Dry Sprinkler System Maintenance

1. Drain the drum drips until they are free of moisture. ...
2. Leave the valves of drum drips in the proper positions (the top valve should be open and the bottom valve closed).
3. Check to make sure the valve room is heated. ...
4. Drain priming to proper levels.
5. Check the operation of the air compressor.

How to Avoid Low Point Drain Damage Due to Freezing

One warm day after a cold snap is a refreshing break from a bone-chilling winter. Unfortunately, this extreme temperature change can potentially damage fire sprinkler low point drains found in dry pipe systems.

Even though fire sprinkler dry pipe systems aren't filled with water, condensate will build up over time. If excess water isn't removed from the dry pipe system's low point drain it can lead to costly repairs and water damage due to flooding. This situation occurs when the excess condensate freezes and cracks the pipe. Then on an unseasonably warm winter day, the ice melts. The dry pipe system detects the air pressure change and floods with water that leaks through the cracked pipe.

How to Empty Fire Sprinkler Low Point Drains

In order to avoid low point drain damage due to freezing, follow NFPA 25 guidelines that explain how to empty a fire sprinkler low point drain. Follow these directions on how to empty a dry pipe system's low point drain.

Empty Fire Sprinkler Low Point Drains with a Single Valve:

1. Open the low-point drain valve slowly.
2. Close the drain valve as soon as water ceases to discharge and allow time for additional accumulation above the valve.
3. Repeat this procedure until water ceases to discharge.
4. Replace plug or nipple and cap as necessary.

Empty Fire Sprinkler Low Point Drains with Dual Valves:

1. Close the upper valve.
2. Open the lower valve, and drain the accumulated water.
3. Close the lower valve, open the upper valve and allow time for additional water accumulation.
4. Repeat this procedure until water ceases to discharge.
5. Replace the plug or nipple and cap in the lower valve.

Emptying fire sprinkler low point drains just takes a few steps. Yet, this basic fire sprinkler maintenance could save you thousands of dollars in repairs and water damage. Lastly, regularly check and empty your dry pipe low point drains throughout the season and be wary of a warm winter day.

Dry pipe fire sprinkler systems are a very effective and reliable component in your fire protection system, however, additional maintenance is required. Dry pipe fire sprinkler system winterization begins with weekly maintenance and includes drum drip draining.

What are Dry Pipe Fire Sprinkler Systems?

Dry pipe sprinkler systems are utilized in areas of the facility where sprinkler protection is required but is likely to experience freezing conditions. These areas can include attics, entry vestibules, outside canopies, and similar areas. (If you are unsure if you have dry pipe sprinkler systems, refer to your Annual Sprinkler System Inspection Report.)

Dry pipe sprinkler systems function in a similar manner to normal “wet” type sprinkler systems. Dry systems, however, are pressurized with air instead of water under normal circumstances within the section of piping that is exposed to freezing conditions. In these dry systems, when a fire occurs, a “dry pipe valve” operates and allows water to enter the system, replace the air, and be discharged onto the fire.

Why is Dry Pipe Fire Sprinkler System Winterization needed?

In addition to the periodic inspections, additional attention is required to remove any water in the system that may potentially freeze. This additional water is typically due to condensation and draining of the water within the system. When this trapped water freezes within the sprinkler system, the result is often costly due to damaged pipe and/or property.

To facilitate draining water out of dry sprinkler systems, most of these systems have drains called drum drips (also referred to as “auxiliary drains”, “drip legs” or “condensate drains”). Drum drips typically consist of two 1 inch valves with a short section of two inch pipe between them (see picture). They are installed to collect water that enters the system and provide an easy way for it to be drained.

The drum drips are normally located at the lower portions of the system, or where piping elevation changes may occur. NOTE THAT THERE MAY BE MULTIPLE DRUM DRIPS ON THE SYSTEM AND ALL NEED TO BE DRAINED.

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 stays dry.

A quick-opening device, if installed, should be removed temporarily from service prior to draining low points.

REMEMBER ALL DRUM DRIPS MUST BE DRAINED ROUTINELY DURING FALL AND WINTER MONTHS, EVEN WHEN WATER IS NOT FOUND ON A REGULAR BASIS.

Step-by-step drum drip draining procedure

1 Locate all drum drips throughout the property, remembering that there may be multiple drum drips in each area mentioned above.

2 If installed, temporarily remove the quick opening device from service.

3 At each drum drip, close both valves on the drum drip (if not already shut).

4 Remove the plug in the bottom valve, if present, and provide suitable container if needed to capture drained water. (Note: plug may not be present if drum drip drains to exterior location)

5 Open the top valve, slowly, to full open position. Maintain in open position for 10 seconds. (Note: If valves will not operate or are stuck, contact your Representative for assistance)

WARNING: NEVER OPEN BOTH TOP AND BOTTOM VALVE AT THE SAME TIME. ACCIDENTAL TRIP OF THE DRY VALVE MAY RESULT

6 Close the top valve.

7 Open the bottom valve, slowly, and watch for water to discharge. Note: Some drum drips may not allow you to see the discharge point, so allow water to drain for approximately 10 seconds.

8 Close the bottom valve.

9 If water is observed on step 7, repeat steps 5 thru 8 until no additional water drains out.

10 When completely drained, close the bottom valve, slowly open the top valve and replace plug (if applicable) to return the drum drip to service.

11 If installed, restore the quick opening device to service.

Tips: For drum drips with drains that cannot be observed during draining (that is, discharge is located on outside of building wall), a second person may be helpful to watch the drain to see when water stops running. Another alternative is to place a small container under the drain and empty it after step 8 until no water is found in the container. In some areas a container may be useful to prevent water damage to surrounding areas or to prevent spilled water in a traffic area.

NFPA standards call for drum drips

NFPA standards call for drum drips within the buildings to be identified to make it easier on building owners and maintenance staff to properly care for them as needed. This information is excerpted here for your use/benefit, highly recommends that these signs and identification be provided to simplify this process in the future.

4.1.7 Valve Location. The location of shutoff valves shall be identified.

4.1.8 Information Sign.

4.1.8.1 A permanently marked metal or rigid plastic information sign shall be placed at the system control riser supplying an antifreeze loop, dry system, pre-action system, or auxiliary system control valve.

4.1.8.2 Each sign shall be secured with a corrosion-resistant wire, chain, or other approved means and shall indicate at least the following information:

(1) Location of the area served by the system

(2) Location of auxiliary drains and low-point drains for dry pipe and pre-action systems

(3) The presence and location of antifreeze or other auxiliary systems

(4) The presence and location(s) of heat tape

Dry Pipe Fire Sprinkler System Winterization Next Steps

If your dry pipe or pre-action systems show signs of being tripped (are filled with water), or your staff discovers excessive amounts of water when performing the drain task, we encourage you to contact your sprinkler repair company.

#176 – Guide to Dry Sprinkler Systems, Part 5: Daily, Weekly, and Monthly Inspections

NFPA 25's shorter inspection timelines for dry sprinkler systems

Dry sprinkler systems protect people and property from fires in areas prone to freezing, but this important benefit comes with some strings attached. Since dry sprinklers are more complicated than wet sprinkler systems and regularly exposed to harsh environments, extra care is required to maintain reliable fire protection.

In this blog, we explain the guidelines for daily, weekly, and monthly inspections found in *NFPA 25: Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*. Stay tuned for the

next installment, covering quarterly and annual inspections, as well as inspections that can stretch longer than every year.

Check out previous installments in our dry sprinklers series:

A Guide to Dry Sprinkler Systems, Part 1: System Overview

A Guide to Dry Sprinkler Systems, Part 2: Components and Installation Requirements

A Guide to Dry Sprinkler Systems, Part 3: Installation of Dry Pipe Valves, Check Valves, and Quick-Opening and Antiflooding Devices

A Guide to Dry Sprinkler Systems, Part 4: Installation of Air Compressors and Air Maintenance Devices

Are you looking to buy components for your building's sprinkler system? QRFS offers a range of dry sprinkler heads available on special order. Simply give us a call at 888.361.6662 or email support@qrfs.com.

You can also view our in-stock selection of sprinkler gauges, valves, supervisory switches, and other accessories.

Dry sprinkler inspections: before we begin

The 2017 edition of NFPA 25 establishes minimum requirements for the periodic inspection of dry sprinkler systems. Dry systems avoid frozen pipes that plague wet sprinkler systems by filling the network with pressurized air or nitrogen instead of water. The gas holds a dry valve closed until the heat from a fire activates a sprinkler head, releasing the compressed air, opening the valve, and enabling the water supply to flow into the pipes and onto the fire.

Programs that meet NFPA 25's inspection requirements are ongoing, maintaining weekly and even daily interaction with the dry system

during cold temperatures. The inspection involves a visual once-over of the system's status, looking to see if it's free of physical damage and appears to be in operating condition. Any type of damage could compromise the integrity and operation of your system, rendering it ineffective during a fire.

Let's get some housekeeping out of the way: NFPA 25 (**4.4**) requires all water supplies, including fire pumps, to remain in service during system inspections, except under specific circumstances.
And **4.6.6.2** allows inspectors to substitute automated inspection equipment for visual inspections as long as the desired outcomes are achieved.

Inspection is generally followed by more in-depth testing, which will be addressed in a future blog and requires qualified personnel to physically operate the system or one of its parts to make sure it performs to an acceptable standard.

NFPA 25 establishes that it's the responsibility of property owners or their representatives to ensure that sprinkler systems are functioning properly, but grants the ability to delegate authority to a representative *and* specifies that inspection, testing, and maintenance be performed by a qualified professional.

However, since some inspections are ideally conducted on a daily basis and the ultimate liability rests with the owner, it's wise to familiarize those located at the property with the facility's systems so they know how to spot damage as well as understand what the professionals are looking for during inspections. In addition, they should know what actions to take in the event of a problem that constitutes an emergency, when it's unlikely a sprinkler contractor will be present.

From the 2017 Edition of NFPA 25

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.

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 managing of impairments, the designated representative shall comply with the requirements identified for the property owner or designated representative throughout this standard.

While it's also important to follow specific manufacturer instructions, NFPA 25 recommends timelines for how often various dry sprinkler components should be inspected**.** Here's an overview of what should be done:

Table 5.1.1.2 Summary of Sprinkler System Inspection, Testing, and Maintenance

Item	Frequency	Reference
Inspection		
Control valves		Chapter 13
Fire department connections		Chapter 13
Gauges (wet and deluge systems)	Quarterly	Chapter 13
Gauges (dry and preaction systems)	Monthly/quarterly	Chapter 13
Hanger/braces/supports	Annually	5.2.3
Heat tracing	Per manufacturer's requirements	5.2.7
Hydraulic design information sign	Annually	5.2.6
Information signs	Annually	5.2.8, 5.2.9
Internal piping condition		Chapter 14
Pipe and fittings	Annually	5.2.2
Sprinklers	Annually	5.2.1
Sprinklers (spare)	Annually	5.2.1.4
Supervisory signal devices (except valve supervisory switches)	Quarterly	5.2.5
System valves		Chapter 13
Valve supervisory signal devices	Quarterly	5.2.5
Waterflow alarm devices	Quarterly	5.2.5

Source: NFPA 25

Daily and weekly inspections: valve enclosures, control valves, fire pump conditions, and water storage tanks during freezing temperatures

Inspecting valve enclosures and water tanks

For any parts of dry sprinkler systems containing water, **4.1.2** mandates that property owners maintain a minimum temperature of 40°F (4°C) to protect them from freezing conditions unless an approved antifreeze solution is used. That includes daily inspection during cold weather of the enclosure that protects the dry valve since the piping beneath it holds water during normal operating conditions, as well as heating systems in water storage tanks that lack low-temperature alarms and

help protect frequently-occupied property. The tank's water temperature must also be checked weekly when an area's mean temperatures fall below 40°F (4.0°C) *if* low-temperature alarms aren't present.

The frequency of inspections can stretch to weekly, however, for valve enclosures supervised by a low-temperature alarm that would prompt property owners to investigate a deteriorating situation. NFPA 25 also requires low-temperature alarms to be inspected annually to ensure they are working properly.

From the 2017 Edition of NFPA 25

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.

Inspecting control valves

Closed control valves are the leading cause of failure in water-based fire protection systems and NFPA 25 (**13.3.2.1**) recommends weekly checks. However, inspection times for valves secured with locks or supervised in accordance with applicable NFPA standards can be increased to monthly (**13.3.2.1.1**), and control valves that are electrically supervised can be inspected quarterly (**13.3.2.1.2**)—although the alarm device itself must be inspected quarterly as well (**13.3.2.1.3**).

13.3.2.2* The valve inspection shall verify that the valves are in the following condition:

(1) In the normal open or closed position
(2)* Sealed, locked, or supervised
(3) Accessible
(4) Post indicator valves (PIVs) are provided with correct wrenches
(5) Free from external leaks
(6) Provided with applicable identification

Again, this diligence is required because closed control valves are the primary way sprinkler systems malfunction in an emergency. Supervision reduces the inspection requirements because it will alert someone if a valve is tampered with or a contractor has left it closed after maintenance or testing. Watch this video for step-by-step instructions on how to inspect a control valve:

Inspecting fire pumps

For systems that require fire pumps to provide the water pressure needed to meet system demand, weekly inspections of pump conditions ensure proper operation and prevent freezing in the pipes that safeguard pump rooms. Electrical, diesel, and steam pump all have different weekly inspection requirements, which we addressed in detail in a previous blog on fire pump inspections.

8.2.2* The pertinent visual observations specified in the following checklists shall be performed weekly:

(1) Pumphouse conditions are determined as follows:

(a) Heat is adequate, not less than 40°F (4.0°C) for pump room with electric motor or diesel engine–driven pumps with engine heaters.
(b) Heat is adequate, not less than 70°F (21°C) for pump room with diesel engine–driven pumps without engine heaters.
c) Ventilating louvers are free to operate.
(d) Excessive water does not collect on the floor.
(e) Coupling guard is in place.

(2) Pump system conditions are determined as follows:

(a) Pump suction and discharge and bypass valves are fully open.
(b) Piping is free of leaks.
(c) Suction line pressure gauge reading is within acceptable range.
(d) System line pressure gauge reading is within acceptable range.
(e) Suction reservoir has the required water level.
(f) Wet pit suction screens are unobstructed and in place.
(g) Waterflow test valves are in the closed position, the hose connection valve is closed, and the line to test valves is free of water.

Monthly inspections: gauges, dry valves, and air compressors

Inspecting gauges

All gauges should be inspected monthly and repaired and replaced as needed. Damaged gauges—or those not accurate within 3 percent of the full scale—must be immediately recalibrated or replaced. Otherwise, NFPA mandates the replacement or testing of gauges every five years. Frankly, most facilities find it easier and more cost-effective to simply replace gauges instead of recalibrating them, given their low cost.

It's important to ensure that the gauge on the supply side of the dry valve reveals normal water supply pressure, while the gauge on the system side indicates that the ratio of pressurized air or nitrogen vs. water-supply pressure meets the manufacturer's instructions. Using a marker pen to record safe pressure ranges on the gauge's face cover helps keep that information readily available.

There are some caveats: higher pressure readings on the system gauge are normal when using variable-pressure water supplies. Pressure over 175 psi (12.1 bar) could be caused by fire pump tests, but could also be the result of thermal expansion that needs to be investigated and corrected. (NFPA 25: **A.13.4.1.1**)

It's also worth noting that "normal" water supply pressure could still be too high or too low relative to what's reasonably expected based on the dry sprinkler's system design information, a knowledge of the connected water supply, or reading data from past inspections. For instance, **A.13.2.7.1.1** explains that trapped pressure surges could cause normal water supply pressure on a gauge above an alarm or system check valve to be higher than that of a gauge below it. This is one of the reasons why the design context and accurate history of data are essential.

If a quick-opening device that speeds the operation of the dry valve is present, its gauge should match the pressure reading on the system

side of the dry valve. If its gauge reads zero, it could indicate that the device is shut off or inoperative. When the readings don't match, this may mean there is an obstructed orifice or leak in the isolated chamber of the device. Either condition must be immediately addressed so it doesn't delay tripping the dry valve and delivering water during a fire.

From the 2017 Edition of NFPA 25

13.2.7.1.1* Gauges shall be inspected monthly to verify that the gauge is operable and not physically damaged.

13.2.7.1.2 Gauges monitoring water pressure shall be inspected quarterly to verify that normal water supply pressure is being maintained.
13.2.7.1.3 Gauges monitoring air or nitrogen pressure shall be inspected monthly to verify that normal air or nitrogen pressure are being maintained.

13.2.7.1.3.1 The gauge on the quick-opening device, if provided, shall indicate the same pressure as the gauge on the system side of the dry pipe valve.

13.2.7.1.3.2 Where air pressure supervision is connected to a constantly attended location, gauges shall be inspected quarterly.

13.2.7.1.4* For dry pipe or preaction systems protecting freezers with an air pressure gauge(s) on the airline(s) between the compressor and the dry pipe or preaction valve, the air pressure gauge near the compressor shall be compared monthly to the pressure gauge above the dry pipe or preaction valve.

13.2.7.1.4.1 When the gauge near the compressor is reading higher than the gauge near the dry pipe valve, the airline in service shall be taken out of service and the alternate airline shall be opened to equalize the pressure.

13.2.7.1.4.2 An airline taken out of service in accordance with 13.2.7.1.4.1 shall be internally inspected, removed of all ice blockage, and reassembled for use as a future alternate airline.

13.2.7.2* Gauges shall be replaced every 5 years or tested every 5 years by comparison with a calibrated gauge.

13.2.7.3 Gauges not accurate to within 3 percent of the full scale shall be recalibrated or replaced.

Inspecting dry pipe valves

The dry valve is arguably the most critical component of a dry sprinkler system, preventing the pressurized water in the fire mains from entering the sprinkler piping unless fires occur. While NFPA 25 requires monthly external inspections of the dry valve,

enclosure, trim, and other related components for most of the year, the frequency of certain parts increases weekly and even daily when the temperatures drop. Weekly checks are also wise if your facility has public access or is located in an area prone to vandalism. In fact, some corporate policies require facilities to conduct weekly checks as best practices.

External inspections should check for physical damage, ensure that all trim valves are in the appropriate open or closed positions as indicated by the system diagram and make sure there are no drips or leaks in the valve's intermediate chamber. Internal checks must be conducted annually, while inspections of strainers, filters, and restricted orifices can take place every five years.

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.

13.4.5.1.3 The dry pipe valve shall be externally inspected monthly to verify the following:

(1) The valve is free of physical damage.
(2) All trim valves are in the appropriate open or closed position.
(3) The intermediate chamber is not leaking.

13.4.5.1.4 The interior of the dry pipe valve shall be inspected annually when the trip test is conducted.

13.4.5.1.5 Strainers, filters, and restricted orifices shall be inspected internally every 5 years unless tests indicate a greater frequency is necessary.

A riser-mounted air compressor (right) and a dry pipe valve (left) in a dry sprinkler system. Source: A.L. Fire Protection

Inspecting air compressors

Air compressors are essential to the proper operation of the dry valve, pressurizing the sprinkler piping so the valve stays closed until the sprinkler is activated by heat. NFPA 25 specifies monthly inspections of air compressors, which tend to vibrate their connections loose during operation. It's also important to follow your compressor's manufacturer requirements, which generally include the extra step of checking and draining condensation in the air tank. Sitting water could lead to corrosion that impacts the operation of the entire dry sprinkler system.

13.10.2.1 Air compressors dedicated to water-based fire protection systems shall be inspected monthly to verify the following:

(1) Air compressor is free of physical damage.
(2) Power wiring to the air compressor is intact and free of physical damage.
(3) Piping from the air compressor to the fire protection system is intact and free of physical damage.
(4) The means of anchoring the air compressor to the structure or to the system piping is secure, tight, and free of physical damage.
(5) Air compressors requiring oil have the required amount of oil in the oil reservoir.

Keep your dry sprinkler system working with regular inspections and the right replacement parts

NFPA standards are complex, and inspection timelines can feel onerous and daunting. But at the end of the day, meeting the daily, weekly, and monthly requirements is the best way to ensure that your dry sprinkler system will reliably offer automatic protection during a fire.

Stay tuned for the next installment in our review of dry sprinkler systems and their applications, in which we'll explore quarterly and annual inspections, as well as inspections that can stretch longer than every year.