



RE-Konnect

Risk Engineering Bulletin

March 2019 Vol. 3 | Issue 1

In Focus

Fire Sprinklers



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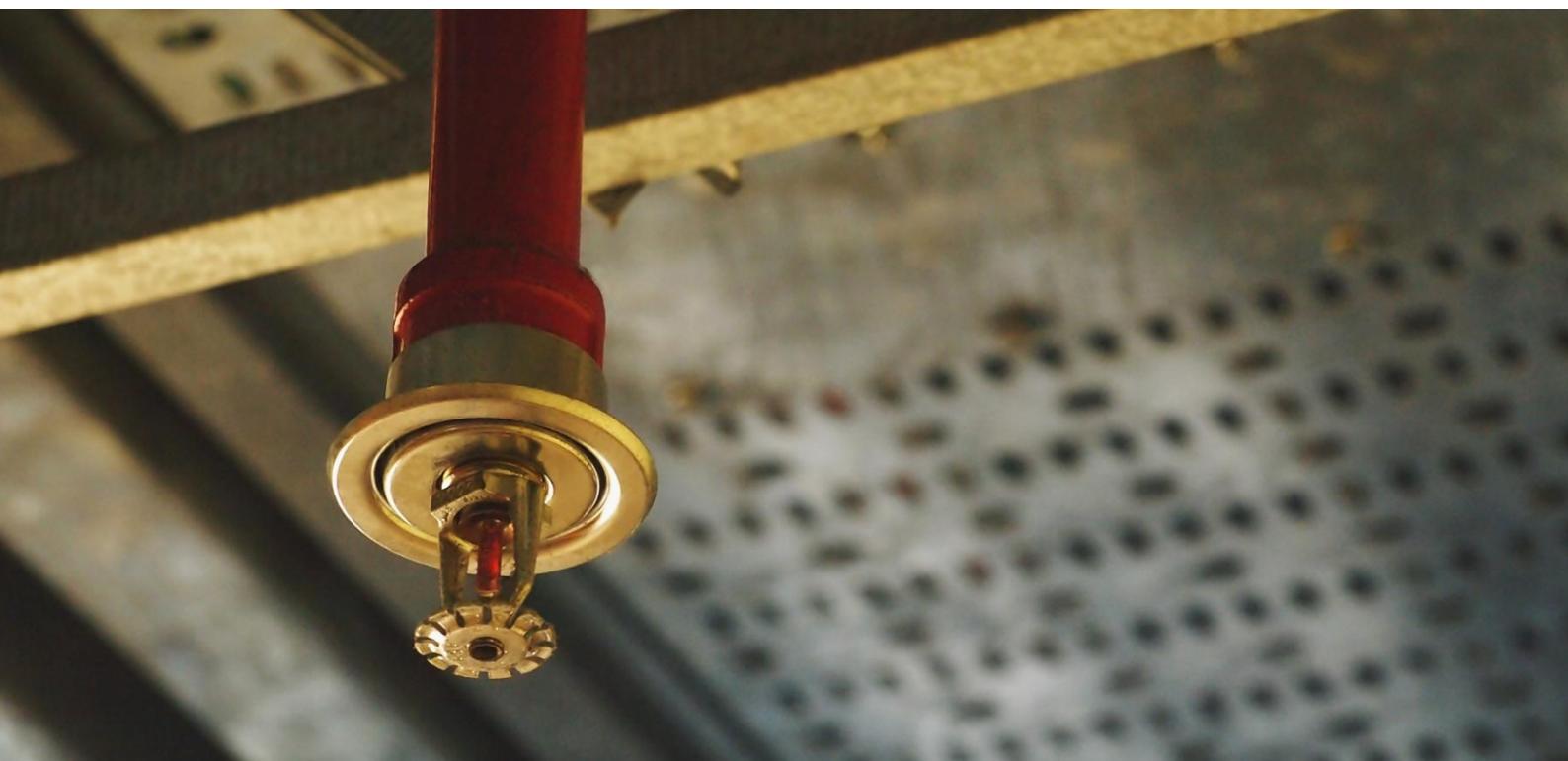
Preface

In June 2007, two strikingly similar fire incidences in two isolated furniture stores located in United States had extraordinarily different outcomes. While one led to multiple causalities and several millions of dollars in damages, completely gutting the store, another only caused a minor damage of few thousand dollars with no fatalities or injuries. The only major difference between the two stores was the provision of Fire Sprinklers. This highlighted a great success story of fire sprinklers and one that stood out in our research. Fire sprinklers are efficient, effective and in many cases indispensable to protecting lives and property.

There have been several incidences in past and recent times where the damage could have been limited to a fraction of the suffered losses. In our attempt to highlight this simple yet efficacious fire protection system, we present you a brief overview on fire sprinklers and related aspects.

Did You Know?

- Henry S. Parmalee of New Haven, Connecticut is considered the inventor of the first practical automatic sprinkler head in 1874 to protect his Piano Factory.
- 90% of all fires are controlled with six or less sprinkler heads and a study conducted during 80 years of automatic sprinkler use found that 82% of the fires that have occurred were controlled by two or less sprinkler heads.
- Sprinklers reduce injuries by at least 80%, reduce property damage by 90% and substantially reduce damage to the environment from fire.
- Sprinkler heads use less water than Fire Brigades hoses. A sprinkler system attacks the fire immediately; typically the only Fire Brigade action will be to turn off the sprinkler system.
- It costs about as much to install fire sprinklers in a building as it would to install carpeting.
- Your chances of experiencing a serious fire in your lifetime are about one in five.



Disasters

Charleston Sofa Super Store Fire

On the evening of June 18, 2007, in Charleston, USA, a massive fire broke-out which completely gutted the facility and killed nine fire-fighters. This was among the deadliest disasters in the United States.

The fire started at approximately 7:00 pm in a covered loading dock area built between the showroom and warehouse building which was attached to both buildings. The fire was believed to have started from discarded furniture possibly due to a discarded cigarette. At the time, the business was open and employees were present. The building had no fire sprinkler system. Charleston firefighters arrived on the scene within three minutes of the alarm.



Despite efforts to confine and extinguish the fire, it continued to spread into the structure and ignited furniture in the showroom, growing more quickly than the few operating hose lines could control. Meanwhile, efforts to stretch and begin operating additional hose lines continued. At 7:41 pm the showroom area of the store experienced a flashover while at least sixteen firefighters were working inside. The flashover contributed to the rapid deterioration of the structural integrity of the building, leading to a near-complete collapse of the roof minutes later.

Similar Fire, Different Outcome

On June 27, 2007, a similar fire occurred at Modernage Furniture located in Ormond Beach, Florida. On arrival, fire-fighters found a small fire within the showroom being held in check with the building's automatic fire sprinkler system. The fire was caused by discarded smoking material according to the state fire marshal investigator. The damage was limited to a small area of approximately 10x10 resulting in approximately \$8,000 dollars in damage. Three sprinkler heads activated. There were no fatalities, no injuries, and a very small amount of property damage.

Before and After

Sofa Super Store Fire



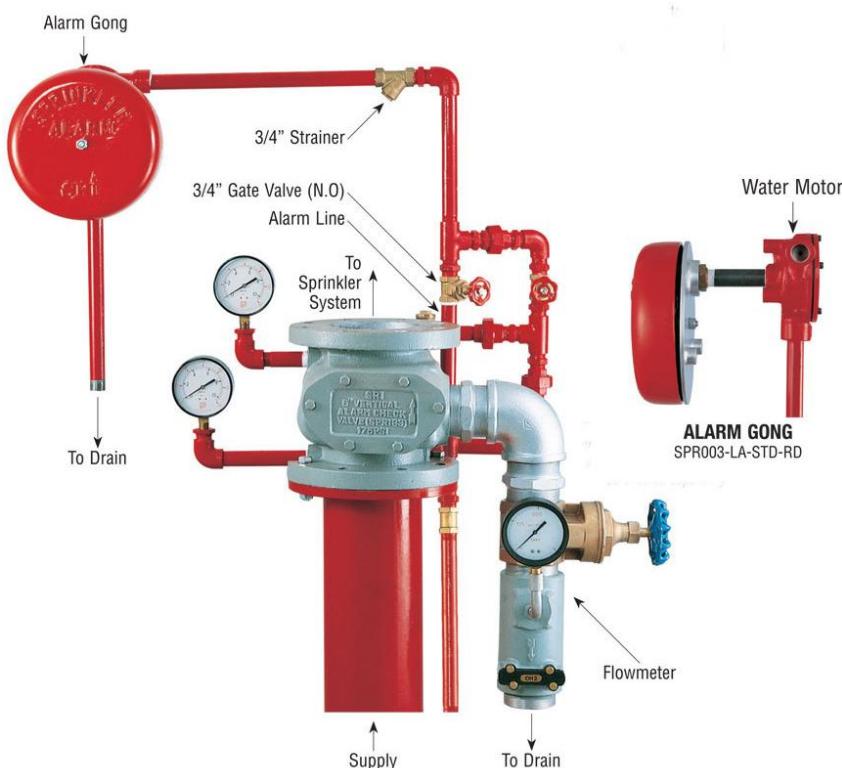
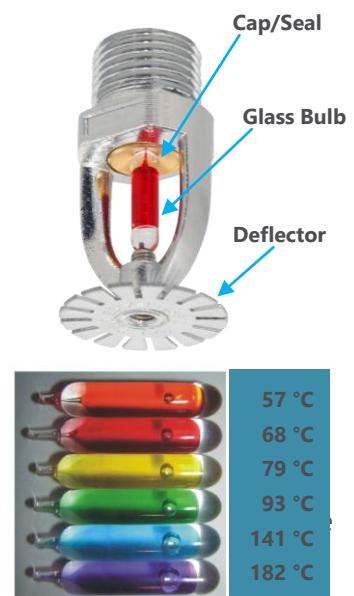
Sprinkler System: Components

Automatic fire sprinkler systems are the most effective method for controlling the spread of fires in commercial buildings. With their proven track records, local fire brigades and insurance companies require their installation because they may save lives and limit damage to properties. NFPA 13 is the standard for the installation of sprinkler systems, and NFPA 25 is the standard for the inspection, testing and maintenance of water-based fire protection systems.

Sprinkler Heads

The fire sprinkler heads are one of the only parts of the fire sprinkler system that you see on a daily basis. Fire sprinkler heads are not much more than valves that open in response to high temperatures. As per requirement designers can choose the type of glass bulb required. Each closed-head sprinkler is held closed by either a heat-sensitive glass bulb or a two-part metal link held together with fusible alloy.

The glass bulb or link applies pressure to a pipe cap which acts as a plug which prevents water from flowing until the ambient temperature around the sprinkler reaches the design activation temperature of the individual sprinkler head. In a standard wet-pipe sprinkler system, each sprinkler activates independently when predetermined heat level is reached.



Alarm Valve

When a sprinkler system is activated, the alarm valve is triggered. This valve controls the water flow into the sprinkler itself. It is a one-way valve, only meant to transport water to the sprinkler. It remains closed when the sprinkler heads are closed, but opens up once the heads are opened.

Fire Pumps

A fire pump is a part of a fire sprinkler system's water supply and powered by electric, diesel or steam. The pump intake is either connected to the public underground water supply piping, or a static water source (e.g., tank, reservoir, lake). The pump provides

water flow at a higher pressure to the sprinkler system risers and hose standpipes. A jockey pump is a small pump connected to a fire sprinkler system to maintain pressure in the sprinkler pipes.

Sprinkler System Types

Wet Pipe Systems

In this system, water is always present in the pipes supplying the sprinkler heads. Hence, these types of sprinkler system are quick to react upon the operation of a sprinkler head in a fire scenario. These are the most common systems and are used in buildings where there is no risk of freezing.

Dry Pipe Systems

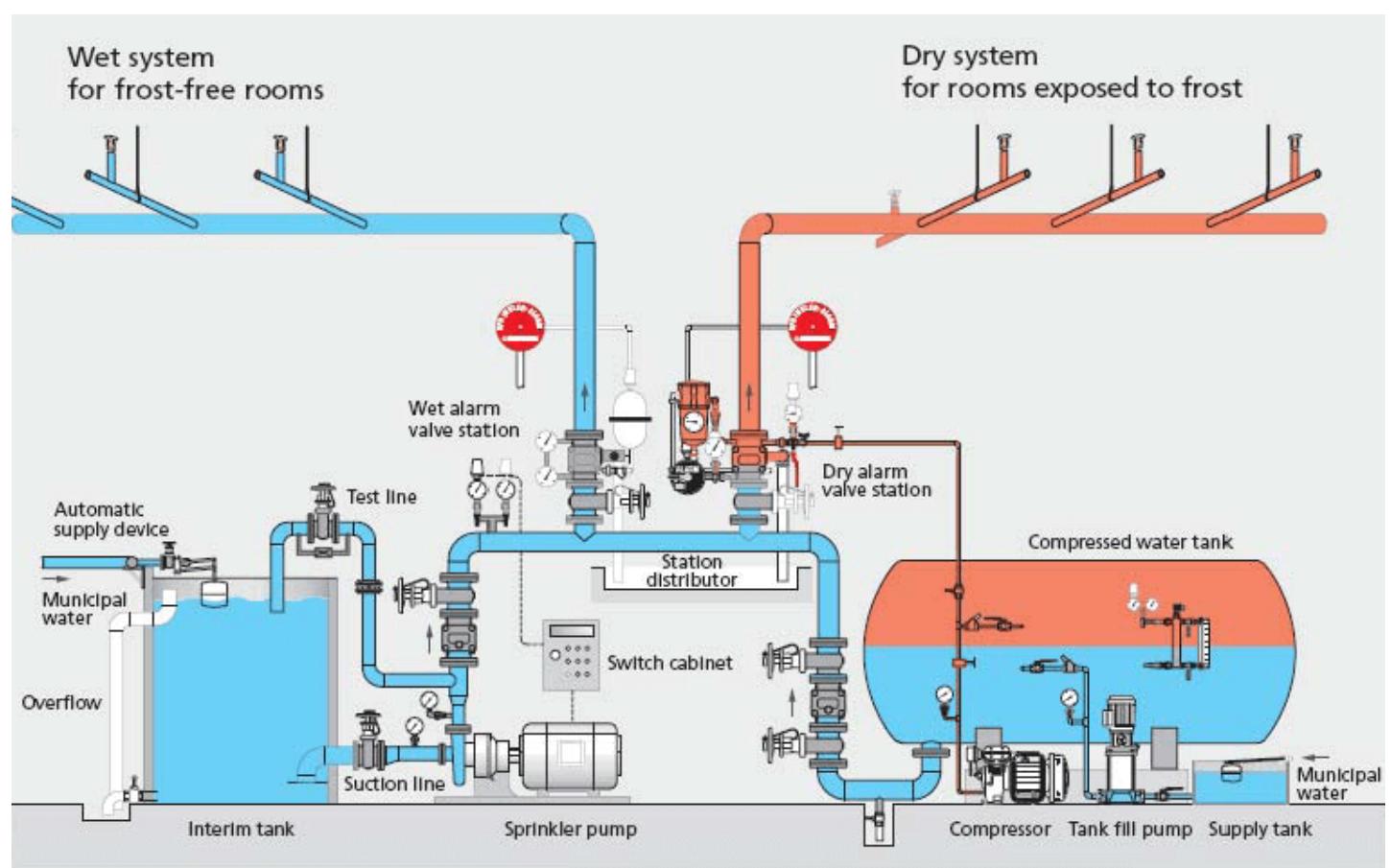
Normally installed in places where colder temperatures can be a factor and potentially freeze pipes that feed the fire sprinkler heads. The pipes are filled with air under pressure at all times and the water is held back by the control valve outside of the protected area. When a sprinkler head opens in a fire scenario, the drop in air pressure opens the supply valve. There are usually many parts in a dry pipe system which means higher installation and upkeep costs.

Pre-action Systems

Like dry pipe systems the pipes are filled with air but water is only let into the pipes when the detector operates (e.g. smoke detectors). Pre-action systems are used where it is not acceptable to have a sprinkler activate unless there is a real threat of fire, i.e. for high value stock or irreplaceable items.

Deluge Systems

These sprinkler systems are used in special cases such as industrial risks. They are most commonly used for protecting tank farms where all the sprinkler heads/nozzles operate simultaneously. Foam is often introduced in to the system. All sprinkler heads are open on the fire sprinkler system, and trigger a deluge of water, normally activated by heat detectors, smoke detectors or smoke alarms.



Common Myths

- The system can go off accidentally and cause water damage**

Fire sprinkler systems are almost impossible to set off accidentally, and only about one in sixteen million fire sprinkler systems are sold with manufacturing defects.

- A fire in a single room will set off the whole system**

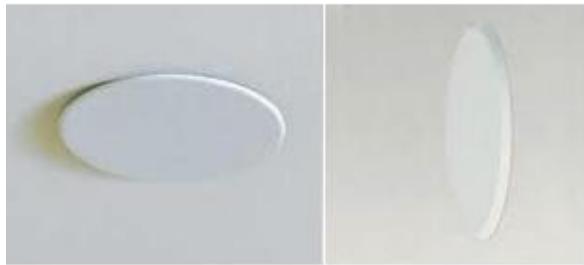
Fire sprinkler systems are designed so that each head operates individually. Most fires can be controlled with only one or two sprinkler heads.

- Fire sprinkler systems are too expensive**

Fire sprinkler systems typically cost about as much as it would to install new carpeting.

- Sprinkler heads won't look good on my ceiling**

Many residential fire sprinkler systems are designed to be undetectable-unless there's a fire.



Ceiling Mounted

Sidewall Mounted



When concealed sprinkler heads are exposed to heat from a fire, the cover plate, which is normally soldered to the support cup at three points, drops down to expose the sprinkler assembly.

Maintenance & Inspection

The sprinkler system is a working mass of piping and sensory parts that will need to be properly maintained for it to work effectively in case of actuation.

- A full sprinkler system inspection should be performed at least annually by a sprinkler system professional. Main drain test should be done quarterly.
- Ensure that the sprinkler system is well designed to provide adequate coverage to the occupancy.
- Perform a system adequacy check after an expansion of a facility or increase in the fire load.
- Perform periodic operational tests in line with NFPA 25 to ensure system responds as designed.
- Never hang anything from any part of a sprinkler system or stack items close to fire sprinklers.
- Always make sure control valves are in the open position.



Guidelines

Following codes and standards can be referred for further reading:

- **National Building Code of India, 7.22:** Guidelines for Installation of Automatic Sprinklers
- **NFPA 13:** Standard for Installation of Sprinkler Systems
- **NFPA 25:** Inspection, Testing, and Maintenance of Water-based Fire Protection Systems
- **FM Global Datasheet 2-0:** Installation Guidelines for Automatic Sprinklers
- **FM Global Datasheet 2-5:** Installation Guidelines for Automatic Sprinklers in Residential Occupancies

Engage

Answer the following question and win Amazon coupons worth Rs 500 each. Send the answers to editor.bulletin@tataaig.com. Five winners for this quiz will be announced in the next issue.

Q1. Preferred sprinkler system for places such as museums, where rare works and high value items are located, is:-

- | | |
|--------------------|----------------------|
| a) Wet Pipe System | b) Dry pipe system |
| c) Deluge system | d) Pre action system |

Q2. Drain test should be performed once in a:-

- | | |
|--------------|------------|
| a) Month | b) Quarter |
| c) Half year | d) Year |

Q3. NFPA Standard for installation of Sprinkler Systems is:-

- | | |
|------------|------------|
| a) NFPA 25 | b) NFPA 72 |
| b) NFPA 13 | d) NFPA 70 |

Winners of the previous issue are as follows:

- **K.S. Ramprasad** – Marsh India, Chennai
- **Anup Sharma** – JSW Steel Ltd, Mumbai
- **Kumar Ashish** – GIC Re, Mumbai
- **Tapas Nandi** – J B Boda, Mumbai
- **Arpit Kataria** – Shree Cement, Mumbai

Answers to previous questions: 1. Greater than 50% 2. All of the Above 3. 35,000 °F



Editor**Kushlesh Kumar**

Risk Engineering, Energy

kushlesh1.kumar@tataaig.com OR

editor.bulletin@tataaig.com

Contributed by**Chetan Rathore**

Risk Engineering, Property

chetan.rathore@tataaig.com

*Fire sprinkler in action at a chemical facility*

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<https://www.tataaig.com/PropertyEnergyLossPrevention>

Tata-AIG General Insurance Company Limited

Peninsula Business Park, Tower A, 15th Floor

G. K. Marg, Lower Parel, Mumbai 400013

www.tataaig.com

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