Risk Control

The Sprinkler System Freeze-up Prevention Guide

Cold weather brings the danger of impaired fire protection because of water freezing in sprinkler piping, underground mains, gravity suction tanks or fire pumps. Such freezing not only leaves a risk vulnerable to fire and damage to the building contents, but may also necessitate expensive repairs to the system.

Frequent freezing of automatic sprinkler systems occurs in climates not normally associated with cold weather. It is important that property owners be alert to unusual climatic changes that may cause freezing. They should be prepared to take preventive measures as if in a cold climate. The following preventive measures should be considered, prior to the cold season.

Wet pipe sprinkler systems

Freeze-ups in wet sprinkler systems occur most frequently in exposed and out-of-the way places and during weekends or other shut-down periods when a sudden cold snap catches a building unprepared. Most freeze-ups result from failure to provide adequate heat. Others are caused by doors, windows, cracks, loose siding or similar defects in building maintenance.

- During severe weather conditions, if an interruption of heating service extends more than a few hours, and the temperature in the building drops close to 5 degrees Celsius, you may need to drain the water from wet pipe sprinkler piping. If this is not done, ice plugs can obstruct the piping or possibly damage fittings and sprinklers. It would be advisable to become familiar with the operation of your system and drain procedures, prior to the onset of cold weather. It is likely that a contractor may not be able to respond quickly in an emergency. Should you need to do this, remember the protection afforded by the sprinkler system is no longer in effect. Any and all hazardous operations should be curtailed during this period. A continuous fire watch should be posted and provided with first aid fire fighting equipment and the means to summon assistance.
- Provide adequate heating capacity to prevent freezing during the most sever protracted cold that might reasonably be expected.
- Pay particular attention to attics, under floor spaces, entries, stair towers, shipping rooms and penthouses to ensure there are adequate heating ducts and air ow in these areas.
- Where false ceilings are installed under sprinklers or under piping with pendent heads, be sure that the concealed space receives sufficient heat.
- Search for isolated drafts or cold air leaks into little frequented areas or spaces where there are sprinkler pipes. Keep in mind the possibility of high winds during periods of low temperatures.
- Repair windows and doors when necessary and instruct watchmen to keep them tightly closed.
- Enclose pipes exposed outdoors in heated weather-tight boxing.
- Maintain extra heat during periods of extreme cold to keep the sprinkler piping from freezing.

- Check the heating system to make sure that it is delivering heat to all areas of the facility.
- Maintain a tight building envelope. Look particularly for places where cold winds can blow in, closing up even small openings and keeping all doors, especially large shipping doors, tightly closed at all times except when they must be opened.
- Check room temperatures frequently, especially if they get near 5 degrees Celsius.
- After a prolonged period of abnormally cold weather, make drain tests of sprinkler risers, wherever practicable, to determine if underground mains are frozen. Open the drain wide, let it run half a minute or more, and then shut it off. If the pressure fails to return to normal, clear the mains of ice as soon as possible.
- Do not use open flames or torches for thawing frozen water pipes near combustible materials or combustible building components.

Dry pipe systems

- Dry pipe systems are generally installed in structures where temperatures are expected to drop below 5 degrees Celsius. They are designed for use inside buildings that are unheated, inadequately heated, or that must be open to outside cold temperature for appreciable time periods. Dry pipe systems generally freeze due to water collecting in improperly pitched pipes, failure to remove accumulated water from low point drains, or failure to drain the system properly after the valve has tripped.
- Air is usually supplied to a dry pipe system by a compressor. The air intakes into the compressor should be located in a cold, dry atmosphere. Avoid warm, damp areas, since moisture introduced with the air condenses in the piping and collects at low points where it may freeze. Air driers should be installed on the air intake. An alternative is to use dry nitrogen gas in lieu of air.
- Valved drains should be installed at all low points that cannot be eliminated. These low point drain valves should be periodically opened (at least once a month) to see that the pipes are entirely free of water. Pay particular attention to low points under stairs or platforms.
- Repair, replace or refasten broken, missing or loose sprinkler pipe hangers to ensure proper pitch of sprinkler piping and to provide good drainage.
- Repair all air leaks in the system to prevent the valve from tripping should the compressor lose power.
- It is mandatory that water always be present in supply piping up to the clapper of the dry pipe valve. Compressed air fills the piping from the clapper on the outermost sprinkler head. Therefore, arrangements must be made to prevent the water in the supply piping to the dry pipe valve from freezing. The best arrangement is to provide a dry pipe valve enclosure, suitably heated to at least 5 degrees Celsius at all times.
- The water supply pipe should come up through the floor in the center of the enclosure if possible. If the floor is concrete laid directly on earth, without air space, the supply pipe will be adequately protected by ground cover until it emerges in the valve enclosure. But if the floor of the enclosure is wood or any other material having appreciable air space beneath it, then the supply pipe beneath the floor must be enclosed and protected with insulation, sand or earth over its entire exposed portion until it enters the valve enclosure.
- The valve enclosure can be heated electrically from permanently mounted heaters under thermostatic control, so that 5 degrees Celsius or higher is always maintained. Steam or hot water heating systems from boilers supplied on a 24-hour basis can also be used. A thermometer should be placed in the enclosure and checked at least once a day. The use of heat tape is now permitted.
- A temperature signaling device can be installed in the valve room or enclosure monitored by a central station alarm service.

Antifreeze systems

- These types of systems are generally used in small unheated areas of buildings, such as docks. The system uses an antifreeze solution generally consisting of water and water-soluble liquid, such as a glycerin or certain glycols.
- Antifreeze solutions are recommended only for systems not exceeding 40 gallons.
- The antifreeze solution should be tested annually by a qualify ed contractor to assure proper solution-to-water mixture.
- Listed plastic CPVC sprinkler pipe and fittings should be protected from freezing with glycerin only.

Gravity/suction tanks

Gravity/suction tanks require adequate heat to be maintained during cold weather to keep them from freezing. The formation of ice in the tank itself and on any part of the tank structure should not be allowed. The formation of heavy icicles through leaking of the tank is dangerous as tank collapse may ensue. People may also be endangered by falling icicles.

- Heating devices should be kept in good working order and the water temperature in the tank should be checked daily during freezing weather to maintain a temperature at or above 6 degrees Celsius.
- Service heating and circulation equipment well before the heating season arrives to permit adequate time for repairs or maintenance.

Fire pumps

- Keep pump rooms heated; maintain the room temperature above 6 degrees Celsius. Pay particular attention to detached buildings' housing pumps.
- For diesel engine drives, maintain the room temperature at manufacturer's recommended temperature.
- Protect the suction source from freezing. If suction is taken from open water, make sure that the pipe and intake are located so that they will at all times be completely below frost level underground and deep enough in the water to prevent them being obstructed by ice.
- Intake screens should be kept clear of obstruction by ice.

Call your local CNA Risk Control representative for assistance in implementing this program.

Dealing with a frozen sprinkler system

Should your best efforts fail and you discover your sprinkler system is frozen what immediate action should you take to limit the potential for further damage or an uncontrolled fire while the sprinkler system is impaired?

Limiting further damage

First, shut the control valve to the affected sprinkler system. Then open the two inch drain on the riser and any low point drains on the system. Use plastic tarps in the area of any actual pipe breakage to limit water damage to stock and supplies.

After water flow has been stopped, follow these steps:

1. Notify the public fire department and consult the Impairment Kit provided by CNA if your sprinkler system is out of service and requires repairs.
2. Do not attempt to thaw out piping in the building by using a torch or open flame device.
3. Cutting and welding or other operations employing an open flame should be prohibited in the area where the sprinkler system is out of service.
4. Hazardous operations such as spray painting, dipping or others using flammable liquids or producing a combustible dust should be suspended while the sprinklers are out of service.
5. A strict "No Smoking" policy should be enforced throughout the affected area.
6. Extra fire extinguishers should be distributed throughout the area.
7. If extensive repairs are required, efforts should be directed toward restoring as much protection as possible by plugging or blocking of the damaged section. For example, if a single branch line breaks, it is often possible to blank off that one line and return the rest of the system to service until permanent repairs are completed. Be sure to keep records of all plugs or blind flanges used so you can check they have all been removed when repairs have been completed.
8. Watch service should be provided on a 24-hour basis until repairs are completed and all valves have been reopened. In the event of a fire, the watchman should be instructed to first notify the public fire department and then reopen any closed valves.
9. If temporary heat is necessary, use only portable units listed by Underwriter's Laboratories or approved by Factory Mutual. Additionally, these units should have constant supervision.
10. Electrical resistance heating should not be directly attached to overhead piping. If it is used to thaw underground piping, it should only be used by well-trained personnel.
11. Before the sprinkler system is restored to service, examine the system for cracked fittings, split pipes or leaking sprinkler heads.

Finally, open all control valves and notify the local fire department and CNA Risk Control that the system is back in service.

To learn more about how CNA's Risk Control services can help you manage your risks and increase efficiencies, please contact your local CNA Risk Control, or visit www.cnacanada.ca.

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