

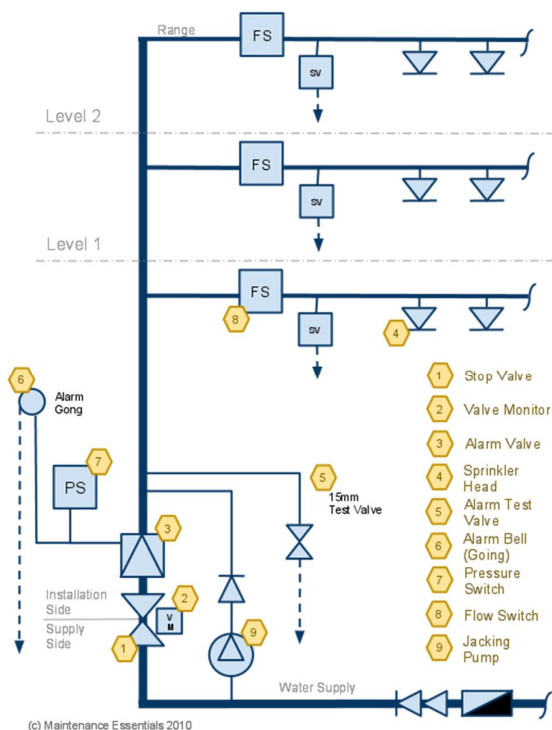
# Automatic Fire Sprinkler Systems - Principal of Operation

## Components of an automatic fire sprinkler system

Typically, a Fire Sprinkler Systems are made up from a series of components including; Stop Valve, Alarm Valve, Fire Sprinkler (head), Alarm Test Valve and Motorized Alarm Bell (Gong). In addition to this there are additional components that support this arrangement including a Valve Monitor, Pressure Switch and Flow Switch.

The illustration to the right shows each of these components, and the approximate location within the arrangement.

This illustration shows only one type of fire sprinkler system however there are other types including *dry pipe*, *pre-action*, *tail-end*, *residential and domestic fire sprinkler systems*.



## Purpose of each main component

(1) **Stop Valve** - The Stop Valve is used to isolate the water supply, it may also be called the isolating valve. It is often painted RED in colour with a large black circular handle, and is locked in the OPEN position, allowing the free flow of water. The stop valve is used to isolate (stop) the water supply coming in to the fire sprinkler system. Often the *Stop Valve* is also fitted with a (2) **Valve Monitor** that is used to monitor the state (open or closed) of the *Stop Valve*.

The water within an automatic fire sprinkler system can be divided into two parts;

- Water Supply or Mains; and  
This is the water being fed into an automatic fire sprinkler system from a water supply such as the town mains or a static water supply such as a tank, up to the *Stop Valve*
- Installation  
The water after the stop valve forms part of the installation.

(3) **Alarm Valve** - The Alarm Valve is used to control the flow of water into the fire sprinkler system. This is accomplished by providing a one way valve that is normally closed when the water pressure on the fire sprinkler side of the valve exceeds the water supply pressure. When the pressure equalizes or falls below the water supply pressure, the valve opens to enable water flow.

(4) **Automatic Fire Sprinkler** - The Fire Sprinkler is also used to control the flow of water. It is essentially a valve that when exposed for a sufficient time to a temperature at or above the temperature rating of the heat sensitive element (glass bulb or fusible link) releases, allowing water to flow from only the affected sprinkler. The operation and subsequent water flow of an automatic fire sprinkler will lead to a drop in pressure within the fire sprinkler system after the alarm valve.

(5) **Alarm Test Valve** - The alarm test valve is a small valve, normally secured in the closed position. The alarm test valve is fitted between the sprinkler system side of the alarm valve and the drain. The purpose of the alarm valve is when opened to simulate the flow of water from a single automatic fire sprinkler.

(6) **Motorized Alarm Bell or Gong** - The motorized alarm bell or gong is a mechanical device, operated by the flow of water oscillating a hammer that strikes a gong, causing an audible alarm signal.

## Ancillary Components

In addition to the main components of the fire sprinkler system, there are a series of ancillary (support) components that regularly form part of an automatic fire sprinkler system.

(7) **Pressure Switch** - The pressure switch is an electro-mechanical device that monitors a fire sprinkler system for a fall in water pressure after the *alarm valve*. The purpose of monitoring a fall in pressure is to activate a switch that is monitored by a fire alarm panel or alarm signaling equipment, as the *primary* method for signaling an alarm to the fire brigade.

(8) **Flow Switch** - The flow switch is an electro-mechanical device that monitors the flow of water through a *section* of pipe within an automatic fire sprinkler system. Flow switches are often fitted with a mechanical delay (up to six minutes) preventing small or minor water flow fluctuations from signaling an alarm. When sustained water flow is detected by a flow switch, a signal is transmitted to a fire indicator panel. This signal is then used to determine which section (floor) of a fire sprinkler system has water flow. *Note: Most flow switches fitted to automatic fire sprinkler systems are NOT set to automatically call the fire brigade*

(9) **Jacking Pump** - Jacking are manual (hand) or electric (semi-automatic or fully automatic) pumps are not always fitted to an automatic fire sprinkler system. They however provide a method of pumping (boosting) water from the water supply to the fire sprinkler system after the alarm valve. This leads to an increase in water pressure in the fire sprinkler system, thus forcing the alarm valve into the closed position. Jacking Pumps have a secondary function of maintaining the water pressure within a fire sprinkler system reducing the likelihood of false alarms caused by low pressure, caused by small water leaks.

**Pressure Gauge** - A pressure gauge is a mechanical device that is usually fitted to an automatic fire sprinkler system. There are usually two gauges fitted to a system, one showing the water supply pressure and the second showing the installation pressure. Normally the pressure differential should be not less than 200 KPa.

## Principal of operation

Normally an wet pipe automatic fire sprinkler system, is fully charged with water coming from a known reliable water supply. The installation is pressurized with the alarm valve secured in the open position. When a fire sprinkler is exposed for a sufficient time to a temperature at or above the temperature rating of the heat sensitive element (glass bulb or fusible link) it releases, allowing water to flow from only the affected sprinkler. Additional fire sprinklers may also operate if they too are exposed to sufficient heat.

When this occurs water from the water supply will pass through the alarm valve to the affected fire sprinkler and also past the alarm bell. The resultant pressure drop will also activate the alarm pressure switch, which in turn will activate an alarm calling the fire brigade.

A flow switch will also operate in the affected section of the fire sprinkler system, indicating the location of the water flow. (In the case of a multi-storey building there is typically one flow switch per floor). The flow switch will indicate its location a fire indicator panel (but may not call the fire brigade).

The water supply may be isolated (stopping the flow of water to the affected fire sprinklers) by closing the stop valve.