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SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

TIPS:

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To read **detailed research, technical information about products and materials, and coordination checklists**, click on MasterWorks/Supporting Information.

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. Cover system for sprinkler piping.
3. Specialty valves.
4. Sprinklers.
5. Alarm devices.
6. Manual control stations.
7. Control panels.
8. Pressure gages.

B. Related Requirements:

1. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire department connections.
2. Section 230523 "General-Duty Valves for Water-Based Fire-Suppression Piping" for ball, butterfly, check, gate, post-indicator, and trim and drain valves.

1.3 DEFINITIONS

A. High-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig (1200 kPa), but not higher than [**250 psig (1725 kPa)**] [**300 psig (2070 kPa)**].

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

C. EPDM: Ethylene propylene diene monomer.

D. FKM: Fluoroelastomoer flat black in color.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

D. Delegated-Design Submittal: For wet-pipe 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.

1.5 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 include 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. Welding certificates.

E. Fire-hydrant flow test report.

F. 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."

G. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals. Include technical data sheets, product instructions, and design calculation reports.

1.7 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.

1.8 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.

2. Installers of press-connect bronze, copper, carbon steel or stainless steel fittings:

a. Installers shall attend manufacturer's installation training class as having been trained and qualified to join piping with press-connect fittings.
b. Installer shall be a qualified installer, licensed within the jurisdiction, and familiar with the installation of press-connect bronze or copper systems.
c. Press-connect bronze, copper, carbon steel or stainless steel fittings shall be installed using proper tool, actuator, jaws, and rings as instructed by the manufacturer.

B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.

1.9 FIELD 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.

1.10 WARRANTY

A. Special Warranty: Viega LLC warrants to wholesalers, and licensed plumbing and mechanical contractors in the United States and Canada, that its fittings, when properly installed in nonindustrial and non-marine applications and under normal conditions of use, will be free of failure from manufacturing defect for a period of.

1. Warranty Period for ProPress Fittings: 50 years from date of Substantial Completion.
2. Warranty Period for ProPress Valves: Two years from date of Substantial Completion.
3. Warranty Period for MegaPress Fittings: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13.
2. NFPA 13R.

B. Standard-Pressure Piping System Component: Listed for 175-psig (1200-kPa) minimum working pressure.

C. High-Pressure Piping System Component: Listed for [**250-psig (1725-kPa) minimum**] [**300-psig (2070-kPa)**] working pressure.

D. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.

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)**>.

2. Sprinkler system design shall be approved by authorities having jurisdiction.

a. Margin of Safety for Available Water Flow and Pressure: [**10**] [**20**] <**Insert number**> percent, including losses through water-service piping, valves, and backflow preventers.
b. Sprinkler Occupancy Hazard Classifications:

1) Automobile Parking Areas: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
2) Building Service Areas: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
3) Churches: [**Light Hazard**] <**Insert classification**>.
4) Electrical Equipment Rooms: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
5) Dry Cleaners: [**Ordinary Hazard, Group 2**] <**Insert classification**>.
6) General Storage Areas: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
7) Laundries: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
8) Libraries except Stack Areas: [**Light Hazard**] <**Insert classification**>.
9) Library Stack Areas: [**Ordinary Hazard, Group 2**] <**Insert classification**>.
10) Machine Shops: [**Ordinary Hazard, Group 2**] <**Insert classification**>.
11) Mechanical Equipment Rooms: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
12) Office and Public Areas: [**Light Hazard**] <**Insert classification**>.
13) Plastics Processing Areas: [**Extra Hazard, Group 2**] <**Insert classification**>.
14) Printing Plants: [**Extra Hazard, Group 1**] <**Insert classification**>.
15) Repair Garages: [**Ordinary Hazard, Group 2**] <**Insert classification**>.
16) Residential Living Areas: [**Light Hazard**] <**Insert classification**>.
17) Restaurant Service Areas: [**Ordinary Hazard, Group 1**] <**Insert classification**>.
18) Solvent Cleaning Areas: [**Extra Hazard, Group 2**] <**Insert classification**>.
19) Upholstering Plants: [**Extra Hazard, Group 1**] <**Insert classification**>.

20) <**Insert classification**>.

3. Minimum Density for Automatic-Sprinkler Piping Design:

a. Residential (Dwelling) Occupancy: [**0.05 gpm over 400-sq. ft. (2.04 mm/min. over 37.2-sq. m)**] <**Insert value**> area.
b. Light-Hazard Occupancy: [**0.10 gpm over 1500-sq. ft. (4.1 mm/min. over 139-sq. m)**] <**Insert value**> area.
c. Ordinary-Hazard, Group 1 Occupancy: [**0.15 gpm over 1500-sq. ft. (6.1 mm/min. over 139-sq. m)**] <**Insert value**> area.
d. Ordinary-Hazard, Group 2 Occupancy: [**0.20 gpm over 1500-sq. ft. (8.1 mm/min. over 139-sq. m)**] <**Insert value**> area.
e. Extra-Hazard, Group 1 Occupancy: [**0.30 gpm over 2500-sq. ft. (12.2 mm/min. over 232-sq. m)**] <**Insert value**> area.
f. Extra-Hazard, Group 2 Occupancy: [**0.40 gpm over 2500-sq. ft. (16.3 mm/min. over 232-sq. m)**] <**Insert value**> area.
g. Special Occupancy Hazard: As determined by authorities having jurisdiction.

4. Minimum Density for Deluge-Sprinkler Piping Design:

a. Ordinary-Hazard, Group 1 Occupancy: [**0.15 gpm (6.1 mm/min.)**] <**Insert value**> over entire area.
b. Ordinary-Hazard, Group 2 Occupancy: [**0.20 gpm (8.1 mm/min.)**] <**Insert value**> over entire area.
c. Extra-Hazard, Group 1 Occupancy: [**0.30 gpm (12.2 mm/min.)**] <**Insert value**> over entire area.
d. Extra-Hazard, Group 2 Occupancy: [**0.40 gpm (16.3 mm/min.)**] <**Insert value**> over entire area.
e. Special Occupancy Hazard: As determined by authorities having jurisdiction.

5. Maximum Protection Area per Sprinkler: According to UL listing.
6. Maximum Protection Area per Sprinkler:

a. Residential Areas: [**400 sq. ft. (37 sq. m)**] <**Insert dimension**>.
b. Office Spaces: [**120 sq. ft. (11.1 sq. m)**] [**225 sq. ft. (20.9 sq. m)**] <**Insert dimension**>.
c. Storage Areas: [**130 sq. ft. (12.1 sq. m)**] <**Insert dimension**>.
d. Mechanical Equipment Rooms: [**130 sq. ft. (12.1 sq. m)**] <**Insert dimension**>.
e. Electrical Equipment Rooms: [**130 sq. ft. (12.1 sq. m)**] <**Insert dimension**>.
f. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

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

2.2 STEEL PIPE AND FITTINGS

A. Standard-Weight, [**Galvanized-**] [**and**] [**Black-**]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-**] [**and**] [**Black-**]Steel Pipe: ASTM A 135/A 135M; 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-**] [**and**] [**Black-**]Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.

D. Schedule 10, Black-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M, Schedule 10 in NPS 5 (DN 125) and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250), plain end.

E. Nonstandard OD, Thinwall Black-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M thinwall with plain ends and wall thickness less than Schedule 10.

F. Hybrid Black-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M lightwall, with wall thickness less than Schedule 10 and greater than Schedule 5.

G. Schedule 5 Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M lightwall with plain ends.

H. [**Galvanized-**] [**and**] [**Black-**]Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

I. [**Galvanized-**] [**and**] [**Uncoated-**]Steel Couplings: ASTM A 865/A 865M, threaded.

J. [**Galvanized**] [**and**] [**Uncoated**], Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

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

L. Cast-Iron Flanges: ASME 16.1, Class 125.

M. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

1. Pipe-Flange Gasket Materials: [**AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick**] [**ASME B16.21, nonmetallic and asbestos free**] [**or**] [**EPDM rubber gasket**].

   a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
   b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.

2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.

N. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

O. Steel Press-Connect Flanges:

1. Pressure Rating: UL 213, FM Global-approved, 175 psig (1200 kPa).
2. Flanges: Steel housing, rubber EPDM O-rings, and pipe stop; for use with fitting manufacturer's pressure-seal tools.
3. Class 150, carbon steel; raised-face flanges with full-face gaskets

P. Stainless Steel Press-Connect Flanges:

1. Pressure Rating: UL 213-approved, 175 psig (1200 kPa).
2. Flanges: Stainless steel housing, rubber FKM O-rings, and pipe stop; for use with fitting manufacturer's press-connect tools.
3. Class 150, 304 stainless steel; raised-face flanges with full-face gaskets.
4. Stainless steel tube and fittings provided by the same manufacturer.
5. Pipe Standard: ASTM A 312 or ASTM A 554, stainless steel.

Q. Grooved-Joint, Steel-Pipe Appurtenances:

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

   a. Anvil International.
   b. Corcoran Piping System Co.
   c. National Fittings, Inc.
   d. Shurjoint Piping Products.
   e. Smith-Cooper International.
   f. Tyco Fire & Building Products LP.
   g. Victaulic Company.
   h. <**Insert manufacturer's name**>.

2. Pressure Rating: [**175-psig (1200-kPa)**] [**250-psig (1725-kPa)**] [**300-psig (2070-kPa)**] minimum.
3. [**Galvanized**] [**Painted**] [**Uncoated**] Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

R. Stainless Steel Press-Connect Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Viega LLC; ProPress Stainless Steel or comparable product by one of the following:

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

2. For NPS 1/2 to NPS 4 (DN 15 to DN 100) type 304 stainless steel NTS/CTS. Stainless steel tube and fittings provided by the same manufacturer.
3. Pipe Standard: ASTM A 312 or ASTM A 554, stainless steel.
4. Pressure Rating: UL 213-approved, 175-psig (1200-kPa).
5. Press-Connect Fittings: ASTM A 312, stainless steel with FKM sealing elements.
6. Threaded Fittings: Pipe threads conforming to ASTM B 1.20.1.
7. Press Ends: Unpressed fitting identification feature to the fitting wall.

8. Sealing Element and Pipe Stops: FKM.
9. Tools: Manufacturer's special tools.

S. Steel Press-Connect Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Viega LLC MegaPress fittings or comparable product by one of the following:

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

2. Pipe: Black steel pipe shall conform to [**ASTM A53**] [**ASTM A135**] [**ASTM A 795**] [**ASTM A 106**] Pipe schedule (pipe wall thickness) shall conform to the standard referenced dimensions for schedule 10 to 40.
3. Pressure Rating: UL 213, FM Global-approved, 175-psig (1200-kPa).
4. Press-Connect Mechanical Joint Fitting: ASTM A 420 or ASME B 16.3 and IAPMO PS117 or ICC LC 1002.
5. Sealing Element and Pipe Stops: EPDM; factory installed or an alternative supplied by fitting manufacturer.
6. Press Ends: Unpressed fitting identification feature to the fitting wall.
7. Pipe Threads: ASTM B 16.3.
8. Hangers and Supports: MSS SP 58 and MSS SP 69.
9. Tools: Manufacturer's special tool.

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

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

G. Copper or Bronze Press-Connect Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Viega LLC ProPress Fittings or comparable product by one of the following:

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

2. Standard: UL 213, FM 1920.
3. NPS 2-1/2 (DN 65) thru NPS 4 (DN 100) Fittings: Stainless steel grip ring and separator ring.

4. Press Ends: Unpressed fitting identification feature to the fitting wall.
5. Sealing Element: EPDM.

H. Cast Copper Alloy Pipe Flanges with Press-Connect Fittings.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Viega LLC; ProPress Copper or comparable product by one of the following:

   a. NIBCO, INC.
   b. <**Insert manufacturer's name**>.

2. Standard: UL 213, FM 1920.
3. Flanges: ASME B 16.24, Class 150, powder coated steel plate; two-piece design.
4. NPS 2-1/2 (DN 65) thru NPS 4 (DN 100) Fittings: Stainless steel grip ring and separator ring.
5. Housing: Copper or bronze.
6. Press Ends: Unpressed fitting identification feature to the fitting wall.
7. Sealing Element: EPDM.

I. Grooved-Joint, Copper-Tube Appurtenances:

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

   a. Anvil International.
   b. Shurjoint Piping Products.
   c. Victaulic Company.
   d. <**Insert manufacturer's name**>.

2. Grooved-End Copper Fittings: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.
3. Grooved-End-Tube Couplings: To fit copper-tube dimensions, with design similar to AWWA C606. Include ferrous housing sections, EPDM-rubber gasket suitable for hot and cold water, and bolts and nuts.

J. Copper-Tube, Extruded-Tee Connections:

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

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

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

2.4 CPVC PIPE AND FITTINGS

A. CPVC Pipe: ASTM F 442/F 442M and UL 1821, SDR 13.5, for 175-psig (1200-kPa) rated pressure at 150 deg F (62 deg C), with plain ends. Include "LISTED" and "CPVC SPRINKLER PIPE" markings.

B. CPVC Fittings: [**UL listed**] [**or**] [**FM Global approved**], for 175-psig (1200-kPa) rated pressure at 150 deg F (62 deg C), socket type. Include "LISTED" and "CPVC SPRINKLER FITTING" markings.

1. NPS 3/4 to NPS 1-1/2 (DN 20 to DN 40): ASTM F 438 and UL 1821, Schedule 40, socket type.
2. NPS 2 to NPS 3 (DN 50 to DN 80): ASTM F 439 and UL 1821, Schedule 80, socket type.
3. CPVC-to-Metal Transition Fittings: CPVC, one piece, with dimensions equivalent to pipe; one end with threaded brass insert, and one socket end.
4. CPVC-to-Metal Transition Unions: CPVC, with dimensions equivalent to pipe; one end with threaded brass insert, and one socket end.
5. Flanges: CPVC, one or two pieces.

C. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493 solvent cement recommended by pipe and fitting manufacturer, and made for joining CPVC sprinkler pipe and fittings. Include cleaner or primer recommended by pipe and fitting manufacturer.

1. Adhesive primer shall have a VOC content of 550 g/L or less.
2. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Solvent cement shall have a VOC content of 490 g/L or less.
4. Solvent cement shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Plastic Pipe-Flange Gasket and Bolts and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.5 COVER SYSTEM FOR SPRINKLER PIPING

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

1. DecoShield Systems, Inc.
2. <**Insert manufacturer's name**>.

B. Description: System of support brackets and covers made to protect sprinkler piping.

C. Brackets: Glass-reinforced nylon.

D. Covers: Extruded-PVC sections of length, shape, and size required for size and routing of CPVC piping.

2.6 SPECIALTY VALVES

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating:

1. Standard-Pressure Piping Specialty Valves: 175-psig (1200-kPa) minimum.
2. High-Pressure Piping Specialty Valves: [**250-psig (1725-kPa) minimum**] [**300-psig (2070-kPa)**].

C. Body Material: Cast or ductile iron.

D. Size: Same as connected piping.

E. End Connections: Flanged or grooved.

F. Alarm Valves:

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

   a. Globe Fire Sprinkler Corporation.
   b. Reliable Automatic Sprinkler Co., Inc. (The).
   c. Tyco Fire & Building Products LP.
   d. Venus Fire Protection Ltd.
   e. Victaulic Company.
   f. Viking Corporation.
   g. <**Insert manufacturer's name**>.

2. Standard: UL 193.
3. Design: For horizontal or vertical installation.
4. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages,[**retarding chamber,**] and fill-line attachment with strainer.
5. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
6. Drip Cup Assembly: Pipe drain with check valve to main drain piping.
7. 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.

G. Deluge Valves:

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

   a. BERMAD Control Valves.
   b. CLA-VAL Automatic Control Valves.
   c. Globe Fire Sprinkler Corporation.
   d. Kidde Fire Fighting; A UTC Business Unit.
   e. OCV Control Valves.
   f. Reliable Automatic Sprinkler Co., Inc. (The).
   g. Tyco Fire & Building Products LP.
   h. Venus Fire Protection Ltd.
   i. Victaulic Company.
   j. Viking Corporation.
   k. <**Insert manufacturer's name**>.

2. Standard: UL 260.
3. Design: Hydraulically operated, differential-pressure type.
4. Include trim sets for alarm-test bypass, drain, electrical water-flow alarm switch, pressure gages, drip cup assembly piped without valves and separate from main drain line, and fill-line attachment with strainer.
5. Wet, Pilot-Line Trim Set: Include gage to read diaphragm-chamber pressure and manual control station for manual operation of deluge valve, and connection for actuation device.

H. Automatic (Ball Drip) Drain Valves:

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

   a. Reliable Automatic Sprinkler Co., Inc. (The).
   b. Tyco Fire & Building Products LP.
   c. <**Insert manufacturer's name**>.

2. Standard: UL 1726.
3. Pressure Rating: 175-psig (1200-kPa) minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4 (DN 20).
6. End Connections: Threaded.

2.7 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

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

   a. Anvil International.
   b. National Fittings, Inc.
   c. Shurjoint Piping Products.
   d. Tyco Fire & Building Products LP.
   e. Victaulic Company.
   f. <**Insert 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-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

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

a. AGF Manufacturing Inc.
b. Reliable Automatic Sprinkler Co., Inc. (The).
c. Tyco Fire & Building Products LP.
d. Victaulic Company.
e. <**Insert manufacturer's name**>.

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: [**175-psig (1200-kPa) minimum**] [**300 psig (2070 kPa)**].
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded or grooved.

C. Branch Line Testers:

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

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

2. Standard: UL 199.
3. Pressure Rating: 175 psig (1200 kPa).
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

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

a. AGF Manufacturing Inc.
b. Triple R Specialty.
c. Tyco Fire & Building Products LP.
d. Victaulic Company.
e. Viking Corporation.
f. <**Insert manufacturer's name**>.

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: [**175-psig (1200-kPa) minimum**] [**300 psig (2070 kPa)**].
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

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

    a. Aegis Technologies, Inc.
    b. CECA, LLC.
    c. Corcoran Piping System Co.
    d. Merit Manufacturing.
    e. <**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-rubber O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

F. Flexible Sprinkler Hose Fittings:

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

    a. Fivalco Inc.
    b. FlexHead Industries, Inc.
    c. Gateway Tubing, Inc.
    d. Victaulic Company.
    e. <**Insert manufacturer's name**>.

2. Standard: UL 1474.
3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
4. Pressure Rating: [**175-psig (1200-kPa) minimum**] [**300 psig (2070 kPa)**].
5. Size: Same as connected piping, for sprinkler.

2.8 SPRINKLERS

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

1. Globe Fire Sprinkler Corporation.
2. Reliable Automatic Sprinkler Co., Inc. (The).
3. Tyco Fire & Building Products LP.
4. Venus Fire Protection Ltd.
5. Victaulic Company.
6. Viking Corporation.
7. <**Insert manufacturer's name**>.

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Residential Sprinklers: 175-psig (1200-kPa) maximum.

D. Pressure Rating for Automatic Sprinklers: 175-psig (1200-kPa) minimum.

E. Pressure Rating for High-Pressure Automatic Sprinklers: [**250-psig (1725-kPa) minimum**] [**300 psig (2070 kPa)**].

F. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: [**UL 1767**] <**Insert standard**>.
2. Nonresidential Applications: [**UL 199**] <**Insert standard**>.
3. Residential Applications: [**UL 1626**] <**Insert standard**>.
4. Characteristics: Nominal 1/2-inch (12.7-mm) orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

G. Open Sprinklers with Heat-Responsive Element Removed: UL 199.

1. Nominal Orifice: [**1/2 inch (12.7 mm)**], with discharge coefficient K [**between 5.3 and 5.8**] <**Insert value**>.
2. Nominal Orifice: [**17/32 inch (13.5 mm)**] with discharge coefficient K [**between 7.4 and 8.2**] <**Insert value**>.

H. Sprinkler Finishes: [**Chrome plated**] [**bronze**] [**and**] [**painted**].

I. Special Coatings: [**Wax**] [**lead**] [**and**] [**corrosion-resistant paint**].

J. 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.

K. Sprinkler Guards:

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

a. Reliable Automatic Sprinkler Co., Inc. (The).
b. Tyco Fire & Building Products LP.
c. Victaulic Company.
d. Viking Corporation.
e. <**Insert manufacturer's name**>.

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.9 ALARM DEVICES

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

B. Water-Motor-Operated Alarm:

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

a. Globe Fire Sprinkler Corporation.
b. Tyco Fire & Building Products LP.
c. Victaulic Company.
d. Viking Corporation.
e. <**Insert 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: 8-1/2-inches (216-mm) diameter.
6. Components: Shaft length, bearings, and sleeve to suit wall construction.
7. Inlet: NPS 3/4 (DN 20).
8. Outlet: NPS 1 (DN 25) drain connection.

C. Electrically Operated Alarm Bell:

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

a. Fire-Lite Alarms, Inc.; a Honeywell International company.
b. Notifier.
c. Potter Electric Signal Company, LLC.
d. <**Insert 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.
6. 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. Water-Flow Indicators:

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

a. ADT Security Services, Inc.
b. McDonnell & Miller.
c. Potter Electric Signal Company, LLC.
d. System Sensor.

e. Viking Corporation.
f. Watts; a Watts Water Technologies company.
g. <**Insert manufacturer's name**>.

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig (1725 kPa).
7. Design Installation: Horizontal or vertical.

E. Pressure Switches:

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

a. Barksdale, Inc.
b. Detroit Switch, Inc.
c. Potter Electric Signal Company, LLC.
d. System Sensor.
e. Tyco Fire & Building Products LP.
f. United Electric Controls Co.
g. Viking Corporation.
h. <**Insert 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.

F. Valve Supervisory Switches:

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

a. Fire-Lite Alarms, Inc.; a Honeywell International company.
b. Kennedy Valve Company; a division of McWane, Inc.
c. Potter Electric Signal Company, LLC.
d. System Sensor.
e. <**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 valve is in other than fully open position.
6. 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.

2.10 MANUAL CONTROL STATIONS

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" for hydraulic operation, with union, NPS 1/2 (DN 15) pipe nipple, and bronze ball valve.

B. Include metal enclosure labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.11 CONTROL PANELS

A. Description: Single-area, two-area, or single-area cross-zoned control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves.

1. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" when used with thermal detectors and Class A detector circuit wiring.
2. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.
3. 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.

B. 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.

C. 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.

D. Panels Components:

1. Power supply.
2. Battery charger.
3. Standby batteries.
4. Field-wiring terminal strip.
5. Electrically supervised solenoid valves and polarized fire-alarm bell.
6. Lamp test facility.
7. Single-pole, double-throw auxiliary alarm contacts.
8. Rectifier.

2.12 PRESSURE GAGES

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

1. AGF Manufacturing Inc.
2. AMETEK, Inc.
3. Ashcroft Inc.
4. Brecco Corporation.

5. WIKA Instrument Corporation.
6. <**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. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in 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.[**Comply with requirements for backflow preventers in Section 211100 "Facility Fire-Suppression Water-Service Piping."**]

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.3 WATER-SUPPLY CONNECTIONS

A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."

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

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.4 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

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

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with NFPA 13 requirements 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. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

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

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

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.

N. Pressurize and check preaction sprinkler system piping and [**air-pressure maintenance devices**] [**air compressors**].

O. Fill sprinkler system piping with water.

P. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing. Comply with requirements for heating cables in Section 210533 "Heat Tracing for Fire-Suppression Piping" and for piping insulation in Section 210700 "Fire-Suppression Systems Insulation."

Q. 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."

R. 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."

S. 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, Press-connect Joints: Join schedule 5 to schedule 40 black steel pipe and carbon steel Press-connect fittings.

1. Ream and remove burrs from pipe ends.

2. Prepare pipe surface per manufacturer’s installation instructions.
3. Mark proper insertion depth prior to making press connection.
4. Use tool and jaw/rings recommended by fitting manufacturer.

J. Stainless Steel-Piping, Press Connect Joints: Stainless steel pipe shall conform to the material requirements of ASTM A 312 or ASTM A 554 and be provided by the fitting manufacturer.

1. Ream and remove burrs from pipe ends.
2. Mark proper insertion depth prior to making press connection.
3. Use tool and jaw/rings recommended by fitting manufacturer.

K. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

L. 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.

M. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

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

O. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

P. Copper-Tubing, Press-connect Joints: Join copper tube and copper Press-connect fittings.

1. Ream and remove burrs from pipe ends
2. Mark proper insertion depth prior to making press connection.
3. Use tool and jaw/rings recommended by fitting manufacturer.

Q. 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.

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

S. Plastic-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

3.6 INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING

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

3.7 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.
2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.
3. Install deluge valves in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

3.8 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of[**narrow dimension of**] acoustical ceiling panels.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

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

3.9 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 the following tests and inspections[**with the assistance of a factory-authorized service representative**]:

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. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.
7. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.11 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.12 DEMONSTRATION

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

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 valves, instead of specified fittings.

C. Copper-tube, extruded-tee connections may be used for tee branches in copper tubing instead of specified copper fittings. Branch-connection joints must be brazed.

D. CPVC pipe, [**Schedule 40**] [**Schedule 80**] CPVC fittings, and solvent-cemented joints may be used for light-hazard and residential occupancies.

E. Standard-pressure, wet-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**], black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. [**Standard-weight**] [**or**] [**Schedule 30**], galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
3. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with plain ends; uncoated, plain-end-pipe fittings; and twist-locked joints.
4. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with plain ends; carbon steel press-connect fittings.
5. [**Standard-weight**] [**or**] [**Schedule 30**], galvanized-steel pipe with plain ends; galvanized, plain-end-pipe fittings; and twist-locked joints.
6. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with [**cut-**] [**or**] [**roll-**]grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
7. [**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.
8. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with plain ends; steel welding fittings; and welded joints.
9. [**Thinwall**] [**Schedule 10**] [**nonstandard OD, thinwall**] [**or**] [**hybrid**] black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
10. [**Thinwall**] [**Schedule 10**] [**or**] [**hybrid**] black-steel pipe with plain ends; uncoated, plain-end-pipe fittings; and twist-locked joints.
11. [**Thinwall**] [**Schedule 10**] [**nonstandard OD, thinwall**] [**or**] [**hybrid**] black-steel pipe with plain ends; welding fittings; and welded joints.
12. [**Thinwall**] [**Schedule 10**] [**or**] [**hybrid**] black-steel pipe with plain ends; carbon steel press-connect fittings.
13. Schedule 5S stainless steel pipe; stainless steel press-connect fittings; and press-connect joints.
14. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with plain ends; [**cast-**] [**or**] [**wrought-**]copper, solder-joint fittings; and brazed joints.
15. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with plain ends; copper press-connect fittings; and press-connect joints.
16. 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.

F. Standard-pressure, wet-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**], black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. [**Standard-weight**] [**or**] [**Schedule 30**], galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
3. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with [**cut-**] [**or**] [**roll-**]grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

4. [**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.
5. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with plain ends; steel welding fittings; and welded joints.
6. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with plain ends; carbon steel press-connect fittings.
7. [**Thinwall**] [**Schedule 10**] [**nonstandard OD, thinwall**] [**or**] [**hybrid**] black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
8. [**Thinwall**] [**Schedule 10**] [**nonstandard OD, thinwall**] [**or**] [**hybrid**] black-steel pipe with plain ends; welding fittings; and welded joints.
9. [**Thinwall**] [**Schedule 10**] [**or**] [**hybrid**] black-steel pipe with plain ends; press-connect fittings; and press-connect joints.
10. Schedule 5S stainless steel pipe; stainless steel press-connect fittings; and press-connect joints.
11. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with plain ends; [**cast-**] [**or**] [**wrought-**]copper, solder-joint fittings; and brazed joints.
12. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with plain ends; copper press-connect fittings; and press-connect joints.
13. [**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.

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

1. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. [**Standard-weight**] [**or**] [**Schedule 30**], galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
3. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with [**cut-**] [**or**] [**roll-**]grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
4. [**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.
5. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with plain ends; steel welding fittings; and welded joints.
6. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with plain ends; carbon steel press-connect fittings; and press-connect joints.
7. [**Thinwall**] [**Schedule 10**] [**or**] [**hybrid**] black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
8. [**Thinwall**] [**Schedule 10**] [**or**] [**hybrid**] black-steel pipe with plain ends; welding fittings; and welded joints.
9. [**Thinwall**] [**Schedule 10**] [**or**] [**hybrid**] black-steel pipe with plain ends; carbon steel press-connect fittings; and press-connect joints.
10. Schedule 5S stainless steel pipe; stainless steel press-connect fittings; and press-connect joints.
11. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with plain ends; [**cast-**] [**or**] [**wrought-**]copper, solder-joint fittings; and brazed joints.

12. [**Type L (Type B)**] [**Type M (Type C)**], hard copper tube with plain ends; [**cast-**] [**or**] [**wrought-**]copper press-connect fittings; and press-connect joints.
13. [**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.

H. High-pressure, wet-pipe sprinkler system, [**NPS 4 (DN 100) 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. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with plain ends; steel welding fittings; and welded joints.
4. [**Thinwall**] [**Schedule 10**] [**or**] [**hybrid**] black-steel pipe with plain ends; welding fittings; and welded joints.

I. High-pressure, wet-pipe sprinkler system, [**NPS 5 (DN 125) and larger**] <**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. [**Standard-weight**] [**or**] [**Schedule 30**], black-steel pipe with plain ends; steel welding fittings; and welded joints.
4. [**Thinwall**] [**Schedule 10**] [**or**] [**hybrid**] black-steel pipe with plain ends; welding fittings; and welded 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: [**Pendent sprinklers**] [**Recessed sprinklers**] [**Flush sprinklers**] [**Concealed sprinklers**] [**Pendent, recessed, flush, and concealed sprinklers as indicated**].
3. Wall Mounting: Sidewall sprinklers.
4. Spaces Subject to Freezing: [**Upright sprinklers**] [**Pendent, dry sprinklers**] [**Sidewall, dry sprinklers**] [**Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as indicated**] <**Insert type**>.
5. Deluge-Sprinkler Systems: [**Upright**] [**and**] [**pendent**], open sprinklers.
6. Special Applications: [**Extended-coverage, flow-control, and quick-response sprinklers where indicated**] [**Attic sprinklers**] [**Combustible concealed space sprinklers**] [**Institutional space sprinklers**] <**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. Residential Sprinklers: Dull chrome.
5. [**Upright**] [**Pendent**] [**and**] [**Sidewall**] Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211313