

NOT ALL SPRINKLER SYSTEMS ARE CREATED EQUAL

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Sprinkler system design adequacy is an important concept to understand and quantify. Contrary to popular belief, an adequately installed but under designed sprinkler system can lead to a near total loss in event of fire; therefore, **not all sprinkler systems are created equal.**

The concept of automatic fire sprinkler systems dates back to the 1800's where a heat operated system was developed that distributed water through perforated pipes to control a fire. In an effort to standardize systems, a group of insurance companies joined together to form the National Fire Protection Association (NFPA) in 1896. The principle standard for the design and installation of sprinkler systems is NFPA 13, Standard for the Installation of Sprinkler Systems, which is also used by Allianz Global Corporate & Specialty (AGCS).

TYPES OF FIRE SPRINKLER SYSTEMS

There are four basic types of fire sprinkler systems used in commercial and industrial applications:

Wet Pipe System – automatic sprinklers connected to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers opened by heat from a fire. These are the most common, least expensive type of systems to install and maintain and can be found in a wide variety of commercial and industrial properties where adequate heat is provided. This type of system is the preferred, most reliable option.

Dry Pipe System – automatic sprinklers connected to a piping system containing air or nitrogen under pressure. Upon heat from a fire, one or more sprinkler heads will 'open', which allows air to escape from the piping system, dropping system air pressure. Once the air pressure drops to a certain level, a sprinkler valve (known as the 'dry pipe valve') will 'trip', allowing water to enter the system from the sprinkler system water supply source and out of the opened sprinkler heads.



Typical Dry Pipe Sprinkler System and Component Parts

Preaction Systems – A sprinkler system employing automatic sprinklers that are attached to a piping system that contains air that might or might not be under pressure, with a supplemental detection system installed in the same areas as the sprinklers. When the detection system (commonly smoke detectors) senses fire/smoke, it will allow the sprinkler system preaction valve to operate, filling the sprinkler system with water. Thus, it usually takes both smoke and heat from any fire to trigger sprinkler operation. These systems are found in computer rooms, art galleries, freezers, and similar occupancies where accidental water damage could lead to a significant loss. Preaction systems are similar to dry pipe systems, but even more complex due to the need for a detection system.

Deluge Systems – A sprinkler system employing open sprinklers that are attached to a piping system that is connected to a water supply through a valve that is opened by the operation of a detection system installed in the same areas as the sprinklers. When this valve opens, water flows into the piping system and discharges from all sprinklers attached thereto. These systems are often found in chemical plants and aircraft hangers where fires can rapidly develop.

DESIGN EVOLUTION

Since its inception and up through the 1960's, fire sprinkler system design consisted of pipe schedule systems, which specifies the number of sprinklers that can be supplied by a given pipe size based on the building occupancy classification – light hazard, ordinary hazard or extra hazard. For example, an office building is classified as light hazard, a machine shop as ordinary hazard and an auto body repair shop would be extra hazard. Although this design approach is now rarely used in new installations, there are many buildings with pipe schedule designed systems in service, typically found in buildings built before the 1970's.

Since the early 1970's the design approach moved from pipe schedule systems to hydraulically engineered, or "calculated" sprinkler system design. This approach applies fundamental laws of hydraulics with computer based software to establish actual flow rates per unit area based on the anticipated fire loads in the building.

Current sprinkler technology, depending on the type of sprinkler, can control (or suppress) a fire to a certain size area (square footage) until the fire department arrives to extinguish the fire with hose streams.



Typical Sprinkler

IS THE DESIGN ADEQUATE?

Ultimately it is important to know that a sprinkler system design is adequate for the occupancy to offer maximum credit from an underwriting perspective to our clients. During a loss control survey, a qualified property risk consultant will typically compare the available sprinkler system design to the design required by NFPA 13 ('the code') to determine adequacy. The following are examples of situations where sprinkler design might be compromised or inadequate:

- **Under designed system** – for example, an ordinary hazard sprinkler design in a high rack storage warehouse.
- **Significant change in occupancy or commodity** – for example, an office building that has been converted to a manufacturing facility. Another very common example is a sprinkler system designed to protect one commodity (such as paper), but the warehouse is now storing a higher hazard commodity (such as plastics, which burn with greater intensity than paper).
- **Under designed or impaired water supply** – water and pressure will not be delivered to the operating sprinklers as originally designed.
- **Poor maintenance and testing** – for example, old sprinklers, internal pipe corrosion and blockage, or off site alarm signals not received.
- **Inadequate clearance or obstructions to sprinklers** – critical for high rack storage warehouses and those with Early Suppression Fast Response (ESFR) sprinkler systems.

WHAT IF THE DESIGN IS “INADEQUATE”?

If the design is ‘inadequate’ for the occupancy, the sprinkler system should generally be considered unreliable to provide adequate protection in the event of a fire, which will often result in far greater damage to the building and contents than if the system was properly designed.

Properly designed sprinkler systems will often limit direct fire damage to less than 2,500 square feet. Inadequately designed systems often result in a much more sizeable or even a total loss.

Allianz Risk Consulting can provide a field survey of the premises to fully evaluate sprinkler protection and water supply to verify adequacy of the design based on the occupancy.



The result of a warehouse with an inadequately designed sprinkler system