

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and Divisions 00 and 01, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 10.
 - 2. Division 21.
 - 3. Division 23.
 - 4. Division 28.

1.2 CODES AND STANDARDS

- A. Codes and Standards shall be the current version adopted by the Authority Having Jurisdiction.

1.3 SUMMARY

- A. This Section includes fire-suppression piping and equipment for the following building systems:
 - 1. [Dedicated][Dedicated and Combined][Combined][Class I][Class II][Class III] fire-suppression standpipes.
 - 2. Wet-pipe fire-suppression system, including piping, valves, specialties, automatic sprinklers and accessories.
 - 3. Dry-pipe fire-suppression system, including piping, valves, specialties, automatic sprinklers, air compressor(s) and accessories.
 - 4. Preaction fire-suppression system, including piping, valves, specialties, automatic sprinklers, air compressor(s) and accessories operated by fire-detection system.
 - 5. Deluge fire-suppression sprinklers, including piping, valves, specialties, automatic sprinklers and accessories operated by fire-detection system.

1.4 DEFINITIONS

- A. Hose Connection: Valve with threaded outlet matching fire hose coupling thread for attaching fire hose.
- B. Hose Station: Hose connection, fire hose rack, and fire hose.
- C. Working Plans: Documents, including drawings, calculations, and material specifications prepared according to NFPA 13 and NFPA 14 [and FM Global Property Loss Prevention Data Sheets 2-0 and 2-8] for obtaining approval from authorities having jurisdiction [and from FM Global].

1.5 SYSTEM PERFORMANCE REQUIREMENTS

- A. Design [standpipe] [and] [sprinkler] system[s] according to the following and obtain approval from authorities having jurisdiction.

1. Static pressure of [insert pressure] psig, residual pressure of [insert pressure] psig with [insert flow] gpm flowing. Location of test hydrant at [insert location]. Elevation of test hydrant at [insert elevation relative to mean sea level or other relevant datum] ft. [MSL] [insert reference datum]. Location of flowing hydrant at [insert location]. Date of test: [insert date]. Source of information: [insert data source].
- B. Base bid on the following information:
1. Static pressure at base of riser of [insert base of riser static pressure] psig, residual pressure of [insert base of riser residual pressure] psig with [insert flow] gpm flowing.
- C. Design [standpipe] [and] [sprinkler] system[s] according to the following and obtain approval from authorities having jurisdiction.
1. Perform a flow test as described in the Preparation Article in Part 3 of this specification section. Use results for system design calculations.
 2. Include 10 psi margin of safety for available water flow and pressure.
 3. Include losses through water-service piping, valves, and backflow preventers.
 4. Sprinkler Occupancy Hazard Classifications: As follows unless indicated otherwise:
 - a. Building Service Areas: [Ordinary Hazard, Group 1] [0.15 gpm/sf over 2,500 sf area and 250 gpm hose allowance].
 - b. Electrical Equipment Rooms: [Ordinary Hazard, Group 1] [0.15 gpm/sf over 2,500 sf area and 250 gpm hose allowance].
 - c. General Incidental Storage Areas: [Ordinary Hazard, Group 1] [0.15 gpm/sf over room area and 250 gpm hose allowance if less than 200 sf and 0.30 gpm/sf over 2,000 sf area and 250 gpm hose allowance using FM approved sprinkler heads with a k-factor of 11.2 per FM Global Property Loss Prevention Data Sheet 8-9 if over 200 sf].
 - d. Library Stack Areas: Ordinary Hazard, Group 2.
 - e. Mechanical Equipment Rooms: [Ordinary Hazard, Group 1] [0.15 gpm/sf over 2,500 sf area and 250 gpm hose allowance].
 - f. Office and Public Areas: Light Hazard.
 - g. Repair Garages: Ordinary Hazard, Group 2.
 - h. Residential Living Areas: Light Hazard.
 - i. Restaurant Service Areas: Ordinary Hazard, Group 1.
 - j. Laboratories: Ordinary Hazard, Group 2.
 - k. Theatres and Auditoriums, excluding stages and prosceniums: Light Hazard.
 - l. Dining Areas: Light Hazard.
 - m. Classrooms: Light Hazard.
 - n. Hospital Patient Care Areas: Light Hazard.
 - o. Church Worship Areas: Light Hazard.
 - p. Laundries: Ordinary Hazard, Group 1.
 - q. Restaurant Service Areas: Ordinary Hazard, Group 1.
 - r. Machine Shops: Ordinary Hazard, Group 2.
 - s. Stages: Ordinary Hazard, Group 2.
 - t. Boiler, Generator and Fuel Rooms: [Ordinary Hazard, Group 1] [0.25 gpm/sf over 4,000 sf area and 250 gpm hose allowance].
 - u. Outdoor Canopies (above vehicles): [Ordinary Hazard, Group 1] [0.15 gpm/sf over 3,500 sf area and 250 gpm hose allowance] dry coverage.
 - v. Switchgear Rooms (with oil filled equipment): [Ordinary Hazard, Group 1] [0.20 gpm/sf over 3,000 sf area and 500 gpm hose allowance].

- w. Switchgear Rooms (without oil filled equipment): [Ordinary Hazard, Group 1] [0.15 gpm/sf over 2,500 sf area and 500 gpm hose allowance].
 - x. Parking Garages: [Ordinary Hazard, Group 1] [0.15 gpm over 2500- sq. ft. area and 500 gpm hose allowance for wet systems and 0.15 gpm over 3500- sq. ft. area and 500 gpm hose allowance for dry systems.]
 - y. [High Ceiling Areas (over 15 feet): 0.15 gpm over 2500- sq. ft. area and 500 gpm hose allowance using FM approved sprinkler heads with a k-factor of 8.0 per FM Global Property Loss Prevention Data Sheet 8-9.]
5. Minimum Flow Density (per square foot) for Closed Head Automatic-Sprinkler Piping Design: As follows:
- a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
 - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500- sq. ft. area.
 - c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500- sq. ft. area.
 - d. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over 2500-sq. ft. area.
 - e. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over 2500-sq. ft. area.
 - f. Special Occupancy Hazard: As determined by authorities having jurisdiction.
6. The area of operation reduction allowed by NFPA Standard 13 [will][will not] be permitted where quick response sprinkler heads are used in accordance with the provisions of this specification section.
7. In non-finished shell spaces provide line sizes that allow for 1.4 times the calculated flow at the crossmain of the most remote area.
8. Minimum Flow Density for Deluge-Sprinkler Piping Design: Shall be the same as above except applied over entire area.
9. Maximum Protection Area per Sprinkler: As follows:
- a. Light Hazard: 225 sq. ft.
 - b. Ordinary Hazard: 130 sq. ft.
 - c. Other Areas: According to NFPA 13 recommendations, unless otherwise indicated.
- D. Components and Installation: Capable of producing piping systems with 175-psig minimum working-pressure rating, unless otherwise indicated.

1.6 SUBMITTALS

- A. General: See Division 21 for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Submit product data, flow test report (if required) and drawings with hydraulic calculations in one single package prior to installation.
- C. Product Data: For the following:
 - 1. Pipe and fitting materials and methods of joining for standpipe piping.
 - 2. Pipe and fitting materials and methods of joining for sprinkler piping.
 - 3. Pipe hangers and supports.
 - 4. Piping seismic restraints.
 - 5. Valves, including specialty valves, accessories, and devices.
 - 6. Backflow Preventers: Include pressure drop curve and maintenance and testing information.
 - 7. Alarm devices. Include electrical data.

8. Air compressors. Include electrical data.
 9. Fire department connections. Include type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.
 10. Hose connections. Include size, type, and finish.
 11. Hose stations. Include size, type, and finish of hose connections; type and length of fire hoses; finish of fire hose couplings; type, material, and finish of nozzles; and finish of rack.
 12. Excess-pressure pumps. Include electrical data.
 13. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.
- D. Fire-Hydrant Flow Test Report: As specified in "Preparation" Article.
- E. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13 [and FM Global Property Loss Prevention Data Sheets 2-0 and 2-8], that have been approved by authorities having jurisdiction [and FM Global]. Include hydraulic calculations, if applicable.
- F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13 and NFPA 14 [and FM Global Property Loss Prevention Data Sheets 2-0 and 2-8]. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."
- G. Maintenance Data: For each type of standpipe and sprinkler specialty to include in maintenance manuals specified in Division 1.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer [with Seattle Fire Department Certification for the installation of fire sprinkler systems] who has designed and installed fire-suppression piping similar to that indicated for this Project and obtained design approval and inspection approval from authorities having jurisdiction. The field installation shall be supervised at all times by a journeyman sprinkler fitter.
- B. Designer Qualifications: The system shall be designed by a [NICET Level 3 certified sprinkler designer] [Registered Professional Fire Protection Engineer] legally qualified to practice in the jurisdiction where the project is located. Design services for installation of the fire suppression system include performing hydraulic calculations, preparing working plans and field test reports. Submitted calculations and shop drawings shall be stamped and signed by a legally qualified design professional.
- C. Special Inspector: Make arrangements for inspection of mechanical concrete anchors during installation to verify anchor type, anchor dimensions, concrete type, concrete compressive strength, hole dimension, hole cleaning procedure, anchor spacing, edge distances, concrete thicknesses, anchor embedment, and tightening torque.
- D. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL's "Fire Protection Equipment Directory" [and FM's "Fire Protection Approval Guide"] and that comply with other requirements indicated.
- E. Standpipe and Sprinkler Components: Listing/approval stamp, label, or other marking by a testing agency acceptable to authorities having jurisdiction.

- F. To ensure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied from the same manufacturer as the grooved components.
- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- H. NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following:
 - 1. NFPA 13, "Installation of Sprinkler Systems."
 - 2. NFPA 14, "Standpipe and Hose Systems."
 - 3. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."
 - 4. NFPA 20, "Standard for the Installation of Centrifugal Fire Pumps."
- I. [FM Global Standards:
 - 1. FM Global Property Loss Prevention Data Sheet 2-0 "Installation Guidelines for Automatic Sprinklers."
 - 2. FM Global Property Loss Prevention Data Sheet 2-8 "Earthquake Protection for Water-based Fire Protection Systems."
 - 3. FM Global Property Loss Prevention Data Sheet 8-9 "Storage of Class 1, 2, 3, 4 and Plastic Commodities."
 - 4. FM Global Property Loss Prevention Data Sheet 3-11 "Pressure Reducing Valves for Fire Protection Service."]

1.8 EXTRA MATERIALS

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

PART 2 – PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.2 PIPES AND TUBES

- A. Ductile-Iron Pipe: AWWA C151, mechanical-joint type; with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.
- B. Steel Pipe, NPS 2 and Smaller: ASTM A 53/A 53M, Schedule 40. Hot dip galvanized where indicated.

- C. Steel Pipe, NPS 2-1/2 and Larger: ASTM A 135 or ASTM A 795, Grade A, Schedule 10 for NPS 5-inch and Smaller; NFPA specified wall thickness for NPS 6-inch and NPS 8-inch. Hot dip galvanized where indicated.
- D. Copper Tube: ASTM B 88, Type K water tube, drawn temper.
- E. Stainless Steel Pipe: ASTM A 312/A 312M, Grade TP 304, SML, Schedule 10.

2.3 PIPE AND TUBE FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Grooved Mechanical Joint Piping System:
 - a. Anvil Grivlok.
 - b. Grinnell Grooved Products.
 - c. Victaulic Co.
 - d. Or Approved Equal
- B. Ductile-Iron Fittings: ASTM A 536, ductile-iron casting complying with AWWA pipe size; with ends factory grooved according to AWWA C606. Include cement-mortar lining and seal coat according to AWWA C104 or epoxy, interior coating according to AWWA C550.
- C. Cast-Iron Flanges: ASME B16.1.
- D. Cast-Iron Threaded Fittings: ASME B16.4.
- E. Steel Threaded Couplings: ASTM A 865.
- F. Steel Welding Fittings: ASTM A 234/A 234M, ASME B16.9, or ASME B16.11.
- G. Steel Flanges and Flanged Fittings: ASME B16.5.
- H. Steel Pipe Grooved Mechanical Joint Fittings: Victaulic fittings or equal by Anvil Grivlok or Grinnell Grooved Products, UL-listed and FM-approved, ASTM A 536 Grade 65-4542 ductile iron or ASTM A 106, Grade B forged steel; with ends factory grooved to match specified coupling.
- I. Cast-Bronze Flanges: ASME B16.24.
- J. Copper Tube Grooved Mechanical Joint Fittings: Victaulic fittings or equal by Anvil Grivlok or Grinnell Grooved Products, UL listed and FM-approved, ASTM B 75, copper tube or ASTM B 584, bronze castings with copper tube dimensioned grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted).
- K. Stainless Steel Pipe Grooved Mechanical Joint Fittings: Victaulic fittings or equal by Anvil Grivlok or Grinnell Grooved Products, UL listed and FM-approved, ASTM A-403, Type 304 stainless steel with ends factory grooved to match specified coupling.

2.4 JOINING MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Grooved Mechanical Joint Piping System:
 - a. Anvil Gruvlok.
 - b. Grinnell Grooved Products.
 - c. Victaulic Co.
 - d. Or Approved Equal
 - B. Refer to Division 21 for pipe-flange gasket materials and welding filler metals.
 - C. Ductile-Iron, Mechanical Grooved Joint Couplings: Victaulic Style 307, Style 31 or equal by Anvil Gruvlok or Grinnell Grooved Products, UL listed and FM-approved AWWA C606, for ductile-iron pipe dimensions. Include ASTM A 536, ductile-iron housing, synthetic rubber gaskets, and steel bolts and nuts.
 - D. Steel Pipe, Grooved Mechanical Joint Coupling: Victaulic Style 009H rigid couplings for 1-1/4" through 4" sizes, Style 005 rigid couplings for 6" through 8" sizes; and Style 177 or 75 flexible couplings or equal by Anvil Gruvlok or Grinnell Grooved Products; UL listed and FM-approved, ductile iron housing conforming to ASTM A-536, Grade 65-45-12; Grade "E" or "EHP" EPDM gaskets.
 - E. Copper Pipe, Grooved Mechanical Joint Coupling: Victaulic Style 607 rigid coupling or equal by Anvil Gruvlok or Grinnell Grooved Products, UL listed and FM-approved, ductile iron housing conforming to ASTM A-536, Grade 65-45-12; Grade "EHP" gaskets.
 - F. Stainless Steel Pipe, Grooved Mechanical Joint Coupling: Victaulic Style 89 rigid coupling and Style 77 flexible coupling or equal by Anvil Gruvlok or Grinnell Grooved Products, ductile iron housing conforming to ASTM A-536, Grade 65-45-12; Grade "E" EPDM gaskets.
 - G. Ductile-Iron, Flanged Joints: AWWA C115, ductile-iron or gray-iron pipe flanges, rubber gaskets, and steel bolts and nuts.
 - H. Transition Couplings: AWWA C219, sleeve type, or other manufactured fitting the same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

2.5 POLYETHYLENE ENCASEMENT

- A. Polyethylene Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, film, 0.008-inch minimum thickness, tube or sheet.

2.6 GENERAL-DUTY VALVES

- A. Refer to Division 21 for gate, ball, butterfly, globe, and check valves not required to be UL listed and FM approved.

2.7 FIRE-PROTECTION-SERVICE VALVES

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

1. Indicator Posts and Indicator-Post, Gate Valves:
 - a. American Cast Iron Pipe Co.; Waterous Co.
 - b. McWane, Inc.; Clow Valve Co. Div.
 - c. McWane, Inc.; Kennedy Valve Div.
 - d. Nibco, Inc.
 - e. Stockham Valves & Fittings, Inc.
 - f. Victaulic Co.
 - g. Or Approved Equal
 2. Indicator Valves:
 - a. McWane, Inc.; Kennedy Valve Div.
 - b. Milwaukee Valve Co., Inc.
 - c. Nibco, Inc.
 - d. Tyco Fire Suppression & Building Products
 - e. Victaulic Co.
 - f. Or Approved Equal
 3. Fire-Protection-Service Valves:
 - a. McWane, Inc.; Kennedy Valve Div.
 - b. Nibco, Inc.
 - c. Stockham Valves & Fittings, Inc.
 - d. Tyco Fire Suppression & Building Products
 - e. Victaulic Co.
 - f. Or Approved Equal
- B. General: UL listed and FM approved, with minimum 175-psig nonshock working-pressure rating. Valves for grooved-end piping may be furnished with grooved ends instead of type of ends specified.
- C. Gate Valves, NPS 2 and Smaller: UL 262; cast-bronze, threaded ends; solid wedge; OS&Y; and rising stem.
- D. Gate Valves, NPS 2-1/2 and Larger: UL 262, ductile iron body, bronze mounted, taper wedge, OS&Y, and rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.
- E. Gate Valves, NPS 2-1/2 and Larger, Working Pressure over 175 psi: UL 262, ductile iron body, bronze mounted, resilient wedge, OS&Y, brass rising stem, grooved by grooved ends, or grooved by flanged ends, 250 psi.
- F. Indicating Valves, NPS 2 and Smaller: UL 1091; butterfly or ball-type, bronze body with threaded or grooved ends; integral indicating device and prewired, 115-V ac, two-circuit, supervisory switches where required.
- G. Indicating Valves, NPS 2-1/2 and Larger: UL 1091; butterfly type, ductile iron body with grooved ends; integral indicating devices with weatherproof actuator and prewired, 115-V ac, two-circuit, supervisory switches.
- H. Indicator-Post, Gate Valves: UL 262, ductile iron body, bronze mounted, solid-wedge disc, and nonrising stem with operating nut and flanged ends.

- I. Indicator-Post, Gate Valves, Working Pressure over 175 psi: UL 262, ductile iron body, bronze mounted, resilient wedge, brass nonrising stem with cast iron wall post indicator, grooved by grooved ends or flanged by grooved ends, 250 psi.
- J. Wall Indicator Posts: UL 789, FM approved, horizontal, wall type, cast-iron body, with windows for target plates that indicate valve position, extension rod and coupling, locking device, hand wheel operator, and red enamel finish.
 - 1. Operation: Operating wrench.
- K. Swing Check Valves, NPS 2 and Smaller: UL 312 or MSS SP-80, Class 150; bronze body with bronze disc and threaded ends.
- L. Swing Check Valves, NPS 2-1/2 and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze-disc ring and flanged ends.
- M. Spring-Loaded Check Valves, NPS 2 and Larger: UL 312, ductile iron body, stainless steel or EPDM coated ductile iron disc, stainless steel spring, plated nickel or welded-in nickel seat, grooved ends.

2.8 SPECIALTY VALVES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Firematic Sprinkler Devices, Inc.
 - 2. Grinnell Corp. Tyco Fire & Building Products Division.
 - 3. Reliable Automatic Sprinkler Co., Inc.
 - 4. Star Sprinkler Corp.
 - 5. Tyco Fire Suppression & Building Products
 - 6. Viking Corp.
 - 7. Victaulic Co.
 - 8. Wilkins.
 - 9. Or Approved Equal
- B. Alarm Check Valves: UL 193, 175-psig working pressure; designed for horizontal or vertical installation, with cast-iron flanged or ductile iron grooved inlet and outlet, bronze or brass grooved seat with nitrile O-ring seals, and single-hinge pin and latch design. Include trim sets for bypass, drain, electric sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
 - 1. Drip Cup Assembly: Pipe drain without valves, and separate from main drain piping.
 - 2. Drip Cup Assembly: Pipe drain with check valve to main drain piping.
- C. Dry-Pipe Valves: UL 260; differential type; 175-psig working pressure; with cast-iron flanged or ductile iron grooved inlet and outlet, bronze or brass seat with nitrile O-ring seals, and single-hinge pin and latch design. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - 1. Air-Pressure Maintenance Devices: UL-listed and FM Global approved automatic device to maintain correct air pressure in piping. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regu

- lator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig maximum inlet pressure.
2. Air Compressor: Fractional horsepower, 120-V ac, 60 Hz, single phase.
 3. Air Maintenance/Compressor Assembly: Consisting of a riser mounted compressor, air maintenance device and flexible hoses for installation. Designed to ensure the valve system can achieve operational air pressure within 30 minutes of discharge in accordance with NFPA 13 requirements.
- D. [Preaction][Deluge] Valves: UL 260, cast-iron body, 175-psig working pressure; [single interlock, hydraulically operated] [double interlock, electrically operated], hydraulically operated, differential-pressure type. Include flanged or grooved inlet and outlet, bronze or brass seat with nitrile O-ring seals, trim sets for bypass, drain, electric sprinkler alarm switch, pressure gages, drip cup assembly piped without valves and separate from main drain line, fill-line attachment with strainer, and push-rod chamber supply connection. Provide double interlock preaction system with solenoid valve for electrical activation, unless noted otherwise on plans.
1. Air-Pressure Maintenance Devices: Automatic device to maintain correct air pressure in piping. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig maximum inlet pressure.
 2. Air Compressor: Fractional horsepower, 120-V ac, 60 Hz, single phase.
 3. Air Maintenance/Compressor Assembly: Consisting of a riser mounted compressor, air maintenance device and flexible hoses for installation. Designed to ensure the valve system can achieve operational air pressure within 30 minutes of discharge in accordance with NFPA 13 requirements.
- E. Pressure-Regulating Valves: UL 1468, 400-psig minimum rating, brass. Include NPS 1-1/2 or NPS 2-1/2, female NPS inlet and outlet; adjustable setting feature; and straight or 90-degree angle pattern design as indicated.
1. Finish: Rough chrome-plated.
- F. Ball Drip Valves: UL 1726, automatic drain valve, NPS 3/4, ball check device with threaded ends.

2.9 MANUAL CONTROL STATIONS

- A. Manual Control Stations: Hydraulic operation, with union, NPS 1/2 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.

2.10 EXCESS-PRESSURE PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Gamewell Co.
 2. Or Approved Equal

- B. Description: UL-listed, factory-fabricated, positive-displacement, gear-type pump assembly. Include controls; wet-pipe kit; switches; fittings; valves; mounting brackets; and connections for power, hydraulic piping, wiring from alarm devices, and the following features:
1. Pump and Motor: Directly connected.
 2. Motor Control: By differential-pressure switch.
 3. Lights: To indicate sprinkler system operating condition:
 - a. White Light: Pressure is normal.
 - b. Red Light: Pressure is low.
 - c. Pump Capacity: Approximately 1 gpm.
 - d. Pump Discharge Head: Approximately 130 psig, and limited to 175 psig maximum.
 - e. Motor: 1/4 hp, 115-V ac, 60 Hz.

2.11 SPRINKLERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Firematic Sprinkler Devices, Inc.
 2. Globe Fire Sprinkler Corp.
 3. Reliable Automatic Sprinkler Co., Inc.
 4. Tyco Fire Suppression & Building Products
 5. Victaulic Co.
 6. Viking Corp.
 7. Or Approved Equal
- B. Automatic Sprinklers: With heat-responsive element complying with the following:
1. UL 199, for applications except residential.
 2. UL 1626, for residential applications.
 3. UL 1767, for early suppression, fast-response applications.
- C. Sprinklers shall be glass bulb type. Body shall be die-cast brass with hex-shaped wrench boss cast into the body to facilitate installation and reduce risk of damage during installation.
- D. Sprinkler Types and Categories: Nominal 1/2-inch orifice for "Ordinary" temperature classification rating, quick response, unless otherwise indicated or required by application.
1. Open Sprinklers: UL 199, without heat-responsive element.
 - a. Orifice: 1/2 inch, with discharge coefficient K between 5.3 and 5.8.
 - b. Orifice: 17/32 inch, with discharge coefficient K between 7.4 and 8.2.
- E. Sprinkler types, features, and options include the following: Sprinkler heads located in OR's and sub-sterile rooms must be clean room type so that the rooms meet the requirements for monolithic construction 2010 FGI 2.12.1-7.2.3.4(3)(a):
1. Concealed ceiling sprinklers, including cover plate.
 2. Extended-coverage sprinklers.
 3. Flush ceiling sprinklers, including escutcheon.
 4. Institution sprinklers, made with small, breakaway projection.

5. Open sprinklers.
 6. Pendent sprinklers.
 7. Pendent, dry-type sprinklers.
 8. Recessed sprinklers, including escutcheon.
 9. Sidewall sprinklers.
 10. Sidewall, dry-type sprinklers.
 11. Upright sprinklers.
 12. Non-ferrous sprinklers.
- F. Sprinkler Finishes: Chrome-plated, rough bronze, and factory-painted.
- G. Special Coatings: Wax, nickel-teflon and corrosion-resistant paint.
- H. 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, two piece, with 1/2-inch to 3/4-inch vertical adjustment.
 2. Sidewall Mounting: Chrome-plated steel, one piece, flat.
- I. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler. Sprinkler guards shall be listed, supplied and approved for use with the sprinkler, by the sprinkler manufacturer.

2.12 SPECIALTY SPRINKLER FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Sprinkler, Drain and Alarm Test Fittings:
 - a. Fire-End and Croker Corp.
 - b. Tyco Fire Suppression & Building Products
 - c. Victaulic Co.
 - d. Or Approved Equal
 2. Sprinkler, Branch-Line Test Fittings:
 - a. Elkhart Brass Mfg. Co., Inc.
 - b. Fire-End and Croker Corp.
 - c. Smith Industries, Inc.; Potter-Roemer Div.
 - d. Or Approved Equal
 3. Sprinkler, Inspector's Test Fittings:
 - a. AGF Manufacturing, Inc.
 - b. Fire-End and Croker Corp.
 - c. G/J Innovations, Inc.
 - d. Triple R Specialty of Ajax, Inc.
 - e. Or Approved Equal

- B. Specialty Fittings: UL listed and FM approved; made of steel, ductile iron, or other materials compatible with piping.
- C. [Preaction][Deluge][Dry-Pipe] System Fittings: UL listed for dry-pipe service.
- D. Press-Seal Fittings: UL 213, steel housing with butylene O-rings and pipe stop.
- E. Locking-Lug Fittings: UL 213, ductile-iron body with locking-lug ends.
- F. Drop-Nipple Fittings: UL 1474, with threaded inlet, threaded outlet, and seals; adjustable.
- G. Sprinkler, Drain and Alarm Test Fittings: UL-listed, cast- or ductile-iron or bronze body; with threaded or grooved inlet and outlet, test valve, and orifice and sight glass.
- H. Sprinkler, Branch-Line Test Fittings: UL-listed, brass body; with threaded inlet and capped drain outlet and threaded outlet for sprinkler.
- I. Sprinkler, Inspector's Test Fittings: UL-listed, cast- or ductile-iron or bronze housing; with threaded or grooved inlet and drain outlet and sight glass.

2.13 HOSE CONNECTIONS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Elkhart Brass Mfg. Co., Inc.
 - 2. Fire-End and Croker Corp.
 - 3. Guardian Fire Equipment, Inc.
 - 4. Smith Industries, Inc.; Potter-Roemer Div.
 - 5. Or Approved Equal
- B. Description: UL 668, 300-psig minimum pressure rating, brass, hose valve for connecting fire hose. Include 90-degree angle pattern design; female NPS inlet and male hose outlet; and lugged cap, gasket, and chain. Include NPS 1-1/2 or NPS 2-1/2 as required by authority having jurisdiction, and hose valve threads according to NFPA 1963 and matching local fire department threads.
 - 1. Valve Operation: Nonadjustable type, unless pressure-regulating type is indicated.
 - 2. Finish: [Rough brass][Rough chrome-plated].

2.14 HOSE STATIONS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Elkhart Brass Mfg. Co., Inc.
 - 2. Fire-End and Croker Corp.
 - 3. Guardian Fire Equipment, Inc.
 - 4. Smith Industries, Inc.; Potter-Roemer Div.
 - 5. Or Approved Equal

- B. Description: UL 47, semiautomatic hose stations. Include brass, rack nipple; hose rack; and the following features:
1. Valves: UL 668, 300-psig minimum pressure rating, 90-degree angle pattern hose valve with female NPS inlet and outlet, unless otherwise indicated.
 - a. Valve Operation: Nonadjustable type, unless pressure-regulating type is indicated.
 2. Threads and Gaskets: NFPA 1963 and matching local fire department threads.
 3. Flow-Restricting Devices: NPS 1-1/2 brass, adjustable for NPS 1-1/2 fire hose inlet.
 4. Fire Hose: NFPA 1961 and UL 219, lined fire hose with couplings, gaskets, and nozzle. Include the following fire hose materials:
 - a. Jacket: Natural, synthetic, or combination of threads.
 - b. Lining: Rubber, plastic, or combination of compounds.
 - c. Cover: Rubber, plastic, or combination of compounds.
 5. Nozzles: UL 401.
 6. Drain Valves: UL 1726.
 7. Mountings: Pipe clamp or wall bracket for freestanding units.
 8. Mountings: Pipe escutcheon for cabinet-mounted units.
- C. NPS 2-1/2 by NPS 1-1/2 Hose Stations: NPS 2-1/2 hose valve; NPS 2-1/2 by NPS 1-1/2 reducer adapter; hose rack with water-retention device and pins for folded, NPS 1-1/2 lined hose; NPS 1-1/2 lined hose with swivel inlet coupling and nozzle; and reducer adapter spanner wrench.
1. Hose-Rack Finish: Polished chrome-plated.
 2. Hose Valve and Trim Finish: Rough chrome-plated.
 3. Fire Hose: Lined, [50][75][100]-foot length.
 4. Nozzle: Brass, adjustable from shutoff to fog spray or straight stream.
- D. NPS 1-1/2 Hose Stations: NPS 1-1/2 hose valve; hose rack with water-retention device and pins for folded, NPS 1-1/2 lined hose; and NPS 1-1/2 lined hose with swivel inlet coupling and nozzle.
1. Hose-Rack Finish: Polished chrome-plated.
 2. Hose Valve and Trim Finish: Rough chrome-plated.
 3. Fire Hose: Lined, [50][75][100]-foot length.
 4. Nozzle: Brass, adjustable from shutoff to fog spray or straight stream.
- E. NPS 2-1/2 and NPS 1-1/2 Hose Stations: NPS 2-1/2 hose valve with male threaded outlet, cap, and chain and NPS 1-1/2 hose valve; hose rack with water-retention device and pins for folded, NPS 1-1/2 lined hose; and NPS 1-1/2 lined hose with swivel inlet coupling and nozzle.
1. Hose-Rack Finish: Polished chrome-plated.
 2. Hose Valve and Trim Finish: Rough chrome-plated.
 3. Fire Hose: Lined, [50][75][100]-foot length.
 4. Nozzle: Brass, adjustable from shutoff to fog spray or straight stream.

- F. NPS 1-1/2 Hose-Reel Hose Stations: NPS 1-1/2 hose valve; hose reel with water-retention device and pins for NPS 1-1/2 lined hose; and NPS 1-1/2 lined hose with swivel inlet coupling and nozzle.
1. Hose-Rack Finish: Red enamel.
 2. Hose Valve and Trim Finish: Rough chrome-plated.
 3. Fire Hose: Lined, [50][75][100]-foot length.
 4. Nozzle: Brass, adjustable from shutoff to fog spray or straight stream.

2.15 ROOF HOSE CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Fire-End and Croker Corp.
 2. Metal Cabinet Co.
 3. Smith Industries, Inc.; Potter-Roemer Div.
 4. Or Approved Equal
- B. Description: FM-approved, low-profile-type, hose station for roof mounting. Include the following:
1. Housing: Sheet-steel construction with steel reinforcement and modified to hold not less than length of fire hose indicated.
 2. Shutoff Valve: NPS 1-1/2 gate valve with extended stem.
 3. Hose Connection: NPS 1-1/2 valve.
 4. Fittings: Brass.
 5. Hose: NPS 1-1/2, lined and suitable for exterior service. Include two 75-foot lengths coupled together.
 6. Nozzle: NPS 1-1/2 brass, adjustable from shutoff to fog spray or straight stream.
 7. Nozzle: Brass, adjustable-fog type.
 8. Drain Valve: NPS 1/2 gate valve with extended stem.
 9. Finish: Red enamel paint.
 10. Roof Curb: Matching housing dimensions.
 11. Mounting Materials: Structural steel and wood blocking as recommended in writing by manufacturer.

2.16 WALL FIRE HYDRANTS

- A. Description: Cast-brass body with brass, wall, escutcheon plates; brass, lugged caps with gaskets and brass chains; and brass, lugged swivel connections. Include outlets with threads according to NFPA 1963 and matching local fire department sizes and threads, inlet with pipe threads, extension pipe nipple, and valve control.
1. Type: [Flush mounting][Exposed, projecting mounting].
 2. Escutcheon Plates: [Round][Square][Rectangular].
 3. Finish: [Polished chrome-plated][Rough chrome-plated][Polished brass].
 4. Hydrant, Escutcheon-Plate Marking: "HYDRANT."
 5. Hydrant, Valve Control: Wall-mounting assembly with extension rod for manual control of valve inside building.
 6. Hydrant, Valve Escutcheon Plate Marking: "HYDRANT VALVE CONTROL."

2.17 FIRE DEPARTMENT CONNECTIONS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Elkhart Brass Mfg. Co., Inc.
 2. Fire-End and Croker Corp.
 3. Firematic Sprinkler Devices, Inc.
 4. Guardian Fire Equipment, Inc.
 5. Reliable Automatic Sprinkler Co., Inc.
 6. Smith Industries, Inc.; Potter-Roemer Div.
 7. Or Approved Equal
- B. Wall, Fire Department Connections: UL 405; cast-brass body with brass, wall, escutcheon plate; brass, lugged caps with gaskets and brass chains; and brass, lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking "AUTO SPKR & STANDPIPE."
1. Type: [Flush mounting][Exposed, projecting mounting].
 2. Escutcheon Plates: [Round][Square][Rectangular].
 3. Finish: [Polished chrome-plated][Rough chrome-plated][Polished brass].
- C. Exposed, Freestanding, Fire Department Connections: UL 405, cast-brass body, inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, and bottom outlet with pipe threads. Include brass, lugged caps, gaskets, and brass chains; brass, lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch- high brass sleeve; and round, floor, brass, escutcheon plate with marking "AUTO SPKR & STANDPIPE."
1. Finish Including Sleeve: [Polished chrome-plated][Rough chrome-plated][Polished brass].

2.18 ALARM DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Gamewell Co.
 2. Pittway Corp.; System Sensor Div.
 3. Potter Electric Signal Co.
 4. Reliable Automatic Sprinkler Co., Inc.
 5. System Sensor.
 6. Tyco Fire Suppression & Building Products
 7. Viking Corp.
 8. Watts Industries, Inc.; Water Products Div.
 9. Or Approved Equal
- B. General: Types matching piping and equipment connections.
- C. Water-Motor-Operated Alarms: UL 753, mechanical-operation type with pelton-wheel operator with shaft length, bearings, and sleeve to suit wall construction and 10-inch- diameter, cast-aluminum alarm gong with red-enamel factory finish. Include NPS 3/4 inlet and NPS 1 drain connections.

- D. Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector; with 250-psig pressure rating; and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts rated for 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.
- E. Pressure Switches: UL 753; electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.
- F. Valve Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.
- G. Indicator-Post Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.

2.19 PRESSURE GAGES

- A. Pressure Gages: UL 393, 3-1/2- to 4-1/2-inch- diameter dial with dial range of 0 to 250 psig.

2.20 CONTROL PANELS

- A. Description: Single-area, two-area, or single-area cross-zoned type as indicated. Control panel includes NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves. Panels contain power supply; battery charger; standby batteries; field-wiring terminal strip; electrically supervised solenoid valves and polarized fire alarm bell; lamp test facility; single-pole, double-throw auxiliary alarm contacts; and rectifier.
 - 1. Panels: UL listed and FM approved when used with thermal detectors and Class A detector circuit wiring. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.
 - 2. Manual Control Stations: Electric operation, metal enclosure, labeled "MANUAL CONTROL STATION" with operating instructions and a cover held closed by breakable strut.
 - 3. Manual Control Stations: Hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and a cover held closed by breakable strut.

2.21 BACKFLOW PREVENTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ames Co., Inc.
 - 2. CMB Industries, Inc.; Febco Backflow Preventers.
 - 3. Conbraco Industries, Inc.
 - 4. Mueller Co.; Hersey Meters Div.
 - 5. Sparco, Inc.
 - 6. Watts Industries, Inc.; Water Products Div.
 - 7. Zurn Industries, Inc.; Wilkins Div.
 - 8. Or Approved Equal

- B. General: ASSE standard, backflow preventers.
 - 1. NPS 2 and Smaller: Bronze body with threaded ends.
 - 2. NPS 2-1/2 and Larger: Bronze, cast-iron, steel, or stainless steel body with flanged ends.
 - a. Interior Lining: AWWA C550 or FDA approved, epoxy coating for backflow preventers having cast-iron or steel body.
 - 3. Interior Components: Corrosion-resistant materials.
 - 4. Exterior Finish: Polished chrome plate if used in chrome-plated piping system.
 - 5. Strainer: On inlet, if indicated.
- C. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; test cocks; and two positive-seating check valves. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
- D. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; two positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.

2.22 FLEXIBLE SPRINKLER HOSE FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. FlexHead Industries, Inc.
 - 2. Victaulic Co.
 - 3. Viking Corp.
 - 4. Or Approved Equal
- B. Description: UL 2443, 175-psig minimum pressure rating, 300 degrees F minimum temperature rating, flexible, stainless steel hose assembly for connecting fire sprinkler head. Assembly shall be leak tested and include steel nipple, brass slip nuts, minimum 1 inch diameter, corrugated, stainless steel hose, steel pipe-reducer fitting and galvanized steel ceiling mounting bracket with tamper-resistant fastening screws. The flexible drop must be listed for a minimum of three 90-degree bends to ensure proper installation.

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 in Part 1 of this Section.
- B. Report test results promptly and in writing.

3.2 EARTHWORK

- A. Refer to Division 2 for excavating, trenching, and backfilling.

3.3 EXAMINATION

- A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.
- B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 PIPING APPLICATIONS

- A. Do not use welded joints with galvanized steel pipe.
- B. Flanges, unions, and transition and special fittings with pressure ratings the same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.
- C. Piping between Fire Department Connections and Check Valves: Use galvanized, Schedule 40 steel pipe with grooved ends with mechanical grooved joint system.
- D. Underground Service-Entrance Piping: Use ductile-iron pipe with mechanical grooved joint system.
- E. Service-Entrance Piping Inside Building: If backflow preventer is not within 5 feet of underground service-entrance piping, use Type K hard drawn copper tubing or stainless steel pipe upstream of backflow preventer. Do not use steel pipe on municipal water system upstream of backflow preventer.
- F. Wet Standpipes: Steel pipe with mechanical grooved joint system.
- G. Wet-Pipe Sprinklers: Use the following:
 - 1. NPS 2 and Smaller: Schedule 40 steel pipe with threaded ends, cast-iron threaded fittings, and threaded joints
 - 2. NPS 2-1/2 and Larger: [Schedule 30][Schedule 10] steel pipe with mechanical grooved joint system.
- H. Dry-Pipe [Preaction][Deluge] Sprinklers: Use the following:
 - 1. NPS 2 and Smaller: Galvanized, schedule 40 steel pipe with threaded ends; galvanized, cast-iron threaded fittings; and galvanized threaded joints.
 - 2. NPS 2-1/2 and Larger: Galvanized, [schedule 30][schedule 10] steel pipe with galvanized mechanical grooved joint system.
- I. Drains:
 - 1. Drain Risers in Stairs: Galvanized steel pipe with mechanical grooved pipe system.
 - 2. Miscellaneous Drains: Black steel or galvanized steel pipe with joints same as sprinkler piping.

3.5 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Fire-Protection-Service Valves: UL listed and FM approved for applications where required by NFPA 13 and NFPA 14.
 - a. Shutoff Duty: Use gate valves.
 - 2. General-Duty Valves: For applications where UL-listed and FM-approved valves are not required by NFPA 13 and NFPA 14.
 - a. Shutoff Duty: Use gate, ball, or butterfly valves.

3.6 JOINT CONSTRUCTION

- A. Refer to Division 21 for basic piping joint construction.
- B. Ductile-Iron-Piping, Mechanical Grooved Joint System: Use ductile-iron pipe with radius-cut-grooved ends; mechanical grooved joint fittings and couplings. Piping shall be grooved in accordance to mechanical grooved joint system manufacturer's recommendations. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
- C. Steel-Piping, Mechanical Grooved Joint System: Use steel pipe with cut or roll-grooved ends; steel pipe mechanical grooved joint fittings and couplings. Piping shall be grooved in accordance to mechanical grooved joint system manufacturer's recommendations. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions. Use gaskets listed for dry-pipe service for dry piping.
- D. Copper-Tubing, Mechanical Grooved Joint System: Use copper tube with roll-grooved ends; copper pipe mechanical grooved joint fittings and couplings. Piping shall be grooved in accordance to mechanical grooved joint system manufacturer's recommendations. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions. Use gaskets listed for dry-pipe service for dry piping.
- E. Stainless Steel, Mechanical Grooved Joint System: Use stainless steel pipe with roll-grooved ends; stainless steel pipe grooved mechanical joint fittings and couplings. Piping shall be grooved in accordance to mechanical grooved joint system manufacturer's recommendations. Assemble joints with couplings, gaskets, lubricant, and bolts according to manufacturer's written instructions.
- F. A factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
- G. Dissimilar-Piping-Material Joints: Construct joints using adapters or couplings compatible with both piping materials. Use dielectric fittings if both piping materials are metal. Refer to Division 21 Section " Common Work Results for Fire Suppression" for dielectric fittings.

3.7 SERVICE-ENTRANCE PIPING

- A. Connect standpipe and sprinkler piping to water-service piping of size and in location indicated for service entrance to building. Refer to Division 2 for exterior piping.
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.

3.8 WATER-SUPPLY CONNECTION

- A. Connect standpipe and sprinkler piping to building interior water distribution piping. Refer to Division 22 for interior piping.
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water distribution piping. Comply with requirements of Authorities Having Jurisdiction.

3.9 PIPING INSTALLATION

- A. Refer to Division 21 for basic piping installation.
- B. 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.
- C. Install underground service-entrance piping according to NFPA 24 and with restrained joints.
- D. Use approved 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 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.
- F. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.
- G. Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler zone control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install drain valves on standpipes.
- K. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.
- L. Install alarm devices in piping systems.

- M. Hangers and Supports: Comply with NFPA 13 for hanger materials. Install according to NFPA 13 for sprinkler piping and to NFPA 14 for standpipes.
- N. Earthquake Protection: Install piping according to NFPA 13 to protect from earthquake damage.
- O. Install piping with grooved joints according to manufacturer's written instructions. Construct rigid piping joints, unless otherwise indicated.
- P. 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 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.
- Q. Install flexible sprinkler hose fittings in accordance with the manufacturer's installation instructions. Allow sufficient space between hard pipe connection and ceiling grid for the flexible hose to hang freely. Provide no more than the maximum number of bends as recommended by the manufacturer and take care to ensure that there are no kinks or pinch points in the final installed condition.

3.10 SPECIALTY SPRINKLER FITTING INSTALLATION

- A. Install specialty sprinkler fittings according to manufacturer's written instructions.

3.11 VALVE INSTALLATION

- A. Refer to Division 21 for installing general-duty valves. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13 and NFPA 14, manufacturer's written instructions, and authorities having jurisdiction.
- B. Gate Valves: Install fire-protection-service valves supervised-open, located to control sources of water supply except from fire department connections. Provide permanent identification signs indicating portion of system controlled by each valve.
- C. Valves for Wall Fire Hydrants: Install gate valve with nonrising stem in supply pipe.
- D. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water supply sources.
- E. Alarm Check Valves: Install valves in vertical position for proper direction of flow, including bypass check valve and retard chamber drain-line connection.
- F. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - 1. Air-Pressure Maintenance Devices for Dry-Pipe Systems: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig adjustable range; and 175-psig maximum inlet pressure.
 - 2. Install air compressor and compressed-air supply piping.
 - 3. Install compressed-air supply piping from building compressed-air piping system.

- G. Deluge and Preaction Valves: Install in vertical position, in proper direction of flow, in main supply to deluge system.

3.12 SPRINKLER APPLICATIONS

- A. General: Use sprinklers according to the following applications and in accordance with the manufacturers' installation instructions:
 - 1. Rooms without Ceilings: Upright sprinklers or as indicated.
 - 2. Rooms with Suspended Ceilings: Recessed sprinklers or as indicated.
 - 3. Wall Mounting: Recessed horizontal sidewall sprinklers or as indicated.
 - 4. Spaces Subject to Freezing Served by Wet-Pipe System: Dry-pendent type and/or dry-sidewall type sprinklers.
 - 5. Preaction-Sprinkler Systems: Upright, listed dry, sidewall and pendent sprinklers.
 - 6. Deluge-Sprinkler Systems: Upright and pendent, open sprinklers.
 - 7. Rooms in Healthcare Occupancies with Critical Room Air Pressure Relationships and with Hard Ceilings: Concealed sprinklers with gaskets.
 - 8. Special Applications: Use extended-coverage and quick-response sprinklers where indicated.
 - 9. Sprinkler Finishes: Use sprinklers with the following finishes:
 - a. 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.
 - b. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
 - c. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
 - d. Residential Sprinklers: Dull chrome.

3.13 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical panels and tiles.
- B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space.
- C. The sprinkler bulb protector must remain in place until the sprinkler is completely installed and before the system is placed into service. Remove bulb protectors carefully by hand after installation. Do not use any tools to remove bulb protectors.
- D. Do not install sprinklers that have been dropped, damaged or show visible loss of fluid. Never install sprinklers with cracked bulbs.

3.14 HOSE-CONNECTION INSTALLATION

- A. Install hose connections adjacent to standpipes, unless otherwise indicated.
- B. Install freestanding hose connections for access and minimum passage restriction.
- C. Install NPS 1-1/2 hose-connection valves with flow-restricting device, unless otherwise indicated.
- D. Install wall-mounting-type hose connections in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install

valves at angle required for connection of fire hose. Refer to Division 10 Section "Fire-Protection Specialties" for cabinets.

- E. Install NPS 2-1/2 hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 reducer adapter and flow-restricting device, unless otherwise indicated.

3.15 HOSE-STATION INSTALLATION

- A. Install freestanding hose stations for access and minimum passage restriction.
- B. Install NPS 1-1/2 hose-station valves with flow-restricting device, unless otherwise indicated.
- C. Install NPS 2-1/2 hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 reducer adapter and flow-restricting device, unless otherwise indicated.
- D. Install freestanding hose stations with support or bracket attached to standpipe or substrate.
- E. Install wall-mounting, rack-type hose stations in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose. Cabinets are specified in Division 10 Section "Fire-Protection Specialties."
- F. Install hose-reel hose stations on wall with bracket attached to substrate.

3.16 ROOF HOSE CABINET INSTALLATION

- A. Install cabinets according to manufacturer's written instructions.

3.17 EXCESS-PRESSURE PUMP INSTALLATION

- A. Install excess-pressure pumps, controls, devices, and supports according to manufacturer's written installation instructions for wet-pipe sprinkler system application.
 - 1. Mounting: Install [mounted on wall, where indicated][attached to water-supply pipe].

3.18 CONNECTIONS

- A. Connect water-supply piping and standpipes and sprinklers to fire pumps. Include backflow preventers.
- B. Connect water supplies to standpipes and sprinklers. Include backflow preventers.
- C. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.
- D. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.
- E. Electrical Connections: Power wiring is specified in Division 26.
- F. Connect alarm devices to fire alarm.

G. Connect excess-pressure pumps to the following piping and wiring:

1. Sprinkler system, hydraulically.
2. Pressure gages and controls, hydraulically.
3. Electrical power system.
4. Alarm device accessories for pump.
5. Fire alarm system.

H. Connect compressed-air supply to dry-pipe sprinkler piping.

I. Connect air compressor to the following piping and wiring:

1. Pressure gages and controls.
2. Electrical power system.
3. Fire alarm system devices, including low-pressure alarm.

3.19 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and NFPA 14 and in Division 23.

3.20 FIELD QUALITY CONTROL

- A. Flush, test, and inspect sprinkler piping according to NFPA 13, "System Acceptance" Chapter.
- B. Flush, test, and inspect standpipes according to NFPA 14, "Tests and Inspection" Chapter.
- C. Replace piping system components that do not pass test procedures and retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
- D. Report test results promptly and in writing to Architect and Authorities Having Jurisdiction.

3.21 CLEANING

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

3.22 PROTECTION

A. Protect sprinklers from damage until Substantial Completion.

3.23 START-UP PROCEDURES

- A. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.
- B. Verify that excess-pressure pumps and accessories are installed and operate correctly.
- C. Verify that air compressors and their accessories are installed and operate correctly.

- D. Verify that specified tests of piping are complete.
- E. Verify that damaged sprinklers and sprinklers with paint or coating not specified are replaced with new, correct type.
- F. Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.
- G. Verify that potable-water supplies have correct types of backflow preventers.
- H. Drain dry-pipe and preaction sprinkler piping.
- I. Pressurize and check dry-pipe sprinkler piping air-pressure maintenance devices and air compressors.
- J. Verify that hose connections and fire department connections have threads compatible with local fire department equipment.
- K. Fill wet-pipe sprinkler piping with water.
- L. Fill standpipes with water.
- M. Verify that hose connections are correct type and size.
- N. Verify that hose stations are correct type and size.
- O. Energize circuits to electrical equipment and devices.
- P. Start and run excess-pressure pumps.
- Q. Start and run air compressors.
- R. Adjust operating controls and pressure settings.
- S. Coordinate with fire alarm tests. Operate as required.
- T. Coordinate with fire-pump tests. Operate as required.

3.24 DEMONSTRATION

- A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.
- B. Schedule demonstration with Owner with at least seven days' advance notice.

END OF SECTION