

**NATIONAL
FIRE CODES®**

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16.1 Basic Requirements.

16.1.1 *

System valves and gauges shall be accessible for operation, inspection, tests, and maintenance.

16.1.2

Materials and components shall be installed in accordance with material compatibility information that is available as a part of a listing or manufacturer's published information.

16.1.3 Reconditioned Components.

16.1.3.1

The use of reconditioned valves and devices shall not be permitted in new systems.

16.1.3.2

Reconditioned sprinklers shall not be permitted to be utilized on any new or existing system.

16.2 Sprinkler Installation.

16.2.1

Only new sprinklers shall be installed.

16.2.1.1 *

When a threaded sprinkler is removed from a fitting or welded outlet, it shall not be reinstalled except as permitted by 16.2.1.1.1.

16.2.1.1.1

Dry sprinklers shall be permitted to be reinstalled when removed in accordance with the manufacturer's installation and maintenance instructions.

16.2.2 Corrosion Resistant.

16.2.2.1 *

Listed corrosion-resistant sprinklers shall be installed in locations where chemicals, moisture, or other corrosive vapors sufficient to cause corrosion of such devices exist.

16.2.2.1.1 *

Unless the requirements of 16.2.2.1.2 are met, corrosion-resistant coatings shall be applied only by the manufacturer of the sprinkler and in accordance with the requirements of 16.2.2.1.2.

16.2.2.1.2

Any damage to the protective coating occurring at the time of installation shall be repaired at once using only the coating of the manufacturer of the sprinkler in the approved manner so that no part of the sprinkler will be exposed after installation has been completed.

16.2.3 Painting.

16.2.3.1

Where sprinklers have had paint applied by other than the sprinkler manufacturer, they shall be replaced with new listed sprinklers of the same characteristics, including K-factor, thermal response, and water distribution.

16.2.3.2

Where cover plates on concealed sprinklers have been painted by other than the sprinkler manufacturer, the cover plate shall be replaced.

16.2.4 Protective Coverings.

16.2.4.1

Sprinklers protecting spray areas and mixing rooms in resin application areas shall be protected against overspray residue so that they will operate in the event of fire.

16.2.4.2 *

Where protected in accordance with 16.2.4.1, cellophane bags having a thickness of 0.003 in. (0.08 mm) or less or thin paper bags shall be used.

16.2.4.3

Sprinklers that have been painted or coated shall be replaced in accordance with the requirements of 16.2.3.

16.2.5 Escutcheons and Cover Plates.

16.2.5.1

Plates, escutcheons, or other devices used to cover the annular space around a sprinkler shall be metallic or shall be listed for use around a sprinkler.

16.2.5.2 *

Recessed and flush sprinklers shall be installed with the escutcheon that is part of its listing.

16.2.5.3

Concealed sprinklers shall be installed with the cover assembly that is part of its listing.

16.2.5.4

The use of caulking or glue to seal the penetration or to affix the components of a recessed escutcheon or concealed cover plate shall not be permitted.

16.2.6

Sprinklers subject to mechanical injury shall be protected with listed guards.

16.2.7 Stock of Spare Sprinklers.

16.2.7.1 *

A supply of at least six spare sprinklers shall be maintained on the premises so that any sprinklers that have operated or been damaged in any way can be promptly replaced.

16.2.7.2

The sprinklers shall correspond to the types, orientations, and temperature ratings of the sprinklers in the property.

16.2.7.3

The sprinklers shall be kept in a cabinet located where the temperature to which they are subjected will at no time exceed the maximum ceiling temperatures specified in Table 7.2.4.1 for each of the sprinklers within the cabinet.

16.2.7.4

Where dry sprinklers of different lengths are installed, spare dry sprinklers shall not be required, provided that a means of returning the system to service is furnished.

16.2.7.5

The stock of spare sprinklers shall include all types, orientations, and ratings installed and shall be as follows:

- (1) For protected facilities having under 300 sprinklers — no fewer than six sprinklers
- (2) For protected facilities having 300 to 1000 sprinklers — no fewer than 12 sprinklers
- (3) For protected facilities having over 1000 sprinklers — no fewer than 24 sprinklers

16.2.7.6 *

One sprinkler wrench as specified by the sprinkler manufacturer shall be provided in the cabinet for each type of sprinkler installed to be used for the removal and installation of sprinklers in the system.

16.2.7.7

A list of the sprinklers installed in the property shall be posted in the sprinkler cabinet.

16.2.7.7.1 *

The list shall include the following:

- (1) Sprinkler identification number (SIN), if equipped, the manufacturer, model, K-factor, deflector type, thermal sensitivity, pressure rating, and temperature rating
- (2) Manufacturer's sprinkler wrench model number for each sprinkler type
- (3) General description
- (4) Quantity of each type of sprinkler installed in the property
- (5) Quantity of each type of sprinkler to be contained in the cabinet
- (6) Issue or revision date of the list

16.3 Piping Installation.**16.3.1 * General.**

Sprinkler piping shall comply with the requirements of this section.

16.3.2 * Steel Pipe — Welded or Roll-Grooved.**16.3.2.1**

Black and galvanized pipe sizes shall be no less than 1 in. (25 mm) nominal.

16.3.2.2

When steel pipe referenced in Table 7.3.1.1 is used and joined by welding as referenced in 7.5.2 or by roll-grooved pipe and fittings as referenced in 7.5.3, the minimum nominal wall thickness for pressures up to 300 psi (21 bar) shall be in accordance with Schedule 10 for pipe sizes up to 5 in. (125 mm), 0.134 in. (3.4 mm) for 6 in. (150 mm) pipe, 0.188 in. (4.8 mm) for 8 in. and 10 in. (200 mm and 250 mm) pipe, and 0.330 in. (8.4 mm) for 12 in. (300 mm) pipe.

16.3.3 Steel Pipe — Threaded.**16.3.3.1**

Black and galvanized pipes sizes shall be no less than 1 in. (25 mm) nominal.

16.3.3.2

When steel pipe referenced in Table 7.3.1.1 is joined by threaded fittings referenced in 7.5.1 or by fittings used with pipe having cut grooves, the minimum wall thickness shall be in accordance with Schedule 30 pipe [in sizes 8 in. (200 mm) and larger] or Schedule 40 pipe [in sizes less than 8 in. (200 mm)] for pressures up to 300 psi (21 bar).

16.3.4 Nonmetallic Pipe.**16.3.4.1**

Nonmetallic pipe shall be in accordance with 16.3.10.

16.3.4.2

Nonmetallic pipe shall be no less than $\frac{3}{4}$ in. (20 mm) nominal.

16.3.5 Specially Listed Steel Pipe.

Pressure limitations and wall thickness for steel pipe specially listed in accordance with 7.3.3 shall be permitted to be in accordance with the pipe listing requirements.

16.3.6 * Copper Tube.**16.3.6.1**

Copper tube shall be no less than $\frac{3}{4}$ in. (20 mm) nominal.

16.3.6.2

Copper tube as specified in the standards listed in Table 7.3.1.1 shall have a wall thickness of Type K, Type L, or Type M where used in sprinkler systems.

16.3.7 Brass Pipe.

16.3.7.1

Brass pipe shall be no less than $\frac{3}{4}$ in. (20 mm) nominal.

16.3.7.2

Brass pipe specified in Table 7.3.1.1 shall be permitted in the standard weight in sizes up to 6 in. (150 mm) for pressures up to 175 psig (12 bar) and in the extra strong weight in sizes up to 8 in. (200 mm) for pressures up to 300 psig (21 bar).

16.3.8 Stainless Steel Pipe.

16.3.8.1

Stainless steel pipe shall be no less than $\frac{3}{4}$ in. (20 mm) nominal.

16.3.8.2

Stainless steel pipe as referenced in the standards listed in Table 7.3.1.1 shall be in accordance with Schedules 10S or 40S pipe.

16.3.9 Metallic Pipe and Tube Bending.

16.3.9.1

Bending of Schedule 10 steel pipe, or any steel pipe of wall thickness equal to or greater than Schedule 10 and Types K and L copper tube, shall be permitted when bends are made with no kinks, ripples, distortions, or reductions in diameter or any noticeable deviations from round.

16.3.9.2

For Schedule 40 steel pipe and Types K and L copper tubing, the minimum radius of a bend shall be six pipe diameters for pipe sizes 2 in. (50 mm) and smaller and five pipe diameters for pipe sizes $2\frac{1}{2}$ in. (65 mm) and larger.

16.3.9.3

For all other steel pipe, the minimum radius of a bend shall be 12 pipe diameters for all sizes.

16.3.9.4

Bending of listed pipe and tubing shall be permitted as allowed by the listing.

16.3.10 Nonmetallic Pipe and Tubing.

16.3.10.1

Listed nonmetallic pipe shall be installed in accordance with its listing limitations, including installation instructions.

16.3.10.2

When nonmetallic pipe is used in systems utilizing steel piping internally coated with corrosion inhibitors, the steel pipe coating shall be listed for compatibility with the nonmetallic pipe materials.

16.3.10.3

When nonmetallic pipe is used in systems utilizing steel pipe that is not internally coated with corrosion inhibitors, no additional evaluations shall be required.

16.3.10.4 *

When nonmetallic pipe is used in systems utilizing steel pipe, cutting oils and lubricants used for fabrication of the steel piping shall be compatible with the nonmetallic pipe materials in accordance with 16.1.2.

16.3.10.5

Fire-stopping materials intended for use on nonmetallic piping penetrations shall be compatible with the nonmetallic pipe materials in accordance with 16.1.2.

16.3.10.6

Nonmetallic pipe listed for light hazard occupancies shall be permitted to be installed in ordinary hazard rooms of otherwise light hazard occupancies where the room does not exceed 400 ft² (37 m²).

16.3.10.6.1

Nonmetallic pipe installed in accordance with 16.3.10.6 shall be permitted to be installed exposed, in accordance with the listing.

16.3.10.6.2

Where nonmetallic pipe installed in accordance with 16.3.10.6 supplies sprinklers in a private garage within a dwelling unit, and the garage does not exceed 1000 ft² (93 m²) in area, the nonmetallic piping shall be permitted to be protected from the garage compartment by not less than the same wall or ceiling sheathing that is required by the applicable building code.

16.3.10.7

Bending of listed nonmetallic pipe or tubing shall be permitted as allowed by the listing.

16.3.11 Listed Metallic Pipe and Tubing.

16.3.11.1

Pipe or tube listed only for light hazard occupancies shall be permitted to be installed in ordinary hazard rooms of otherwise light hazard occupancies where the room does not exceed 400 ft² (37 m²).

16.3.11.1.1

Pipe or tube installed in accordance with 16.3.11.1 shall be permitted to be installed exposed, in accordance with the listing.

16.3.11.2

Bending of listed pipe and tubing shall be permitted as allowed by the listing.

16.3.12 Return Bends.

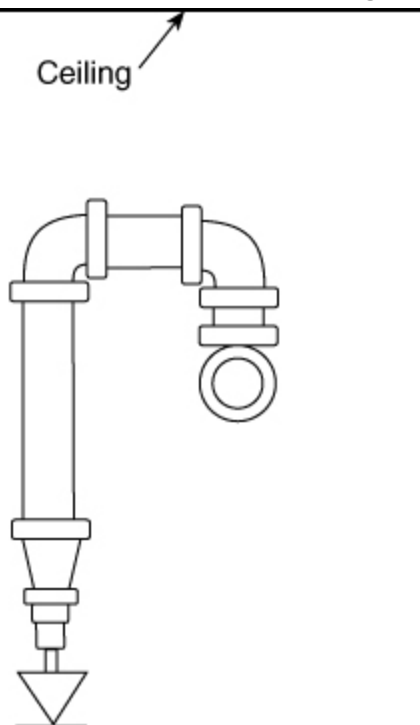
16.3.12.1

Unless the requirements of 16.3.12.3, 16.3.12.4, or 16.3.12.5 are met, return bends shall be used where pendent sprinklers are supplied from a raw water source, a mill pond, or open-top reservoirs.

16.3.12.2

Return bends shall be connected to the top of branch lines in order to avoid accumulation of sediment in the drop nipples in accordance with Figure 16.3.12.2.

Figure 16.3.12.2 Return Bend Arrangement.



16.3.12.3

Return bends shall not be required for deluge systems.

16.3.12.4

Return bends shall not be required where dry pendent sprinklers are used.

16.3.12.5

Return bends shall not be required for wet pipe systems where sprinklers with a nominal K-factor of K-11.2 (160) or larger are used.

16.3.13 Piping to Sprinklers Below Ceilings.**16.3.13.1 ***

In new installations expected to supply sprinklers below a ceiling utilizing black or galvanized steel piping, minimum 1 in. (25 mm) outlets shall be provided.

16.3.13.2 *

In new installations, it shall be permitted to provide minimum 1 in. (25 mm) outlets with hexagonal bushings to accommodate sprinklers attached directly to branch line fittings to allow for future system modifications.

16.4 Protection of Piping.**16.4.1 Protection of Piping Against Freezing.****16.4.1.1 ***

Where any portion of a system is subject to freezing, system shall be installed as a dry pipe or preaction system.

16.4.1.1.1 *

The weather temperature used to determine if a portion of a system is subject to freezing and required to be protected in accordance with 16.4.1.1 shall be the average annual extreme minimum temperature, obtained from an approved source.

16.4.1.1.2

The requirements of 16.4.1.1 shall not apply where alternate methods of freeze prevention are provided in accordance with one of the methods described in 16.4.1.2 through 16.4.1.4.2.

16.4.1.2

Unheated areas shall be permitted to be protected by antifreeze systems or by other systems specifically listed for the purpose.

16.4.1.3

Where aboveground water-filled supply pipes, risers, system risers, or feed mains pass through open areas, cold rooms, passageways, or other areas exposed to temperatures below 40°F (4°C), the pipe shall be permitted to be protected against freezing by insulating coverings, frostproof casings, or other means of maintaining a minimum temperature between 40°F and 120°F (4°C and 49°C).

16.4.1.4 *

Listed heat-tracing systems shall be permitted in accordance with 16.4.1.4.1 and 16.4.1.4.2.

16.4.1.4.1

Where used to protect branch lines, the heat-tracing system shall be specifically listed for use on branch lines.

16.4.1.4.2

Electric supervision of the heat-tracing system shall provide positive confirmation that the circuit is energized.

16.4.1.5

Water-filled piping shall be permitted to be installed in areas where the temperature is less than 40°F (4°C) when heat loss calculations performed by a professional engineer verify that the system will not freeze.

16.4.2 * Protection of Piping Against Corrosion.**16.4.2.1 ***

Where corrosive conditions are known to exist due to moisture or fumes from corrosive chemicals or both, special types of fittings, pipes, and hangers that resist corrosion shall be used, or a protective coating shall be applied to all unprotected exposed surfaces of the sprinkler system.

16.4.2.2

Where corrosive conditions exist or piping is exposed to the weather, corrosion-resistant types of pipe, fittings, and hangers or protective corrosion-resistant coatings shall be used.

16.4.2.3

Where steel pipe is used underground, the pipe shall be protected against corrosion.

16.4.2.4

Where conditions that contribute to MIC are found or known to exist, the owner(s) shall notify the sprinkler system installer and develop a plan to treat the system using one of the following methods:

- (1) Install system piping that will not be affected by the MIC microbes.
- (2) Treat all water that enters the system using a listed bacterial inhibitor.
- (3) Implement an approved plan for monitoring the interior conditions of the pipe at established time intervals and locations.
- (4) Install a corrosion monitoring station and monitor at established intervals.

16.4.2.5

Where conditions are found or are known to exist that contribute to unusual corrosive properties, the owner(s) shall notify the sprinkler system installer, and a plan shall be developed to treat the system using at least one of the following methods:

- (1) Install system piping that is corrosion resistant.
- (2) Treat water that enters the system using a listed corrosion inhibitor.
- (3) Implement an approved plan for monitoring the interior conditions of the pipe at established intervals and locations.
- (4) Install approved corrosion monitoring stations and monitor at established intervals.
- (5) Fill dry-pipe or preaction systems with at least 98 percent pure nitrogen in lieu of air to mitigate against corrosion.
- (6) Use a listed nitrogen generator that is sized and installed in accordance with the manufacturer's instructions.
- (7) Use a listed vapor corrosion inhibitor delivery system sized and installed in accordance with the manufacturer's instructions.

16.4.2.6

Where water supplies or environmental conditions are known to have unusual corrosive properties, piping shall have a corrosion resistance ratio (CRR) of 1 or more, and the system shall be treated in accordance with 5.1.4.

16.4.3 * Protection of Piping in Hazardous Areas.

16.4.3.1

Private service main aboveground piping shall not pass through hazardous areas and shall be located so that it is protected from mechanical and fire damage.

16.4.3.2

Private service main aboveground piping shall be permitted to be located in hazardous areas protected by an automatic sprinkler system.

16.4.4 Protection of Piping Subject to Mechanical Damage.

Where concealed pipe other than steel is installed through holes or notches in studs, joists, rafters, or similar members less than 1.25 in. (32 mm) from the nearest edge of the member, the following provisions shall apply:

- (1) Steel shield plates shall be provided.
- (2) Steel shield plates shall have a minimum thickness of 0.0575 in. (1.463 mm) (No. 16 gauge).
- (3) Steel shield plates shall cover the area of the pipe where the member is notched or bored.
- (4)* Steel shield plates shall extend a minimum of 2 in. (50 mm) along the member.

16.5 Protection of Risers Subject to Mechanical Damage.

Sprinkler risers subject to mechanical damage shall be protected by steel posts, concrete barriers, or other approved means.

16.6 Provision for Flushing Systems.

16.6.1

All sprinkler systems shall be arranged for flushing.

16.6.2

Readily removable fittings shall be provided at the end of all cross mains.

16.6.3

All cross mains shall terminate in 1 1/4 in. (32 mm) or larger pipe.

16.6.4

All branch lines on gridded systems shall be arranged to facilitate flushing.

16.7 * Air Venting.

The vent required by 8.1.5 shall be located near a high point in the system to allow air to be removed from that portion of the system by one of the following methods:

- (1) Manual valve, minimum 1/2 in. (15 mm) size
- (2) Automatic air vent
- (3) Inspector's test valve
- (4) Other approved means

16.8 Fitting Installation.**16.8.1 Metallic Fittings. (Reserved)****16.8.2 Nonmetallic Fittings.****16.8.2.1 ***

When nonmetallic fittings are used in systems utilizing internally coated steel piping, the steel pipe shall be listed for compatibility with the nonmetallic fittings.

16.8.2.2 *

When nonmetallic fittings are used in systems utilizing steel pipe that is not internally coated with corrosion inhibitors, no additional evaluations are required.

16.8.2.3

When nonmetallic fittings are used in systems utilizing steel pipe, cutting oils and lubricants used for fabrication of the steel piping shall be compatible with the nonmetallic fittings in accordance with 16.1.2.

16.8.2.4

Fire-stopping materials intended for use on nonmetallic fitting penetrations shall be investigated for compatibility with the nonmetallic fitting materials in accordance with 16.1.2.

16.8.3 * Fitting Pressure Limits.**16.8.3.1**

Standard weight pattern cast-iron fittings 2 in. (50 mm) in size and smaller shall be permitted where pressures do not exceed 300 psi (21 bar).

16.8.3.2

Standard weight pattern malleable iron fittings 6 in. (150 mm) in size and smaller shall be permitted where pressures do not exceed 300 psi (21 bar).

16.8.3.3

Fittings not meeting the requirements of 16.8.3.1 and 16.8.3.2 shall be extra-heavy pattern where pressures exceed 175 psi (12 bar).

16.8.3.4

Cast bronze threaded fittings in accordance with ASME B16.15, *Cast Copper Alloy Threaded Fittings: Classes 125 and 250*, shall be permitted where pressures do not exceed 200 psi (14 bar) for Class 125 fittings and 400 psi (28 bar) for Class 250 fittings.

16.8.3.5

Listed fittings shall be permitted for system pressures up to the limits specified in their listings.

16.8.4 Couplings and Unions.**16.8.4.1**

Screwed unions shall not be used on pipe larger than 2 in. (50 mm).

16.8.4.2

Couplings and unions of other than screwed-type shall be of types listed specifically for use in sprinkler systems.

16.8.5 Reducers and Bushings.**16.8.5.1**

Unless the requirements of 16.8.5.2 or 16.8.5.3 are met, a one-piece reducing fitting shall be used wherever a change is made in the size of the pipe.

16.8.5.2

Hexagonal or face bushings shall be permitted in reducing the size of openings of fittings when standard fittings of the required size are not available.

16.8.5.3

Hexagonal bushings as permitted in 16.3.13.2 shall be permitted to be used.

16.8.5.4

The requirements of 16.8.5.1 and 16.8.5.2 shall not apply to CPVC fittings.

16.8.6 Extension Fitting.**16.8.6.1**

Extension fittings shall be permitted to be used with sprinklers K-8.0 or smaller.

16.8.6.2

Extension fittings shall be permitted to be used with sprinklers in light hazard and ordinary hazard occupancies only.

16.8.6.3

The internal diameter of extension fittings shall have the same nominal inlet diameter of the attached sprinkler.

16.8.6.4

A single extension fitting up to a maximum of 2 in. (50 mm) in length shall be permitted to be installed with a sprinkler.

16.8.6.4.1

Extension fittings longer than 2 in. (50 mm) shall not be permitted unless specifically listed.

16.8.6.5

Extension fittings shall be included in the hydraulic calculations.

16.8.6.5.1

Extension fittings 2 in. (50 mm) and less shall not be required to be included in the hydraulic calculations.

16.8.7 Threaded Pipe and Fittings. (Reserved)**16.8.8 Flexible Sprinkler Hose Fitting Length.****16.8.8.1 ***

Flexible sprinkler hose fittings shall not exceed 12 ft (3.7 m) in length when installed above a rigid ceiling.

16.8.8.2

Flexible sprinkler hose fittings shall not exceed 6 ft (1.8 m) in length when installed above an acoustical tile and lay-in panel ceiling.

16.9 Valves.

16.9.1 General.

16.9.1.1 Drain Valves and Test Valves.

Drain valves and test valves shall be approved.

16.9.1.2 Valve Pressure Requirements.

When water pressures exceed 175 psi (12 bar), valves shall be used in accordance with their pressure ratings.

16.9.2 Wafer-Type Valves.

Wafer-type valves with components that extend beyond the valve body shall be installed in a manner that does not interfere with the operation of any system components.

16.9.3 * Control Valves.

16.9.3.1 * General.

16.9.3.1.1

Each sprinkler system shall be provided with a listed indicating valve in an accessible location, so located as to control all automatic sources of water supply.

16.9.3.1.2

At least one listed indicating valve shall be installed in each source of water supply.

16.9.3.1.3

The requirements of 16.9.3.1.2 shall not apply to the fire department connection, and there shall be no shutoff valve in the fire department connection.

16.9.3.2 Listed Indicating Valves.

Unless the requirements of 16.9.3.2.1, 16.9.3.2.2, or 16.9.3.2.3 are met, all valves controlling connections to water supplies and to supply pipes to sprinklers shall be listed indicating valves.

16.9.3.2.1

A listed underground gate valve equipped with a listed indicator post shall be permitted.

16.9.3.2.2

A listed water control valve assembly with a reliable position indication connected to a remote supervisory station shall be permitted.

16.9.3.2.3

A nonindicating valve, such as an underground gate valve with approved roadway box, complete with T-wrench, and where accepted by the authority having jurisdiction, shall be permitted.

16.9.3.3 * Supervision.

16.9.3.3.1

Valves on connections to water supplies, sectional control and isolation valves, and other valves in supply pipes to sprinklers and other fixed water-based fire suppression systems shall be supervised by one of the following methods:

- (1) Central station, proprietary, or remote station signaling service
- (2) Local signaling service that will cause the sounding of an audible signal at a constantly attended point
- (3) Valves locked in the correct position
- (4) Valves located within fenced enclosures under the control of the owner, sealed in the open position, and inspected weekly as part of an approved procedure

16.9.3.3.2

Floor control valves in high-rise buildings shall comply with 16.9.3.3.1(1) or 16.9.3.3.1(2).

16.9.3.3.3

The requirements of 16.9.3.3.1 shall not apply to underground gate valves with roadway boxes.

16.9.3.3.4

Where control valves are installed overhead, they shall be positioned so that the indicating feature is visible from the floor below.

16.9.3.3.5

A listed backflow prevention assembly shall be permitted to be considered a control valve, provided both control valves are listed for fire protection system use and an additional control valve shall not be required.

16.9.3.4 * Control Valve Accessibility.

All control valves shall be located where accessible and free of obstructions.

16.9.3.5 Control Valve Identification.

Identification signs shall be provided at each valve to indicate its function and what it controls.

16.9.4 * Check Valves.

16.9.4.1

Where a fire department connection is installed or there is more than one source of water supply, a check valve shall be installed in each connection.

16.9.4.2

A listed backflow prevention device shall be considered a check valve, and an additional check valve shall not be required.

16.9.4.3

Check valves shall be installed in a vertical (flow upwards) or horizontal position in accordance with their listing.

16.9.4.4 *

Where a single wet pipe sprinkler system is equipped with a fire department connection, the alarm valve is considered a check valve, and an additional check valve shall not be required.

16.9.5 * Control Valves with Check Valves.

16.9.5.1

In a connection serving as one source of supply, listed indicating valves or post-indicator valves shall be installed on both sides of all check valves required in 16.9.4.

16.9.5.2

The city services control valve (non-indicating control valve) shall be permitted to serve as the supply side control valve.

16.9.5.3

The requirements of 16.9.5.1 shall not apply to the check valve located in the fire department connection piping, and there shall be no control valves in the fire department connection piping.

16.9.5.4

The requirements of 16.9.5.1 shall not apply where the city connection serves as the only automatic source of supply to a wet pipe sprinkler system; a control valve is not required on the system side of the check valve or the alarm check valve.

16.9.5.5 * Control Valves for Gravity Tanks.

Gravity tanks shall have listed indicating valves installed on both sides of the check valve.

16.9.6 * Pumps.

When a pump is located in a combustible pump house or exposed to danger from fire or falling walls, or when a tank discharges into a private fire service main fed by another supply, either the check valve in the connection shall be located in a pit or the control valve shall be of the post-indicator type located a safe distance outside buildings.

16.9.7 Pressure-Reducing Valves.

16.9.7.1

In portions of systems where the potential exists for normal (nonfire condition) water pressure in excess of 175 psi (12 bar) and all components are not listed for pressures equal to or greater than the maximum potential water pressure, a listed pressure-reducing valve shall be installed and set for an outlet pressure not exceeding 10 psi (0.7 bar) below the minimum rated pressure of any component within that portion of the system at the maximum inlet pressure.

16.9.7.1.1

The pressure on the inlet side of the pressure-regulating device shall not exceed the rated working pressure of the device.

16.9.7.2

Pressure gauges shall be installed on the inlet and outlet sides of each pressure-reducing valve.

16.9.7.3 *

A listed relief valve of not less than $\frac{1}{2}$ in. (15 mm) in size shall be provided on the discharge side of the pressure-reducing valve set to operate at a pressure not exceeding the rated pressure of the components of the system.

16.9.7.4

A listed indicating valve shall be provided on the inlet side of each pressure-reducing valve, unless the pressure-reducing valve meets the listing requirements for use as an indicating valve.

16.9.7.5

A test connection shall be provided downstream of all pressure-reducing valves for the performance of flow tests at sprinkler system demand as required by this standard and NFPA 25.

16.9.7.5.1

A 2 $\frac{1}{2}$ in. (65 mm) hose valve shall be provided downstream of the pressure reducing valve for every 250 gpm (950 L/min) of flow rate required by the system demand.

16.9.7.5.2 *

Existing hose connections downstream of the pressure reducing valve shall be allowed to be utilized.

16.9.7.5.3 *

Other means shall be permitted as long as the system doesn't require modification to perform the test and it is sized to meet the system demand.

16.9.8 * Post-Indicator Valves.

16.9.8.1

Where post-indicator valves are used, they shall be set so that the top of the post is 32 in. to 40 in. (800 mm to 1000 mm) above the final grade.

16.9.8.2

Post-indicator valves shall be properly protected against mechanical damage where needed.

16.9.8.3

The requirements of 16.9.8.1 shall not apply to wall post-indicator valves.

16.9.9 Valves in Pits.

16.9.9.1

Where it is impractical to provide a post-indicator valve, valves shall be permitted to be placed in pits with permission of the authority having jurisdiction.

16.9.9.2 * Valve Pit Construction.

16.9.9.2.1

When used, valve pits shall be of adequate size and accessible for inspection, operation, testing, maintenance, and removal of equipment contained therein.

16.9.9.2.2

Valve pits shall be constructed and arranged to properly protect the installed equipment from movement of earth, freezing, and accumulation of water.

16.9.9.2.3

Poured-in-place or precast concrete, with or without reinforcement, or brick (all depending upon soil conditions and size of pit) shall be appropriate materials for construction of valve pits.

16.9.9.2.4

Other approved materials shall be permitted to be used for valve pit construction.

16.9.9.2.5

Where the water table is low and the soil is porous, crushed stone or gravel shall be permitted to be used for the floor of the pit.

16.9.9.2.6

Valve pits located at or near the base of the riser of an elevated tank shall be designed in accordance with NFPA 22.

16.9.9.3 Valve Pit Marking.

The location of the valve shall be clearly marked, and the cover of the pit shall be kept free of obstructions.

16.9.10 Floor Control Valve Assemblies.

16.9.10.1

Multistory buildings exceeding two stories in height shall be provided with a floor control valve, check valve, pressure gauge, main drain valve, and flow switch for isolation, control, and annunciation of water flow for each individual floor level.

16.9.10.2

The floor control valve, check valve, pressure gauge, main drain valve, and flow switch required by 16.9.10.1 shall not be required where sprinklers on the top level of a multistory building are supplied by piping on the floor below.

16.9.10.3

The floor control valve, check valve, pressure gauge, main drain valve, and flow switch required by 16.9.10.1 shall not be required where the total area of all floors combined does not exceed the system protection area limitations of 4.4.1.

16.9.10.4

The requirements of 16.9.10 shall not apply to dry systems in parking garages.

16.9.11 * Identification of Valves.

16.9.11.1

All control, drain, venting, and test connection valves shall be provided with permanently marked weatherproof metal or rigid plastic identification signs.

16.9.11.2

The identification sign shall be secured with corrosion-resistant wire, chain, or other approved means.

16.9.11.3

The control valve sign shall identify the portion of the building served.

16.9.11.3.1 *

Systems that have more than one control valve that must be closed to work on a system or space shall have a sign referring to existence and location of other valves.

16.10 Drainage.

16.10.1 * General.

All sprinkler pipe and fittings shall be installed so that the system can be drained.

16.10.2 Wet Pipe Systems.

16.10.2.1

On wet pipe systems, sprinkler pipes shall be permitted to be installed level.

16.10.2.2

Trapped piping shall be drained in accordance with 16.10.5.

16.10.3 Dry Pipe and Preaction Systems.

Piping shall be pitched to drain as stated in 16.10.3.1 through 16.10.3.2.

16.10.3.1 Dry Pipe and Preaction Systems in Nonrefrigerated Areas.

Branch lines shall be pitched at least $\frac{1}{2}$ in. per 10 ft (4 mm/m), and mains shall be pitched at least $\frac{1}{4}$ in. per 10 ft (2 mm/m) in nonrefrigerated areas.

16.10.3.2 Dry Pipe and Preaction Systems in Refrigerated Areas.

Branch lines shall be pitched at least $\frac{1}{2}$ in. per 10 ft (4 mm/m), and mains shall be pitched at least $\frac{1}{2}$ in. per 10 ft (4 mm/m) in refrigerated areas.

16.10.4 * System, Main Drain, or Sectional Drain Connections.

16.10.4.1

Provisions shall be made to properly drain all parts of the system.

16.10.4.2 *

Main drain test connections for system risers mains shall be sized as shown in Table 16.10.4.2.

Table 16.10.4.2 Drain Size

Riser Size		Size of Drain Connection	
in.	mm	in.	mm
Up to 2	Up to 50	$\frac{3}{4}$ or larger	20 or larger
2 $\frac{1}{2}$, 3, 3 $\frac{1}{2}$	65, 80, 90	1 $\frac{1}{4}$ or larger	32 or larger
4 and larger	100 and larger	2 or larger	50 or larger

16.10.4.3

Where an interior sectional or floor control valve(s) is provided, it shall be provided with a drain connection having a minimum size as shown in Table 16.10.4.2 to drain that portion of the system controlled by the sectional valve.

16.10.4.4

Drains shall discharge outside or to a drain connection capable of handling the flow of the drain.

16.10.4.5

For those drains serving pressure-reducing valves, the drain, drain connection, and all other downstream drain piping shall be sized to permit a flow of at least the greatest system demand supplied by the pressure-reducing valve.

16.10.4.6 Main Drain Test Connections.

16.10.4.6.1

Main drain test connections shall be provided at locations that will permit flow tests of water supplies and connections.

16.10.4.6.2

Main drain test connections shall be installed so that the valve can be opened wide for a sufficient time to assure a proper test without causing water damage.

16.10.4.6.3

Main drain connections shall be sized in accordance with 16.10.4.2.

16.10.4.7

The test connections required by 16.10.4.6 shall be permitted to be used as main drain connections.

16.10.4.8

Where drain connections for floor control valves are tied into a common drain riser, the drain riser shall be one pipe size larger downstream of each size drain connection tying into it.

16.10.4.9

Where subject to freezing, a minimum 4 ft (1.2 m) of exposed drain pipe shall be in a heated area between the drain valve and the exterior wall when drain piping extends through the wall to the outside.

16.10.5 Auxiliary Drains.**16.10.5.1**

Auxiliary drains shall be provided where a change in piping direction prevents drainage of system piping through the main drain valve.

16.10.5.2 Auxiliary Drains for Wet Pipe Systems and Preaction Systems in Areas Not Subject to Freezing.**16.10.5.2.1**

Where the capacity of isolated trapped sections of pipe is 50 gal (200 L) or more, the auxiliary drain shall consist of a valve not smaller than 1 in. (25 mm), piped to an accessible location.

16.10.5.2.2

Where the capacity of isolated trapped sections of pipe is more than 5 gal (20 L) and less than 50 gal (200 L), the auxiliary drain shall consist of a valve $\frac{3}{4}$ in. (20 mm) or larger and a plug or a nipple and cap.

16.10.5.2.3

Where the capacity of trapped sections of pipes in wet systems is less than 5 gal (20 L), one of the following arrangements shall be provided:

- (1) An auxiliary drain shall consist of a nipple and cap or plug not less than $\frac{1}{2}$ in. (15 mm) in size.
- (2) An auxiliary drain shall not be required for trapped sections less than 5 gal (20 L) where the system piping can be drained by removing a single pendent sprinkler.
- (3) Where flexible couplings, flexible hose connections, or other easily separated connections are used, the nipple and cap or plug shall be permitted to be omitted.

16.10.5.2.4

Tie-in drains shall not be required on wet pipe systems and preaction systems protecting nonfreezing environments.

16.10.5.3 Auxiliary Drains for Dry Pipe Systems and Preaction Systems in Areas Subject to Freezing.**16.10.5.3.1**

Auxiliary drains located in areas subject to freezing shall be accessible.

16.10.5.3.2

Auxiliary drains located in areas maintained at freezing temperatures shall be accessible and shall consist of a valve not smaller than 1 in. (25 mm) and a plug or a nipple and cap.

16.10.5.3.3

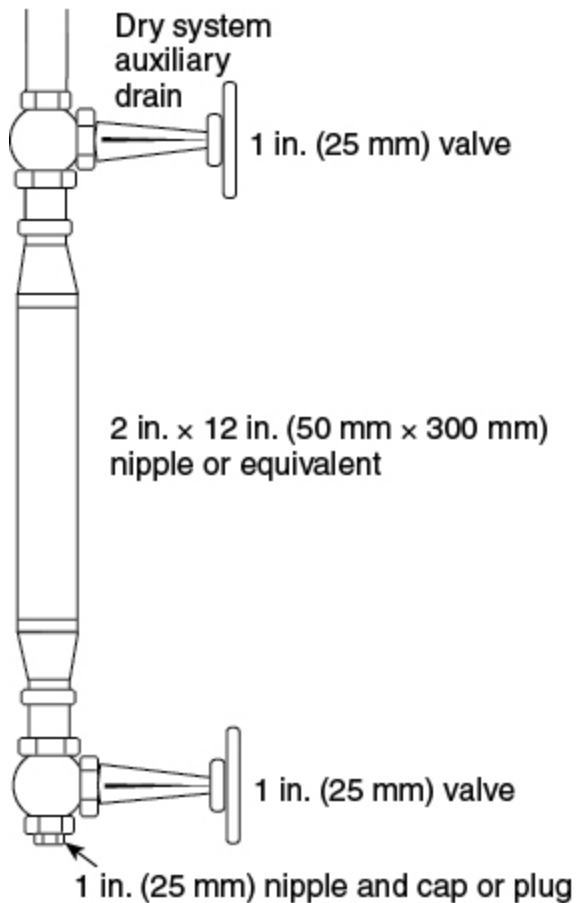
Where the capacity of trapped sections of pipe is less than 5 gal (20 L), the auxiliary drain shall consist of a valve not smaller than $\frac{1}{2}$ in. (15 mm) and a plug or a nipple and cap.

16.10.5.3.4 *

Auxiliary drains shall not be required for pipe drops supplying dry pendent sprinklers installed in accordance with 8.2.2, 8.3.2.6, and 8.7.3.4.

16.10.5.3.5

Where the capacity of isolated trapped sections of system piping is more than 5 gal (20 L), the auxiliary drain shall consist of two 1 in. (25 mm) valves and one 2 in. × 12 in. (50 mm × 300 mm) condensate nipple or equivalent, accessibly located in accordance with Figure 16.10.5.3.5, or a device listed for this service.

Figure 16.10.5.3.5 Dry System Auxiliary Drain.**16.10.5.3.6**

Tie-in drains shall be provided for multiple adjacent trapped branch pipes and shall be only 1 in. (25 mm). Tie-in drain lines shall be pitched a minimum of $\frac{1}{2}$ in. per 10 ft (4 mm/m).

16.10.5.3.7

Systems with low point drains shall have a sign at the dry pipe or preaction valve indicating the number of low point drains and the location of each individual drain.

16.10.6 Discharge of Drain Valves.**16.10.6.1 ***

Direct interconnections shall not be made between sprinkler drains and sewers.

16.10.6.2

The drain discharge shall conform to any health or water department regulations.

16.10.6.3

Where drain pipes are buried underground, approved corrosion-resistant pipe shall be used.

16.10.6.4

Drain pipes shall not terminate in blind spaces under the building.

16.10.6.5

Where exposed to the atmosphere, drain pipes shall be fitted with a turned-down elbow.

16.10.6.6

Drain pipes shall be arranged to avoid exposing any of the water-filled portion of the sprinkler system to freezing conditions.

16.11 System Attachments.

16.11.1 Attachments — General.**16.11.1.1 ***

An alarm unit shall include a listed mechanical alarm, horn, or siren or a listed electric gong, bell, speaker, horn, or siren.

16.11.1.2 *

Exterior water motor-operated or electrically operated bells shall be weatherproofed and guarded.

16.11.1.3 Documentation Cabinet.**16.11.1.3.1**

A documentation cabinet shall be installed at an approved location at the protected premises.

16.11.1.3.2

The documentation cabinet shall be sized so that it can contain all necessary documentation.

16.11.1.3.3

All record documentation shall be stored in the documentation cabinet in an electronic or hardcopy format.

16.11.1.3.4

The documentation cabinet shall contain at a minimum the final record of completion documents, final shop drawings, and as-builts of the fire sprinkler system.

16.11.1.4

All piping to water motor-operated devices shall be galvanized steel, brass, copper, or other approved metallic corrosion-resistant material of not less than $\frac{3}{4}$ in. (20 mm) nominal pipe size.

16.11.1.5

Piping between the sprinkler system and a pressure-actuated alarm-initiating device shall be galvanized steel, brass, copper, or other approved metallic corrosion-resistant material of not less than $\frac{3}{8}$ in. (10 mm) nominal pipe size.

16.11.2 * Sprinkler Alarms/Waterflow Alarms.**16.11.2.1 Local Waterflow Alarms.**

A local waterflow alarm shall be provided on every sprinkler system having more than 20 sprinklers.

16.11.3 Waterflow Detection Devices.**16.11.3.1 Wet Pipe Systems.**

The alarm apparatus for a wet pipe system shall consist of a listed alarm check valve or other listed waterflow detection alarm device with the necessary attachments required to give an alarm.

16.11.3.2 Dry Pipe Systems.**16.11.3.2.1**

The alarm apparatus for a dry pipe system shall consist of listed alarm attachments to the dry pipe valve.

16.11.3.2.2

Where a dry pipe valve is located on the system side of an alarm valve, connection of the actuating device of the alarms for the dry pipe valve to the alarms on the wet pipe system shall be permitted.

16.11.3.3 Preaction and Deluge Systems.

The alarm apparatus for deluge and preaction systems shall consist of alarms actuated independently by the detection system and the flow of water.

16.11.3.3.1

Deluge and preaction systems activated by pilot sprinklers shall not require an independent detection system alarm.

16.11.3.4 * Paddle-Type Waterflow Devices.

Paddle-type waterflow alarm indicators shall be installed in wet systems only.

16.11.4 Retarding Devices.

On each alarm check valve used under conditions of variable water pressure, a retarding device shall be installed.

16.11.5 Alarm Bypass Test Connections.

16.11.5.1

Alarm, dry pipe, preaction, and deluge valves shall be fitted with an alarm bypass test connection for an electric alarm switch, water motor gong, or both.

16.11.5.2

The alarm bypass test connection for alarm, dry pipe, preaction, and deluge valves shall be made on the water supply side of the system and provided with a control valve and drain for the alarm piping.

16.11.5.3

The alarm bypass test connection for alarm valves at the riser shall be permitted to be made on the system side of an alarm valve.

16.11.5.4

A check valve shall be installed between the intermediate chamber of a dry pipe valve and the waterflow alarm device so as to prevent flow from the alarm bypass test connection from entering the intermediate chamber of a dry pipe valve during an alarm test via the alarm bypass test connection.

16.11.6 Indicating Control Valves.

16.11.6.1

Where a control valve is installed in the connection to pressure-type contactors or water motor-operated alarm devices, it shall be of the indicating type.

16.11.6.2

Such valves shall be sealed, locked, or electrically supervised in the open position.

16.11.7 * Attachments — Electrically Operated.

16.11.7.1

Electrically operated alarm attachments forming part of an auxiliary, central station, local protective, proprietary, or remote station signaling system shall be installed in accordance with *NFPA 72* or other approved fire alarm code.

16.11.7.2

Sprinkler waterflow alarm systems that are not part of a required protective signaling system shall not be required to be supervised and shall be installed in accordance with *NFPA 70*, Article 760.

16.11.7.3

Exterior electric alarm devices shall be listed for outdoor use.

16.11.8 * Attachments — Mechanically Operated.

16.11.8.1

For all types of sprinkler systems employing water motor-operated alarms, a listed $\frac{3}{4}$ in. (20 mm) strainer shall be installed at the alarm outlet of the waterflow detecting device.

16.11.8.2

Where a retarding chamber is used in connection with an alarm valve, the strainer shall be located at the outlet of the retarding chamber unless the retarding chamber is provided with an approved integral strainer in its outlet.

16.11.9 Alarm Device Drains.

Drains from alarm devices shall be arranged so that there will be no overflowing at the alarm apparatus, at domestic connections, or elsewhere with the sprinkler drains wide open and under system pressure. (See 16.10.6.)

16.11.10 * Alarm Attachments — High-Rise Buildings.

When a fire must be fought internally due to the height of a building, the following additional alarm apparatus shall be provided:

- (1) Each sprinkler system on each floor shall be equipped with a separate waterflow device. The waterflow device shall be connected to an alarm system in such a manner that operation of one sprinkler will actuate the alarm system, and the location of the operated flow device shall be indicated on an annunciator and/or register. The annunciator or register shall be located at grade level at the normal point of fire department access, at a constantly attended building security control center, or at both locations.
- (2) Where the location within the protected buildings where supervisory or alarm signals are received is not under constant supervision by qualified personnel in the employ of the owner, a connection shall be provided to transmit a signal to a remote central station.
- (3) A distinct trouble signal shall be provided to indicate a condition that will impair the satisfactory operation of the sprinkler system.

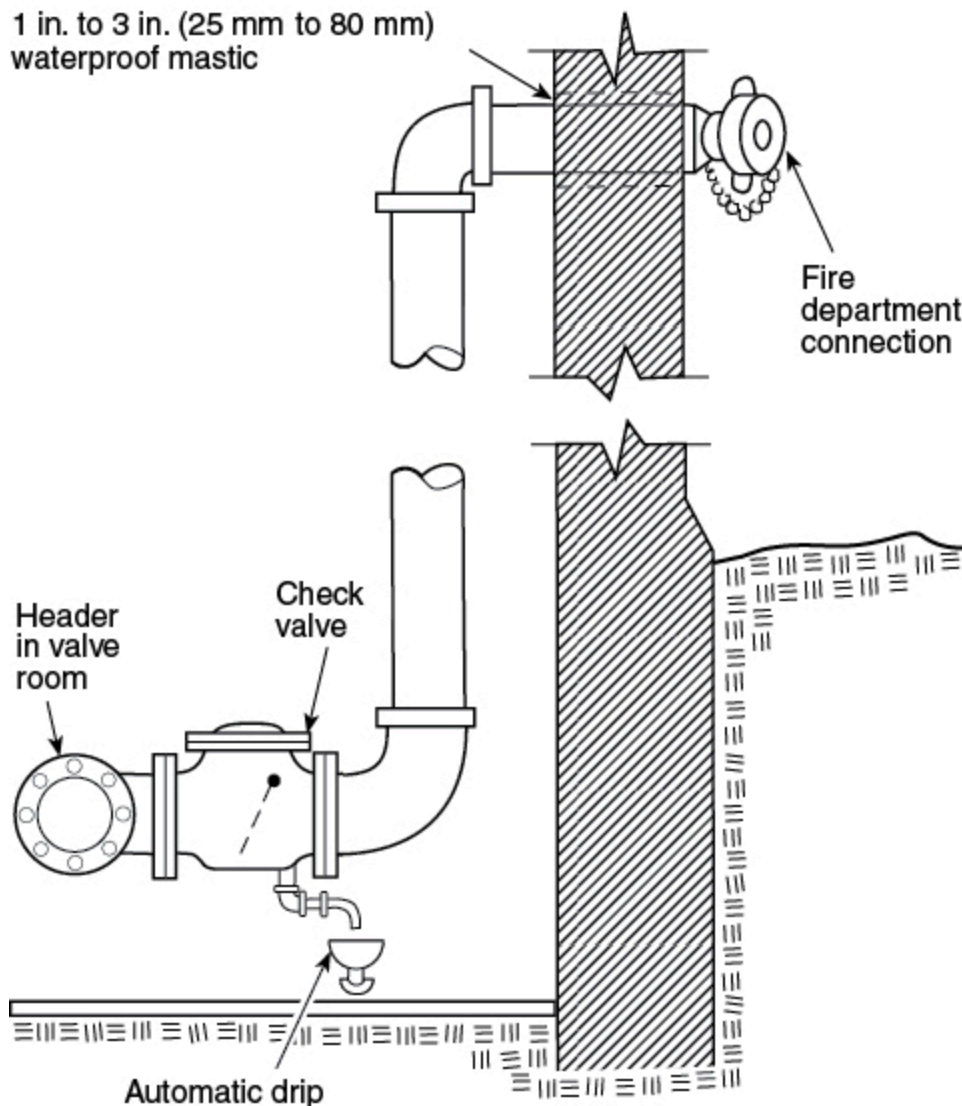
16.12 * Fire Department Connections.

16.12.1 *

Unless the requirements of 16.12.2 are met, a fire department connection shall be provided as described in Section 16.12 in accordance with Figure 16.12.1.

Figure 16.12.1 Fire Department Connection.

1 in. to 3 in. (25 mm to 80 mm)
waterproof mastic



16.12.2

The following systems shall not require a fire department connection:

- (1) Buildings located in remote areas that are inaccessible for fire department support
- (2) Large-capacity deluge systems exceeding the pumping capacity of the fire department

(3) Single-story buildings not exceeding 2000 ft² (185 m²) in area

16.12.3 Fire Department Connection Types.

16.12.3.1 *

Unless the requirements of 16.12.3.1.1, 16.12.3.1.2, or 16.12.3.1.3 are met, the fire department connection(s) shall consist of two 2½ in. (65 mm) connections using NH internal threaded swivel fitting(s) with “2.5–7.5 NH standard thread,” as specified in NFPA 1960.

16.12.3.1.1

Where local fire department connections do not conform to NFPA 1960, the authority having jurisdiction shall be permitted to designate the connection to be used.

16.12.3.1.2

The use of threadless couplings shall be permitted where required by the authority having jurisdiction and where listed for such use.

16.12.3.1.3

A single-inlet fire department connection shall be acceptable where piped to a 3 in. (80 mm) or smaller riser.

16.12.3.2

Fire department connections shall be equipped with approved plugs or caps, properly secured and arranged for easy removal by fire departments.

16.12.3.3

Fire department connections shall be of an approved type.

16.12.4 * Size.

The size of the pipe for the fire department connection shall be in accordance with one of the following:

- (1) Pipe size shall be a minimum of 4 in. (100 mm) for fire engine connections.
- (2) Pipe size shall be a minimum of 6 in. (150 mm) for fire boat connections.
- (3) For hydraulically calculated systems, the pipe size shall be permitted to be less than 4 in. (100 mm), but not less than the largest riser being served by that connection.

16.12.5 * Arrangement.

The fire department connection shall be arranged in accordance with Figure 16.12.1.

16.12.5.1 *

The fire department connection shall be on the system side of the water supply check valve.

16.12.5.1.1

The fire department connection shall not be attached to branch line piping.

16.12.5.1.2

The fire department connection shall be located not less than 18 in. (450 mm) and not more than 4 ft (1.2 m) above the level of the adjacent grade or access level.

16.12.5.2

For single systems, the fire department connection shall be installed as follows:

- (1) Wet system — on the system side of system control, check, and alarm valves (*see Figure A.16.9.3*)
- (2) Dry system — between the system control valve and the dry pipe valve
- (3) Preaction system — between the preaction valve and the check valve on the system side of the preaction valve
- (4) Deluge system — on the system side of the deluge valve

16.12.5.3

The fire department connection shall be permitted to be connected to the main piping on the wet pipe or deluge system it serves.

16.12.5.4

For multiple systems, the fire department connection shall be connected between the supply control valves and the system control valves.

16.12.5.5 *

The requirements of 16.12.5.2 and 16.12.5.4 shall not apply where the fire department connection is connected to the underground piping.

16.12.5.6

Where a fire department connection services only a portion of a building, a sign shall be attached indicating the portions of the building served.

16.12.5.7 *

Fire department connections shall be located at the nearest point of fire department apparatus accessibility or at a location approved by the authority having jurisdiction.

16.12.5.8 Signs.**16.12.5.8.1**

Each fire department connection to sprinkler systems shall be designated by a sign having raised or engraved letters at least 1 in. (25 mm) in height on plate or fitting reading service design — for example, AUTOSPKR., OPEN SPKR., AND STANDPIPE.

16.12.5.8.2

A sign shall also indicate the pressure required at the inlets to deliver the greatest system demand.

16.12.5.8.3

The sign required in 16.12.5.8.2 shall not be required where the system demand pressure is less than 150 psi (10.3 bar).

16.12.5.9

Fire department connections shall not be connected on the suction side of fire pumps.

16.12.5.10

Fire department connections shall be properly supported.

16.12.6 Valves.**16.12.6.1**

A listed check valve shall be installed in each fire department connection and shall be located in an accessible location.

16.12.6.2

There shall be no shutoff valve in the fire department connection piping.

16.12.7 * Drainage.

The piping between the check valve and the outside hose coupling shall be equipped with an approved automatic drain valve in areas subject to freezing.

16.12.7.1

The automatic drain valve shall be installed in a location that permits inspection and testing as required by NFPA 25.

16.13 Gauges.**16.13.1**

A pressure gauge with a connection not smaller than $\frac{1}{4}$ in. (6 mm) shall be installed at the system main drain, at each main drain associated with a floor control valve, and on the inlet and outlet side of each pressure-reducing valve.

16.13.2

Each gauge connection shall be equipped with a shutoff valve and provisions for draining.

16.13.3

The required pressure gauges shall be approved and shall have a maximum limit not less than one and a half times the normal system working pressure at the point where installed.

16.13.4

Gauges shall be installed to permit removal and shall be located where they will not be subject to freezing.

16.14 System Connections.**16.14.1 * Wet Pipe Systems.****16.14.1.1**

An alarm test connection not less than 1 in. (25 mm) in diameter, terminating in a smooth bore corrosion-resistant orifice, giving a flow equal to or less than one sprinkler of a type having the smallest K-factor installed on the particular system, shall be provided to test each waterflow alarm device for each system.

16.14.1.2

The test connection valve shall be accessible.

16.14.1.3

The discharge shall be to the outside, to a drain connection capable of accepting full flow under system pressure, or to another location where water damage will not result.

16.14.1.4

The alarm test connection shall be permitted to be installed in any location on the fire sprinkler system downstream of the waterflow alarm.

16.14.2 * Dry Pipe Systems.**16.14.2.1**

A trip test connection not less than 1 in. (25 mm) in diameter, terminating in a smooth bore corrosion-resistant orifice, to provide a flow equivalent to one sprinkler of a type installed on the system, shall be installed on each system, except as modified in 16.14.2.2 and 16.14.2.3.

16.14.2.2

When the water delivery requirement has been determined in accordance with 8.2.4.3 or 8.2.4.4 for two sprinklers, the trip test connection shall be arranged to simulate two sprinklers on the most remote sprinkler branch line.

16.14.2.3

When the water delivery requirement has been determined in accordance with 8.2.4.3 or 8.2.4.4 for four sprinklers, the trip test connection shall be arranged to simulate two sprinklers on the most remote sprinkler branch line and two sprinklers on the next adjacent branch line.

16.14.2.4 *

The trip test connection shall be located on the end of the most remote branch line(s) and be equipped with an accessible shutoff valve not less than 1 in. (25 mm) size.

16.14.2.4.1

Disconnection of the trip test connection and plugging of the valve between test cycles shall be permitted.

16.14.2.5

The connection used to control the level of priming water or to remove excess water from above the clapper shall be considered adequate to test the operation of the alarms monitoring the supervisory pneumatic pressure.

16.14.3 Preaction Systems.**16.14.3.1**

A trip test connection in accordance with 16.14.2 shall be installed on each double interlock and noninterlock preaction systems.

16.14.3.2

The connection used to control the level of priming water or to remove excess water from above the clapper shall be considered adequate to test the operation of the alarms monitoring the supervisory pneumatic pressure.

16.14.3.3

For double interlock preaction systems, a trip test connection or manifold not less than 1 in. (25 mm) in diameter, terminating in a smooth bore corrosion-resistant orifice to provide a flow equivalent to one sprinkler of a type installed on the particular system, shall be installed.

16.14.4 Deluge Systems.

A test connection shall not be required on a deluge system.

16.14.5 * Backflow Devices.

16.14.5.1 * Backflow Prevention Valves.

A test connection shall be provided downstream of all backflow prevention valves for the performance of forward flow tests required by this standard and NFPA 25 at a minimum flow rate of the system demand including hose allowance where applicable.

16.14.5.1.1

A 2 ½ in. (65 mm) hose valve shall be provided downstream of the backflow prevention valve for every 250 gpm (950 L/min) of flow rate required by the system demand including hose allowance where applicable.

16.14.5.1.2 *

Existing hose connections downstream of the backflow prevention valve shall be allowed to be utilized.

16.14.5.1.3 *

Other means shall be permitted as long as the system doesn't require modification to perform the test and it is sized to meet the system demand.

16.15 Hose Connections.

16.15.1 Small [1½ in. (40 mm)] Hose Connections.

See Section C.5.

16.15.1.1 *

Where required, small [1½ in. (40 mm)] hose connections shall be installed.

16.15.1.1.1

Valves shall be available to reach all portions of the area with 100 ft (30 m) of hose plus 30 ft (9.1 m) of hose stream distance.

16.15.1.1.2

Where the building is protected throughout by an approved automatic sprinkler system, the presence of 1½ in. (40 mm) hose lines for use by the building occupants shall not be required, subject to the approval of the authority having jurisdiction.

16.15.1.1.3

Where approved by the authority having jurisdiction, the location of valves shall be permitted to exceed the distances specified in 16.15.1.1.1.

16.15.1.2

The hose connections shall not be required to meet the requirements of Class II hose systems defined by NFPA 14.

16.15.1.3

Hose connections shall be supplied from one of the following:

- (1) Outside hydrants
- (2) Separate piping system for small hose connections
- (3) Valved hose connections on sprinkler risers where such connections are made upstream of all sprinkler control valves
- (4) Adjacent sprinkler systems
- (5) In rack storage areas, the ceiling sprinkler system in the same area (as long as in-rack sprinklers are provided in the same area and are separately controlled)
- (6) In nonstorage occupancies that are not a part of a standpipe system, ceiling sprinkler piping in the same area as the hose connection

16.15.1.4 *

Hose connections used for fire purposes only shall be permitted to be connected to wet pipe sprinkler systems only, subject to the following restrictions:

- (1) Hose connection's supply pipes shall not be connected to any pipe smaller than 2 1/2 in. (65 mm) in diameter.
- (2) The requirements of 16.15.1.4(1) shall not apply to hydraulically designed loops and grids, where the minimum size pipe between the hose connection's supply pipe and the source shall be permitted to be 2 in. (50 mm).
- (3) For piping serving a single hose connection, pipe shall be a minimum of 1 in. (25 mm) for horizontal runs up to 20 ft (6.1 m), a minimum of 1 1/4 in. (32 mm) for the entire run for runs between 20 ft and 80 ft (6.1 m and 24 m), and a minimum of 1 1/2 in. (40 mm) for the entire run for runs greater than 80 ft (24 m). For piping serving multiple hose connections, runs shall be a minimum of 1 1/2 in. (40 mm) throughout.
- (4) Piping shall be at least 1 in. (25 mm) for vertical runs.
- (5) Where the residual pressure at a 1 1/2 in. (40 mm) outlet on a hose connection exceeds 100 psi (7 bar), an approved pressure-regulating device shall be provided to limit the residual pressure at the outlet to 100 psi (7 bar).
- (6) Where the static pressure at a 1 1/2 in. (40 mm) hose connection exceeds 175 psi (12 bar), an approved pressure-regulating device shall be provided to limit static and residual pressures at the outlet to 100 psi (7 bar).

16.15.2 Hose Connections for Fire Department Use.

16.15.2.1

In buildings of light or ordinary hazard occupancy, 2 1/2 in. (65 mm) hose valves for fire department use shall be permitted to be attached to wet pipe sprinkler system risers.

16.15.2.2 *

The following restrictions shall apply:

- (1) Each connection from a standpipe that is part of a combined system to a sprinkler system shall have an individual control valve and check valve of the same size as the connection.
- (2) The minimum size of the riser shall be 4 in. (100 mm) unless hydraulic calculations indicate that a smaller size riser will satisfy sprinkler and hose stream allowances.
- (3) Each combined sprinkler and standpipe riser shall be equipped with a riser control valve to permit isolating a riser without interrupting the supply to other risers from the same source of supply. *(For fire department connections serving standpipe and sprinkler systems, refer to Section 16.12.)*

16.16 Electrical Bonding and Grounding.

16.16.1

In no case shall sprinkler system piping be used for the grounding of electrical systems.

16.16.2 *

The requirement of 16.16.1 shall not preclude the bonding of the sprinkler system piping to the lightning protection grounding system as required by NFPA 780 in those cases where lightning protection is provided for the structure.

16.17 * Signs.

A copy of the information from all required signage shall be kept in the documentation cabinet in an electronic and/or hardcopy format.