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Color Loss in Glass Bulb Sprinklers

Cold environments can be challenging for any equipment and mechanical component. However, when there is concern about a sprinkler, life and property safety could be at risk. It has been noticed that glass bulb fire sprinklers could lose the color of the liquid inside the glass bulb when subjected to cold temperatures, such as those found in coolers and freezers. Typically, this scenario has been found on inspection of the fire sprinkler system during the normal procedures outlined in NFPA 25, *Standard for Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*.

The UL/FM/NFSA Standards Review Committee discussed this topic and conducted testing on glass bulbs. Glass bulb samples from multiple manufacturers were subjected to different levels of cold temperatures by both Underwriters Laboratories (UL) and FM Approvals. It was noted that a limited number of the samples with a temperature rating of 155°F (red) lost their color at low temperatures. However, these bulbs would change back to the red color upon warming to room temperature. The fading of color could also be seen in 175°F (green) colored bulbs, but they did not reach a clear liquid. Again, the color returned when exposed to warmer temperatures.

If the inspector cannot see color in a glass bulb sprinkler from the floor level and suspects that sprinkler is empty of liquid, is this a deficiency in the fire sprinkler system? Yes, by the letter of NFPA 25 when the inspector cannot verify that there is fluid in the bulb of the sprinkler it would be a deficiency. The initial reaction has been to replace the sprinkler(s). However, with knowledge that cold environments can impact the color of a glass bulb sprinkler, the scenario may warrant further investigation. It should be noted, as described above, that there may not be anything wrong with that sprinkler. The glass bulb sprinklers located in cold environments may still have their liquid and can operate as intended. If further investigation reveals that there is fluid and only color is lost, that sprinkler may remain in service. Should the investigation reveal a loss of fluid in the glass bulb element, the sprinkler would have to be replaced in accordance with Section 5.2.1.1.2(4) in the 2014 Edition of NFPA 25.

As there is concern that a floor inspection, as required by NFPA 25, would not differentiate between glass bulb sprinklers that are empty versus those that are faded, the UL/FM/NFSA Standard Review Committee suggested language to make inspectors aware. During the NFPA 25 First Draft meeting, the following first revision language has been included in the annex under Section A.5.2.1.1.1:

"....Glass bulbs in sprinklers exposed to sunlight or installed in cold environments such as walk-in coolers and freezers may lose their temperature classification color due to the environment. This loss of color should not be confused with loss of fluid in the glass bulb. Tests have shown that this loss of color in the bulb does not affect the operation or any other performance characteristics of the sprinkler and these sprinklers may be allowed to remain in service. The tests also showed when sprinklers installed in cold environments were subjected to temperatures above 60F, the fluid color returned...."

In conclusion, the color in glass bulb sprinklers is a simple way to confirm that fluid is in the bulb. Should the color be absent, additional review of sprinklers in cold environments might show the fluid is still present. Where this is the condition, the sprinkler should be expected to operate as intended.