

SECTION 21 13 13
WET-PIPE SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society of Mechanical Engineers (ASME):
 - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250.
 - b. B16.4, Gray Iron Threaded Fittings: Classes 125 and 250.
 - c. B16.5, Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.
2. American Water Works Association (AWWA):
 - a. C110/A21.10, Ductile-Iron and Gray-Iron Fittings.
 - b. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - c. C115/A21.15, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
3. ASTM International (ASTM):
 - a. A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - b. A135/A135M, Standard Specification for Electric-Resistance-Welded Steel Pipe.
 - c. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - d. A197/A197M, Standard Specification for Cupola Malleable Iron.
 - e. A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.
 - f. A563/A563M, Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric).
 - g. A795/A795M, Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
4. FM Global (FM).
5. National Fire Protection Association (NFPA):
 - a. 13, Installation of Sprinkler Systems.
 - b. 70, National Electrical Code (NEC).
 - c. 72, National Fire Alarm and Signaling Code.
 - d. 1963, Standard for Fire Hose Connections.

6. UL:
- a. 193, Standard for Safety Alarm Valves for Fire-Protection Service.
 - b. 199, Safety Automatic Sprinklers for Fire-Protection Service.
 - c. 213, Rubber Gasketed Fittings for Fire-Protection Service.
 - d. 262, Standard for Gate Valves for Fire-Protection Service.
 - e. 312, Check Valves for Fire-Protection Service.
 - f. 346, Standard for Waterflow Indicators for Fire Protective Signaling Systems.
 - g. 393, Standard for Safety Indicating Pressure Gauges for Fire-Protection Service.
 - h. 405, Standard for Fire Department Connection Devices.
 - i. 464, Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories.
 - j. 753, Standard for Alarm Accessories for Automatic Water-Supply Control Valves for Fire-Protection Service.
 - k. 789, Standard for Indicator Posts for Fire-Protection Service.
 - l. 1091, Butterfly Valves for Fire-Protection Service.
 - m. 1474, Standard for Adjustable Drop Nipples for Sprinkler Systems.
 - n. 1626, Residential Sprinklers for Fire-Protection Service.
 - o. 1767, Early-Suppression Fast-Response Sprinklers.

1.02 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 300 psig.
- B. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig maximum.
- C. 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.
- D. Abbreviations:
 - 1. American National Taper Pipe Thread (NPT).
 - 2. Authority having jurisdiction (AHJ).
 - 3. Hertz (Hz).
 - 4. Pounds per square inch, gauge (psig).
 - 5. Single-pole, double-throw (SPDT).
 - 6. Volts alternating current (V ac).
 - 7. Volts direct current (V dc).

1.03 DESIGN REQUIREMENTS

- A. Provide design criteria and area densities for automatic sprinkler systems as indicated on the Drawings.
- B. Provide sprinkler systems, including seismic bracing designed and installed in accordance with NFPA 13.
- C. Hydraulically design systems. Submit calculations to verify that, at minimum, densities indicated on the Drawings are met.
- D. Base hydraulic calculations on water supply as indicated below available at the tie in point as indicated on the bid documents:
 - 1. Static pressure: 140 psi.
 - 2. Residual pressure: 50 psi.
 - 3. Residual flow: 500 gpm.
- E. The Drawings are provided for general layout of sprinkler system. Contractor design responsibility includes determining exact layout and dimensions of system. Clearly identify deviations from the Drawings or Specifications in the Shop Drawing submittal.

1.04 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Drawings for wet-pipe sprinkler systems; include plans, elevations, sections, details, and attachments to other work. Provide required shop drawing information as required by NFPA 13.
 - b. Product Data: For pipe, fittings, valves, sprinklers and all other attachments and components needed to provide a complete and compliant installation. For electrical/alarm components include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - c. Submit for approval by Government's loss protection consultant and the fire marshal prior to the start of construction.
 - d. Coordination Drawings:
 - 1) Sprinkler systems, drawn to scale, illustrating coordination of sprinkler system with:
 - a) Process piping.
 - b) Domestic water piping.
 - c) Compressed air piping.
 - d) HVAC hydronic piping and duct work.

- e) Items penetrating finished ceiling, include the following:
 - (1) Lighting fixtures.
 - (2) Air outlets and inlets.
 - (3) Ceiling access doors.

B. Informational Submittals:

- 1. Qualification Data: Qualified installer, design technician, and professional engineer.
- 2. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- 3. Welding certificates.
- 4. Manufacturer's printed installation instructions.
- 5. Field test reports and certificates.
- 6. Field quality control reports.
- 7. Operation and Maintenance Data.

1.05 QUALITY ASSURANCE

- A. Comply with the applicable Building Code building codes, and government regulations, and requirements identified on the Drawings.
- B. Provide approvals, permits, and required inspections.
- C. Provide materials and equipment UL listed and in compliance with applicable NFPA standards and fire marshal's requirements. Submit documentation that specific items furnished under this section for this Project conform to such requirements.
- D. Welding Qualifications: Refer to NFPA 13 for qualifications and restrictions.

1.06 QUALIFICATIONS

- A. Design of fire sprinkler systems must be performed by one of the following:
 - 1. A licensed fire protection engineer.
 - 2. A NICET certified engineering technician at Level III or IV in the subfield of Water-Based Systems Layout.
 - 3. As approved by the FCO.
- B. Installation of fire sprinkler systems must be performed by one of the following:
 - 1. A state or municipal licensed fire sprinkler contractor.
 - 2. As approved by the FCO.

1.07 EXTRA MATERIALS

- A. Furnish, tag, and box for shipment and storage the following spare parts:

Item	Quantity
Sprinkler Cabinet	One each
Sprinklers	Six of each different size unit

- B. Delivery: In accordance with Section 01 67 00, Product Requirements.

PART 2 PRODUCTS

2.01 GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application. Comply with additional requirements of NFPA 72.
- B. Refer to Section 28 31 00, Fire Detection and Alarm, for additional requirements and interface to wet-pipe sprinkler systems.
- C. Sprinkler System Equipment, Specialties, Accessories, Installation, and Testing: Comply with NFPA 13.
- D. Piping Materials: Comply with requirements in Piping Schedule located on the Drawings.

2.02 STEEL PIPE AND FITTINGS

- A. Pipe:
1. FM Approved Standard Weight, Schedule 40 Black Steel Pipe: ASTM A53/A53M or ASTM A153. Pipe ends may be factory or field formed to match joining method.
 2. For aboveground feed mains, cross mains, and branch lines in sizes 2-1/2 inches and larger only, pipe may be FM approved Schedule 10 carbon steel, electric resistance welded, ASTM A135/A135M or ASTM A795/A795M. Pipe ends to suit fittings used.
 3. Do not use light wall pipe and Schedule 5 pipe.

B. Fittings:

1. Uncoated, Gray-Iron Threaded Fittings:
 - a. ASME B16.4, Class 125, standard pattern. Provide galvanized fittings and couplings:
 - 1) Where scheduled.
 - 2) Exterior locations.
2. Flanges:
 - a. Cast Iron: ASME B16.1 or AWWA C110/A21.10, AWWA C111/A21.11, AWWA C115/A21.15, 250 psi water service rating, Class 125 dimensions and bolt pattern.
 - b. Galvanized Steel Flanges and Flanged Fittings: ASME B16.5, Class 150, dimensions and bolt pattern.
3. Grooved-Joint, Steel Pipe Appurtenances:
 - a. Uncoated, Grooved-End Fittings and Couplings for Steel Piping: UL 213 listed for fire protection service, FM approved, malleable-iron casting or ductile-iron casting; with dimensions matching steel pipe. Standard EPDM gaskets. Rigid type except where flexible type is required for vibration isolation or stress relief.
4. Certify fittings, couplings, flanges, and flange adaptors used with thinwall pipe or Schedule 10 pipe by the fitting manufacturer as dimensionally compatible with and fully connectable to the pipe used without field modifications.
5. Welded or segmented fittings are not acceptable.

2.03 PIPING SCHEDULE

- A. Piping Between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends; grooved-end fittings; grooved-end pipe couplings; and grooved joints.
- B. Standard-pressure, Wet-pipe Sprinkler System, 2 inches and Smaller: Schedule 40, black steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
- C. Standard-pressure, Wet-pipe Sprinkler System, 2-1/2 inches to 4 inches:
 1. Schedule 40, black steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 2. 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.
- D. Standard-pressure, Wet-pipe Sprinkler System, 5 inches and Larger: Schedule 10, black steel pipe with plain ends; welding fittings; and welded joints.

2.04 PIPING JOINING MATERIALS

- A. Pipe Flange Gasket Materials: AWWA C110/A21.10, rubber, flat face, 1/8-inch (3.2 mm) thick.
 - 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: ASTM A307 Grade B, galvanized, with galvanized nuts in accordance with ASTM A563/A563M Grade A.
- C. Unions: 150 psig galvanized malleable iron, ASTM A197, threaded, ground joint, integral seat.

2.05 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: 300 psig.
 - 4. Make flanged end and wafer type valves compatible for installation with flanges as specified.
- B. Ball Valves:
 - 1. Standard: UL 1091, except with ball instead of disc.
 - 2. 1-1/2 Inches and Smaller: Bronze body with threaded ends.
 - 3. 2 Inches and 2-1/2 Inches: Bronze body with threaded ends or ductile-iron body with grooved ends.
 - 4. 3 Inches: Ductile-iron body with grooved ends.
- C. Check Valves:
 - 1. Standard: UL 312.
 - 2. Pressure Rating: 300 psig.
 - 3. Type: Swing check or spring assisted swing check.
 - 4. Body Material: Cast or ductile iron.
 - 5. End Connections: Flanged or grooved.
- D. Indicating-Type Butterfly Valves:
 - 1. Standard: UL 1091.
 - 2. Pressure Rating: 175 psig minimum.

3. Valves 2 Inches and Smaller:
 - a. Valve Type: Ball or butterfly.
 - b. Body Material: Bronze.
 - c. End Connections: Threaded or grooved.
4. Valves 2-1/2 Inches and Larger:
 - a. Valve Type: Butterfly.
 - b. Body Material: Cast or ductile iron.
 - c. Stem Material: Stainless steel.
 - d. End Connections: Flanged, grooved, or wafer.
5. Valve Operation: Weatherproof actuator housing with handwheel and integral dual single-pole, double-throw (SPDT) (Form C) contacts, rated for a minimum of 10 amps at 125/250V ac, 2 amps at 30V dc, 10 mA minimum at 24V dc in tamper-proof cover with mounting and required hardware for attachment to indicated valves visual indicating device.

2.06 TRIM AND DRAIN VALVES

A. General:

1. Standard: UL's "Fire Protection Equipment Directory" listing or FM "Approval Guide," listing.
2. Pressure Rating: 175 psig minimum.

B. Angle Valves:

1. Body Material: Bronze

C. Ball Valves:

1. Body Material: Bronze

2.07 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or FM "Approval Guide" listing.
2. Pressure Rating:
 - a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.
 - b. High-Pressure Piping Specialty Valves: 300 psig.
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

2.08 FIRE DEPARTMENT CONNECTIONS

A. Exposed-Type:

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 threaded connections according to NFPA 1963 and matching local fire department requirements; include extension pipe nipples, brass lugged swivel connections, and check devices or clappers. Verify inlet connections with local fire authority.
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.
10. Escutcheon Plate Marking: Similar to "AUTO SPKR."
11. Finish: Polished chrome plated.
12. Outlet Size: 4 inches.

B. Flush-Type:

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. Number of Inlets: Two.

2.09 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Standard: UL 213.
2. Pressure Rating: 300 psig.
3. Body Material: Ductile-iron housing with EPDM seals, bolts, and nuts.
4. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
5. Size: Dimension to fit on sprinkler main and with outlet connections as required to match connected branch piping.
6. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Standard: UL's "Fire Protection Equipment Directory" listing or FM "Approval Guide" listing.
2. Pressure Rating: 300 psig.
3. Body Material: Cast-iron or ductile-iron housing with orifice, sight glass, and integral test valve.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded or grooved.

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 FM "Approval Guide" listing.
2. Pressure Rating: 300 psig.
3. Body Material: Cast-bronze, cast-iron, or ductile-iron housing with sight glass.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded or grooved.

2.10 SPRINKLERS

A. General:

1. Standard: UL's "Fire Protection Equipment Directory" listing or FM "Approval Guide" listing.
2. Pressure Rating:
 - a. Automatic Sprinklers: 175 psig minimum.

B. Sprinkler Schedule:

1. Use sprinkler types below for the following applications:
 - a. Rooms without Ceilings: Upright sprinklers.
2. Provide sprinkler types below with finishes indicated:
 - a. Upright Sprinklers: Rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199.
2. Special Coatings:
 - a. Wax.
 - b. Corrosion-resistant paint.

2.11 ALARM DEVICES

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

B. Electrically Operated Alarm Bell:

1. Standard: UL 464.
2. Type: Vibrating, metal alarm bell.
3. Size: Minimum 10-inch (250-mm) diameter.
4. Finish: Red enamel factory finish, suitable for outdoor use.
5. UL listed and FM approved.
6. Comply with NFPA 72 for installation, inspection, testing, and maintenance. Bell shall be powered with supervised circuit.

C. Water Flow Indicators:

1. Standard: UL 346.
2. Water Flow Detector: Electrically supervised.
3. Components: Provide device with two sets of SPDT (Form C) contacts. Provide minimum switch electrical rating of 10 amps at 125/250V ac, 2 amps at 30V dc resistive, 10 mA at 24V dc.
4. Type: Paddle operated.
5. Pressure Rating: 250 psig.
6. Installation: Horizontal or vertical.
7. UL listed and FM approved.

D. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single unit composed of dual single-pole, double-throw (SPDT) (Form C) contacts, rated for a minimum of 10 amps at 125/250V ac, 2 amps at 30V dc, 10 mA minimum at 24V dc in tamper-proof cover with mounting hardware for attachment to indicated valves.
4. Design: Signals that controlled valve is in other than fully OPEN position.
5. UL listed and FM Approved.

2.12 PRESSURE GAUGES

A. Description:

1. Standard: UL 393.
2. Dial Size: 3-1/2-inch to 4-1/2-inch (90-mm to 115-mm) diameter.
3. Pressure Gauge Range: 0 psig to 300 psig.
4. Water System Piping Gauge: Include “WATER” or “AIR/WATER” label on dial face.

2.13 SLEEVES AND PENETRATIONS FOR PIPING SYSTEMS

A. Sleeves:

1. Walls:
 - a. Interior and Exterior Walls: Schedule 40 carbon steel.
 - b. Concrete: Cast-iron wall sleeves with integrally cast water stop.
 - c. Interior Partitions: 22-gauge (U.S. Standard) minimum galvanized sheet steel.
2. Interior Floor: Schedule 40 carbon steel.
3. Slab on Grade: Cast-iron wall sleeves with integrally cast water stop.
4. Underground (Beneath Foundations, Footings, Grade Beams): Standard weight corrugated steel, bituminous coating inside and outside, with close-fitting bituminous coated plate at each end.

B. Sleeve and Penetration Packing:

1. Modular Wall and Casting Seals: Link-Seal as manufactured by Thunderline Corporation, Flexicraft PipeSeal. Sleeve and modular wall and casting seal to be furnished together as a single integrated unit.
2. Penetration Packing (With or Without Sleeve) for Interior Walls and Interior Elevated Floors:
 - a. UL listed, FM approved materials and sealant systems, by 3M Fire Barrier Wrap/Strip FS-195+.
 - b. Flexible elastomeric material unless specified otherwise.
 - c. Include additional materials and accessories to meet requirements of manufacturer and this section.
 - d. Compatible with penetrated surface.
 - e. Hazard Ratings:
 - 1) Pipes Penetrating Fire Rated Walls, Fire Rated Ceilings, and Fire Rated Floor Slabs (1 hour or greater): Material having maximum flame spread of 25 and maximum smoke develop rating of 50, selected to maintain fire rating of penetrated surface.

- 2) Pipes Penetrating Other Interior Walls: Material having maximum smoke develop rating of 50, selected to prevent smoke transmission through penetration.
- 3) Pipes Penetrating Nonrated Interior Floors: Mineral wool and fire-rated caulk.

PART 3 EXECUTION

3.01 PREPARATION

- A. Reference Piping Schedule on the Drawings and Section 09 90 00, Painting and Coating, for additional pipe and pipe support requirements.

3.02 PIPING INSTALLATION

- A. Locations and Arrangements:
 1. Install piping in accordance with approved Shop Drawings, schematics, and diagrams which indicate general location and arrangement of piping.
 2. Deviations from approved piping Shop Drawings require written approval from AHJ. Submit written approval to Contracting Officer before deviating from approved working plans.
- B. Piping Standard: Comply with NFPA 13 sprinkler piping installation requirements.
- C. Seismic Design Category (SDC) is shown on Structural General Notes on the Drawings.
- D. Based on the SDC, seismic bracing is required for this Project.
- E. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- F. Install unions adjacent to each valve in pipe 2 inches and smaller.
- G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, 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 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 NFPA 13 requirements for hanger materials.
- M. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe.
 - 1. Include pressure gauges with connection not less than 1/4 inch and with soft metal seated globe valve, arranged to drain pipe between gauge and valve.
 - 2. Install gauges to permit removal, and where not subject to freezing.
- N. Fill sprinkler system piping with water.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors.
- P. Install sleeve seals for piping penetrations of concrete walls and slabs.
- Q. Install escutcheons for exposed piping penetrations of walls, ceilings, and floors.

3.03 JOINT CONSTRUCTION

- A. Steel Piping:
 - 1. Pressure-Sealed Joints: Join with tools recommended by fitting manufacturer.
 - 2. Welded Joints: Construct joints according to NFPA 13, using qualified processes and welding operators according to Article Quality Assurance.
 - a. Shop-weld pipe joints where welded piping is indicated.
 - b. Do not use welded joints for galvanized-steel pipe.
 - 3. Cut-Grooved and Roll-Grooved Joints:
 - a. Cut square-edge groove or roll rounded-edge groove in end of pipe according to NFPA 13.
 - b. Install grooved joints in accordance with the manufacturer's latest published installation instructions.
 - c. Provide grooved ends clean and free from indentations, projections, and tool marks.
 - d. Join steel pipe and grooved-end fittings according to NFPA 13 for steel pipe joints.
- B. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.04 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire protection valves, drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and AHJ.
- B. Install listed fire protection shutoff valves supervised open, located to control sources of water supply other than 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.
- E. Specialty Sprinkler Fittings: Install downstream of control valves instead of specified fittings if indicated in approved Shop Drawings.

3.05 SPRINKLER INSTALLATION

- A. Do not install any sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install any sprinkler with a cracked bulb.
- B. Remove sprinkler bulb protector by hand. Do not use any tools or devices that could damage the bulb.

3.06 FIRE DEPARTMENT CONNECTION INSTALLATION

- A. Install wall-type, fire department connection.
- B. Install automatic drain valve at each check valve for fire department connection.

3.07 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to NFPA 13 requirements.
- B. Identify system components.

3.08 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until leak free.
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.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire alarm tests. Operate as required.
6. Demonstrate that equipment hose threads match local fire department equipment.

B. Sprinkler piping system is defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

1. 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."

3.09 MANUFACTURER'S SERVICES

A. Manufacturer's Representative:

1. Present at Site or classroom designated by Contracting Officer, for minimum person-days listed below, travel time excluded:
 - a. 1 person-day for inspection.
 - b. 1 person-day for performance testing and completion of Manufacturer's Certificate of Proper Installation.
 - c. 1 person-day for prestartup classroom or Site training.

3.10 CLEANING

A. Clean dirt and debris from sprinklers.

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

END OF SECTION