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CODE REVIEW

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Freeze protection of fire sprinkler systems

References:
NFPA 13 The Standard for the installation of Sprinkler Systems, 2002 Edition;
Section 8.15.3.1 - 8.15.3.1.3, pg 77
Section 8.15.2.3 – 8.15.2.3.4, pg 76
Section 8.15.2.5.3 – 8.15.2.5.3.4, pg 77

1. Section 8.15.3.1 of NFPA 13, The Standard for the Installation of Sprinkler Systems covers protection of piping against freezing.
   - 8.15.3.1.1 Unless the requirements of 8.15.3.1.2 are met, where portions of systems are subject to freezing and temperatures cannot reliably be maintained at or above 40ºF (4ºC), sprinkler shall be installed as a dry pipe or preaction system.
   - 8.15.3.1.2 Small unheated areas are permitted to be protected by antifreeze systems or by other systems specifically listed for this purpose.
   - 8.15.3.1.3* Where above ground water-filled supply pipes, risers, system risers, or feed mains pass through open areas, cold rooms, passageways, or other areas exposed to freezing temperatures, the pipe shall be protected against freezing by insulating coverings, frost proof casings, or other reliable means capable of maintaining a minimum temperature between 40ºF (4ºC) and 120ºF (48.9ºC).
   - *A.8.15.3.1.3 Branch lines have been intentionally left out of this paragraph as it is an unacceptable practice to heat trace and insulate branch lines.
2. All system piping that is routed through non-conditioned areas is subject to freezing whether it is a wet, dry or preaction system.
   - Wet system piping should not be run through unheated areas under any circumstance.
   - Dry and preaction system piping must be installed with an appropriate pitch towards the low point drain to allow adequate draining.
3. As stated by 8.15.3.1.2 Antifreeze systems are only approved for small areas. This is due to the mixing of the water with the antifreeze solution throughout the system.

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4. It is important to verify that the designer/installer has taken the proper precautions to appropriately insulate the piping. In some situations this may only be a layer of insulation tented over the exposed piping. In other situations it may require that the wet system be changed out for a dry or preaction system.
   - Several years ago a dry system was installed, inspected tested and put into service. Two years after the owner took control of the building he returned on a Monday after a long weekend to find the entire building flooded. There were two major factors to this incident:
     i) The dry pipe sprinkler system froze, due to standing water that remained after the pre-winter test, because of improper pitching of the pipe. There was no way for the water to drain.
     ii) The system was monitored; however the low pressure alarm was connected as a supervisory and there were no other water alarms on the system, the entire building was a dry system.
   - More recently a wet pipe system installed in an attic space and tented with insulation froze in several spots causing the system to be taken out of service for an extended period of time. The factors in this case were:
     i) Insulation was tented over the piping; however the piping was a considerable distance above the ceiling. This caused the insulation to tear under its own weight exposing the wet system to below freezing temperatures.
     ii) No inspections were done of the passive systems, except the original inspection, prior to freezing temperatures.
5. Systems that utilize freeze protection should be inspected prior to freezing temperatures each year. The freeze protection should also be inspected especially if it is a passive system such as tented insulation or pipe insulation.