**Chapter 9 Protection From Freezing**

9.1 System Types

Systems shall be permitted to be wet pipe, dry pipe, or preaction.

9.1.1\* Wet Pipe Systems

A wet pipe system shall be permitted to be used where all piping is installed in areas not subject to freezing, including areas properly insulated to maintain 40°F (4°C).

9.1.2 Systems in Areas Subject to Freezing

Where any portion of a system is subject to freezing and the temperature cannot be maintained at or above 40°F (4°C), the pipe shall be protected against freezing by use of one of the following methods:

Dry pipe system and preaction systems in accordance with Section 9.3

Antifreeze system in accordance with Section 9.2

Listed standard dry pendent or dry sidewall sprinklers extended from pipe in heated areas into unheated areas not intended for living purposes

\* Listed heat tracing provided that it is installed and insulated in accordance with manufacturer's instructions, specifically heat tracing used on branch lines is listed for branch lines of fire sprinkler systems

Listed residential dry pendent or dry sidewall sprinklers extended from pipe in heated areas into unheated areas

9.2\* Antifreeze Systems

9.2.1\* Conformity With Health Regulations

The use of antifreeze solutions shall be in conformity with any state or local health regulations.

9.2.2\* Antifreeze Solutions

9.2.2.1

Except as permitted in 9.2.2.2, antifreeze solutions shall be listed for use in new sprinkler systems.

9.2.2.1.1

For existing systems, antifreeze solutions shall be limited to premixed antifreeze solutions of glycerine (chemically pure or United States Pharmacopoeia 96.5 percent) at a maximum concentration of 50 percent by volume, propylene glycol at a maximum concentration of 40 percent by volume, or other solutions listed specifically for use in fire protection systems.

9.2.2.2\*

Premixed solutions of glycerine (chemically pure or United States Pharmacopoeia 96.5 percent at a maximum concentration of 48 percent by volume or propylene glycol at a maximum concentration of 38 percent by volume shall be permitted to protect piping that is supplying sprinklers in a specific area of the dwelling unit, where acceptable to the authority having jurisdiction.

9.2.2.2.1\*

Documentation shall be presented to the AHJ to substantiate the use of the antifreeze solution.

9.2.2.3\*

The specific gravity of the antifreeze solution shall be checked by a hydrometer with a scale having 0.002 subdivisions.

9.2.3\* Arrangement of Supply Piping and Valves

9.2.3.1 Connections Between Antifreeze System and Wet Pipe System With No Backflow Prevention Device

9.2.3.1.1

A 5 ft (1.5 m) drop pipe, or U-loop, shall be installed in the connection between the antifreeze system and the wet pipe system as illustrated in Figure 9.2.3.1.1.

Notes:

Check valve shall be permitted to be omitted where sprinklers are below the level of valve A.

The 1/32 in. (0.8 mm) hole in the check valve clapper is needed to allow for expansion of the solution during a temperature rise, thus preventing damage to sprinklers.

FIGURE 9.2.3.1.1 Arrangement of Supply Piping and Valves.

9.2.3.1.2

If sprinklers are above the level of the water supply to the antifreeze system, a check valve with a 1/32 in. (0.8 mm) hole in the clapper shall be provided in the U-loop.

9.2.3.1.3

Valves shall be provided as illustrated in Figure 9.2.3.1.1.

9.2.3.1.4

Arrangement of supply piping when the water supply comes from a storage tank or the water supply feeds through a check valve that does not have a 1/32 in. (0.8 mm) hole drilled in the clapper shall meet the requirements of 9.2.3.2.2.

9.2.3.2\* Connections Between Antifreeze System and Wet Pipe System With Backflow Prevention Device Installed

9.2.3.2.1

Valves shall be provided as illustrated in Figure 9.2.3.2.1.

FIGURE 9.2.3.2.1 Arrangement of Supply Piping with Backflow Device.

9.2.3.2.2

An expansion chamber shall be provided as illustrated in Figure 9.2.3.2.1.

9.2.3.2.3

The expansion chamber shall be sized based on the minimum and maximum volume of the antifreeze solution over the life of the system.

9.2.4 Hydrostatic Test

Where pendent sprinklers are utilized, and where a hydrostatic test shall be performed, the hydrostatic test shall be performed with water and then the water shall be completely drained before antifreeze solution is placed in the system, or the hydrostatic test shall be performed with antifreeze solution at the proper concentration for the system.

9.2.5 Placard Information

A placard shall be placed on the antifreeze system main valve that indicates the manufacturer type and brand of antifreeze solution, the concentration of antifreeze solution used, and the volume of the antifreeze solution used in the system.

9.3 Dry Pipe and Preaction Systems

9.3.1 Sprinklers

9.3.1.1

Sprinklers shall be specifically listed for use on dry pipe and double interlock preaction systems.

9.3.1.2

The following types of sprinklers and arrangements shall be permitted for dry pipe and preaction systems:

Residential upright sprinklers

Residential dry sprinklers

Residential pendent and sidewall sprinklers installed on return bends, where the sprinklers, return bends, and branch line piping are in an area maintained at or above 40°F (4°C)

Residential horizontal sidewall sprinklers, installed so that water is not trapped

9.3.1.3

Return bends required per 9.3.1.2(3) shall be permitted to be omitted when using potable water supplies combined with corrosion-resistant pipe.

9.3.1.4

Sprinklers with nominal K-factors greater than 4.0 and less than 5.6 shall be permitted to be installed on dry pipe systems where piping is corrosion resistant or internally galvanized.

9.3.1.5

Sprinklers with nominal K-factors of 5.6 or greater shall be permitted to be installed on pipe complying with the requirements of Section 5.2.

9.3.2 Preaction Systems

Preaction systems shall be one of the following types:

A single interlock system, which admits water to sprinkler piping upon operation of detection devices

A noninterlock system, which admits water to sprinkler piping upon operation of detection devices or automatic sprinklers

A double interlock system, which admits water to sprinkler piping upon operation of both detection devices and automatic sprinklers

9.3.3 Dry Pipe and Double Interlock Preaction System Water Delivery

9.3.3.1

Water delivery shall be based on the hazard shown in Table 9.3.3.1.

Table 9.3.3.1 Water Delivery Time for Dry Pipe and Double Interlock Preaction Systems

Hazard Number of Most Remote Sprinklers Initially Open Maximum Time of Water Delivery (seconds)

Residential 1 15

9.3.3.2

Water delivery shall be based on one of the following:

A calculation program and method that shall be listed by a nationally recognized laboratory

An inspector's test connection providing a flow equivalent to the smallest sprinkler K-factor utilized, wherein the test connection is located on the end of the most remote branchline

9.3.4 Location and Protection of Dry Pipe and Preaction Valves

The dry pipe valve, preaction valve, and supply pipe shall be protected against freezing and physical damage.

9.3.5.1

The detection system shall be designed to operate sooner than the first sprinkler.

9.3.5.2

Detectors shall be installed in all areas and compartments where sprinklers are installed.

9.3.6 System Configuration

Dry pipe systems and preaction systems of the type described in 9.3.2(3) shall not be gridded.

9.3.7 Drainage

Piping shall be pitched a minimum of 1/4 in. per 10 ft (6 mm per 3 m) to facilitate draining.

9.3.8 Auxiliary Drains

9.3.8.1

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

9.3.8.2

At a minimum, auxiliary drains shall be a nipple and cap or plug not less than 1/2 in. (13 mm).

9.3.9 Air Supply

The system air pressure shall be maintained by approved equipment.