



WMU Design Guidelines Instructions: These guidelines are to be used by the Design Professional to inform the design process and outline WMU-specific desires for all University projects. These guidelines have been edited to reflect WMU preferences, and the intent is for the Design Professional to use this information to guide their normal specifications-writing process. Straying from what is indicated in the guidelines is not prohibited, but shall be discussed with WMU during the development of the project.

SECTION 21 1000 – WATER BASED FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

DESIGNER NOTE: The University's Fire Suppression Standard includes only the basic systems that are required for most projects (Wet Pipe, Pre-Action, Dry-Pipe). Specialty or Chemical-Type systems shall be specified and discussed with the University as needed per project.

1.1 SUMMARY

- A. This Section includes the wet-pipe sprinkler systems inside the building:
- B. Related Sections:
 - 1. Division 22 Section "Facility Water Distribution Piping" for [piping outside the building].
 - 2. Division 28 fire detection and alarm sections for alarm devices not specified in this Section.

1.2 DEFINITIONS

- A. High-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig, but not higher than [250 psig] [300 psig].
- B. 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.
- B. 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.]



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1.4 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- B. High-Pressure Piping System Component: Listed for [250-psig minimum] [300-psig] working pressure.
- C. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer.
- D. Sprinkler system design shall be approved by authorities having jurisdiction.
- E. Maximum Protection Area per Sprinkler: Per UL listing, NFPA, and manufacturers specifications.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Piping materials, including flexible connections and sprinkler specialty fittings.
 - 2. Valves, including listed fire-protection valves, unlisted general-duty valves, and specialty valves and trim.
 - 3. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.
 - 4. Fire department connections, including type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.
 - 5. Alarm devices, including electrical data.
 - 6. Elevator valve wall box.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Fire-hydrant flow test report.
- D. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations, if applicable.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control test reports.
- C. 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" and "Contractor's Material and Test Certificate for Underground Piping."
- D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in [NFPA 13] [NFPA 13 and NFPA 14] [NFPA 14].



Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

1.7 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Installation and alterations of fire protection piping, equipment, specialties, and accessories, and repair and servicing of equipment shall be performed only by a qualified installer experienced in such work; with a minimum of 5 previous projects similar in size and scope to this project; be familiar with all precautions required; and has complied with all the requirements of the authority having jurisdiction.
 - 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 or NICET Level III or IV certified layout technician.
- 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: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with NFPA requirements.
- E. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13, "Installation of Sprinkler Systems."
 - 2. NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height."
 - 3. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

1.9 COORDINATION

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



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1.10 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.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell end and plain end.
 - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron gland, rubber gasket, and steel bolts and nuts.

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795; Schedule 10 or schedule 40. Refer to pipe application scheduled near end of this section.
 - 1. Main and line piping NPS 2 and larger to be Schedule 10 grooved.
 - 2. Line piping NPS 1-1/2 and smaller to be Schedule 40 threaded.
 - a. If hydraulically proven, NPS 1-1/4 and NPS 1-1/2 may be Schedule 10.
- B. Steel Pipe Fittings:
 - 1. Cast-Iron Threaded Flanges: ASME B16.1.
 - 2. Malleable-Iron Threaded Fittings: ASME B16.3.
 - 3. Gray-Iron Threaded Fittings: ASME B16.4.
 - 4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe. Include ends matching joining method.
 - 5. Steel Threaded Couplings: ASTM A 865.
 - 6. Locking-Lug Fittings: UL 213, ductile-iron body with retainer lugs that require one-quarter turn to secure pipe in fitting.
 - 7. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
 - 8. Steel Flanges and Flanged Fittings: ASME B16.5.
- C. Grooved-Joint Piping Systems:
 - 1. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
 - 2. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys



matching steel-pipe and fitting grooves, rubber gasket listed for use with housing, and steel bolts and nuts.

3. Gaskets: Material, thickness, and type suitable for intended service and design system temperatures and pressures.

2.3 STEEL PIPE AND FITTINGS

2.4 COPPER TUBE AND FITTINGS

2.5 CPVC PIPE AND FITTINGS

2.6 PIPING JOINING MATERIALS

2.7 COVER SYSTEM FOR SPRINKLER PIPING

2.8 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] [300 psig].

B. Ball Valves:

1. Standard: UL 1091 except with ball instead of disc.
2. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
3. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
4. Valves NPS 3: Ductile-iron body with grooved ends.

C. Bronze Butterfly Valves:

1. Standard: UL 1091.
2. Pressure Rating: 175 psig.
3. Body Material: Bronze.
4. End Connections: Threaded.

D. Iron Butterfly Valves:

1. Standard: UL 1091.
2. Pressure Rating: 175 psig.
3. Body Material: Cast or ductile iron.
4. Style: Lug or wafer.
5. End Connections: Grooved, threaded, or flanged.



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E. Check Valves:

1. Standard: UL 312.
2. Pressure Rating: [250 psig minimum] [300 psig].
3. Type: Swing check.
4. Body Material: Cast iron.
5. End Connections: Flanged or grooved.

F. Bronze OS&Y Gate Valves:

1. Standard: UL 262.
2. Pressure Rating: 175 psig.
3. Body Material: Bronze.
4. End Connections: Threaded.

G. Iron OS&Y Gate Valves:

1. Standard: UL 262.
2. Pressure Rating: [250 psig minimum] [300 psig].
3. Body Material: Cast or ductile iron.
4. End Connections: Flanged or grooved.

H. Indicating-Type Butterfly Valves:

1. Standard: UL 1091.
2. Pressure Rating: 175 psig minimum.
3. Valves NPS 2 and Smaller:
 - a. Valve Type: Ball or butterfly.
 - b. Body Material: Bronze.
 - c. End Connections: Threaded.
4. 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.
5. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit or two-circuit supervisory switch. Coordinate with fire alarm system.
6. Valve Operation: Integral [electrical, 115-V ac, prewired, single-circuit, supervisory switch] [electrical, 115-V ac, prewired, two-circuit, supervisory switch] [visual] indicating device.

I. NRS Gate Valves with Indicator Post:

1. Standard: UL 262.
2. Body Material: Cast iron with indicator post flange.
3. Stem: Nonrising.
4. End Connections: Flanged or grooved.
5. Indicator Posts:
 - a. Standard: UL 789.



- b. Type: Horizontal for wall mounting.
- c. Body Material: Cast iron with extension rod and locking device.
- d. Operation: [Wrench] [Hand wheel].

J. NRS Gate Valves:

- 1. Standard: UL 262.
- 2. Pressure Rating: [250 psig minimum] [300 psig].
- 3. Body Material: Cast iron with indicator post flange.
- 4. Stem: Nonrising.
- 5. End Connections: Flanged or grooved.

K. Indicator Posts:

- 1. Standard: UL 789.
- 2. Type: Horizontal for wall mounting.
- 3. Body Material: Cast iron with extension rod and locking device.
- 4. Operation: [Wrench] [Hand wheel].

2.9 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:

C. Ball Valves:

D. Globe Valves:

E. Plug Valves:

2.10 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.
 - b. High-Pressure Piping Specialty Valves: [250 psig minimum] [300 psig].
- 3. Body Material: Cast or ductile iron.
- 4. Size: Same as connected piping.
- 5. End Connections: Flanged or grooved.



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B. Alarm Valves:

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

C. Deluge Valves:

1. Standard: UL 260.
2. Design: Hydraulically operated, differential-pressure type.
3. 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.
 - a. Include wet, pilot-line trim set as required.
4. 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.

D. Automatic (Ball Drip) Drain Valves:

1. Standard: UL 1726.
2. Pressure Rating: 175 psig minimum.
3. Type: Automatic draining, ball check.
4. Size: NPS 3/4.
5. End Connections: Threaded.

2.11 FIRE-DEPARTMENT CONNECTIONS

A. Exposed-Type, Fire-Department Connection:

1. Standard: UL 405.
2. Type: Exposed, projecting, for wall mounting.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Corrosion-resistant metal.
5. 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.
6. Caps: Brass, lugged type, with gasket and chain.
7. Escutcheon Plate: Round, brass, wall type.
8. Outlet: Back, with pipe threads.
9. Number of Inlets: [Two] [Three].
10. Escutcheon Plate Marking: Similar to "[AUTO SPKR & STANDPIPE] [AUTO SPKR]."
11. Finish: [Polished chrome plated] [Rough brass or bronze] [Rough chrome plated].
12. Outlet Size: [NPS 4] [NPS 5] [NPS 6].



B. Flush-Type, Fire-Department Connection:

1. Standard: UL 405.
2. Type: Flush, for wall mounting.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Corrosion-resistant metal.
5. 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.
6. Caps: Brass, lugged type, with gasket and chain.
7. Escutcheon Plate: Rectangular, brass, wall type.
8. Outlet: With pipe threads.
9. Body Style: Horizontal.
10. Body Style: [Horizontal] [Square] [Vertical].
11. Number of Inlets: Two.
12. Number of Inlets: [Two] [Three] [Four] [Six].
13. Outlet Location: Side by side.
14. Outlet Location: [Back] [Bottom] [Left side] [Right side] [Top].
15. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE" or "AUTO SPKR" as required.
16. Escutcheon Plate Marking: Similar to "[AUTO SPKR & STANDPIPE] [AUTO SPKR]."
17. Finish: Rough chrome plated.
18. Finish: [Polished chrome plated] [Rough brass or bronze] [Rough chrome plated].
19. Outlet Size: NPS 4.
20. Outlet Size: [NPS 4] [NPS 5] [NPS 6] [NPS 8].

C. Flush-Type, Fire-Department Connection:

1. Standard: UL 405.
2. Type: Flush, for wall mounting.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Corrosion-resistant metal.
5. 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.
6. Caps: Brass, lugged type, with gasket and chain.
7. Escutcheon Plate: Rectangular, brass, wall type.
8. Outlet: With pipe threads.
9. Body Style: [Horizontal] [Square] [Vertical].
10. Number of Inlets: [Two] [Three] [Four] [Six].
11. Outlet Location: [Back] [Bottom] [Left side] [Right side] [Top].
12. Escutcheon Plate Marking: Similar to "[AUTO SPKR & STANDPIPE] [AUTO SPKR]."
13. Finish: [Polished chrome plated] [Rough brass or bronze] [Rough chrome plated].
14. Outlet Size: [NPS 4] [NPS 5] [NPS 6] [NPS 8].

D. Yard-Type, Fire-Department Connection:

1. Standard: UL 405.
2. Type: Exposed, freestanding.
3. Pressure Rating: [175 psig minimum] [300 psig].
4. Body Material: Corrosion-resistant metal.



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5. 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.
6. Caps: Brass, lugged type, with gasket and chain.
7. Escutcheon Plate: Round, brass, floor type.
8. Outlet: Bottom, with pipe threads.
9. Number of Inlets: [Two] [Three] [Four].
10. Sleeve: [Brass] [Not required].
11. Sleeve Height: 18 inches.
12. Escutcheon Plate Marking: Similar to "[AUTO SPKR & STANDPIPE] [AUTO SPKR]."
13. Finish[, Including Sleeve]: [Polished chrome plated] [Rough brass or bronze] [Rough chrome plated].
14. Outlet Size: [NPS 4] [NPS 5] [NPS 6].

2.12 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Standard: UL 213.
2. Pressure Rating: 175 psig minimum.
3. Pressure Rating: [175 psig minimum] [300 psig].
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. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.
3. Pressure Rating: [175 psig minimum] [300 psig].
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. Standard: UL 199.
2. Pressure Rating: 175 psig.
3. Body Material: Brass.
4. Size: Same as connected piping.
5. Inlet: Threaded.
6. Drain Outlet: Threaded and capped.
7. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:



1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.
3. Pressure Rating: [175 psig minimum] [300 psig].
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. Standard: UL 1474.
2. Pressure Rating: 250 psig minimum.
3. Pressure Rating: [250 psig minimum] [300 psig].
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. Standard: UL 1474.
2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
3. Pressure Rating: 175 psig minimum.
4. Pressure Rating: [175 psig minimum] [300 psig].
5. Size: Same as connected piping, for sprinkler.

2.13 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] [300 psig].

C. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.



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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.
4. Coated.

E. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications for sprinklers not furnished with escutcheons.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, two piece, with 1-inch vertical adjustment.
2. Ceiling Mounting: [Chrome-plated steel, one piece, flat] [Chrome-plated steel, two piece, with 1-inch vertical adjustment] [Plastic, white finish, one piece, flat].
3. Sidewall Mounting: Chrome-plated steel, one piece, flat.
4. Sidewall Mounting: [Chrome-plated steel] [Plastic, white finish], one piece, flat.

G. Sprinkler Guards:

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

2.14 ALARM DEVICES

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

B. Horn Strobe Alarm:

1. The horn strobe shall be listed to UL 1971 and UL 464 suitable for outdoor mounting and shall be approved for fire protective service. The horn strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1Hz over the strobe's entire operating voltage range.
2. The horn strobe shall mount to a standard back box with a universal mounting plate. The notification appliance circuit wiring shall terminate at the universal mounting plate.

C. Water-Motor-Operated Alarm:

1. Standard: UL 753.
2. Type: Mechanically operated, with Pelton wheel.
3. Alarm Gong: Cast aluminum with red-enamel factory finish.
4. Size: 10-inch diameter.



5. Components: Shaft length, bearings, and sleeve to suit wall construction.
6. Inlet: NPS 3/4.
7. Outlet: NPS 1 drain connection.

D. Electrically Operated Alarm Bell:

1. Standard: UL 464.
2. Type: Vibrating, metal alarm bell.
3. Size: [6-inch minimum-] [8-inch minimum-] [10-inch] diameter.
4. Finish: Red-enamel factory finish, suitable for outdoor use.

E. Water-Flow Indicators:

1. Standard: UL 346.
2. Water-Flow Detector: Electrically supervised.
3. 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.
4. Type: Paddle operated.
5. Pressure Rating: 250 psig.
6. Design Installation: Horizontal or vertical.

F. Pressure Switches:

1. Standard: UL 346.
2. Type: Electrically supervised water-flow switch with retard feature.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design Operation: Rising pressure signals water flow.

G. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled valve is in other than fully open position.

H. Indicator-Post Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled indicator-post valve is in other than fully open position.

2.15 PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- C. Pressure Gage Range: 0 to 250 psig minimum.



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- D. Pressure Gage Range: [0 to 250 psig minimum] [0 to 300 psig].
- 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.

2.16 ELEVATOR VALVE RECESSED WALL BOXES

- A. Cabinet: Suitable for shut-off valve with supervisory switch.
 - 1. Cabinet Construction: Fire-rated with rating equal to wall installed in.
 - a. Non-rated Wall: Non-rated construction
 - b. Rated Wall: Fire-rated with rating equal to wall installed in
 - 2. Cabinet Material: Steel sheet.
 - 3. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit shut-off valve.
 - a. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 4. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.
 - a. Rolled-Edge Trim: 2-1/2-inch backbend depth.
 - 5. Cabinet Trim Material: Same material and finish as door.
 - 6. Door Material: Steel sheet.
 - 7. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material.
 - a. Provide projecting door pull and friction latch.
 - b. Provide concealed hinge permitting door to open 180 degrees.
 - 8. Accessories:
 - a. Door Lock: [Cam lock that allows door to be opened during emergency by pulling sharply on door handle] [Cylinder lock, keyed alike to other cabinets].
 - b. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
 - 1) Identify valve located in cabinet.
 - 9. Finishes: Manufacturer's standard baked-enamel paint.



PART 3 - EXECUTION

3.1 PREPARATION

- A. If a flow test at the nearest outside fire hydrant is older than two (2) years from the date of the calculations, perform a new fire-hydrant flow test according to NFPA 13 and NFPA 291.
- B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

- A. Connect sprinkler piping to water-service piping at service entrance to building.
- B. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in Section 21 1100 "Facility Fire-Suppression Water-Service Piping."
- C. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories as required by authorities having jurisdiction at connection to water-service piping.
- D. 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 21 1100 "Facility Fire-Suppression Water-Service Piping."]
- E. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.3 [WATER-SUPPLY CONNECTIONS]

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 zone control valves, test assemblies, and drain risers in accessible locations.
- J. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes [when sprinkler piping is connected to standpipes].
- K. Install automatic (ball drip) drain 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.
- L. Install alarm devices in piping systems.
- M. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
- N. Install pressure gages on riser or feed main, at each sprinkler test connection. 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.
- O. 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.
- P. Fill sprinkler system piping with water.
- Q. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing. Comply with requirements for heating cables in Section 21 0533 "Heat Tracing for Fire-Suppression Piping" and for piping insulation in Section 21 0700 "Fire-Suppression Systems Insulation."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 21 0500 "Common Work Results for Fire-Suppression."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in [Section 21 0517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."]
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 21 0500 "Common Work Results for Fire-Suppression."



- U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 21 0518 "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 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:
 - 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.



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- M. [Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.]
- N. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Braze Joints" Chapter.
- O. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- P. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.
- Q. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2104. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- R. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
- S. Plastic-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

3.6 INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING

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

3.7 VALVE AND SPECIALTIES INSTALLATION

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



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

3.8 SPRINKLER INSTALLATION

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

3.9 FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Install wall-type, fire-department connections.
- B. Install yard-type, fire-department connections in concrete slab support. Comply with requirements for concrete in Section 03 3000 "Cast-in-Place Concrete."
 1. Install [two] [three] <Insert number> protective pipe bollards [around] [on sides of] each fire-department connection. Comply with requirements for bollards in Section 05 5000 "Metal Fabrications."
- C. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.10 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 26 0553 "Identification for Electrical Systems."

3.11 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.



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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.

- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.12 CLEANING

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

3.13 DEMONSTRATION

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

3.14 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 vales, instead of specified fittings.
- C. Standard-pressure, wet-pipe sprinkler system shall be the following:
1. Main and line piping NPS 2 and larger to be Schedule 10 grooved.
 2. Line piping NPS 1-1/2 and smaller to be Schedule 40 threaded.
 - a. If hydraulically proven, NPS 1-1/4 and NPS 1-1/2 may be Schedule 10.
- D. Underground Service-Entrance Piping: Ductile-iron, mechanical-joint pipe and fittings and restrained joints.



3.15 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
1. Rooms without Ceilings: Upright sprinklers.
 2. Rooms without Ceilings: [Upright sprinklers] <Insert type>.
 3. Rooms with Suspended Ceilings: Concealed sprinklers.
 4. Rooms with Suspended Ceilings: [Pendent sprinklers] [Recessed sprinklers] [Flush sprinklers] [Concealed sprinklers] [Pendent, recessed, flush, and concealed sprinklers as indicated].
 5. Rooms with Hard Ceilings: Concealed sprinklers.
 6. Rooms with Ceiling Clouds: Extended coverage sidewall sprinklers to cover under the fabric ceiling clouds without poking down thru or be mounted under them.
 7. Wall Mounting: Sidewall sprinklers.
 8. Spaces Subject to Freezing: Upright, pendent, and sidewall, dry sprinklers.
 9. Spaces Subject to Freezing: [Upright sprinklers] [Pendent, dry sprinklers] [Sidewall, dry sprinklers] [Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as indicated] <Insert type>.
 10. Deluge-Sprinkler Systems: [Upright] [and] [pendent], open sprinklers.
 11. Special Applications: [Extended-coverage, flow-control, and quick-response sprinklers where indicated] <Insert type>.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate, or colored to match ceiling material.
 2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
 3. Recessed Sprinklers: White, with white escutcheon.
 4. Residential Sprinklers: Dull chrome.
 5. Upright, Pendent, and Sidewall Sprinklers:
 - a. Chrome plated in finished spaces exposed to view
 - b. Rough bronze in unfinished spaces not exposed to view
 - c. Painted black in exposed black painted ceilings.
 - d. Painted white in exposed white painted ceilings.
 - e. Wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 21 1000