

Exception No. 2: 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.

Exception No. 3: In the discharge pipe from a pressure tank or a gravity tank of less than 15,000 gal (56.78 m³) capacity, no control valve need be installed on the tank side of the check valve.

5-14.1.1.9* Where a gravity tank is located on a tower in the yard, the control valve on the tank side of the check valve shall be an outside screw and yoke or listed indicating valve; the other shall be either an outside screw and yoke, a listed indicating valve, or a listed valve having a post-type indicator. Where a gravity tank is located on a building, both control valves shall be outside screw and yoke or listed indicating valves and all fittings inside the building, except the drain tee and heater connections, shall be under the control of a listed valve.

5-14.1.1.10* 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.

5-14.1.1.11* All control valves shall be located where readily accessible and free of obstructions.

5-14.1.1.12 Identification signs shall be provided at each valve to indicate its function and what it controls.

5-14.1.2 Pressure-Reducing Valves.

5-14.1.2.1 In portions of systems where all components are not listed for pressure greater than 175 psi (12.1 bar) and the potential exists for normal (nonfire condition) water pressure in excess of 175 psi (12.1 bar), a listed pressure-reducing valve shall be installed and set for an outlet pressure not exceeding 165 psi (2.4 bar) at the maximum inlet pressure.

5-14.1.2.2 Pressure gauges shall be installed on the inlet and outlet sides of each pressure-reducing valve.

5-14.1.2.3* A relief valve of not less than 1/2 in. (13 mm) in size shall be provided on the discharge side of the pressure-reducing valve set to operate at a pressure not exceeding 175 psi (12.1 bar).

5-14.1.2.4 A listed indicating valve shall be provided on the inlet side of each pressure-reducing valve.

Exception: A listed indicating valve is not required where the pressure-reducing valve meets the listing requirements for use as an indicating valve.

5-14.1.2.5 Means shall be provided downstream of all pressure-reducing valves for flow tests at sprinkler system demand.

5-14.1.3* Post-Indicator Valves.

5-14.1.3.1 Post-indicator valves shall be set so that the top of the post will be 36 in. (0.9 m) above the final grade.

5-14.1.3.2 Post-indicator valves shall be properly protected against mechanical damage where needed.

5-14.1.4 Valves in Pits.

5-14.1.4.1 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.

5-14.1.4.2* When used, valve pits shall be of adequate size and readily accessible for inspection, operation, testing, maintenance, and removal of equipment contained therein. They shall be constructed and arranged to properly protect the installed equipment from movement of earth, freezing, and accumulation of water. Poured-in-place or precast concrete, with or without reinforcement, or brick (all depending upon soil conditions and size of pit) are appropriate materials for construction of valve pits. Other approved materials shall be permitted to be used. 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. [See Figure A-5-15.2(b) for a suggested arrangement.]

Valve pits located at or near the base of the riser of an elevated tank shall be designed in accordance with Chapter 9 of NFPA 22, *Standard for Water Tanks for Private Fire Protection*.

5-14.1.4.3 The location of the valve shall be clearly marked, and the cover of the pit shall be kept free of obstructions.

5-14.1.5 Sectional Valves.

5-14.1.5.1 Large private fire service main systems shall have sectional controlling valves at appropriate points in order to permit sectionalizing the system in the event of a break or for the making of repairs or extensions.

5-14.1.5.2 A valve shall be provided on each bank where a main crosses water and outside the building foundation(s) where the main or section of main runs under a building. (See 5-14.4.3.1.)

5-14.1.6* In-Rack Sprinkler System Control Valves. Where sprinklers are installed in racks, separate indicating control valves and drains shall be provided and arranged so that ceiling and in-rack sprinklers can be controlled independently.

Exception No. 1: Installation of 20 or fewer in-rack sprinklers supplied by any one ceiling sprinkler system.

Exception No. 2: The separate indicating valves shall be permitted to be arranged as sectional control valves where the racks occupy only a portion of the area protected by the ceiling sprinklers.

5-14.2 Drainage.

5-14.2.1* All sprinkler pipe and fittings shall be so installed that the system can be drained.

5-14.2.2 On wet pipe systems, sprinkler pipes shall be permitted to be installed level. Trapped piping shall be drained in accordance with 5-14.2.5.

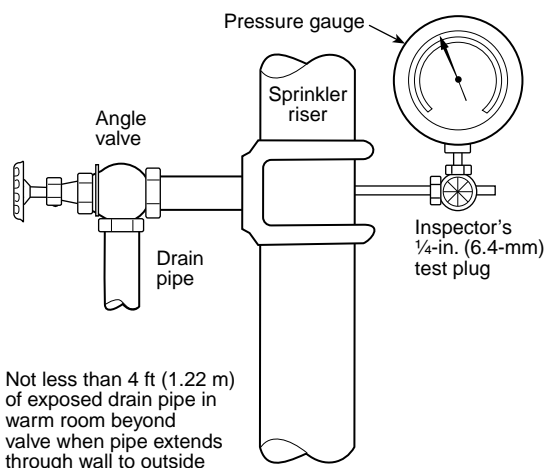
5-14.2.3 In dry pipe systems and preaction systems branch lines shall be pitched at least 1/2 in. per 10 ft (4 mm/m) and mains shall be pitched at least 1/4 in. per 10 ft (2 mm/m).

Exception No. 1: Mains shall be pitched at least 1/2 in. per 10 ft (4 mm/m) in refrigerated areas.

Exception No. 2: Praction systems located entirely in areas not subject to freezing are not required to be pitched.

5-14.2.4 System, Main Drain, or Sectional Drain Connections. [See Figures 5-14.2.4 and A-5-15.4.2(b).]

Figure 5-14.2.4 Drain connection for system riser.



5-14.2.4.1 Provisions shall be made to properly drain all parts of the system.

5-14.2.4.2 Drain connections for systems supply risers and mains shall be sized as shown in Table 5-14.2.4.2.

Table 5-14.2.4.2 Drain Size

Riser or Main Size	Size of Drain Connection
Up to 2 in.	$\frac{3}{4}$ in. or larger
2 $\frac{1}{2}$ in., 3 in., 3 $\frac{1}{2}$ in.	1 $\frac{1}{4}$ in. or larger
4 in. and larger	2 in. only

For SI units, 1 in. = 25.4 mm.

5-14.2.4.3 Where an interior sectional or floor control valve(s) is provided, it shall be provided with a drain connection sized as shown in Table 5-14.2.4.2 to drain that portion of the system controlled by the sectional valve. Drains shall discharge outside or to a drain connection. [See Figure A-5-15.4.2(b).]

Exception: 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.

5-14.2.4.4 The test connections required by 5-15.4.1 shall be permitted to be used as main drain connections.

Exception: Where drain connections for floor control valves are tied into a common drain riser, the drain riser shall be one pipe size larger than the largest size drain connection tying into it.

5-14.2.5 Auxiliary Drains.

5-14.2.5.1 Auxiliary drains shall be provided where a change in piping direction prevents drainage of system piping through the main drain valve.

5-14.2.5.2 Auxiliary Drains for Wet Pipe Systems and Preaction Systems in Areas Not Subject to Freezing.

5-14.2.5.2.1 Where the capacity of trapped sections of pipes in wet systems is less than 5 gal (18.9 L), the auxiliary drain shall consist of a nipple and cap or plug not less than $\frac{1}{2}$ in. (12 mm) in size.

Exception No. 1: Auxiliary drains are not required for system piping that can be drained by removing a single pendent sprinkler.

Exception No. 2: Where flexible couplings or other easily separated connections are used, the nipple and cap or plug shall be permitted to be omitted.

5-14.2.5.2.2 Where the capacity of isolated trapped sections of pipe is more than 5 gal (18.9 L) and less than 50 gal (189 L), the auxiliary drain shall consist of a valve $\frac{3}{4}$ in. (19 mm) or larger and a plug or a nipple and cap.

5-14.2.5.2.3* Where the capacity of isolated trapped sections of pipe is 50 gal (189 L) or more, the auxiliary drain shall consist of a valve not smaller than 1 in. (25.4 mm), piped to an accessible location.

5-14.2.5.2.4 Tie-in drains are not required on wet pipe systems and preaction systems protecting non-freezing environments.

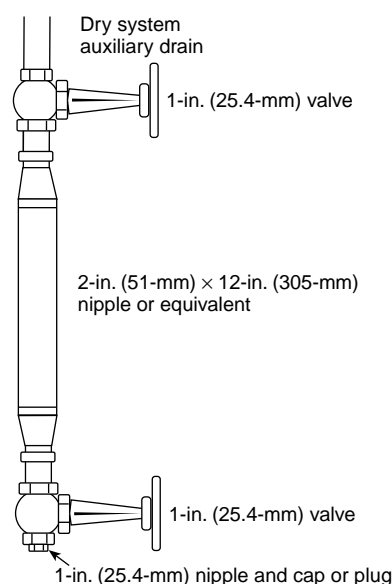
5-14.2.5.3 Auxiliary Drains for Dry Pipe Systems and Preaction Systems in Areas Subject to Freezing.

5-14.2.5.3.1 Where the capacity of trapped sections of pipe is less than 5 gal (18.9 L), the auxiliary drain shall consist of a valve not smaller than $\frac{1}{2}$ in. (12 mm) and a plug or a nipple and cap.

Exception: Auxiliary drains are not required for pipe drops supplying dry-pendent sprinklers installed in accordance with 4-2.2.

5-14.2.5.3.2 Where the capacity of isolated trapped sections of system piping is more than 5 gal (18.9 L), the auxiliary drain shall consist of two 1-in. (25.4-mm) valves and one 2-in. \times 12-in. (51-mm \times 305-mm) condensate nipple or equivalent, accessibly located. (See Figure 5-14.2.5.3.2.)

Figure 5-14.2.5.3.2 Dry system auxiliary drain.



5-14.2.5.3.3 Tie-in drains shall be provided for multiple adjacent trapped branch pipes and shall be only 1 in. (25.4 mm). Tie-in drain lines shall be pitched a minimum of $1/2$ in. per 10 ft (4 mm/m).

5-14.2.6 Discharge of Drain Valves.

5-14.2.6.1* Direct interconnections shall not be made between sprinkler drains and sewers. The drain discharge shall conform to any health or water department regulations.

5-14.2.6.2 Where drain pipes are buried underground, approved corrosion-resistant pipe shall be used.

5-14.2.6.3 Drain pipes shall not terminate in blind spaces under the building.

5-14.2.6.4 Where exposed to the atmosphere, drain pipes shall be fitted with a turned-down elbow.

5-14.2.6.5 Drain pipes shall be arranged to avoid exposing any part of the sprinkler system to freezing conditions.

5-14.3 Protection of Piping.

5-14.3.1 Protection of Piping Against Freezing.

5-14.3.1.1 Where portions of systems are subject to freezing and temperatures cannot reliably be maintained at or above 40°F (4°C), sprinklers shall be installed as a dry pipe or preaction system.

Exception: Small unheated areas are permitted to be protected by anti-freeze systems or by other systems specifically listed for this purpose. (See 4-5.2.)

5-14.3.1.2 Where aboveground water-filled supply pipes, risers, system risers, or feed mains pass through open areas, cold rooms, passageways, or other areas exposed to freezing temperatures, the pipe shall be protected against freezing by insulating coverings, frostproof casings, or other reliable means capable of maintaining a minimum temperature between 40°F (4°C) and 120°F (48.9°C).

5-14.3.2 Protection of Piping Against Corrosion.

5-14.3.2.1* 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. (See 3-2.6.)

5-14.3.2.2 Where water supplies are known to have unusual corrosive properties and threaded or cut-groove steel pipe is to be used, wall thickness shall be in accordance with Schedule 30 [in sizes 8 in. (200 mm) or larger] or Schedule 40 [in sizes less than 8 in. (200 mm)].

5-14.3.2.3 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.

5-14.3.2.4 Where steel pipe is used underground, the pipe shall be protected against corrosion.

5-14.3.3 Protection of Piping in Hazardous Areas. 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.

Exception: Aboveground piping is permitted to be located in hazardous areas protected by an automatic sprinkler system.

5-14.4* Underground Private Fire Service Mains.

5-14.4.1 Depth of Cover.

5-14.4.1.1* The depth of cover over water pipes shall be determined by the maximum depth of frost penetration in the locality where the pipe is laid. The top of the pipe shall be buried not less than 1 ft (0.3 m) below the frost line for the locality. In those locations where frost is not a factor, the depth of cover shall be not less than $2\frac{1}{2}$ ft (0.8 m) to prevent mechanical damage. Pipe under driveways shall be buried a minimum of 3 ft (0.9 m) and under railroad tracks a minimum of 4 ft (1.2 m).

5-14.4.1.2 Depth of covering shall be measured from top of pipe to finished grade, and due consideration shall always be given to future or final grade and nature of soil.

5-14.4.2 Protection Against Freezing.

5-14.4.2.1 Where it is impracticable to bury pipe, it shall be permitted to be laid aboveground, provided the pipe is protected against freezing and mechanical damage.

5-14.4.2.2 Pipes shall not be placed over water raceways or near embankment walls without special attention being given to protection against frost.

5-14.4.2.3 Where pipe is laid in water raceways or shallow streams, care shall be taken that there will be sufficient depth of running water between the pipe and the frost line during all seasons of frost; a safer method is to bury the pipe 1 ft (0.3048 m) or more under the bed of the waterway. Care shall also be taken to keep the pipe back from the banks a sufficient distance to avoid any danger of freezing through the side of the bank above the water line. Pipe shall be buried below the frost line where entering the water.

5-14.4.3 Protection Against Damage.

5-14.4.3.1 Pipe shall not be run under buildings.

Exception No. 1: When absolutely necessary to run pipe under buildings, special precautions shall be taken that include arching the foundation walls over the pipe, running pipe in covered trenches, and providing valves to isolate sections of pipe under buildings. (See 5-14.5.2.)

Exception No. 2: Fire service mains shall be permitted to enter the building adjacent to the foundation.

Exception No. 3: Where adjacent structures or physical conditions make it impractical to locate risers immediately inside an exterior wall, such risers shall be permitted to be located as close as practical to exterior walls to minimize underground piping under the building.

5-14.4.3.2 Where a riser is close to building foundations, underground fittings of proper design and type shall be used to avoid pipe joints being located in or under the foundations.

5-14.4.3.3 Mains running under railroads carrying heavy trucking, under large piles of heavy commodities, or in areas that subject the main to heavy shock and vibrations shall be subjected to an evaluation of the specific loading conditions and suitably protected, if necessary. (See 3-4.2.)

5-14.4.3.4* When it is necessary to join metal pipe with pipe of dissimilar metal, the joint shall be insulated, by an approved method, against the passage of an electric current.

5-14.4.3.5 In no case shall the pipe be used for grounding of electrical services.