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Fire Sprinkler Failures

by Albert L. de Richemond, P.E.

Fire sprinkler systems are life and property-saving devices that have proved their worth for more than a century. In modern systems, a small glass cylinder or bulb filled with a liquid is the activating mechanism for the sprinkler head. Heat from a fire causes the liquid to expand and breaks the bulb. The breaking of the bulb releases the sprinkler head stopper and water is released to douse or limit the fire.

Consulting Engineers & Scientists, Inc. (CESI) has investigated many fire sprinkler failures (activating without a fire) that have caused large property losses through water damage. Most failures resulted from freezing, overheating, or corrosion.

Freezing typically occurs when a section of pipe is routed through an unheated space or the building is left unheated. Lights focused on, or too close to, the sprinkler head can also cause overheating. Direct heating from a hot air duct can also cause the bulb to fail and release water. Occasionally a low temperature bulb in the sprinkler head is installed in a space that is too close to stoves, ovens, or other heat producing devices and the heat causes the bulb to break and release water. Corrosion of the sprinkler head, or sprinkler piping, can occur from many different causes and often starts with small leaks, which if left unattended can result in the sprinkler head leaking or opening completely. Corroded pipes may leak, fracture or cause the system not to function when needed.

In one case, a sprinkler system with a deluge system was inadvertently activated and the entire building was flooded. Unlike most sprinkler heads, deluge sprinkler heads are designed to always be open so once the system is activated, huge quantities of water can be released.

CESI determined that the cause of the activated deluge system was an improperly installed electrical box, not shown on the building's drawings. The electrical box had been installed without a box cover leaving the wiring exposed. During the renovation of the facility lights, the wire nut was removed leaving the wiring exposed. The exposed and live wire, which was part of the control system for the sprinkler system, arced to the ground and activated the sprinkler deluge system flooding the building.

For CESI to determine how a sprinkler system failed, we need to examine thoroughly:

- the building and its contents
- the location of the failed sprinkler head relative to its surroundings
- the controls of the sprinkler system
- the failed sprinkler head itself and any recovered parts of the failed sprinkler head
- the piping (if involved).

As a lawyer or investigator, you can help us help you by getting us involved early in the case before evidence is altered or disappears and the conditions change. We will need access to the failure site and we may need architectural or construction plans of the building and/or the sprinkler system. We may also need to obtain samples of the sprinkler heads, pipe, or the system's water.

The sooner we examine the failure, the faster and easier it could be to solve the puzzle. Like Yogi Berra said, *"Ya can see a lot by lookin'."* We know how to fit the pieces of the puzzle together to present a picture of what actually happened.

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