

SECTION 21 1300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

- A. This section covers the furnishing and installation of materials, equipment, and appurtenances associated with wet-pipe, fire sprinkler systems. All labor, materials, tools, equipment, service, and supervision required to design, install, test, and place the fire sprinkler systems in service shall be provided.
- B. Fire sprinkler systems shall meet the design conditions and features and as indicated on the drawings. All required piping, valves and appurtenances are not indicated on the drawings but shall be provided for a complete system compliant with the requirements indicated herein.
- C. Scope includes provide automatic wet sprinkler for entire Material Handling Bldg. Sprinkler system shall meet minimum design criteria in accordance with local fire code and NFPA 13 and FM Approval Guide. In addition, sprinkler system shall be designed to meet owner and owner insurance underwriter standard guidelines.

1.2 GENERAL

- A. Coordination
 - 1. Piping, equipment, and appurtenances furnished and installed under this section shall be designed, fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations furnished by the manufacturer unless exceptions are noted by Engineer.
 - 2. Contractor shall verify that each component of the fire sprinkler system is compatible with all other parts of the system; that all piping, equipment, and appurtenances are appropriate for the intended function; and that all devices necessary for a properly functioning system have been provided.
 - 3. Equipment and appurtenances furnished under this section shall be the standard product of the manufacturer. Where two or more units of the same class of equipment are required, they shall be the products of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.
 - 4. Contractor shall coordinate with the electrical contractor to make certain that the field wiring associated with this section is complete in accordance with the requirements of the equipment specified herein. Contractor shall coordinate the wiring of alarm devices to the equipment furnished and installed under the Fire Detection and Alarm System section.

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5. Contractor shall become familiar with details of the work, shall verify dimensions in the field, and notify Engineer of any discrepancy before performing the work.

B. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

C. Seismic Design Requirements

1. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

D. Governing Standards

1. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with the applicable national, state, and local codes and ordinances, laws, regulations, and NFPA Standards which pertain to such work. Client fire protection design criteria and insurance underwriter requirement shall be met in the design of fire protection systems. In case of a conflict between these specifications and any applicable national, state, or local code, ordinance, law, regulation, or NFPA Standard, the most restrictive requirement shall govern.

1.3 SUBMITTALS

A. Drawings and Data

1. Complete design calculations; assembly, and installation drawings; together with complete engineering data covering the materials used and the parts, devices, and accessories forming a part of the equipment and appurtenances furnished, shall be submitted in accordance with the Submittals Procedures section.
2. The submittal to Engineer shall be made after the local authorities having jurisdiction have approved the design.
3. The data and specifications submitted shall include, but not be limited to, the following:

Design Documents

Complete working plans, hydraulic calculations, water supply data, and information required by NFPA Standards.

Hydraulic design placard.

Equipment, Piping, and Appurtenances

Name of manufacturer

Type and model

Construction materials, thickness, and finishes

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Capacities

Pressure and temperature ratings

Overall dimensions

Piping connection type, size, and location

Wiring diagrams

Pressure loss data

Net weight

Test Reports

Test reports and certificates as described in NFPA Standard 13.

Seismic Design Requirements

Confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

B. Operation and Maintenance Manuals

1. Adequate operation and maintenance information shall be supplied as required in the Submittals Procedures section. Operation and maintenance manuals shall be submitted in accordance with the Submittals Procedures section.

1.4 QUALITY ASSURANCE

- A. All materials and work shall conform to the requirements of the National Fire Protection Association (NFPA), Factory Mutual (FM), and Underwriters' Laboratories (UL).
- B. Manufacturers providing equipment and appurtenances shall be listed by product name and manufacturer in the UL Fire Protection Equipment Directory and FM Approval Guide.
- C. Fire sprinkler system materials shall be permanently stamped or labeled with the listing and approval agency's identification.
- D. Materials, installation, inspection, and testing of the fire sprinkler system shall comply with the requirements of the local authorities having jurisdiction and Owner's insurance underwriter.
- E. The sprinkler system drawings and calculations shall be performed by an individual who has National Institute for Certification of Engineering Technologies (NICET) III certification in the subfield of automatic sprinkler design and signed and sealed by a registered professional engineer licensed in the state in which the project is located.
- F. The fire sprinkler system shall be installed by a firm having previously installed a minimum of five systems similar in size and scope to this project.

1.5 PERFORMANCE AND DESIGN REQUIREMENTS

- A. All piping, equipment, and appurtenances shall be designed to meet the performance and design conditions as specified herein and on the Drawings. The system shall be designed as an automatic wet-pipe system as indicated in Schedule 13930-S01. The system type, zoning, hazard classification, sprinkler density, and design area of operation shall meet design installation standards and owner requirements and as indicated on Schedule 13930-S01.
- B. The design area represents the minimum area to be considered for hydraulic calculations. The system shall be designed to discharge the sprinkler density over the most hydraulically demanding design area. The area required to be sprinkled may be larger than the design area.
- C. Water allowances shall be made for inside and outside hose streams. Hose stream flow rates shall be as specified by NFPA Standards.
- D. Flow Test
 - 1. The sprinkler system shall be designed using data from a water flow test performed by [the Contractor.
 - 2. The water flow test is to verify that adequate pressure is available at the required flow before the system is designed. If it is not possible to perform a flow test prior to designing the system, the test may be performed later, however, Contractor shall accept responsibility for any modifications required if the flow tests indicate a lower available water supply than that on which the calculations were based.
- E. Pipe Sizing
 - 1. The sprinkler system shall be hydraulically calculated, and shall include a safety factor of 10 psig at the design flow.
 - 2. Pipe and accessory sizes indicated on the Drawings are the minimum allowed, and shall be increased if determined necessary by hydraulic calculations. The water velocity in piping systems shall not exceed 20 fps at design flow.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.

1.7 EXTRA MATERIALS

- A. A supply of spare sprinklers shall be provided in accordance with NFPA Standard 13. The sprinklers shall be stored in a suitable metal container and shall be representative of the number of each type and each temperature rating of the sprinklers installed.
- B. Extra materials shall be packaged with labels indicating the contents of each package. Each label shall include the manufacturer's name, equipment identification, part nomenclature, part

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number, address of nearest distributor, and current list price. Extra materials shall be delivered to Owner as directed.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS

- A. All components of the fire sprinkler system shall be designed to meet the specified conditions.

2.2 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers shall be as indicated in the respective product description paragraphs.

2.3 MATERIALS

- A. All piping systems and related components shall be rated for at least 175 psig working pressure.
- B. Anchor Bolts and Expansion Anchors
 - 1. All anchor bolts, expansion anchors, nuts and washers shall comply with UL, FM, and NFPA requirements. Powder-driven anchor assemblies shall not be used.
- C. Piping Systems
 - 1. Piping on the supply side of the backflow prevention device shall be as specified in other sections for potable water use. Piping on the sprinkler side of the backflow prevention device shall be black or galvanized steel pipe as follows:
 - Standard Weight ASTM A53 with Threaded Malleable or Cast Iron Fittings.
 - All 2 inch and smaller piping.
 - Standard Weight ASTM A53 with Flanged Fittings.
 - All 2-1/2 inch and larger piping.
 - Standard Weight ASTM A53 with Grooved-End Fittings.
 - All 2-1/2 inch and larger piping on the sprinkler side of the backflow preventer. (optional)
 - Schedule 40 ASTM A135 with Roll-Grooved Fittings or Sch 40 ASTM A795 Pipe and Fittings.
 - All 2-1/2 inch and larger piping on the sprinkler side of the backflow preventer. (optional)
 - 2. Galvanized steel pipe shall be used for sprinkler piping and outdoors in chemical feed and storage rooms.

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3. Pipe shall be furnished complete with all fittings, jointing materials, supports and anchors, and other accessories required for a complete system.
4. Plain-end fittings with mechanical devices which grip into the pipe, and saddle type branch fittings shall not be used.

D. Pipe Supports

1. Pipe supports shall be suitable for the application, construction, and type and size of pipe used.
2. "C" type clamps shall be provided with retaining clips and shall not be used for piping larger than 3 inch [75 mm] size.
3. Galvanized hanger assemblies shall be used for the support of galvanized steel piping systems.

E. Service Valves

1. Service valves shall be UL-listed and FM approved, with 175 psig [1207 kPa] non-shock minimum working pressure rating.

F. Gate Valves

1. Gate valves in 2 inch and smaller sizes shall be cast-bronze with threaded ends, solid wedge disc, outside screw and yoke, and rising stem.
2. Gate valves in 2-1/2 inch and larger sizes shall be iron body, bronze mounted, with tapered solid wedge disc, outside screw and yoke, and rising stem. Valves shall be provided with replaceable bronze disc facing rings and flanged ends.
3. Gate valves in 4 inch and larger sizes for use with indicator posts shall be iron body, bronze mounted, with solid wedge disc, non-rising stem, operating nut, replaceable bronze disc facing rings, and bonnet cap for indicator post.
4. Indicator posts shall be wall type with cast-iron body, windows for target plates that indicate valve position, extension rod and coupling, locking device, hand wheel operator, wall flange, and red enamel finish. Gate valves for use with wall indicator posts shall be provided with flanged ends.
5. Indicator posts shall be vertical type with cast-iron body, ductile iron barrel, windows for target plates that indicate valve position, extension rod and coupling, locking device, operating wrench, and red enamel finish. The indicator post shall be of suitable length for the water main bury depth, with the operating handle located approximately 3 feet above finish grade. Gate valves for use with vertical indicator posts shall be provided with flanged or mechanical joint ends.
6. Indicator posts shall be provided with a supervisory switch to alarm when the valve is not in the full open position.

G. Butterfly Valves Not Allowed.

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H. Ball Valves

1. Ball valves in 2 inch and smaller sizes shall be brass ball and body with reinforced Teflon seat and threaded ends.

I. Check Valves

1. Swing check valves 2-1/2 inch and larger shall be cast-iron body with bolted cap, bronze disc or cast-iron disc with bronze disc ring, and flanged ends.

J. Specialty Valves

1. Specialty valves shall be UL-listed and FM approved, with 175 psig non-shock minimum working pressure rating.
2. Alarm Check Valve
 - a. Alarm check valves shall be provided with variable pressure trim and standard accessories including pressure gauges; alarm switch with contacts rated for 120 volts, 10 amperes; testing bypass; drain cup; retarding chamber; and all necessary pipe, fittings, and accessories required for a complete trimming installation in accordance with NFPA No. 13. The valve shall be provided with flanged inlet and outlet, bronze grooved seat with O-ring seals, and single hinge pin and latch design. The alarm switch shall be wired to the fire alarm system.
3. Deluge-Pipe Valve Not used.
4. Air Maintenance Device Not used.
5. Dry-Pipe Valve Not used.
6. Air Maintenance Device Not used.
7. Ball Drip Valves
 - a. Ball drip valves shall be automatic drain type, 3/4 inch body size, with spring-loaded ball check device and threaded ends.
8. Backflow Preventer
 - a. The sprinkler system backflow preventer shall be a double check type. The unit body shall be epoxy-coated cast iron or stainless steel. Gate valves with flanged ends, outside screw and yoke, rising stem, and resilient seats shall be factory installed at each end of the unit. Each gate valve shall be provided with a supervisory switch to alarm in the event that the valve is not in the full open position.
 - b. Backflow preventers shall be as manufactured by Febco, Watts Industries, Inc., or Ames.

K. Automatic Sprinklers

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1. Sprinklers shall be furnished and installed in accordance with their listed spacing limitations. Automatic sprinklers shall be provided with heat responsive elements conforming to UL 199. Sprinkler types and categories shall be as indicated in Schedule 13930-S01 or as indicated on the drawings. Sprinklers shall be provided with nominal 1/2-inch orifice and minimum 165° F temperature rating unless otherwise indicated or required by application in accordance with NFPA standards. Sprinklers located in the vicinity of heaters shall be provided with intermediate or high temperature ratings as specified by NFPA 13.
2. Sprinklers shall be furnished and installed with all required escutcheons for a complete installation. Escutcheons shall permit sprinkler head adjustment as needed for a proper installation.
3. Sprinkler cabinets shall be of finished steel, with hinged cover, space for minimum of six spare sprinklers plus sprinkler wrench, and shall be suitable for wall mounting. The number of sprinklers required by NFPA 13 and 1 wrench for sprinklers shall be included. A separate cabinet with sprinklers and wrench shall be provided for each style of sprinkler on this project.
4. When indicated in Schedule 13930-S01, wire-cage type sprinkler guards shall be provided with fastening device for attaching to sprinkler.

L. Fire Department Connection

1. A sprinkler system fire department siamese connection shall be provided. The location of the connection shall be as indicated on the Drawings or as approved by Engineer and the local authority having jurisdiction.
2. The siamese connection shall be a projecting wall-type, with cast-brass body; polished chrome plated finish; NH-standard thread inlets according to NFPA 1963 and matching local fire department threads; and threaded NPS outlet. Connection shall include lugged cap, gasket, and chain; lugged swivel connection and drop clappers for each hose connection inlet; and round wall escutcheon plate with marking "AUTO SPKR." The connection shall be provided with two 2-1/2 inch inlets and one 4 inch back outlet.

M. Alarm Devices

1. Alarm devices shall be provided. Alarm device type and size shall be as needed to match piping and equipment connections.
2. Water flow indicators shall be electrical supervision vane type, rated to 250 psig, and shall comply with UL 346. The indicators shall be furnished with a pipe saddle and cast aluminum housing, and shall be suitable for horizontal or vertical installation. Two isolated spdt alarm contacts shall be provided. Contacts shall be rated for 7 ampere, 125 volts ac and 0.25 ampere, 24 volts ac. Water flow indicators shall be complete with factory-set, field-adjustable, instantly recycling pneumatic retard element to prevent false signals, and tamper-proof cover that alarms when cover is removed.
3. Pressure switches shall be electrical supervision type, with spdt contacts, and shall comply with UL 753. The pressure switches shall be designed to signal water flow based on rising pressure.

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4. Supervisory (tamper) switches shall comply with UL 753, and shall be electrical supervision type, with spdt normally closed contacts. The switches shall be designed to signal when the controlled valve is in other than the fully open position and when the switch is removed or dismantled.
 - ~~5.~~ Water flow alarms shall be water motor hydraulically operated outdoor alarm type. The water motor alarm shall be provided with an aluminum alloy alarm gong at least 5 inches in diameter, energy-efficient impeller, and bearings which do not require lubrication. A Y-strainer shall be installed in the alarm pipeline. The alarm shall be initiated by flow from the alarm check valve retarding chamber, dry-pipe valve, or deluge valve.
 6. Water flow alarms shall be electric audible and visual type and shall be compliant with NFPA Standard 72 and UL Standard 1638. The alarm shall be weatherproof, and shall be suitable for a 120 volts ac or 24 volts dc power supply to be compatible with the fire alarm system. The alarm shall be initiated by the flow through the alarm check valve retarding chamber, deluge valve, or water flow switch
- N. Air Compressor Not used.
- O. Pressure Gauges
1. Pressure gauges shall comply with UL 393, and shall be provided with 3-1/2 inch to 4-1/2 inch diameter dial, and a dial range of 0-250 psig .

PART 3 - EXECUTION

3.1 INSPECTION

- A. Contractor shall field verify all existing conditions prior to designing the system.

3.2 INSTALLATION

- A. Piping, equipment, and appurtenances furnished under this section shall be installed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.
- B. A metal placard with the hydraulic design information shall be attached with a stainless steel chain to each sprinkler riser. Each placard shall contain the system design information as required by NFPA 13.
- C. Sprinkler Piping and Accessories
1. Deviations from approved "working plans" for sprinkler piping require recalculation and approval by authority with jurisdiction. Written approval shall be obtained from Engineer prior to deviating from approved "working plans."

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2. Approved fittings shall be used to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes. Unions shall be installed adjacent to each valve in pipes 2 inch and smaller. All piping shall be hidden from view in areas with finished ceilings, unless accepted by Engineer to be exposed.
3. "Inspector's Test Connections" shall be installed in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13.
4. The sprinkler piping shall be installed with drains for complete system drainage. Ball drip valves shall be installed to drain piping between fire department connections and check valves, and where indicated. Drains shall be routed to outside the building unless otherwise indicated on the Drawings.
5. The sprinkler head riser drop lengths shall be determined in the field and shall be coordinated with all ductwork, electrical conduit, piping systems, process equipment, and tanks. If the sprinkler system piping is installed before all ductwork or other building system construction is finished and if any sprinkler head risers need to be relocated to meet the code requirements, Contractor shall extend or relocate the risers and sprinkler heads at his expense.
6. Hanger and support spacing and locations for steel piping joined with grooved mechanical couplings shall be in accordance with the manufacturer's written instructions for rigid systems.
7. Metal roof decking shall not be used for the support of equipment or piping.
8. Piping shall be installed in accordance with NFPA 13 to protect from earthquake damage.
9. Pressure gauges shall be installed at each sprinkler test connection and at top of each riser. Pressure gauges shall be provided with connections not less than 1/4 inch and with soft metal seated globe valve arranged for draining pipe between gage and valve. Gauges shall be installed to permit removal and shall not be installed where subject to freezing.
10. All alarm devices shall be connected to the fire alarm system.
11. The electric sprinkler flow alarm shall be mounted outside on an exterior wall of the building at a location suitable to Engineer so personnel in the area will notified when an alarm is sounded.

D. Sprinkler Valves

1. Fire sprinkler valves shall be installed with all trim, fittings, controls, and specialties according to NFPA 13, manufacturer's written instructions and the requirements of the authority having jurisdiction.
2. Service valves shall be supervised-open, and located to control sources of water supply except from fire department connections. Permanently marked identification signs indicating portion of system controlled by each valve shall be provided.
3. Alarm check valves shall be installed in the vertical position for proper direction of flow, including bypass check valve and retard chamber drain line connection.

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4. Double-check detector assembly backflow preventers shall be installed with bypass water meter, gate valves on each side of meter, and check valve downstream from the meter.
5. Reduced pressure detector assembly backflow preventers shall be installed with bypass water meter, gate valves on each side of meter, and reduced pressure backflow preventer downstream from the meter.

3.3 FIELD TESTING

- A. Field testing of the fire sprinkler systems shall conform to NFPA Standard 13 “System Acceptance” Chapter and to the requirements of the local Fire Department.
- B. The Engineer and the local authority having jurisdiction will witness all tests. Contractor shall arrange the testing schedule with the local authority having jurisdiction and the Engineer; with at least 7 days’ advance notice.
- C. Contractor shall replace piping and components that do not pass the test procedures specified, and then retest to demonstrate compliance. The procedure shall be repeated until satisfactory results are obtained at no additional cost to Owner. Three copies of test reports shall be submitted in writing to Engineer and to the authority having jurisdiction.
- D. Test certificates shall be executed and submitted prior to final inspection and acceptance in accordance with NFPA Standard 13. Three copies of each test certificate shall be furnished to Engineer and the authority having jurisdiction.
- E. After installation and testing of the fire suppression system, complete drawings, conforming to installation records, including location of sprinkler heads, control valves, water supply connections, and wiring diagrams, shall be submitted to Engineer prior to final acceptance.

3.4 ADJUSTING

- A. All alarm devices shall be adjusted for proper operation. All drains shall be checked for proper operation.

3.5 CLEANING

- A. Immediately prior to the final inspection, equipment, piping and appurtenances shall be thoroughly cleaned. Dirt and debris shall be cleaned from sprinklers. Sprinklers having paint other than factory finish shall be replaced with new sprinklers. Cleaning and reuse of painted sprinklers is prohibited.

3.6 FINAL INSPECTION AND ACCEPTANCE

- A. A decision shall be reached during the inspection concerning the resolution of discrepancies and changes as recommended by the authorities having jurisdiction. All work determined to be the responsibility of Contractor, and included within the scope of the specifications, shall be promptly completed at no expense to Owner.

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- B. The final acceptance of the fire sprinkler system shall be made after the completion of the corrective work resulting from the final testing and inspection and after receipt of a formal letter of acceptance from the authority having jurisdiction.

End of Section

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Schedule 13930-S01 Fire Sprinkler Systems

Performance and Design Requirements						
Zone	Area Or Rooms to Be Sprinkled	System Type	Area	Hazard Classification	Sprinkler Density gpm/sq ft	Design Area sq ft [See Remark 3]
	Material Handling Bldg	Wet	Office areas and restrooms	HC-1/Light hazard	0.1	1500
	Material Handling Bldg	Wet	Storage	HC-2	0.2	2500
Sprinkler Requirements						
Area		Sprinkler Type		Sprinkler Finish		Remarks
Unfinished areas without ceilings		Upright		Rough brass		
Finished areas without ceilings		Upright		Polished chrome plated		
Finished areas with ceilings		Pendent		Polished chrome plated		
Chemical feed and storage areas		Upright		Corrosion-resistant		
Electrical and mechanical rooms		Upright		Rough brass		1,2
Remarks:						
1. Sprinkler shall have 212° F temperature rating.						
2. Sprinkler guard required.						
3. Add 30% to the design area for all dry-pipe and pre-action systems.						