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TechNotes

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Maintenance Considerations for Dry Sprinkler Systems

The following issue of TechNotes has been written by Mark Hopkins, P.E., Vice President of Engineering for the NFSA. Mark serves on the NFPA 25 Technical Committee on Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

As the temperature continues to drop, it is important to remind building owners and facility maintenance personnel of some important inspection and maintenance tasks necessary to keep their dry pipe systems in good operational condition during the winter months. Building owners and facility maintenance personnel need to recognize that NFPA 25-2017, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems, provides a minimum set of requirements. NFPA 25 section 1.2.1 states:

> ***1.2.1*** *The purpose of this document is to provide requirements that ensure a reasonable degree of protection for life and property from fire through minimum inspection, testing, and maintenance methods for water-based fire protection systems*.

NFPA 25 section 4.1.1 identifies that it is the owner's or owner representative's responsibility to maintain their sprinkler systems. NFPA 25 does provide the ability to delegate authority as stated in section 4.1.1.

> ***4.1.1**** *Responsibility for Inspection, Testing, Maintenance, and Impairment. The property owner or designated representative shall be responsible for properly maintaining a water-based fire protection system.*
>
> ***4.1.1.1**** *Inspection, testing, maintenance, and impairment procedures shall be implemented in accordance with those established in this document and in accordance with the manufacturer's instructions*.

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4.1.1.2 *Inspection, testing, and maintenance shall be performed by qualified personnel.*

4.1.1.2.1* *The owner shall coordinate with the entity conducting the inspection, testing, and maintenance activities to minimize any water damage caused by the discharge of water.*

4.1.1.3* *Where the property owner or designated representative is not the occupant, the property owner or designated representative shall be permitted to delegate the authority for inspecting, testing, maintenance, and the managing of impairments of the fire protection system to a designated representative.*

4.1.1.4 *Where a designated representative has received the authority for inspecting, testing, maintenance, and the managing of impairments, the designated representative shall comply with the requirements identified for the property owner or designated representative throughout this standard.*

Dry pipe and preaction sprinkler systems normally contain pressurized air or nitrogen to supervise the integrity of the piping and to hold back the valve clapper to prevent water from entering the system during non-fire conditions. These systems are only intended for use when the ambient temperature cannot be maintained at or above 40°F at all times as stated in NFPA 13-2016, Standard for the Installation of Sprinkler Systems, section 8.16.4.1.1.

8.16.4.1.1* *Where any portion of a system is subject to freezing and the temperatures cannot be reliably maintained at or above 40°F (4°C), the system shall be installed as a dry pipe or preaction system.*

Even though dry pipe and preaction sprinkler systems are designed to contain air or nitrogen during normal operating conditions, these systems will contain some residual water after testing and will collect water through condensation as air is pumped into the system by the air compressor. Water vapor entering the system will condense inside of the system piping and will collect along the bottom of the system piping and at low points in the systems. If the system is properly pitched, the water will drain back to the riser and defined system low points.

As part of the minimum inspection, testing, and maintenance requirements for wet pipe systems and portions of dry pipe systems containing water, it is critical to ensure that the piping is protected against freezing conditions. The property owner or the owner's representative must maintain the temperature above 40°F in accordance with NFPA 25 section 4.1.2.

4.1.2* Freeze Protection. *The property owner or designated representative shall ensure that water-filled*

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piping is maintained at a minimum temperature of 40°F (4°C) unless an approved antifreeze solution is utilized.

This includes periodic inspections of the valve enclosures to ensure that the minimum temperature is at or above 40°F since the piping below the valve will contain water during normal operating conditions. NFPA 25 requires daily inspection of the valve enclosures during cold weather[1]. However, the frequency is increased to weekly if the valve enclosure is supervised by a low temperature alarm, which will prompt someone to investigate the situation. In addition, NFPA 25 section 13.4.5.2.7 requires any provided low temperature alarm be tested annually.

> ***13.4.5.1.1*** *Valve enclosures subject to freezing shall be inspected daily during cold weather to verify a minimum temperature of 40°F (4.0°C).*
>
> ***13.4.5.1.1.1*** *Valve enclosures equipped with low temperature alarms shall be inspected weekly.*
>
> ***13.4.5.1.1.2*** *Low temperature alarms, if installed in valve enclosures, shall be inspected annually at the beginning of the heating season to verify that they are free of physical damage.*
>
> ***13.4.5.2.7*** *Low temperature alarms, if installed in valve enclosures, shall be tested annually at the beginning of the heating season.*

Another significant, often overlooked, and likely more important maintenance requirement is to ensure that auxiliary drains are exercised. NFPA 13-2016 section 8.16.2.5.3 provides the following requirements for dry pipe sprinkler system auxiliary drains:

> ***8.16.2.5.3.1*** *Auxiliary drains located in areas subject to freezing shall be accessible.*
>
> ***8.16.2.5.3.2*** *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.*
>
> ***8.16.2.5.3.3*** *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 1/2 in. (15 mm) and a plug or a nipple and cap.*
>
> ***8.16.2.5.3.4*** *Auxiliary drains are not for pipe drops supplying dry pendent sprinklers installed in accordance with 7.2.2.*
>
> ***8.16.2.5.3.5**** *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 8.16.2.5.3.5, or a device listed for this service.

8.16.2.5.3.6 *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 1/2 in. per 10 ft (4 mm/m).*

Example Drum Drips (Auxiliary Drains) in a Parking Garage.

Dry pipe systems having auxiliary drains are required to have a sign at the dry pipe valve indicating the number and location of these drains. Although the sign has been required since the adoption of NFPA 13-2007, many systems do not have these information signs. The requirement is found in NFPA 13-2007 section 8.16.2.5.3.6 and NFPA 13-2016 section 8.16.2.5.3.7. A similar requirement was added in NFPA 25-2017 section 13.4.1.2 to apply to older systems and systems installed without the appropriate signage.

> ***13.4.5.1.2*** *Systems with auxiliary drains shall require a sign at the dry valve indicating the number of auxiliary drains and the location of each individual drain.*

The purpose of the auxiliary drains is to provide a means for removing water from the system after testing or collected through condensation. NFPA 25 section 13.4.5.3.2 requires these drains to be exercised after valve operation, both inadvertent and intentionally through testing, before the onset of freezing conditions and as needed thereafter. The last portion of the statement is a reminder that opening the auxiliary once may not be sufficient and that additional draining may be required at subsequent times.

> ***13.4.5.3.2**** *Auxiliary drains in dry pipe sprinkler systems shall be drained after each operation of the system, before the onset of freezing weather conditions, and thereafter as needed.*

The annex language provides guidance regarding the use of auxiliary drains and clarifies the intent. Although not a required feature, another component for consideration in the design of new dry pipe and preaction systems and retrofit applications is a supervised drum drip (auxiliary drain), which provides a supervisory signal on a fire alarm system when the drum drip contains water. This provides an indication of water accumulation without having to exercise the valve.

> ***A.13.4.5.3.2*** *Removing water from a dry system is an essential part of a good maintenance program. Failure to keep the dry system free of water can result in damage and expensive repairs to both the system and building. A program for monitoring the condition of the system and the operation of the auxiliary drains should be instituted. Auxiliary drains should be operated on a daily basis after a dry sprinkler system operation until several days pass with no discharge of water from the drain valve. Thereafter, it might be possible to decrease the frequency to weekly or longer intervals depending on the volume of water discharged. Likewise, when preparing for cold weather, the auxiliary drains should be operated daily with the frequency of operation decreasing depending on the discharge of accumulated water. In many cases, the frequency of the operation can decrease significantly if a system is shown to be dry. A quick-opening device, if installed, should be removed temporarily from service prior to draining low points.*

It would be advantageous to remind owners and facility maintenance personnel of these requirements if you have not already done so.

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[1] NFPA 25 references cold weather (section 13.4.5.1.1), the

onset of freezing (section 13.4.5.3.2), and heating season (sections 13.4.5.1.1 and 13.4.5.7), which are all intended to include the likely timeframe when the temperature will drop below 40°F and, more importantly, freezing (32°F).