

**SECTION 211313**

**WET-PIPE SPRINKLER SYSTEMS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

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

**1.2 DEFINITIONS**

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

**1.3 SYSTEM DESCRIPTIONS**

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

**1.4 PERFORMANCE REQUIREMENTS**

- A. Standard-Pressure Piping System Component: Listed for 175-psig 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 are available from M.U.D. and provided on the drawings.

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- C. Sprinkler system design shall be approved by authorities having jurisdiction.
  - 1. Margin of Safety for Available Water Flow and Pressure: 20 percent, including losses through water-service piping, valves, and backflow preventers.
  - 2. Sprinkler Occupancy Hazard Classifications:
    - a. Building Service Areas: Ordinary Hazard, Group 1.
    - b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
    - c. General Storage Areas: Ordinary Hazard, Group 1.
    - d. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
    - e. Office and Public Areas: Light Hazard.
    - f. Restaurant Service Areas: Ordinary Hazard, Group 1.
  - 3. Minimum Density for Automatic-Sprinkler Piping Design:
    - a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
    - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
    - c. 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 over entire area.
    - b. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over entire area.
    - c. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over entire area.
    - d. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over entire area.
    - e. Special Occupancy Hazard: As determined by authorities having jurisdiction.]
  - 5. Maximum Protection Area per Sprinkler: Per UL listing.
  - 6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:
    - a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
    - b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.
    - c. Extra-Hazard Occupancies: 500 gpm for 90 to 120 minutes.

### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Wiring Diagrams: For power, signal, and control wiring.
- 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.
- D. 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. Items penetrating finished ceiling include the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
- E. Qualification Data: For qualified Installer NICET Level III/IV Designer.

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- F. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- G. Welding certificates.
- H. Fire-hydrant flow test report.
- I. 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."
- J. Field quality-control reports.
- K. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

### **1.6 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 NICET Level III/IV Designer.
- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
  - 1. NFPA 13, "Installation of Sprinkler Systems."
- E. Owner's Insurance Company: Comply with the design and installation requirements of the Owner's current insurance company.

### **1.7 COORDINATION**

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

### **1.8 EXTRA MATERIALS**

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

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number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

### PART 2 - PRODUCTS

#### 2.1 PIPING MATERIALS

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

#### 2.2 STEEL PIPE AND FITTINGS

- A. Standard Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 30; Galvanized- and Black-Steel Pipe: ASTM A 135; ASTM A 795/A 795M, Type E; or ASME B36.10M, wrought steel; with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.
- C. Thinwall Galvanized and Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.
- D. Schedule 10, Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.
- E. Nonstandard OD, Thinwall Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, thinwall, with plain ends and wall thickness less than Schedule 10.
- F. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- G. Uncoated, Steel Couplings: ASTM A 865, threaded.
- H. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- I. Malleable- or Ductile-Iron Unions: UL 860.
- J. Cast-Iron Flanges: ASME 16.1, Class 125.
- K. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
- L. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.
- M. Grooved-Joint, Steel-Pipe Appurtenances:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Anvil International, Inc.

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- b. Tyco Fire & Building Products LP.
- c. Victaulic Company.
2. Pressure Rating: 175 psig minimum.
3. Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

### 2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic and asbestos free.
  1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
  2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

### 2.4 COVER SYSTEM FOR SPRINKLER PIPING

- A. Description: System of support brackets and covers made to protect sprinkler piping.
- B. Brackets: Glass-reinforced nylon.
- C. Covers: Extruded PVC sections of length, shape, and size required for size and routing of CPVC piping.

### 2.5 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.
  3. Minimum Pressure Rating for High-Pressure Piping: 250 psig.
- B. Ball Valves:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Anvil International, Inc.
    - b. Victaulic Company.
  2. Standard: UL 1091 except with ball instead of disc.
  3. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
  4. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
  5. Valves NPS 3: Ductile-iron body with grooved ends.

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- C. Bronze Butterfly Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Fivalco Inc.
    - b. Global Safety Products, Inc.
    - c. Milwaukee Valve Company.
  - 2. Standard: UL 1091.
  - 3. Pressure Rating: 175 psig.
  - 4. Body Material: Bronze.
  - 5. End Connections: Threaded.
  
- D. Iron Butterfly Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Anvil International, Inc.
    - b. Fivalco Inc.
    - c. Global Safety Products, Inc.
    - d. Kennedy Valve; a division of McWane, Inc.
    - e. Milwaukee Valve Company.
    - f. NIBCO INC.
    - g. Pratt, Henry Company.
    - h. Shurjoint Piping Products.
    - i. Tyco Fire & Building Products LP.
    - j. Victaulic Company.
  - 2. Standard: UL 1091.
  - 3. Pressure Rating: 175 psig.
  - 4. Body Material: Cast or ductile iron.
  - 5. Style: Lug or wafer.
  - 6. End Connections: Grooved.
  
- E. Check Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AFAC Inc.
    - b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
    - c. Anvil International, Inc.
    - d. Clow Valve Company; a division of McWane, Inc.
    - e. Crane Co.; Crane Valve Group; Crane Valves.
    - f. Crane Co.; Crane Valve Group; Jenkins Valves.
    - g. Crane Co.; Crane Valve Group; Stockham Division.
    - h. Fire-End & Croker Corporation.
    - i. Fire Protection Products, Inc.
    - j. Fivalco Inc.
    - k. Globe Fire Sprinkler Corporation.
    - l. Groeniger & Company.
    - m. Kennedy Valve; a division of McWane, Inc.
    - n. Matco-Norca.
    - o. Metraflex, Inc.
    - p. Milwaukee Valve Company.
    - q. Mueller Co.; Water Products Division.

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- r. NIBCO INC.
  - s. Potter Roemer.
  - t. Reliable Automatic Sprinkler Co., Inc.
  - u. Shurjoint Piping Products.
  - v. Tyco Fire & Building Products LP.
  - w. United Brass Works, Inc.
  - x. Venus Fire Protection Ltd.
  - y. Victaulic Company.
  - z. Viking Corporation.
  - aa. Watts Water Technologies, Inc.
- 2. Standard: UL 312.
  - 3. Pressure Rating: 250 psig minimum.
  - 4. Type: Swing check.
  - 5. Body Material: Cast iron.
  - 6. End Connections: Flanged or grooved.
- F. Bronze OS&Y Gate Valves:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 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.
  - 2. Standard: UL 262.
  - 3. Pressure Rating: 175 psig.
  - 4. Body Material: Bronze.
  - 5. End Connections: Threaded.
- G. Iron OS&Y Gate Valves:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
    - b. American Valve, Inc.
    - c. Clow Valve Company; a division of McWane, Inc.
    - d. Crane Co.; Crane Valve Group; Crane Valves.
    - e. Crane Co.; Crane Valve Group; Jenkins Valves.
    - f. Crane Co.; Crane Valve Group; Stockham Division.
    - g. Hammond Valve.
    - h. Milwaukee Valve Company.
    - i. Mueller Co.; Water Products Division.
    - j. NIBCO INC.
    - k. Shurjoint Piping Products.
    - l. Tyco Fire & Building Products LP.
    - m. United Brass Works, Inc.
    - n. Watts Water Technologies, Inc.
  - 2. Standard: UL 262.
  - 3. Pressure Rating: 250 psig minimum.
  - 4. Body Material: Cast or ductile iron.
  - 5. End Connections: Flanged or grooved.

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- H. Indicating-Type Butterfly Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Anvil International, Inc.
    - b. Fivalco Inc.
    - c. Global Safety Products, Inc.
    - d. Kennedy Valve; a division of McWane, Inc.
    - e. Milwaukee Valve Company.
    - f. NIBCO INC.
    - g. Shurjoint Piping Products.
    - h. Tyco Fire & Building Products LP.
    - i. Victaulic Company.
  2. Standard: UL 1091.
  3. Pressure Rating: 175 psig minimum.
  4. Valves NPS 2 and Smaller:
    - a. Valve Type: Ball or butterfly.
    - b. Body Material: Bronze.
    - c. End Connections: Threaded.
  5. Valves NPS 2-1/2 and Larger:
    - a. Valve Type: Butterfly.
    - b. Body Material: Cast or ductile iron.
    - c. End Connections: Flanged, grooved, or wafer.
  6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch indicating device.
- I. NRS Gate Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
    - b. American Valve, Inc.
    - c. Clow Valve Company; a division of McWane, Inc.
    - d. Crane Co.; Crane Valve Group; Stockham Division.
    - e. Kennedy Valve; a division of McWane, Inc.
    - f. Mueller Co.; Water Products Division.
    - g. NIBCO INC.
    - h. Tyco Fire & Building Products LP.
  2. Standard: UL 262.
  3. Pressure Rating: 250 psig minimum.
  4. Body Material: Cast iron with indicator post flange.
  5. Stem: Nonrising.
  6. End Connections: Flanged or grooved.
- J. Indicator Posts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
    - b. American Valve, Inc.
    - c. Clow Valve Company; a division of McWane, Inc.
    - d. Crane Co.; Crane Valve Group; Stockham Division.
    - e. Kennedy Valve; a division of McWane, Inc.



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- f. Mueller Co.; Water Products Division.
- g. NIBCO INC.
- h. Tyco Fire & Building Products LP.
2. Standard: UL 789.
3. Type: Horizontal for wall mounting.
4. Body Material: Cast iron with extension rod and locking device.
5. Operation: Wrench.

### 2.6 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 minimum.
- B. Angle Valves:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Fire Protection Products, Inc.
    - b. United Brass Works, Inc.
- C. Ball Valves:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Affiliated Distributors.
    - b. Anvil International, Inc.
    - c. Barnett.
    - d. Conbraco Industries, Inc.; Apollo Valves.
    - e. Fire-End & Croker Corporation.
    - f. Fire Protection Products, Inc.
    - g. Flowserve.
    - h. FNW.
    - i. Jomar International, Ltd.
    - j. Kennedy Valve; a division of McWane, Inc.
    - k. Kitz Corporation.
    - l. Legend Valve.
    - m. Metso Automation USA Inc.
    - n. Milwaukee Valve Company.
    - o. NIBCO INC.
    - p. Potter Roemer.
    - q. Red-White Valve Corporation.
    - r. Southern Manufacturing Group.
    - s. Stewart, M. A. and Sons Ltd.
    - t. Tyco Fire & Building Products LP.
    - u. Victaulic Company.
    - v. Watts Water Technologies, Inc.
- D. Plug Valves:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Southern Manufacturing Group.

**2.7 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 minimum.
  - 3. Body Material: Cast or ductile iron.
  - 4. Size: Same as connected piping.
  - 5. End Connections: Flanged or grooved.
  
- B. Alarm Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AFAC Inc.
    - b. Globe Fire Sprinkler Corporation.
    - c. Reliable Automatic Sprinkler Co., Inc.
    - d. Tyco Fire & Building Products LP.
    - e. Venus Fire Protection Ltd.
    - f. Victaulic Company.
    - g. Viking Corporation.
  - 2. Standard: UL 193.
  - 3. Design: For horizontal or vertical installation.
  - 4. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, and fill-line attachment with strainer.
  - 5. Drip Cup Assembly: Pipe drain with check valve to main drain piping.
  
- C. Deluge Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AFAC Inc.
    - b. BERMAD Control Valves.
    - c. CLA-VAL Automatic Control Valves.
    - d. Globe Fire Sprinkler Corporation.
    - e. OCV Control Valves.
    - f. Reliable Automatic Sprinkler Co., Inc.
    - g. Tyco Fire & Building Products LP.
    - h. Venus Fire Protection Ltd.
    - i. Victaulic Company.
    - j. Viking Corporation.
  - 2. Standard: UL 260.
  - 3. Design: Hydraulically operated, differential-pressure type.
  - 4. 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.
  - 5. Wet, Pilot-Line Trim Set: Include gage to read push-rod chamber pressure, globe valve for manual operation of deluge valve, and connection for actuation device.

**2.8 FIRE-DEPARTMENT CONNECTIONS**

- A. Exposed-Type, Fire-Department Connection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AFAC Inc.
    - b. Elkhart Brass Mfg. Company, Inc.
    - c. Fire-End & Croker Corporation.
    - d. Fire Protection Products, Inc.
    - e. GMR International Equipment Corporation.
    - f. Guardian Fire Equipment, Inc.
    - g. Tyco Fire & Building Products LP.
    - h. Wilson & Cousins Inc.
  - 2. Standard: UL 405.
  - 3. Type: Exposed, projecting, for wall mounting.
  - 4. Pressure Rating: 175 psig minimum.
  - 5. Body Material: Corrosion-resistant metal.
  - 6. 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.
  - 7. Caps: Brass, lugged type, with gasket and chain.
  - 8. Escutcheon Plate: Round, brass, wall type.
  - 9. Outlet: Back, with pipe threads.

**2.9 SPRINKLER SPECIALTY PIPE FITTINGS**

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

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2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
  3. Pressure Rating: 175 psig minimum.
  4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
  5. Size: Same as connected piping.
  6. Inlet and Outlet: Threaded.
- C. Branch Line Testers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Elkhart Brass Mfg. Company, Inc.
    - b. Fire-End & Croker Corporation.
    - c. Potter Roemer.
  2. Standard: UL 199.
  3. Pressure Rating: 175 psig.
  4. Body Material: Brass.
  5. Size: Same as connected piping.
  6. Inlet: Threaded.
  7. Drain Outlet: Threaded and capped.
  8. Branch Outlet: Threaded, for sprinkler.
- D. Sprinkler Inspector's Test Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AGF Manufacturing Inc.
    - b. Triple R Specialty.
    - c. Tyco Fire & Building Products LP.
    - d. Victaulic Company.
    - e. Viking Corporation.
  2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
  3. Pressure Rating: 175 psig minimum.
  4. Body Material: Cast- or ductile-iron housing with sight glass.
  5. Size: Same as connected piping.
  6. Inlet and Outlet: Threaded.
- E. Flexible, Sprinkler Hose Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Aquaflex.
    - b. Fivalco Inc.
    - c. FlexHead Industries, Inc.
    - d. Gateway Tubing, Inc.
  2. Standard: UL 1474.
  3. Type: Braided stainless steel flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
  4. Pressure Rating: 175 psig minimum.
  5. Size: Same as connected piping, for sprinkler.

**2.10 SPRINKLERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFAC Inc.
  - 2. Globe Fire Sprinkler Corporation.
  - 3. Reliable Automatic Sprinkler Co., Inc.
  - 4. Tyco Fire & Building Products LP.
  - 5. Venus Fire Protection Ltd.
  - 6. Victaulic Company.
  - 7. Viking Corporation.
  
- B. General Requirements:
  - 1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
  - 2. Pressure Rating for Residential Sprinklers: 175 psig maximum.
  - 3. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
  - 4. Pressure Rating for High-Pressure Automatic Sprinklers: 250 psig minimum.
  
- C. Automatic Sprinklers with Heat-Responsive Element:
  - 1. Early-Suppression, Fast-Response Applications: UL 1767.
  - 2. Nonresidential Applications: UL 199.
  - 3. Residential Applications: UL 1626.
  - 4. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
  
- D. Sprinkler Finishes:
  - 1. Chrome plated.
  - 2. Bronze.
  - 3. Painted.
  
- E. 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.
  - 2. Sidewall Mounting: Chrome-plated steel , one piece, flat.
  
- F. Sprinkler Guards:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Reliable Automatic Sprinkler Co., Inc.
    - b. Tyco Fire & Building Products LP.
    - c. Victaulic Company.
    - d. Viking Corporation.
  - 2. Standard: UL 199.
  - 3. Type: Wire cage with fastening device for attaching to sprinkler.

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### 2.11 EXCESS-PRESSURE PUMPS

- A. Pump: Factory-fabricated, positive-displacement, gear type.
- B. Miscellaneous Components: Wet-pipe kit of switches, fittings, valves, mounting brackets, and connections for power, hydraulic piping, and wiring from alarm devices.
- C. Motor Control: Differential-pressure switch.
- D. Lights: To indicate sprinkler system's operating condition.

### 2.12 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Water-Flow Indicators:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ADT Security Services, Inc.
    - b. McDonnell & Miller; ITT Industries.
    - c. Potter Electric Signal Company.
    - d. System Sensor; a Honeywell company.
    - e. Viking Corporation.
    - f. Watts Industries (Canada) Inc.
  - 2. Standard: UL 346.
  - 3. Water-Flow Detector: Electrically supervised.
  - 4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
  - 5. Type: Paddle operated.
  - 6. Pressure Rating: 250 psig.
  - 7. Design Installation: Horizontal or vertical.
- C. Pressure Switches:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AFAC Inc.
    - b. Barksdale, Inc.
    - c. Detroit Switch, Inc.
    - d. Potter Electric Signal Company.
    - e. System Sensor; a Honeywell company.
    - f. Tyco Fire & Building Products LP.
    - g. United Electric Controls Co.
    - h. Viking Corporation.
  - 2. Standard: UL 346.
  - 3. Type: Electrically supervised water-flow switch with retard feature.
  - 4. Components: Single-pole, double-throw switch with normally closed contacts.
  - 5. Design Operation: Rising pressure signals water flow.

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

### 2.13 MANUAL CONTROL STATIONS

- A. Description: UL listed Owner's insurance company approved, hydraulic operation, with union, 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 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.

### 2.15 PRESSURE GAGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AMETEK; U.S. Gauge Division.
  - 2. Ashcroft, Inc.
  - 3. Brecco Corporation.
  - 4. WIKA Instrument Corporation.
  
- B. Standard: UL 393.
  
- C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

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- D. Pressure Gage Range: 0 to 250 psig minimum.
- 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 NFPA requirements.
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories at service entrance required for a fully compliant system.
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

#### **3.3 WATER-SUPPLY CONNECTIONS**

- A. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping.
- B. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

#### **3.4 PIPING INSTALLATION**

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
  - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.
- C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.
- D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install unions adjacent to each valve in pipes NPS 2 and smaller.



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- F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- K. Install alarm devices in piping systems.
- L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal and install where they will not be subject to freezing.
- N. Fill sprinkler system piping with water.
- O. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing.

### 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 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 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:

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1. Apply appropriate tape or thread compound to external pipe threads.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

### **3.6 INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING**

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

### **3.7 VALVE AND SPECIALTIES INSTALLATION**

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

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### **3.8 EXCESS-PRESSURE PUMP INSTALLATION**

- A. Assemble components and mount on wood backing.
- B. Install excess-pressure pumps, controls, devices, and supports for sprinkler piping application.

### **3.9 SPRINKLER INSTALLATION**

- A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.
- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
- C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

### **3.10 FIRE-DEPARTMENT CONNECTION INSTALLATION**

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

### **3.11 IDENTIFICATION**

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

### **3.12 FIELD QUALITY CONTROL**

- A. Perform tests and inspections.
- B. Tests and Inspections:
  - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
  - 4. Energize circuits to electrical equipment and devices.
  - 5. Start and run excess-pressure pumps.
  - 6. Coordinate with fire-alarm tests. Operate as required.

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7. Coordinate with fire-pump tests. Operate as required.
  8. Verify that equipment hose threads are same as local fire-department equipment.
- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

### **3.13 CLEANING**

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

### **3.14 DEMONSTRATION**

- A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

### **3.15 PIPING SCHEDULE**

- A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded or 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. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:
1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
- D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 4, shall be one of the following:
1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
  2. Standard-weight, 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.
  3. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- E. Standard-pressure, wet-pipe sprinkler system, NPS 5 and larger, shall be one of the following:
1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
  2. Standard-weight, 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.

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3. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

### **3.16 SPRINKLER SCHEDULE**

- A. Use sprinkler types in subparagraphs below for the following applications:
  1. Rooms without Ceilings: Upright sprinklers.
  2. Rooms with Suspended Ceilings: Concealed sprinklers.
  3. Wall Mounting: Sidewall sprinklers.
  4. Spaces Subject to Freezing: Pendent, dry sprinklers.
- 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.

**END OF SECTION 211313**