# SECTION 211316 - DRY-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. Sprinkler specialty pipe fittings.
5. Sprinklers.
6. Alarm devices.
7. Manual control stations.
8. Control panels.
9. Pressure gages.

B. Related Sections:

1. Section 211200 "Fire-Suppression Standpipes" for standpipe piping.
2. Section 211313 "Wet-Pipe Sprinkler Systems" for wet-pipe sprinkler piping.
3. Section 211339 "Foam-Water Systems" for AFFF piping.
4. [**Section 213113 "Electric-Drive, Centrifugal Fire Pumps"**] [**Section 213116 "Diesel-Drive, Centrifugal Fire Pumps"**] [**Section 213213 "Electric-Drive, Vertical-Turbine**

**Fire Pumps"**] [**Section 213216 "Diesel-Drive, Vertical-Turbine Fire Pumps"**] for fire pumps, pressure-maintenance pumps, and fire-pump controllers.

5. [**Section 283111 "Digital, Addressable Fire-Alarm System"**] [**Section 283112 "Zoned (DC Loop) Fire-Alarm System"**] for alarm devices not specified in this Section.

## 1.3 DEFINITIONS

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

## 1.4 SYSTEM DESCRIPTIONS

A. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from sprinklers that are open.

B. Combined Dry-Pipe and Preaction Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Fire-detection system in same area as sprinklers actuates tripping devices that open dry-pipe valve without loss of air pressure and actuates fire alarm. Water discharges from sprinklers that have opened.

C. Single-Interlock Preaction Sprinkler System: Automatic sprinklers are attached to piping containing low-pressure air. Actuation of fire-detection system in same area as sprinklers opens deluge valve, permitting water to flow into piping and to discharge from sprinklers that have opened.

D. Double-Interlock Preaction Sprinkler System: Automatic sprinklers are attached to piping containing low-pressure air. Actuation of a fire-detection system in the same area as sprinklers opens the deluge valve permitting water to flow into the sprinkler piping; a closed solenoid valve in the sprinkler piping is opened by another fire-detection device; then water will discharge from sprinklers that have opened.

## 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.

1. Available fire-hydrant flow test records indicate the following conditions:

   a. Date: <**Insert test date**>.
   b. Time: <**Insert time**> [**a.m.**] [**p.m.**]
   c. Performed by: <**Insert operator's name**> of <**Insert firm**>.
   d. Location of Residual Fire Hydrant R: <**Insert location**>.
   e. Location of Flow Fire Hydrant F: <**Insert location**>.

f. Static Pressure at Residual Fire Hydrant R: <**Insert psig (kPa)**>.
g. Measured Flow at Flow Fire Hydrant F: <**Insert gpm (L/s)**>.
h. Residual Pressure at Residual Fire Hydrant R: <**Insert psig (kPa)**>.

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. Automobile Parking Areas: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
b. Building Service Areas: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
c. Churches: [**Light Hazard**] <**Insert classification**>.
d. Electrical Equipment Rooms: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
e. Dry Cleaners: [**Ordinary Hazard, Group 2**] <**Insert classification**>.
f. General Storage Areas: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
g. Laundries: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
h. Libraries Except Stack Areas: [**Light Hazard**] <**Insert classification**>.
i. Library Stack Areas: [**Ordinary Hazard, Group 2**] <**Insert classification**>.
j. Machine Shops: [**Ordinary Hazard, Group 2**] <**Insert classification**>.
k. Mechanical Equipment Rooms: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
l. Office and Public Areas: [**Light Hazard**] <**Insert classification**>.
m. Plastics Processing Areas: [**Extra Hazard, Group 2**] <**Insert classification**>.
n. Printing Plants: [**Extra Hazard, Group 1**] <**Insert classification**>.
o. Repair Garages: [**Ordinary Hazard, Group 2**] <**Insert classification**>.
p. Restaurant Service Areas: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
q. Solvent Cleaning Areas: [**Extra Hazard, Group 2**] <**Insert classification**>.
r. Upholstering Plants: [**Extra Hazard, Group 1**] <**Insert classification**>.
s. <**Insert classification**>.

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)**] <**Insert value**> area.
b. Ordinary-Hazard, Group 1 Occupancy: [**0.15 gpm over 1500-sq. ft. (6.1 mm/min. over 139-sq. m)**] <**Insert value**> area.
c. Ordinary-Hazard, Group 2 Occupancy: [**0.20 gpm over 1500-sq. ft. (8.1 mm/min. over 139-sq. m)**] <**Insert value**> area.
d. Extra-Hazard, Group 1 Occupancy: [**0.30 gpm over 2500-sq. ft. (12.2 mm/min. over 232-sq. m)**] <**Insert value**> area.
e. Extra-Hazard, Group 2 Occupancy: [**0.40 gpm over 2500-sq. ft. (16.3 mm/min. over 232-sq. m)**] <**Insert value**> area.
f. 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)**] <**Insert dimension**>.
b. Storage Areas: [**130 sq. ft. (12.1 sq. m)**] <**Insert dimension**>.
c. Mechanical Equipment Rooms: [**130 sq. ft. (12.1 sq. m)**] <**Insert dimension**>.
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**] <**Insert requirement**>.
b. Ordinary-Hazard Occupancies: [**250 gpm (15.75 L/s) for 60 to 90 minutes**] <**Insert requirement**>.
c. Extra-Hazard Occupancies: [**500 gpm (31.5 L/s) for 90 to 120 minutes**] <**Insert requirement**>.
d. <**Insert requirement**>.

D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and [**ASCE/SEI 7**] <**Insert requirement**>.

## 1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.[ **Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.**]

1. Grooved joint couplings and fittings may be shown on drawings and product submittals, and shall be specifically identified by the manufacturer's style or series designation.

B. Shop Drawings: For dry-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. 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.

## 1.7 INFORMATIONAL SUBMITTALS

A. 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. Compressed air piping.
3. HVAC hydronic piping.
4. Items penetrating finished ceiling including the following:

a. Lighting fixtures.

b. Air outlets and inlets.
c. <**Insert item**>.

5. <**Insert item**>.

B. Qualification Data: For qualified Installer[ **and professional engineer**].

C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

D. Fire-hydrant flow test report.

E. 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."

F. Field quality-control reports.

## 1.8 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

## 1.9 MAINTENANCE MATERIAL SUBMITTALS

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.

## 1.10 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. Date Stamped Castings: All castings used for coupling housings, fittings, and valve bodies shall be date stamped for quality assurance and traceability.

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."

1.11 PROJECT CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify [**Architect**] [**Construction Manager**] [**Owner**] no fewer than [**two**] <**Insert number**> days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without [**Architect's**] [**Construction Manager's**] [**Owner's**] written permission.

1.12 COORDINATION

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

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

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

2.2 SOURCE LIMITATIONS

A. Source Limitations: Obtain all grooved joint couplings, fittings, valves, and specialties from single source. Obtain grooving tools from same source as grooved components.

2.3 STEEL PIPE AND FITTINGS

A. Standard Weight, Galvanized-Steel Pipe: ASTM A 53/A 53M, [**Type E**] <**Insert type**>, [**Grade B**] <**Insert grade**>. Pipe ends may be factory or field formed to match joining method.

B. Schedule 30, Galvanized-Steel Pipe: ASTM A 135; ASTM A 795/A 795M, [**Type E**] <**Insert type**>; 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-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. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

E. Galvanized, Steel Couplings: ASTM A 865, threaded.

F. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

G. Malleable- or Ductile-Iron Unions: UL 860.

H. Grooved-Joint, Steel-Pipe Appurtenances:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Firelock or comparable product by one of the following:

   a. <**Insert manufacturer's name**>.

2. Pressure Rating: [**175 psig (1200 kPa)**] [**250 psig (1725 kPa)**] [**300 psig (2070 kPa)**] minimum.
3. Galvanized, Grooved-End Fittings for Steel Piping: ASTM A 536, ductile-iron casting; short-pattern, with flow equal to standard pattern; and dimensions matching steel pipe.

   a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company: FireLock or comparable product by one of rhe following:

      1) <**Insert engineer approved manufacturer's name**>.

   b. In sizes where short pattern fittings are not available, Victaulic standard fittings may be used.
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 [**,FlushSeal for dry applications**], and ASTM A 449 electroplated steel bolts and nuts.

   a. Rigid Type Couplings: Housings cast with offsetting, angle-pattern bolt pads to provide joint rigidity and support and hanging in accordance with NFPA-13. Couplings shall be fully installed at visual pad-to-pad offset contact. Tongue-and-recess type couplings, or any coupling that requires exact gapping of bolt pads at required torque ratings, are not permitted.

      1) Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Style 009-EZ and Style 107H, Installation-Ready, or comparable product by one of the following:

a) <**Insert engineer approved manufacturer's name**>.

2) Installation: Direct stab installation without field disassembly.

b. Rigid Type Couplings: Housings cast with offsetting, angle-pattern bolt pads to provide joint rigidity and support and hanging in accordance with NFPA-13. Couplings shall be fully installed at visual pad-to-pad offset contact. Tongue-and-recess type couplings, or any coupling that requires exact gapping of bolt pads at required torque ratings, are not permitted.

1) Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Victaulic FireLock Style 005 and Zero-Flex Style 07, or comparable product by one of the following:

a) <**Insert engineer approved manufacturer's name**>.

c. Flexible Type: For use in locations where vibration attenuation and stress relief are required.

1) Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company Installation-Ready Style 177 or comparable product by one of the following:

a) <**Insert engineer approved manufacturer's name**>.

2) Installation: Suitable for direct stab installation without field disassembly.

d. Flexible Type: For use in locations where vibration attenuation and stress relief are required.

1) Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company Style 75 and Style 77 or comparable product by one of the following:

a) <**Insert engineer approved manufacturer's name**>.

e. Flange Adapter: For direct connection to ANSI Class 125 or 150 flanged components.

1) Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company: Style 741 and 744 or comparable product by one of the following:

a) <**Insert engineer approved manufacturer's name**>.

I. Stainless Steel Pressure-Seal Fittings: FM-approved, 500-psig (3450-kPa) maximum pressure rating with stainless steel housing, elastomer O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tool, Series PFT-510.

1. Pipe: Schedule 10S, type 304/304L, conforming to ASTM A312.

2. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; "Vic-Press" system, or comparable product by one of the following:

   a. <**Insert engineer approved manufacture's name**>.

2.4 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: [**ASTM B 88, Type L (ASTM B 88M, Type B)**] [**and**] [**ASTM B 88, Type M (ASTM B 88M, Type C)**] 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**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

   a. Viega; Plumbing & Heating Systems.
   b. <**Insert manufacturer's name**>.

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. Grooved-End, Copper Fittings: ASME B15.22 wrought copper and ASTM B 75 (ASTM B 75M), copper tube or ASME B16.18 and ASTM B 584, bronze castings.

   a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; "Copper-Connection" or comparable product by one of the following:

      1) <**Insert engineer approved manufacturer's name**>.

   b. Fittings to be manufactured to copper tubing sizes. (Flaring tube or fitting ends to accommodate alternate sized couplings is not permitted.)

2. Grooved-End-Tube Couplings: To fit copper tube, with dimensions and design similar to AWWA C606. Include ferrous housing sections cast with offsetting, angle-pattern, bolt

pads, EPDM-HP elastomer gasket suitable for hot and cold water, and electroplated bolts and nuts conforming to ASTM A 449.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Style 607H Installation-Ready, for direct stab installation without field disassembly.

1) : <**Insert engineer approved manufacturer's name**>.

b. Installation: Suitable for direct stab installation without field disassembly.

H. Copper-Tube, Extruded-Tee Connections:

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. T-DRILL Industries Inc.
b. <**Insert manufacturer's name**>.

2. Description: Tee formed in copper tube according to ASTM F 2014.

## 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 and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
2. Class 250, Cast-Iron and Class 300, Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Grooved Joint Lubricant: Compatible with gasket elastomer and fluid media. Supplied by coupling manufacturer.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Vic-Lube or comparable product by one of the following:

**a. <Insert engineer approved manufacturer's name>.**

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

## 2.6 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. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company <**Insert product name or designation**> or comparable product by one of the following:

   a. <**Insert engineered approved manufacturer's name**>.

2. Standard: UL 1091 except with ball instead of disc.
3. Valves NPS 1-1/2 (DN 40) and Smaller: Bronze body with threaded ends.
4. 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.
5. Valves NPS 3 (DN 80): Ductile-iron body with grooved ends.

C. Bronze Butterfly Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Series 608 or comparable product by one of the following:

   a. <**Insert engineer approved manufacturer's name**>.

2. Pressure Rating: 300 psig (3065 kPa).
3. Body Material: Bronze, ASTM B 584.
4. End Connections: Copper-tubing sized grooved ends or threaded.

D. Iron Butterfly Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Series 705 or comparable product by one of the following:

   a. <**Insert engineer approved manufacturer's name**>.

2. Standard: UL 1091.
3. Pressure Rating: 300 psig (2065 kPa).
4. Stem: Stainless seal.

   a. Stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating.

5. Seat: Pressure responsive elastomer.
6. Body Material: Cast or ductile iron.
7. End Connections: Grooved.

E. Check Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; [**Series 717**] [**or**] [**and**] [**717R "Riser-Check"**] or comparable product by one of the following:

   a. <**Insert engineer approved manufacturer's name**>.

2. Standard: UL 312
3. Pressure Rating: [**250 psig (1725 kPa) minimum**] [**300 psig (2070 kPa)**].
4. Type: Spring-assisted swing check for vertical or horizontal installation.
5. Spring and Shaft: Stainless steel.
6. Body Material: Ductile iron.
7. End Connections: Grooved.

F. Bronze 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. 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.
   f. <**Insert manufacturer's name**>.

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. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Series 771H or comparable product by one of the following:

   a. <**Insert engineer approved manufacturer's name**>.

2. Standard: UL 262.
3. Pressure Rating: [**250 psig (1725 kPa) minimum**] [**300 psig (2070 kPa)**].
4. Body Material: Ductile iron.
5. End Connections: Flanged or grooved.

H. Indicating-Type Butterfly Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Series 728 (ball Valve) and Series 705 (butterfly valve) or comparable product by one of the following:

   a. <**Insert engineer approved manufacturer's name**>.

2. Standard: UL 1091.
3. Pressure Rating: 175 psig (1200 kPa) minimum.
4. Valves NPS 2 (DN 50) and Smaller:

a. Valve Type: Ball or butterfly.
b. Body Material: Bronze.
c. End Connections: Grooved or threaded.

5. Valves NPS 2-1/2 (DN 65) and Larger:

a. Valve Type: Butterfly.
b. Body Material: Ductile iron.
c. Stem: Offset from the disc centerline to provide complete 360-degree circumferential seating.
d. Seat: Pressure responsive elastomer.
e. End Connections: Grooved ends.

6. Valve Operation: Integral electrical, 125-V ac, prewired, two single-pole, double-throw supervisory switches with weatherproof actuator housing and visual indicating device.

I. NRS Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Victaulic Series 722 or comparable product by one of the following:

a. <**Insert engineer approved manufacturer's name**>.

2. Standard: UL 262.
3. Pressure Rating: 250 psig (1725 kPa) minimum.
4. Body Material: Ductile iron with indicator post flange.
5. Stem: Nonrising.
6. End Connections: Flanged or grooved.

J. Indicator Posts:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Victaulic Series 773 (wall) and Series 774 (upright) or comparable product by one of the following:

a. <**Insert engineer approved manufacturer's name**>.

2. Standard: UL 789.
3. Type: Vertical or horizontal for wall mounting.
4. Body Material: Cast iron with extension rod and locking device.
5. Operation: [**Wrench**] [**Hand wheel**].

## 2.7 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**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

a. Fire Protection Products, Inc.
b. United Brass Works, Inc.
c. <**Insert manufacturer's name**>.

C. Ball Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company <**Insert product name or designation**> or comparable product by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Watts Water Technologies, Inc.
c. <**Insert engineer approved manufacturer's name**>.

D. Globe 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**]:

a. Fire Protection Products, Inc.
b. United Brass Works, Inc.
c. <**Insert manufacturer's name**>.

E. Plug 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**]:

a. Southern Manufacturing Group.
b. <**Insert manufacturer's name**>.

## 2.8 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**] [**300 psig (2070 kPa)**].

3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Dry-Pipe Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Victaulic Style 768-NXT and Fire Pac Style 745 or comparable product by one of the following:

   a. <**Insert engineer approved manufacturer's name**>.

2. Standard: UL 260
3. Design: Fixed pressure release at 7 psi (48 kPa).
4. Valve: Externally resettable.
5. Internal Components: Replaceable without removing the valve from the installed position.
6. Required air pressure: 13 psi (90 kPa).
7. 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.
8. Air-Pressure Maintenance Device:

   a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Series 757 / 757P or comparable product by one of the following:

      1) <**Insert engineer approved manufacturer's name**>.

   b. Standard: UL 260.
   c. Type: Automatic device to maintain minimum air pressure in piping.
   d. 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 (95- to 410-kPa) adjustable range, and [**175-psig (1200-kPa)**] [**300-psig (2070-kPa)**] outlet pressure.

9. Air Compressor:

   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) Gast Manufacturing Inc.
      2) Victaulic Company.
      3) <**Insert engineer approved manufacturer's name**>.

   c. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

d. Motor Horsepower: Fractional.
e. Power: 120-V ac, 60 Hz, single phase.

C. Deluge Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Victaulic Style 769-NXT and Fire Pac Style 745 or comparable product by one of the following:

a. <**Insert engineer approved manufacturer's name**>.

2. Standard: UL 260.
3. Design: Fixed pressure release at 7 psi (48 pKa).
4. Valve: Externally resettable.
5. Internal Components: Replaceable without removing the valve from the installed position.
6. Include trim sets for bypass, drain, electrical 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.
7. Dry, Pilot-Line Trim Set: Include dry, pilot-line actuator; air- and water-pressure gages; low-air-pressure warning switch; air relief valve; and actuation device. Dry, pilot-line actuator includes cast-iron, operated, diaphragm-type valve with resilient facing plate, resilient diaphragm, and replaceable bronze seat. Valve includes threaded water and air inlets and water outlet. Loss of air pressure on dry, pilot-line side allows pilot-line actuator to open and causes deluge valve to open immediately.
8. Air-Pressure Maintenance Device:

a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; <**Insert product name or designation**> or comparable product by one of the following:

1) <**Insert engineer approved manufacturer's name**>.

b. Standard: UL 260.
c. Type: Automatic device to maintain minimum air pressure in piping.
d. 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 (95- to 410-kPa) adjustable range, and [**175-psig (1200-kPa)**] [**300-psig (2070-kPa)**] outlet pressure.

9. Air Compressor:

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) Gast Manufacturing Inc.
2) Victaulic Company.

3) <**Insert engineer approved manufacturer's name**>.

c. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
d. Motor Horsepower: Fractional.
e. Power: 120-V ac, 60 Hz, single phase.

D. Automatic (Ball Drip) Drain 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. AFAC Inc.
b. Reliable Automatic Sprinkler Co., Inc.
c. <**Insert manufacturer's name**>.

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.

2.9 FIRE-DEPARTMENT CONNECTIONS

A. Exposed-Type, Fire-Department Connection:

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. 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. Wilson & Cousins Inc.
h. <**Insert manufacturer's name**>.

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**] [**Three**].
12. Escutcheon Plate Marking: Similar to "[**AUTO SPKR & STANDPIPE**] [**AUTO SPKR**]."
13. Finish: [**Polished chrome plated**] [**Rough brass or bronze**] [**Rough chrome plated**].
14. Outlet Size: [**NPS 4 (DN 100)**] [**NPS 5 (DN 125)**] [**NPS 6 (DN 150)**].

B. Flush-Type, Fire-Department Connection:

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. AFAC Inc.
   b. Elkhart Brass Mfg. Company, Inc.
   c. GMR International Equipment Corporation.
   d. Guardian Fire Equipment, Inc.
   e. Potter Roemer.
   f. <**Insert manufacturer's name**>.

3. Standard: UL 405.
4. Type: Flush, 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: Rectangular, brass, wall type.
10. Outlet: With pipe threads.
11. Body Style: [**Horizontal**] [**Square**] [**Vertical**].
12. Number of Inlets: [**Two**] [**Three**] [**Four**] [**Six**].
13. Outlet Location: [**Back**] [**Bottom**] [**Left side**] [**Right side**] [**Top**].
14. Escutcheon Plate Marking: Similar to "[**AUTO SPKR & STANDPIPE**] [**AUTO SPKR**]."
15. Finish: [**Polished chrome plated**] [**Rough brass or bronze**] [**Rough chrome plated**].
16. Outlet Size: [**NPS 4 (DN 100)**] [**NPS 5 (DN 125)**] [**NPS 6 (DN 150)**] [**NPS 8 (DN 200)**].

C. Yard-Type, Fire-Department Connection:

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. 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. Wilson & Cousins Inc.
   h. <**Insert manufacturer's name**>.

3. Standard: UL 405.
4. Type: Exposed, freestanding.
5. Pressure Rating: [**175 psig (1200 kPa) minimum**] [**300 psig (2070 kPa)**].
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, floor type.
10. Outlet: Bottom, with pipe threads.
11. Number of Inlets: [**Two**] [**Three**] [**Four**].
12. Sleeve: [**Brass**] [**Not required**].
13. Sleeve Height: 18 inches (460 mm).
14. Escutcheon Plate Marking: Similar to "[**AUTO SPKR & STANDPIPE**] [**AUTO SPKR**]."
15. Finish[**, Including Sleeve**]: [**Polished chrome plated**] [**Rough brass or bronze**] [**Rough chrome plated**].
16. Outlet Size: [**NPS 4 (DN 100)**] [**NPS 5 (DN 125)**] [**NPS 6 (DN 150)**].

D. Elbow with Drain Connection: Install 90-degree elbow with drain connection at low point near each fire department connection to allow for system drainage to prevent freezing.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; #10-DR or comparable product by one of the following:

   a. <**Insert engineer approved manufacturer's name**>.

## 2.10 SPRINKLER SPECIALTY PIPE FITTINGS

A. General Requirements for Dry-Pipe-System Fittings: [**UL listed**] <**Insert standard**> for dry-pipe service.

B. Branch Outlet Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Style 920/920N or comparable product by one of the following:

a. <**Insert engineer approved manufacturer's name**>.

2. Standard: UL 213.
3. Pressure Rating: [**175 psig (1200 kPa) minimum**] [**300 psig (2070 kPa)**].
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.

C. Flow Detection and Test Assemblies:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Zone Control Riser Module Series 747M or comparable product by one of the following:

a. <**Insert engineer approved manufacturer's name**>.

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**] [**300 psig (2070 kPa)**].
4. Body Material: Ductile-iron housing with cast-bronze orifice, sight glass, integral test valve, and waterflow detector.
5. Size: Same as connected piping.
6. Inlet and Outlet: Grooved ends.

D. Branch Line Testers:

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. Elkhart Brass Mfg. Company, Inc.
b. Fire-End & Croker Corporation.
c. Potter Roemer.
d. <**Insert manufacturer's name**>.

2. Standard: UL 199.
3. Pressure Rating: 175 psig (1200 kPa) minimum.
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.

E. Sprinkler Inspector's Test Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; TestMaster II, Style 720 or comparable product by one of the following:

a. <**Insert engineer approved manufacturer's name**>.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 300 psig (2070 kPa).
4. Body Material: Cast-bronze housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded or grooved end.

F. Adjustable Drop Nipples:

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. CECA, LLC.
b. Corcoran Piping System Co.
c. Merit Manufacturing; a division of Anvil International, Inc.
d. <**Insert manufacturer's name**>.

2. Standard: UL 1474.
3. Pressure Rating: [**250 psig (1725 kPa) minimum**] [**300 psig (2070 kPa)**].
4. Body Material: Steel pipe with EPDM O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

G. Flexible, Sprinkler Hose Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic; Vic-Flex or comparable product by one of the following:

a. <**Insert engineer approved manufacturer's name**>.

## 2.11 SPRINKLERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; <**Insert product name or designation**> or comparable product by one of the following:

1. <**Insert engineer approved manufacturer's name**>.

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. Sprinklers shall be glass bulb type, with hex shaped wrench boss integrally cast into the sprinkler head to reduce the risk of damage during installation.

1. Wrenches shall be provided by the sprinkler manufacturer that directly engage the wrench boss cast in the sprinkler body.

a. Basis-of-Design: Subject to compliance with requirements, provide Victaulic Company <**Insert product name or designation**> or comparable product to one of the following:

1) <**Insert engineer approved manufacturer's name**>.

2. Sprinklers with rubber O-rings are not permitted.

D. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: [**UL 199**] <**Insert standard**>.
2. Residential Applications: [**UL 1626**] <**Insert standard**>.
3. 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.

E. Sprinkler Finishes:

1. Chrome plated.
2. Bronze.
3. Painted.

F. Special Coatings:

1. Wax.
2. Lead.
3. Corrosion-resistant paint.
4. Nickel-Teflon.

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.
3. Escutcheons: Listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.

H. Sprinkler Guards:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; <**Insert product name or designation**> or comparable product by one of the following:

a. <**Insert engineer approved manufacturer's name**>.

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.
4. Guards: Listed, supplied, and approved for use with the sprinkler by sprinkler manufacturer.

## 2.12 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Motor-Operated Alarm:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Style 760 or comparable product by one of the following:

a. <**Insert engineered approved manufacturer's name**>.

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**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

a. Fire-Lite Alarms; a Honeywell company.
b. Notifier; a Honeywell company.
c. Potter Electric Signal Company.
d. System Sensor; a Honeywell company.
e. <**Insert engineer approved manufacturer's name**>.

2. Standard: UL 464.
3. Type: Vibrating, metal alarm bell.
4. Size: [**6-inch (150-mm) minimum**] [**8-inch (200-mm) minimum**] [**10-inch (250-mm)**] diameter.
5. Finish: Red-enamel factory finish, suitable for outdoor use.

D. Pressure 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.
c. Viking Corporation.
d. <**Insert engineer approved manufacturer's name**>.

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.

E. Valve 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.
c. <**Insert engineer approved manufacturer's name**>.

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.

F. 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.
c. <**Insert manufacturer's name**>.

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.

## 2.13 MANUAL CONTROL STATIONS

A. Description: UL listed or FM Global 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.

## 2.14 CONTROL PANELS

A. Description: Single-area, two-area, or single-area cross-zoned type control panel as indicated, including 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 Global 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 cover held closed by breakable strut to prevent accidental opening.
3. Manual Control Stations: 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.

## 2.15 PRESSURE GAGES

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**]:

1. AMETEK, Inc.; U.S. Gauge Division.
2. Ashcroft, Inc.
3. Brecco Corporation.
4. WIKA Instrument Corporation.
5. <**Insert manufacturer's name**>.

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**] [**0 to 300 psig (0 to 2070 kPa)**].

E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

F. Air System Piping Gage: Include[ **retard feature and**] "AIR" 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 in Section 211100 "Facility Fire-Suppression Water-Service Piping" for exterior piping.

B. Install shutoff valve,[ **backflow preventer,**] pressure gage, drain, and other accessories indicated at connection to water-service piping.[**$ds~Comply with requirements in Section 211100 "Facility Fire-Suppression Water-Service Piping" for backflow preventers.**]

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 in Section 221116 "Domestic Water Piping" for interior piping.

B. Install shutoff valve,[ **backflow preventer,**] pressure gage, drain, and other accessories indicated at connection to water-distribution piping.[**$ds~Comply with requirements in Section 221119 "Domestic Water Piping Specialties" for backflow preventers.**]

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 in NFPA 13 for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with requirements in NFPA 13 for seismic-restraint device materials and installation.

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. Unions and flanges for servicing and disconnect are not required in installations using grooved joint couplings. (The couplings shall serve as disconnect points.)

H. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

I. Install sprinkler piping with drains for complete system drainage.

J. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

K. Install automatic (ball drip) drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or to outside building.

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

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

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

N. Install alarm devices in piping systems.

O. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in NFPA 13 for hanger materials.

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 (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.

Q. Drain dry-pipe sprinkler piping.

R. Pressurize and check dry-pipe sprinkler system piping and [**air-pressure maintenance devices**] [**air compressors**].

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "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, 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.

1. Assure grooved ends are clean and free from indentations, projections, or roll marks.
2. Use gaskets molded and produced by coupling manufacturer of an elastomer suitable for intended service.
3. On-Site Training: For contractor's field personnel in use of grooving tools and installation of product shall be provided by coupling manufacturer's factory-trained representative. (Distributor's representative is not considered qualified to conduct the training.)
4. Job Site Visitation: Manufacturer's representative shall periodically visit jobsite to ensure best practices in grooved product installation are being followed.
5. The installing contractor shall be certified by the grooved coupling manufacturer for the installation of their product. A manufacturer’s factory trained representative (direct employee) shall provide on-site certification training for the installing contractor’s field personnel in the use of grooving tools, application of groove, and product installation
6. A field training program must be designed, developed, administered and evaluated in accordance to the ANSI/IACET Standard for Continuing Education and Training. (IACET-International Association for Continuing Education and Training)
7. All installation professionals and pipe fitters must be able to provide proof of successful course completion upon request

J. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

K. 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.

1. Assure grooved ends are clean and free from indentations, projections, or roll marks.
2. Use gaskets molded and produced by coupling manufacturer of an elastomer suitable for intended service.
3. On-Site Training: For contractor's field personnel in use of grooving tools and installation of product shall be provided by coupling manufacturer's factory-trained representative. (Distributor's representative is not considered qualified to conduct the training.)
4. Job Site Visitation: Manufacturer's representative shall periodically visit jobsite to ensure best practices in grooved product installation are being followed.
5. The installing contractor shall be certified by the grooved coupling manufacturer for the installation of their product. A manufacturer’s factory trained representative (direct employee) shall provide on-site certification training for the installing contractor’s field personnel in the use of grooving tools, application of groove, and product installation
6. A field training program must be designed, developed, administered and evaluated in accordance to the ANSI/IACET Standard for Continuing Education and Training. (IACET-International Association for Continuing Education and Training)
7. All installation professionals and pipe fitters must be able to provide proof of successful course completion upon request

L. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.

M. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. 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.

N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

## 3.6 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. [**Dry-Pipe**] [**and**] [**Deluge**] Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

    a. Install air compressor and compressed-air supply piping.
    b. Air-Pressure Maintenance Device: 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 (95- to 410-kPa)**] <**Insert value**> adjustable range; and [**175-psig (1200-kPa)**] <**Insert value**> maximum inlet pressure.
    c. Install compressed-air supply piping from building's compressed-air piping system.

## 3.7 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.

D. Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs.

E. Sprinkler bulb protector shall be removed by hand. Do not use any tools or devices that could damage the bulb.

## 3.8 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 Section 033000 "Cast-in-Place Concrete."

    1. Install [**two**] [**three**] <**Insert number**> protective pipe bollards [**around**] [**on sides of**] each fire-department connection. Comply with requirements for bollards in Section 055000 "Metal Fabrications."

C. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

## 3.9 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 Section 260553 "Identification for Electrical Systems."

## 3.10 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 air compressors.
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.

## 3.11 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

## 3.12 DEMONSTRATION AND TRAINING

A. On-Site Training: For contractor's field personnel in use of grooving tools and installation of product shall be provided by coupling manufacturer's factory-trained representative. (Distributor's representative is not considered qualified to conduct the training.)

B. Job Site Visitation: Manufacturer's representative shall periodically visit jobsite to ensure best practices in grooved product installation are being followed.

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

## 3.13 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with [**threaded ends; cast-iron threaded fittings; and threaded**] [**grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved**] joints.

B. Sprinkler specialty fittings may be used, downstream of control vales, 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, dry-pipe sprinkler system, [**NPS 2 (DN 50) and smaller**] <**Insert pipe size range**>, shall be[ **one of**] the following:

1. [**Standard-weight**] [**or**] [**Schedule 30**], galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
2. [**Standard-weight**] [**or**] [**Schedule 30**], galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Schedule 10S stainless steel pipe; stainless steel pressure-seal fittings; and pressure-sealed joints.
4. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with plain ends; [**cast-**] [**or**] [**wrought-**]copper solder-joint fittings; and brazed joints.
5. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with plain ends; copper pressure-seal fittings; and pressure-sealed joints.
6. NPS 2 (DN 50), [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with roll-grooved ends; copper, grooved-end fittings; grooved-end-tube couplings; and grooved joints.

E. Standard-pressure, dry-pipe sprinkler system, [**NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**] <**Insert pipe size range**>, shall be[ **one of**] the following:

1. [**Standard-weight**] [**or**] [**Schedule 30**], galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
2. [**Standard-weight**] [**or**] [**Schedule 30**], galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with plain ends; [**cast-**] [**or**] [**wrought-**]copper solder-joint fittings; and brazed joints.
4. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with plain ends; copper pressure-seal fittings; and pressure-sealed joints.
5. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with roll-grooved ends; copper, grooved-end fittings; grooved-end-tube couplings; and grooved joints.

F. Standard-pressure, dry-pipe sprinkler system, [**NPS 5 and NPS 6 (DN 125 and DN 150)**] <**Insert pipe size range**>, shall be[ **one of**] the following:

1. [**Standard-weight**] [**or**] [**Schedule 30**], galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
2. [**Standard-weight**] [**or**] [**Schedule 30**], galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with plain ends; [**cast-**] [**or**] [**wrought-**]copper solder-joint fittings; and brazed joints.
4. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with roll-grooved ends; copper, grooved-end fittings; grooved-end-tube couplings; and grooved joints.

## 3.14 SPRINKLER SCHEDULE

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

1. Rooms without Ceilings: [**Upright sprinklers**] <**Insert type**>.
2. Rooms with Suspended Ceilings: [**Dry pendent sprinklers**] [**Dry recessed sprinklers**] [**Dry flush sprinklers**] [**Dry concealed sprinklers**] [**Dry pendent, recessed, flush, and concealed sprinklers as indicated**].
3. Wall Mounting: Dry sidewall sprinklers.
4. Spaces Subject to Freezing: [**Upright sprinklers**] [**Dry pendent sprinklers**] [**Dry sidewall sprinklers**] [**Upright, dry pendent sprinklers; and dry sidewall sprinklers as indicated**] <**Insert type**>.
5. Special Applications: [**Extended-coverage and quick-response sprinklers where indicated**] <**Insert type**>.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
4. [**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 211316