

**Technical
Training
Series****Fire sprinkler systems**

In 1874, Henry S. Parmelee patented the first closed sprinkler head. His efforts were driven by the increased insurance premiums that resulted from the Great Fires in Chicago (1871) and Boston (1872). Frederick Grinnell, president of Providence Steam and Gas, purchased the manufacturing rights from Parmelee and patented his own upgraded sprinkler head designs.

In 1878, the Factory Mutual Insurance Companies formed an Inspection Group that researched new methods of fire prevention. This team was joined by John Freeman, an MIT educated Engineer with a background in hydraulics, who conducted the first extensive tests on the various sprinkler systems at the time. By 1901, his research efforts led to the installation of sprinkler systems in most Factory Mutual properties. Factory Mutual's research efforts continue and include the present day 1,600 acre research campus in West Glocester, RI.

Sprinkler technology has advanced significantly; however, there are four basic types of systems:

- **Wet Systems** – are the most common and generally most simple systems. They are mostly installed in conditioned spaces or areas that are not subject to freezing. Loops within wet systems that may be subject to freezing are filled with antifreeze solutions. Antifreeze solutions are ethylene glycol, propylene glycol, or glycerin.
 - Ethylene glycol (automotive antifreeze) is toxic and these systems must have a check valve to prevent backflow into the water supply. Ethylene glycol systems are required to be checked annually.
 - Plastic pipe systems can only be filled with glycerin due to the incompatibility between glycols and plastics.
- **Dry Systems** – are typically installed in unconditioned or outside spaces. Dry system pipes are filled with compressed air, which holds back the water flow. When a head is activated, the air pressure is reduced and water flows to that head. Dry systems are generally more complex and have more limitations than wet systems.
 - The increased complexity and additional equipment increases the cost of dry systems
- **Deluge systems** – are similar to wet and dry systems. In a deluge system the valves are removed from the heads and the pipes are dry. Upon activation, water fills the system and pours through all heads simultaneously.
- **Pre-Action systems** – are complex systems requiring at least two activation triggers. They are generally installed in places where accidental discharge would be catastrophic, such as museums and libraries. Pre-action systems are normally dry and water is held back by a pre-action valve. After sensing a fire, the pre-action valve is opened electronically, filling the system with water. After it is filled with water, the system is similar to a wet system, requiring the individual head to be activated.

Typical fire sprinkler installation cost is approximately \$1.50/sf - \$2.00/sf when installed as part of new construction. Existing structures can be retrofit for approximately \$2.50/sf - \$3.50/sf. More complicated pre-action systems might cost as much as \$10/sf. The 2009 version of the International Residential Code (IRC) requires that sprinklers be installed in new single and two family homes. However, for states adopting the 2009 IRC, that rule will not become effective until January 1, 2011.