Risk Management Considerations for Sprinkler Systems

Automatic fire sprinkler systems have been in use since the 1870's. They are considered the most effective method for fighting the spread of fire in its initial stages. Federal, Provincial and Municipal Codes will set requirements for the installation of automatic sprinkler systems in certain occupancies or in all buildings of a particular class.

Sprinkler systems can be described as a network of piping, water supply, sprinkler heads and alarms. The sprinkler head is a valve with a fusible link or glass bulb that is designed to activate at a particular temperature resulting in the flow of water from the activated head. There are numerous sprinkler head designs that control the distribution of water and the temperature at which it will activate. The exact number, type and location of sprinkler heads will vary according to the type/amount of material stored and the occupancy. All automatic sprinkler systems are regulated for their design, installation, testing and maintenance by the National Fire Protection Association Standards 13 and 25 (N.F.P.A. 13).

The most common sprinkler system is a "wet pipe system." In a wet pipe system, sprinkler heads are closed to prevent the flow of water. The water is under pressure in the piping network. A heat source melts the sprinkler head fusible link or heats the fluid in the glass bulb assembly causing water to flow.

A "dry pipe system" is used when there is a lack of an adequate heat source in the building that will not allow a wet system to be installed because of the possibility of damage due to frozen water in the pipes. Dry system pipes contain pressurized air or nitrogen gas. A heat source melts the sprinkler head fusible link or heats the fluid in the glass bulb assembly and opens the sprinkler head, decreasing the pressure in the pipes allowing the valve to open causing water to flow into the system which is distributed through the sprinkler heads.

Less common sprinkler systems are pre-action systems and deluge systems. These are used for special sprinkler protection and are activated by fire detection systems. These systems represent only a small percentage of those in operation.

It is important to note that not all sprinkler heads activate at the same time, only those that have reached their thermal sensitivity will activate.

Risk Considerations

1. Are all control valves in the open position?

Manufacturers must have an indicating feature on all control valves. Arrows, words, a directional paddle or symbols may be used to indicate the open and closed position outside screw and yoke (OS and Y) valves can be determined by the length of the post in respect to the handle

- as the handle rises the valve opens. Post indicating control valves use the words “open” or “closed” in a small window at the top of the post.

2. Is the system pressurized?

There should be two gauges within plain view of the sprinkler valve assembly. The lower gauge should indicate the water supply pressure provided from the available water supply and be installed prior the alarm or dry pipe valve. The upper most gauge should indicate the system water or air pressure. Note: Certain circumstances allow for sprinkler systems to have no operating water or air pressure, such as a deluge type of sprinkler system.

3. Is the system monitored?

Is the system electronically supervised and monitored by a central station or is it monitored by local alarms to an attended location within the facility? Electronic supervision could include a gate valve tamper switch, plug type supervision switch or a combined switch and valve assembly and flow and pressure switches. At a minimum, the control valves should be chained and padlocked in the open position, if no other system supervision is present.

4. Has the system been tested and maintained as per N.F.P.A. 25?

The sprinkler system should be checked annually by a certified sprinkler contractor or qualified representative who completes the inspection, required testing and evaluates the system for compliance and operation. Testing varies between each type of system. Tests will determine:

- If the system is in compliance with regulatory codes.
- If it is operational.
- If it will function as designed when activated.

Tests can include: flow, drain, trip and fire alarm system interface testing, if applicable.

5. Common inspection hazards

- Is the sprinkler system inspected and tested annually as per N.F.P.A. 25?
- Are all staff trained on how to use the sprinkler system?
- Is there a maintenance contract in place? If so, with whom?
- Were any deficiencies noted from the most recent inspection? If so, were they corrected? If not, why?
- Is a copy of the previous inspection report available?
- Are there inspection tags or certificates present at the sprinkler riser/fire alarm panel or inspection tags on the devices?
- Note the last inspection date. If is greater than a year, the system is due for inspection, testing and maintenance.
- Are the quarterly, monthly, weekly and daily requirements of N.F.P.A. 25 being completed? Refer to N.F.P.A. 25 for a detailed list of testing and inspection requirements.
- Is water discharged from the inspector’s test connection during annual inspection?
- Is the system being flushed as required, or at least annually?
- Has the internal condition of the piping ever been visibly checked for sediment or internal obstructions? This should be done every five years.
- Are the main drain tests being completed as required, or at least quarterly?
- If floor drains are used to accept the discharged water from main drain tests, does the floor drain have the capacity to take the full flow from the sprinkler system (generally not in older facilities)?
- Look for water flowing to the exterior of the building. This can cause damage to the exterior ground surfacing.
- Check the head box for the age of the sprinkler heads because they may be in need of testing and replacement.
- Have the sprinkler system gauges been tested or changed within the last five years? Write the replacement date on the back of the gauge.
- Are the sprinkler heads in good condition (free of paint and buildup)?
- Is the sprinkler piping in good condition and free of corrosion? If piping is exposed to the elements or a corrosive atmosphere, paint the pipes or use galvanized piping.
- Are the hangers present and in good condition?
- Is there a hydraulic data plate on the sprinkler riser or close by it that states the design specifications for the system as well as the flow pressure?
- Are there caps on the fire department connection? If not, they require replacing. Fire department

connections become a favorite place for people to stuff garbage and debris. This is where the fire department connects to pump additional water. Debris will cause an internal obstruction and impair the system.

- Does the sprinkler system have supervised devices? If so, are they tested quarterly?
- Is the system monitored?
- If an antifreeze type sprinkler system is installed, the antifreeze solution should be inspected annually.
- If a back-flow preventor is installed on the sprinkler system, is it inspected annually?
- Do you keep records and certificates of all inspection and service logs?

Common Sprinkler Design Hazards

Obstructions/Impairments/Deficiencies

- Are any sprinkler heads installed in excess of their design spacing?
- If a sprinkler system is installed in a light hazard occupancy, the sprinkler head could have maximum head spacing of 225 sq. ft. per head (15' x 15').
- Ordinary hazard spacing is 130 sq. ft. per head (10' X 13').
- Extra hazard and storage occupancies could have head spacing to maximum of 100 sq. ft. per head (10' x 10').
- Are any sprinkler heads installed greater than one half of the maximum sprinkler spacing from walls as noted above?
- Are there any obstructions to the sprinkler discharge pattern installed below the sprinklers that are greater than 4'? Examples include ductwork, mezzanines, pen grating, cable trays, and overhead roll up doors.
- Sprinklers shall not be installed closer than 4" to any wall or obstruction. Are any walls or fixtures installed directly adjacent to the sprinkler heads? Obstructions can include lights, signs, electrical or mechanical equipment.
- Are the sprinkler heads obstructed by stored material? There should be a minimum 18" clearance below each sprinkler head. Obstructions will diminish the operation of the head.
- Sprinklers should not be installed within 6' of each other unless baffles are installed between them.
- Are all sprinkler heads free of paint or other foreign materials?
- Are all sprinkler heads installed according to the separation requirements for sprinkler head temperature ratings?
- Is the fire department connection in place with all caps secured?
- Is there a fire hydrant located within 150' of the fire department connection?
- Are drains installed on the piping at all low points or trapped sections of piping?
- Are the sprinkler pipes used to support lighting or other objects?
- Are extra sprinkler heads and wrenches located at the control area for maintenance purposes?
- Are all control valves chained in an open position to avoid disabling of the system?
- Are all control valves in an accessible location?
- Are the sprinkler heads installed in the proper orientation for their location (pendent, upright)?
- Has the occupancy classification in the building changed since its installation so that the sprinkler system is now ineffective?
- Is the heat supply in the premises adequate for the operation of a wet pipe system (a minimum of 4 degrees Celsius must be maintained)?
- Is a dry type sprinkler system installed in the building? If so, is there a reliable air supply?
- If there is a dry pipe system, is the piping properly sloped and pitched as required by N.F.P.A. 13?

What kind of occupancy is the sprinkler system protecting?

- Is anything stored in the building?
- Are any flammable or combustible materials stored in the building? If so, what are they? A solid, liquid or gas?
- How large is the storage area?
- What is the height of the storage?
- How is the storage configured, on racks or a solid pile on floor?
- What type of sprinkler system is installed - wet, dry,

Does the building have a sprinkler system?

- Is the building 100% protected by a sprinkler system? If not, what percentage of the building has a sprinkler system?

- Are there any areas of the building that do not have sprinkler protection? If so, where?
- What type of sprinkler system is installed - wet, dry, pre-action, antifreeze/glycol?
- Are there multiple sprinkler systems or zones? If so, identify what type of system is installed where and what areas they protect.
- What is the complete operational area of the sprinkler system? For a light and ordinary hazard system, the maximum system protection size is 52,000 sq. ft. For extra hazard, the storage occupancy it is 40,000 sq. ft.

Sprinkler system description

- What is the piping configuration - tree, grid, loop, exposure or exterior?
- What is the pipe type - steel, galvanized or plastic?
- What type of sprinkler heads are installed?
- What is the protection area of the sprinkler heads?

The placement and number of sprinkler heads in a sprinkler system are determined by the use of the area to be protected. N.F.P.A.'s occupancy classification system regulates sprinkler design based upon the hazard group determined by the type of the material within the structure.

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