place Concrete**] [**Miscellaneous Cast-in-Place Concrete**]."

3.8 ROUGHING-IN FOR WATER METERS

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

3.9 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow preventers.
- D. Support NPS 2-1/2 (DN 65) and larger backflow preventers and piping on concrete piers. Comply with requirements for concrete piers in Division 03 Section "[**Cast-in-Place Concrete**] [**Miscellaneous Cast-in-Place Concrete**]."

3.10 WATER METER BOX INSTALLATION

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

3.11 CONCRETE VAULT INSTALLATION

- A. Install precast concrete vaults according to ASTM C 891.

3.12 PROTECTIVE ENCLOSURE INSTALLATION

- A. Install concrete base level and with top approximately [**2 inches (50 mm)**] <Insert dimension> above grade.
- B. Install protective enclosure over valves and equipment.
- C. Anchor protective enclosure to concrete base.

3.13 FIRE HYDRANT INSTALLATION

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
- B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.
- C. AWWA Fire Hydrants: Comply with AWWA M17.
- D. UL-Listed or FM-Approved Fire Hydrants: Comply with NFPA 24.

3.14 FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Install ball drip valves at each check valve for fire-department connection to mains.
- B. Install protective pipe bollards [**on two sides of**] [**on three sides of**] <Insert arrangement> each fire-department connection. Pipe bollards are specified in Division 05 Section "Metal Fabrications."

3.15 ALARM DEVICE INSTALLATION

- A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.
- B. Supervisory Switches: Supervise valves in open position.
 - 1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
 - 2. 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.
- C. Locking and Sealing: Secure unsupervised valves as follows:

1. Valves: Install chain and padlock on open OS&Y gate valve.
 2. Post Indicators: Install padlock on wrench on indicator post.
- D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.
- E. 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.
- F. Connect alarm devices to building's fire-alarm system. Wiring and fire-alarm devices are specified in Division 28 Sections.

3.16 CONNECTIONS

- A. Connect fire-suppression water-service piping to **[utility water main] [existing water main] <Insert piping system>**. Use **[tapping sleeve and tapping valve] [service clamp and corporation valve] <Insert method>**.
- B. Connect fire-suppression water-service piping to interior fire-suppression piping.
- C. Connect waste piping from concrete vault drains to **[sanitary sewerage system. Comply with requirements in Division 22 Section "Facility Sanitary Sewers" for connection to sanitary sewer] [storm-drainage system. Comply with requirements in Division 33 Section "Storm Utility Drainage Piping" for connection to storm sewer]**.

3.17 FIELD QUALITY CONTROL

- A. Use test procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described below.
- B. 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.
- C. Hydrostatic Tests: Test at not less than one-and-one-half times the working pressure for two hours.
1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- D. Prepare test and inspection reports.

3.18 IDENTIFICATION

- A. Install continuous underground[**detectable**] warning tape during backfilling of trench for underground fire-suppression water-service piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."
- B. Permanently attach equipment nameplate or marker indicating plastic fire-suppression water-service piping or fire-suppression water-service piping with electrically insulated fittings, on main electrical meter panel. Comply with requirements for identifying devices in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.19 CLEANING

- A. Clean[**and disinfect**] fire-suppression water-service piping as follows:
 - 1. Purge new piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. 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.
 - 3. 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:
 - a. 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.
 - b. 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.
 - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging[**and disinfecting**] activities.

3.20 PIPING SCHEDULE

- A. Underground fire-suppression water-service piping [**NPS 2 (DN 50) and smaller**] <Insert pipe size range> shall be[**one of**] the following:
 - 1. [**Hard**] [**Soft**] copper tube, [**ASTM B 88, Type K (ASTM B 88M, Type A)**] [**ASTM B 88, Type L (ASTM B 88M, Type B)**]; [**wrought-copper, solder-joint fittings; and brazed**] [**copper, pressure-seal fittings; and pressure-sealed**] joints.
 - 2. NPS 2 (DN 50) PE, [**Class 150**] [**Class 200**], fire-service pipe; molded PE fittings; and heat-fusion joints.

- B. Underground fire-suppression water-service piping NPS 3 (DN 80) shall be **[one of]** the following:
1. **[Hard] [Soft]** copper tube, **[ASTM B 88, Type K (ASTM B 88M, Type A)] [ASTM B 88, Type L (ASTM B 88M, Type B)]**; **[wrought-copper, solder-joint fittings; and brazed] [copper, pressure-seal fittings; and pressure-sealed]** joints.
 2. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
 3. Mechanical-joint, ductile-iron pipe; mechanical-joint, **[ductile- or gray-iron, standard-pattern] [or] [ductile-iron, compact-pattern]** fittings; glands, gaskets, and bolts; and gasketed joints.
 4. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and gasketed joints.
 5. PE, **[Class 150] [Class 200]**, fire-service pipe; molded PE fittings; and heat-fusion joints.
- C. Underground fire-suppression water-service piping NPS 4 (DN 100) shall be **[one of]** the following:
1. **[Hard] [Soft]** copper tube, **[ASTM B 88, Type K (ASTM B 88M, Type A)] [ASTM B 88, Type L (ASTM B 88M, Type B)]**; **[wrought-copper, solder-joint fittings; and brazed] [copper, pressure-seal fittings; and pressure-sealed]** joints.
 2. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
 3. Mechanical-joint, ductile-iron pipe; mechanical-joint, **[ductile- or gray-iron, standard-pattern] [or] [ductile-iron, compact-pattern]** fittings; glands, gaskets, and bolts; and gasketed joints.
 4. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and gasketed joints.
 5. PE, **[Class 150] [Class 200]**, fire-service pipe; molded PE fittings; and heat-fusion joints.
 6. PVC, **[Class 150] [Class 200]** pipe listed for fire-protection service; PVC fittings of same class as pipe; and gasketed joints.
 7. Fiberglass, RTRP, **[Class 150] [Class 200]**; RTRF; and bonded joints.
- D. Underground fire-suppression water-service piping **[NPS 6 to NPS 12 (DN 150 to DN 300)]** **<Insert pipe size range>** shall be **[one of]** the following:
1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
 2. Mechanical-joint, ductile-iron pipe; mechanical-joint, **[ductile- or gray-iron, standard-pattern] [or] [ductile-iron, compact-pattern]** fittings; glands, gaskets, and bolts; and gasketed joints.
 3. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and gasketed joints.
 4. PE, **[Class 150] [Class 200]**, fire-service pipe; molded PE fittings; and heat-fusion joints.
 5. PVC, **[Class 150] [Class 200]** pipe listed for fire-protection service; PVC fittings of same class as pipe; and gasketed joints.
 6. Fiberglass, RTRP, **[Class 150] [Class 200]**; RTRF; and bonded joints.
- E. **[Aboveground] [and] [vault]** fire-suppression water-service piping **[NPS 2 (DN 50) and smaller]** **<Insert pipe size range>** shall be hard copper tube, **[ASTM B 88, Type K**

(ASTM B 88M, Type A)] [ASTM B 88, Type L (ASTM B 88M, Type B)]; [wrought- or cast-copper-alloy, solder-joint fittings; and brazed] [copper, pressure-seal fittings; and pressure-sealed] joints.

- F. [Aboveground] [and] [vault] fire-suppression water-service piping [NPS 3 and NPS 4 (DN 80 and DN 100)] <Insert pipe size range> shall be[one of] the following:
1. Hard copper tube, [ASTM B 88, Type K (ASTM B 88M, Type A)] [ASTM B 88, Type L (ASTM B 88M, Type B)]; [wrought-copper, solder-joint fittings; and brazed] [copper, pressure-seal fittings; and pressure-sealed] joints.
 2. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
- G. [Aboveground] [and] [vault] fire-suppression water-service piping [NPS 5 to NPS 12 (DN 125 to DN 300)] <Insert pipe size range> shall be grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
- H. Underslab fire-suppression water-service piping [NPS 2 (DN 50) and smaller] <Insert pipe size range> shall be [hard] [soft] copper tube, [ASTM B 88, Type K (ASTM B 88M, Type A)] [ASTM B 88, Type L (ASTM B 88M, Type B)]; [wrought-copper, solder-joint fittings; and brazed] [copper, pressure-seal fittings; and pressure-sealed] joints.
- I. Underslab fire-suppression water-service piping [NPS 3 and NPS 4 (DN 80 and DN 100)] <Insert pipe size range> shall be[one of] the following:
1. [Hard] [Soft] copper tube, [ASTM B 88, Type K (ASTM B 88M, Type A)] [ASTM B 88, Type L (ASTM B 88M, Type B)]; [wrought-copper, solder-joint fittings; and brazed] [copper, pressure-seal fittings; and pressure-sealed] joints.
 2. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
 3. Mechanical-joint, ductile-iron pipe; mechanical-joint, [ductile- or gray-iron, standard-pattern] [or] [ductile-iron, compact-pattern] fittings; glands, gaskets, and bolts; and restrained, gasketed joints.
 4. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and restrained, gasketed joints.
- J. Underslab fire-suppression water-service piping [NPS 6 to NPS 12 (DN 150 to DN 300)] <Insert pipe size range> shall be[one of] the following:
1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
 2. Mechanical-joint, ductile-iron pipe; mechanical-joint, [ductile- or gray-iron, standard-pattern] [or] [ductile-iron, compact-pattern] fittings; glands, gaskets, and bolts; and restrained, gasketed joints.
 3. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and restrained, gasketed joints.

3.21 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
- B. Underground fire-suppression water-service shutoff valves NPS 2 (DN 50) and smaller shall be corporation valves or curb valves with ends compatible with piping.
- C. Meter box fire-suppression water-service shutoff valves NPS 2 (DN 50) and smaller shall be meter valves.
- D. Vault fire-suppression water-service shutoff valves NPS 2 (DN 50) and smaller shall be **[Class 125, MSS, bronze, nonrising stem] [or] [UL-listed or FM-approved, OS&Y, bronze,]** gate valves.
- E. Underground fire-suppression water-service shutoff valves NPS 3 (DN 80) and larger shall be **[one of]** the following:
 - 1. 200-psig (1380-kPa), AWWA, iron, nonrising-stem, **[metal] [resilient]**-seated gate valves.
 - 2. 250-psig (1725-kPa), AWWA, iron, nonrising-stem, resilient-seated gate valves.
 - 3. **[175-psig (1200-kPa)] [250-psig (1725-kPa)]**, UL-listed or FM-approved, iron, nonrising-stem gate valves.
- F. Indicator-post underground fire-suppression water-service valves NPS 3 (DN 80) and larger shall be **[175-psig (1200-kPa)] [250-psig (1725-kPa)]**, UL-listed or FM-approved, iron, nonrising-stem gate valves with indicator-post flange.
- G. Standard-pressure, **[aboveground] [and] [vault]** fire-suppression water-service shutoff valves NPS 3 (DN 80) and larger shall be **[one of]** the following:
 - 1. 200-psig (1380-kPa), AWWA, iron, OS&Y, **[metal] [resilient]**-seated gate valves.
 - 2. 250-psig (1725-kPa), AWWA, iron, OS&Y, resilient-seated gate valves.
 - 3. **[175-psig (1200-kPa)] [250-psig (1725-kPa)]**, UL-listed or FM-approved, iron, OS&Y gate valves.
 - 4. **[AWWA] [or] [UL-listed or FM-approved]** butterfly valves.
- H. Fire-suppression water-service check valves NPS 3 (DN 80) and larger shall be **[one of]** the following:
 - 1. **[AWWA] [or] [UL-listed or FM-approved]** check valves.
 - 2. UL-listed or FM-approved detector check valves.

END OF SECTION 211100

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, fittings, and specialties.
 - 2. Fire-protection valves.
 - 3. Fire-department connections.
 - 4. Sprinklers.
 - 5. Excess-pressure pumps.
 - 6. Alarm devices.
 - 7. Manual control stations.
 - 8. Control panels.
 - 9. Pressure gages.
- B. Related Sections:
 - 1. Division 21 Section "Fire-Suppression Standpipes" for standpipe piping.
 - 2. Division 21 Section "Dry-Pipe Sprinkler Systems" for dry-pipe sprinkler piping.

1.3 DEFINITIONS

- A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig (1200 kPa) maximum.

1.4 SYSTEM DESCRIPTIONS

- A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.
- B. Deluge Sprinkler System: Open sprinklers are attached to piping connected to water supply through deluge valve. Fire-detection system, in same area as sprinklers, opens valve. Water flows into piping system and discharges from attached sprinklers when valve opens.

1.5 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig (1200-kPa) minimum working pressure.
- B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Sprinkler system design shall be approved by authorities having jurisdiction.
 - 1. Margin of Safety for Available Water Flow and Pressure: **[10] [20] <Insert number>** percent, including losses through water-service piping, valves, and backflow preventers.
 - 2. Sprinkler Occupancy Hazard Classifications:
 - a. Building Service Areas: **Ordinary Hazard, Group 1**
 - b. Electrical Equipment Rooms: **Ordinary Hazard, Group 1.**
 - c. General Storage Areas: **Ordinary Hazard, Group 1.**
 - d. Mechanical Equipment Rooms: **Ordinary Hazard, Group 1.**
 - e. Office and Public Areas: **Light Hazard.**
 - 3. Minimum Density for Automatic-Sprinkler Piping Design:
 - a. Light-Hazard Occupancy: **0.10 gpm over 1500-sq. ft. (4.1 mm/min. over 139-sq. m).**
 - b. Ordinary-Hazard, Group 1 Occupancy: **0.15 gpm over 1500-sq. ft. (6.1 mm/min. over 139-sq. m) area.**
 - c. Ordinary-Hazard, Group 2 Occupancy: **0.20 gpm over 1500-sq. ft. (8.1 mm/min. over 139-sq. m) area.**
 - d. Special Occupancy Hazard: As determined by authorities having jurisdiction.
 - 4. Maximum Protection Area per Sprinkler: Per UL listing.
 - 5. Maximum Protection Area per Sprinkler:
 - a. Office Spaces: **120 sq. ft. (11.1 sq. m)] [225 sq. ft. (20.9 sq. m).**
 - b. Storage Areas: **130 sq. ft. (12.1 sq. m).**
 - c. Mechanical Equipment Rooms: **130 sq. ft. (12.1 sq. m).**
 - d. Electrical Equipment Rooms: **[130 sq. ft. (12.1 sq. m)] <Insert dimension>.**
 - e. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.
 - 6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:
 - a. Light-Hazard Occupancies: **100 gpm (6.3 L/s) for 30 minutes.**
 - b. Ordinary-Hazard Occupancies: **250 gpm (15.75 L/s) for 60 to 90 minutes.**

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated. **Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.**
- B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content and chemical components.
 - C. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.
 1. Wiring Diagrams: For power, signal, and control wiring.
 - D. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - E. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Domestic water piping.
 2. HVAC hydronic piping.
 3. Items penetrating finished ceiling include the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - F. Qualification Data: For qualified Installer **and professional engineer**.
 - G. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
 - H. Welding certificates.
 - I. Fire-hydrant flow test report.
 - J. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
 - K. Field quality-control reports.
 - L. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications:
 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

- a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13, "Installation of Sprinkler Systems."
 - 2. NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height."
 - 3. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

1.8 PROJECT CONDITIONS – NOT USED

1.9 COORDINATION

- A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

- A. Standard Weight, **Black**-Steel Pipe: ASTM A 53/A 53M, **Type E, Grade B**. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 30, **Black**-Steel Pipe: ASTM A 135; ASTM A 795/A 795M, **Type E**; or ASME B36.10M, wrought steel; with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.
- C. Thinwall [**Galvanized**-] [**and**] [**Black**]-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.
- D. Schedule 10, Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, Schedule 10 in NPS 5 (DN 125) and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250), plain end.
- E. **Black**-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- F. **Uncoated**, Steel Couplings: ASTM A 865, threaded.
- G. **Uncoated**, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- H. Malleable- or Ductile-Iron Unions: UL 860.
- I. Cast-Iron Flanges: ASME 16.1, Class 125.
- J. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
- K. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.
- L. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Manufacturers: Subject to compliance with requirements:
 - a. Anvil International, Inc.
 - b. Corcoran Piping System Co.
 - c. National Fittings, Inc.
 - d. Shurjoint Piping Products.
 - e. Tyco Fire & Building Products LP.
 - f. Victaulic Company.
 - 2. Pressure Rating: **175 psig (1200 kPa)**.
 - 3. **Uncoated**, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
 - 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

- M. Steel Pressure-Seal Fittings: UL 213, FM-approved, 175-psig (1200-kPa) pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.
1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Victaulic Company.

2.3 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: **ASTM B 88, Type L (ASTM B 88M, Type B** water tube, drawn temper.
- B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.
- D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- E. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- F. Copper Pressure-Seal Fittings:
 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Viega; Plumbing & Heating Systems.
 2. Standard: UL 213.
 3. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
 4. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Cast-bronze fitting with EPDM-rubber O-ring seal in each end.
- G. Grooved-Joint, Copper-Tube Appurtenances:
 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Anvil International, Inc.
 - b. Shurjoint Piping Products.
 - c. Victaulic Company.
 2. Grooved-End, Copper Fittings: ASTM B 75 (ASTM B 75M), copper tube or ASTM B 584, bronze castings.
 3. Grooved-End-Tube Couplings: To fit copper-tube dimensions, with design similar to AWWA C606. Include ferrous housing sections, EPDM-rubber gasket suitable for hot and cold water, and bolts and nuts.

H. Copper-Tube, Extruded-Tee Connections:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. T-DRILL Industries Inc.
2. Description: Tee formed in copper tube according to ASTM F 2104.

2.4 CPVC PIPE AND FITTINGS – NOT USED

2.5 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: **AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free.**
 1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
 2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.6 COVER SYSTEM FOR SPRINKLER PIPING – NOT USED

2.7 LISTED FIRE-PROTECTION VALVES

- A. General Requirements:
 1. Valves shall be UL listed or FM approved.
 2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig (1200 kPa).
- B. Ball Valves:
 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:

- a. Anvil International, Inc.
 - b. Victaulic Company.
3. Standard: UL 1091 except with ball instead of disc.
 4. Valves NPS 1-1/2 (DN 40) and Smaller: Bronze body with threaded ends.
 5. Valves NPS 2 and NPS 2-1/2 (DN 50 and DN 65): Bronze body with threaded ends or ductile-iron body with grooved ends.
 6. Valves NPS 3 (DN 80): Ductile-iron body with grooved ends.
- C. Bronze Butterfly Valves:
1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide; **product name or designation** or comparable product by one of the following:
 - a. Fivalco Inc.
 - b. Global Safety Products, Inc.
 - c. Milwaukee Valve Company.
 3. Standard: UL 1091.
 4. Pressure Rating: 175 psig (1200 kPa).
 5. Body Material: Bronze.
 6. End Connections: Threaded.
- D. Iron Butterfly Valves:
1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name** or comparable product by one of the following:
 - a. Anvil International, Inc.
 - b. Fivalco Inc.
 - c. Global Safety Products, Inc.
 - d. Kennedy Valve; a division of McWane, Inc.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Pratt, Henry Company.
 - h. Shurjoint Piping Products.
 - i. Tyco Fire & Building Products LP.
 - j. Victaulic Company.
 3. Standard: UL 1091.
 4. Pressure Rating: 175 psig (1200 kPa).
 5. Body Material: Cast or ductile iron.
 6. Style: Lug or wafer.
 7. End Connections: Grooved.
- E. Check Valves:

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1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation** or comparable product by one of the following:
 - a. AFAC Inc.
 - b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - c. Anvil International, Inc.
 - d. Clow Valve Company; a division of McWane, Inc.
 - e. Crane Co.; Crane Valve Group; Crane Valves.
 - f. Crane Co.; Crane Valve Group; Jenkins Valves.
 - g. Crane Co.; Crane Valve Group; Stockham Division.
 - h. Fire-End & Croker Corporation.
 - i. Fire Protection Products, Inc.
 - j. Fivalco Inc.
 - k. Globe Fire Sprinkler Corporation.
 - l. Groeniger & Company.
 - m. Kennedy Valve; a division of McWane, Inc.
 - n. Matco-Norca.
 - o. Metraflex, Inc.
 - p. Milwaukee Valve Company.
 - q. Mueller Co.; Water Products Division.
 - r. NIBCO INC.
 - s. Potter Roemer.
 - t. Reliable Automatic Sprinkler Co., Inc.
 - u. Shurjoint Piping Products.
 - v. Tyco Fire & Building Products LP.
 - w. United Brass Works, Inc.
 - x. Venus Fire Protection Ltd.
 - y. Victaulic Company.
 - z. Viking Corporation.
 - aa. Watts Water Technologies, Inc.
3. Standard: UL 312.
4. Pressure Rating: **[250 psig (1725 kPa) minimum] [300 psig (2070 kPa)]**.
5. Type: Swing check.
6. Body Material: Cast iron.
7. End Connections: Flanged or grooved.

F. Bronze OS&Y Gate Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation** or comparable product by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Stockham Division.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.

- e. United Brass Works, Inc.
 - 3. Standard: UL 262.
 - 4. Pressure Rating: 175 psig (1200 kPa).
 - 5. Body Material: Bronze.
 - 6. End Connections: Threaded.
- G. Iron OS&Y Gate Valves:
- 1. Manufacturers: Subject to compliance with requirements, **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **[product indicated on Drawings] <Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - b. American Valve, Inc.
 - c. Clow Valve Company; a division of McWane, Inc.
 - d. Crane Co.; Crane Valve Group; Crane Valves.
 - e. Crane Co.; Crane Valve Group; Jenkins Valves.
 - f. Crane Co.; Crane Valve Group; Stockham Division.
 - g. Hammond Valve.
 - h. Milwaukee Valve Company.
 - i. Mueller Co.; Water Products Division.
 - j. NIBCO INC.
 - k. Shurjoint Piping Products.
 - l. Tyco Fire & Building Products LP.
 - m. United Brass Works, Inc.
 - n. Watts Water Technologies, Inc.
 - o. **<Insert manufacturer's name>**.
 - 3. Standard: UL 262.
 - 4. Pressure Rating: **[250 psig (1725 kPa) minimum] [300 psig (2070 kPa)]**.
 - 5. Body Material: Cast or ductile iron.
 - 6. End Connections: Flanged or grooved.
- H. Indicating-Type Butterfly Valves:
- 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation** or comparable product by one of the following:
 - a. Anvil International, Inc.
 - b. Fivalco Inc.
 - c. Global Safety Products, Inc.
 - d. Kennedy Valve; a division of McWane, Inc.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.

- g. Shurjoint Piping Products.
 - h. Tyco Fire & Building Products LP.
 - i. Victaulic Company.
- 3. Standard: UL 1091.
- 4. Pressure Rating: 175 psig (1200 kPa) minimum.
- 5. Valves NPS 2 (DN 50) and Smaller:
 - a. Valve Type: Ball or butterfly.
 - b. Body Material: Bronze.
 - c. End Connections: Threaded.
- 6. Valves NPS 2-1/2 (DN 65) and Larger:
 - a. Valve Type: Butterfly.
 - b. Body Material: Cast or ductile iron.
 - c. End Connections: Flanged, grooved, or wafer.
- 7. Valve Operation: Integral **electrical, 115-V ac, prewired, single-circuit, supervisory switch visual** indicating device.
- I. NRS Gate Valves:
 - 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation**> or comparable product by one of the following:
 - a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - b. American Valve, Inc.
 - c. Clow Valve Company; a division of McWane, Inc.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Kennedy Valve; a division of McWane, Inc.
 - f. Mueller Co.; Water Products Division.
 - g. NIBCO INC.
 - h. Tyco Fire & Building Products LP.
 - 3. Standard: UL 262.
 - 4. Pressure Rating: **[250 psig (1725 kPa) minimum] [300 psig (2070 kPa)]**.
 - 5. Body Material: Cast iron with indicator post flange.
 - 6. Stem: Nonrising.
 - 7. End Connections: Flanged or grooved.
- J. Indicator Posts:
 - 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation**> or comparable product by one of the following:

- a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - b. American Valve, Inc.
 - c. Clow Valve Company; a division of McWane, Inc.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Kennedy Valve; a division of McWane, Inc.
 - f. Mueller Co.; Water Products Division.
 - g. NIBCO INC.
 - h. Tyco Fire & Building Products LP.
- 3. Standard: UL 789.
 - 4. Type: Horizontal for wall mounting.
 - 5. Body Material: Cast iron with extension rod and locking device.
 - 6. Operation: [**Wrench**] [**Hand wheel**].

2.8 TRIM AND DRAIN VALVES

A. General Requirements:

- 1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
- 2. Pressure Rating: 175 psig (1200 kPa) minimum.

B. Angle Valves:

- 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Fire Protection Products, Inc.
 - b. United Brass Works, Inc.

C. Ball Valves:

- 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Affiliated Distributors.
 - b. Anvil International, Inc.
 - c. Barnett.
 - d. Conbraco Industries, Inc.; Apollo Valves.
 - e. Fire-End & Croker Corporation.
 - f. Fire Protection Products, Inc.
 - g. Flowserve.
 - h. FNW.
 - i. Jomar International, Ltd.
 - j. Kennedy Valve; a division of McWane, Inc.
 - k. Kitz Corporation.
 - l. Legend Valve.
 - m. Metso Automation USA Inc.
 - n. Milwaukee Valve Company.

- o. NIBCO INC.
- p. Potter Roemer.
- q. Red-White Valve Corporation.
- r. Southern Manufacturing Group.
- s. Stewart, M. A. and Sons Ltd.
- t. Tyco Fire & Building Products LP.
- u. Victaulic Company.
- v. Watts Water Technologies, Inc.

D. Globe Valves:

- 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Fire Protection Products, Inc.
 - b. United Brass Works, Inc.

E. Plug Valves:

- 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Southern Manufacturing Group.

2.9 SPECIALTY VALVES

A. General Requirements:

- 1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
- 2. Pressure Rating:
 - a. Standard-Pressure Piping Specialty Valves: 175 psig (1200 kPa) minimum.
 - b. High-Pressure Piping Specialty Valves: **250 psig (1725 kPa) minimum.**
- 3. Body Material: Cast or ductile iron.
- 4. Size: Same as connected piping.
- 5. End Connections: Flanged or grooved.

B. Alarm Valves:

- 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation** or comparable product by one of the following:
 - a. AFAC Inc.
 - b. Globe Fire Sprinkler Corporation.
 - c. Reliable Automatic Sprinkler Co., Inc.

- d. Tyco Fire & Building Products LP.
 - e. Venus Fire Protection Ltd.
 - f. Victaulic Company.
 - g. Viking Corporation.
- 3. Standard: UL 193.
 - 4. Design: For horizontal or vertical installation.
 - 5. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, **retarding chamber**, and fill-line attachment with strainer.
 - 6. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
 - 7. Drip Cup Assembly: Pipe drain with check valve to main drain piping.
- C. Automatic (Ball Drip) Drain Valves:
- 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation**> or comparable product by one of the following:
 - a. AFAC Inc.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Tyco Fire & Building Products LP.
 - 3. Standard: UL 1726.
 - 4. Pressure Rating: 175 psig (1200 kPa) minimum.
 - 5. Type: Automatic draining, ball check.
 - 6. Size: NPS 3/4 (DN 20).
 - 7. End Connections: Threaded.

2.10 FIRE-DEPARTMENT CONNECTIONS

- A. Exposed-Type, Fire-Department Connection:
- 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide **product name or designation**> or comparable product by one of the following:
 - a. AFAC Inc.
 - b. Elkhart Brass Mfg. Company, Inc.
 - c. Fire-End & Croker Corporation.
 - d. Fire Protection Products, Inc.
 - e. GMR International Equipment Corporation.
 - f. Guardian Fire Equipment, Inc.
 - g. Tyco Fire & Building Products LP.
 - h. Wilson & Cousins Inc.
 - 3. Standard: UL 405.
 - 4. Type: Exposed, projecting, for wall mounting.

5. Pressure Rating: 175 psig (1200 kPa) minimum.
6. Body Material: Corrosion-resistant metal.
7. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
8. Caps: Brass, lugged type, with gasket and chain.
9. Escutcheon Plate: Round, brass, wall type.
10. Outlet: Back, with pipe threads.
11. Number of Inlets: **Two**.
12. Escutcheon Plate Marking: Similar to **AUTO SPKR.**"
13. Finish: **Polished chrome plated**
14. Outlet Size: **NPS 6 (DN 150).**

2.11 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Anvil International, Inc.
 - b. National Fittings, Inc.
 - c. Shurjoint Piping Products.
 - d. Tyco Fire & Building Products LP.
 - e. Victaulic Company.
2. Standard: UL 213.
3. Pressure Rating: **175 psig (1200 kPa) minimum.**
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-T and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. AGF Manufacturing Inc.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: **175 psig (1200 kPa) minimum.**

4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

C. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Elkhart Brass Mfg. Company, Inc.
 - b. Fire-End & Croker Corporation.
 - c. Potter Roemer.
2. Standard: UL 199.
3. Pressure Rating: 175 psig (1200 kPa).
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. AGF Manufacturing Inc.
 - b. Triple R Specialty.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
 - e. Viking Corporation.
2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: **175 psig (1200 kPa) minimum.**
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. CECA, LLC.
 - b. Corcoran Piping System Co.
 - c. Merit Manufacturing; a division of Anvil International, Inc.
2. Standard: UL 1474.

3. Pressure Rating: **250 psig (1725 kPa) minimum.**
4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

F. Flexible, Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Fivalco Inc.
 - b. FlexHead Industries, Inc.
 - c. Gateway Tubing, Inc.
2. Standard: UL 1474.
3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
4. Pressure Rating: **175 psig (1200 kPa) minimum.**
5. Size: Same as connected piping, for sprinkler.

2.12 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**

1. AFAC Inc.
2. Globe Fire Sprinkler Corporation.
3. Reliable Automatic Sprinkler Co., Inc.
4. Tyco Fire & Building Products LP.
5. Venus Fire Protection Ltd.
6. Victaulic Company.
7. Viking Corporation.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Residential Sprinklers: 175 psig (1200 kPa) maximum.
3. Pressure Rating for Automatic Sprinklers: 175 psig (1200 kPa) minimum.
4. Pressure Rating for High-Pressure Automatic Sprinklers: **[250 psig (1725 kPa) minimum] [300 psig (2070 kPa)].**

C. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: **UL 1767.**
2. Nonresidential Applications: **UL 199.**
3. Residential Applications: **UL 1626.**

4. Characteristics: Nominal 1/2-inch (12.7-mm) orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
- D. Open Sprinklers with Heat-Responsive Element Removed: UL 199.
1. Characteristics:
 - a. Nominal [1/2-inch (12.7-mm)] <Insert value> Orifice: With Discharge Coefficient K [between 5.3 and 5.8] <Insert value>.
 - b. Nominal [17/32-inch (13.5-mm)] <Insert value> Orifice: With Discharge Coefficient K [between 7.4 and 8.2] <Insert value>.
- E. Sprinkler Finishes:
1. Chrome plated.
 2. Bronze.
 3. Painted.
- F. Special Coatings:
1. Wax.
 2. Lead.
 3. Corrosion-resistant paint.
- G. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
1. Ceiling Mounting: [Chrome-plated steel, one piece, flat] [Chrome-plated steel, two piece, with 1-inch (25-mm) vertical adjustment] [Plastic, white finish, one piece, flat].
 2. Sidewall Mounting: [Chrome-plated steel] [Plastic, white finish], one piece, flat.
- H. Sprinkler Guards:
1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Reliable Automatic Sprinkler Co., Inc.
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company.
 - d. Viking Corporation.
 2. Standard: UL 199.
 3. Type: Wire cage with fastening device for attaching to sprinkler to be installed in mechanical spaces only.

2.13 EXCESS-PRESSURE PUMPS – NOT USED

2.14 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Water-Motor-Operated Alarm:
 - 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Globe Fire Sprinkler Corporation.
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company.
 - d. Viking Corporation.
 - 2. Standard: UL 753.
 - 3. Type: Mechanically operated, with Pelton wheel.
 - 4. Alarm Gong: Cast aluminum with red-enamel factory finish.
 - 5. Size: 10-inch (250-mm) diameter.
 - 6. Components: Shaft length, bearings, and sleeve to suit wall construction.
 - 7. Inlet: NPS 3/4 (DN 20).
 - 8. Outlet: NPS 1 (DN 25) drain connection.
- C. Electrically Operated Alarm Bell:
 - 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. Fire-Lite Alarms, Inc.; a Honeywell company.
 - b. Notifier; a Honeywell company.
 - c. Potter Electric Signal Company.
 - 2. Standard: UL 464.
 - 3. Type: Vibrating, metal alarm bell.
 - 4. Size: **6-inch (150-mm) minimum**-diameter.
 - 5. Finish: Red-enamel factory finish, suitable for outdoor use.
- D. Water-Flow Indicators:
 - 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 - a. ADT Security Services, Inc.
 - b. McDonnell & Miller; ITT Industries.
 - c. Potter Electric Signal Company.
 - d. System Sensor; a Honeywell company.
 - e. Viking Corporation.
 - f. Watts Industries (Canada) Inc.

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for 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 if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig (1725 kPa).
7. Design Installation: Horizontal or vertical.

E. Pressure Switches:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
 - a. AFAC Inc.
 - b. Barksdale, Inc.
 - c. Detroit Switch, Inc.
 - d. Potter Electric Signal Company.
 - e. System Sensor; a Honeywell company.
 - f. Tyco Fire & Building Products LP.
 - g. United Electric Controls Co.
 - h. Viking Corporation.
2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

F. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
 - a. Fire-Lite Alarms, Inc.; a Honeywell company.
 - b. Kennedy Valve; a division of McWane, Inc.
 - c. Potter Electric Signal Company.
 - d. System Sensor; a Honeywell company.
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

G. Indicator-Post Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

- a. Potter Electric Signal Company.
 - b. System Sensor; a Honeywell company.
2. Standard: UL 346.
 3. Type: Electrically supervised.
 4. Components: Single-pole, double-throw switch with normally closed contacts.
 5. Design: Signals that controlled indicator-post valve is in other than fully open position.

2.15 MANUAL CONTROL STATIONS

- A. Description: UL listed or FM approved, hydraulic operation, with union, NPS 1/2 (DN 15) pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.16 CONTROL PANELS – NOT USED

2.17 PRESSURE GAGES

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 1. AMETEK; U.S. Gauge Division.
 2. Ashcroft, Inc.
 3. Brecco Corporation.
 4. WIKA Instrument Corporation.
- B. Standard: UL 393.
- C. Dial Size: 3-1/2- to 4-1/2-inch (90- to 115-mm) diameter.
- D. Pressure Gage Range: **0 to 250 psig (0 to 1725 kPa) minimum.**
- E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

- A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in Division 21 Section "Facility Fire-Suppression Water-Service Piping."
- B. Install shutoff valve, **backflow preventer**, pressure gage, drain, and other accessories indicated at connection to water-service piping. **Comply with requirements for backflow preventers in Division 21 Section "Facility Fire-Suppression Water-Service Piping."**
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.3 WATER-SUPPLY CONNECTIONS

- A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Division 22 Section "Domestic Water Piping."
- B. Install shutoff valve, **backflow preventer**, pressure gage, drain, and other accessories indicated at connection to water-distribution piping. **Comply with requirements for backflow preventers in Division 22 Section "Domestic Water Piping Specialties."**
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.4 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.
- C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.
- D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- K. Install alarm devices in piping systems.
- L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- N. Fill sprinkler system piping with water.
- O. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing. Comply with requirements for heating cables in Division 21 "Heat Tracing for Fire-Suppression Piping" and for piping insulation in Division 21 Section "Fire-Suppression Systems Insulation."
- P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 21 Section "Escutcheons for Fire-Suppression Piping."

3.5 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- N. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.
- O. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- P. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.
- Q. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2144. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

- R. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
- S. Plastic-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

3.6 INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING

- A. Install cover system, brackets, and cover components for sprinkler piping according to manufacturer's "Installation Manual" and with NFPA 13 or NFPA 13R for supports.

3.7 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
 - 2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.
 - 3. Deluge Valves: Install in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

3.8 EXCESS-PRESSURE PUMP INSTALLATION – NOT USED

3.9 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of [**narrow dimension of**] acoustical ceiling panels.
- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

- C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

3.10 FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Install wall-type, fire-department connections.
- B. Install yard-type, fire-department connections in concrete slab support. Comply with requirements for concrete in Division 03 Section "Cast-in-Place Concrete."
 - 1. Install **two** protective pipe bollards **around on sides of** each fire-department connection. Comply with requirements for bollards in Division 05 Section "Metal Fabrications."
- C. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.11 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.12 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Start and run excess-pressure pumps.
 - 6. Coordinate with fire-alarm tests. Operate as required.
 - 7. Coordinate with fire-pump tests. Operate as required.
 - 8. Verify that equipment hose threads are same as local fire-department equipment.
- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.13 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.

3.14 DEMONSTRATION

- A. **Engage a factory-authorized service representative to train** Owner's maintenance personnel to adjust, operate, and maintain **specialty valves**.

3.15 PIPING SCHEDULE

- A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with **grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints**.
- B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- C. Copper-tube, extruded-tee connections may be used for tee branches in copper tubing instead of specified copper fittings. Branch-connection joints must be brazed.
- D. Standard-pressure, wet-pipe sprinkler system, **NPS 2 (DN 50) and smaller**, shall be **one of the** following:
 - 1. **Standard-weight**, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. **Standard-weight**, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - 3. **Standard-weight**, black-steel pipe with plain ends; uncoated, plain-end-pipe fittings; and twist-locked joints.
 - 4. [**Standard-weight**, black-steel pipe with **cut- or roll-grooved** ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 5. **Standard-weight**, black-steel pipe with plain ends; steel welding fittings; and welded joints.
 - 6. **Type L (Type B)**, hard copper tube with plain ends; **cast- or wrought-copper** solder-joint fittings; and brazed joints.
 - 7. **Type L (Type B)**, hard copper tube with plain ends; copper pressure-seal fittings; and pressure-sealed joints.
 - 8. NPS 2 (DN 50), **Type L (Type B)**, hard copper tube with roll-grooved ends; copper, grooved-end fittings; grooved-end-tube couplings; and grooved joints.

3.16 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: **Upright sprinklers.**
 2. Rooms with Suspended Ceilings: **Pendent sprinklers.**
 3. Wall Mounting: Sidewall sprinklers.
 4. Spaces Subject to Freezing: **Upright sprinklers.**
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
1. **Upright Pendent and Sidewall** Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211313