

# Advisory Note

A Service to A.G. Coombs Group Clients.

## How effective is your Fire Sprinkler System

The principle on which fire sprinklers operate is a simple one and has been the same since they were invented in 1806, the automatic discharge of water on a fire. It is still the most practical and effective method to control fire in a building. This advisory note explains the principles behind automatic fire sprinkler systems, common reasons for system failure and a key test for older systems that is often overlooked.

An Automatic Fire Sprinkler System, that is correctly installed and maintained, is a highly effective safeguard against loss of life and property damage by fire. In most instances it can detect and control fire before hazardous heat, smoke and gas conditions are created.

Fire Protection Association (FPA) have published the following data.

### Effectiveness of a fire sprinkler system:

- + In fully sprinkler protected premises, automatic sprinklers can be expected to control fires in over 95% of cases.
- + In over 90% of cases the fire can be expected to be controlled within the system's design area of operation.
- + In over 50% of cases fire can be expected to be controlled within an area of 24m<sup>2</sup> to 42m<sup>2</sup>.

### Reliability of a well maintained and regularly inspected fire sprinkler system is considered upward of 95%

#### Common reasons for fire sprinkler failures are:

- + **Isolated:** Due to leaks in the system, or to avoid vandalism causing accidental discharge and flooding of the facility.
- + **Inadequate maintenance in occupied and unoccupied facilities:** Failure to perform regular inspections and testing can lead to failures in system. Over time, components can become damaged, corroded, or obstructed, reducing their effectiveness.
- + **Corrosion:** Corrosion is a common issue in fire sprinkler systems, particularly if the pipes are made of black steel. Corrosion can lead to leaks, blockages, or weakened pipe integrity, causing the system to fail. Non-invasive simple to implement pipe thickness testing regimes are recommended in older systems to identify this issue before failure.
- + **Obstructions:** Obstructions to sprinkler heads, such as protective caps, tape and painted heads during a fitout can prevent the sprinklers from discharging water properly or inhibit their activation during a fire. Regular inspections and audits can help avoid this issue.
- + **Incorrect design or installation:** If the fire sprinkler system is not designed or installed correctly, it may not adequately cover the intended area or deliver the required water flow and pressure. For example, incorrect hazard classification was applied to the design, this can result in ineffective fire suppression in the event of a fire. This can also be caused by building churn or change of use. Particular attention should be paid to the sprinkler installation in any building fitout changes.
- + **Type of system:** Preventing false water discharge in a Hospital Operating Theatre that could cause harm to an occupant (e.g. contamination, infection, etc); in that area for example a Pre-action fire sprinkler system may be more appropriate.
- + **Lifecycle:** Fire sprinkler systems have an expected life, and as they age, their components can deteriorate or become less reliable. Older systems may be more prone to failures if they have not been properly maintained or upgraded. It is very important to note that regulatory requirements for fire sprinkler system Inspection and Test regimes have monthly, three-monthly, six-monthly, yearly, 5 yearly, 10 yearly, 25 yearly and 30 yearly requirements. The longer term requirements can be difficult to keep track of in older installations however are important to address to ensure systems are operable.
- + **Recalled fire sprinkler heads:** Recalled fire sprinkler heads due to the performance of their O-ring degrading over time. These sprinkler heads can corrode or minerals, salts and other contaminants in water can affect the rubber O-ring seals. These factors could cause the sprinkler heads not to activate in a fire. Up to date Information on recalled sprinkler heads is readily available. Fire services providers should be able to provide advice on the status of fire sprinkler heads.

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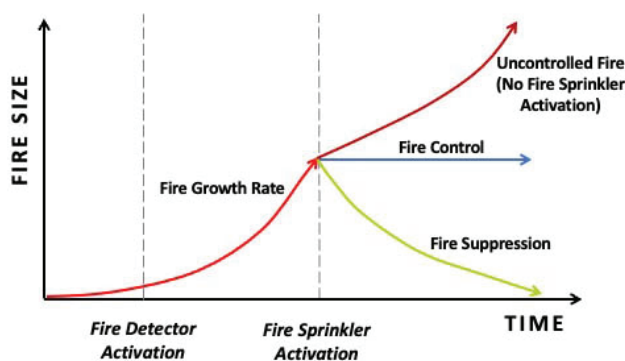
P: +61 3 9248 2700 W: [www.agcoombs.com.au](http://www.agcoombs.com.au)

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### Fire Growth Rate

The Automatic Fire Sprinkler System is an engineered system designed to control a fire within minutes of it starting. The basis of the fire sprinkler design is to keep a fire a relatively small size and under control; not necessarily extinguish the fire. Although on many occasions fire has been extinguished (e.g. suppression) before fire brigade intervention. In the event a facility does not have a fire sprinkler system or failure of the facility's fire sprinkler system can result in a fully developed fire (e.g. loss of control) and potentially catastrophic failure of the facility. The figure below illustrates the three fire scenarios clearly.



### A simple test could be the difference between effective and ineffective sprinkler heads.

A simple test that is often overlooked is the 25-year Batch Test in accordance with Australian Standard AS/NZS 1851, where a sample of 14 fire sprinkler heads are removed from each control valve and tested in an authorised laboratory. Fire sprinklers in the batch that fail the test must be replaced. A batch 'passes the test' if the number of tested sprinklers meets the minimum requirement of the batch and all of the tested sprinklers still demonstrate that they meet their design specifications. This is a minimum frequency but can be increased if there is concern about sprinkler operation.

#### The Standard requires the removal and testing of a representative sample of sprinklers at the following intervals:

- + **Fast Response Sprinklers (not less than 14 samples):** At 25 years, then every ten years.
- + **Dry Pendent Sprinklers (representative sample):** At 25 years, then every ten years.
- + **All other sprinklers (not less than 14 samples):** At 25 years, then every ten years.

Subject the samples to the following test conducted by a registered laboratory:

- + Release temperature
- + Functional test
- + Leak resistance test- Maximum system design pressure test (nominally 1200kPa or 2000 kPa)

For all the sprinklers above using ISO 6182- 12, ISO 6182-6 and ISO 6182-7 components standards, sample sprinklers should be selected from the range of site environmental conditions to which the system(s) is subjected to (i.e. office, factory, boiler house environments). Should one or more sprinkler fail any of the above tests, further sampling and testing should be conducted until the results can be considered truly representative. The extent of sprinkler replacement, if any, will be dependent on the results of testing.

In addition, in line with Building Regulation occupied and unoccupied buildings that have a fire sprinkler system should be subject to regular inspections, maintenance, and testing to verify their operational readiness. These tests may include checking the water supply, inspecting the sprinkler heads, and conducting flow tests to ensure an adequate water supply and pressure.

### Site Design Verification Survey

An Automatic Fire Sprinkler System may seem simple by nature, but the holistic fire safety strategy requires an understanding of the hazard / commodity stored within a facility (e.g. in particular in warehouses that have a High Hazard Sprinkler System Classification). Routine Site Design Verification Surveys to ensure no impediment to the fire sprinkler heads and the existing fire sprinkler system is compliant for the commodities currently being stored (e.g. the hazard classification has changed to the where the original system design and installation is no longer adequate to protect it).

Automatic Fire Sprinkler Systems may have similar characteristics, but changes in the occupancy, contents, storage arrangement and process can render a sprinkler system inadequate to protect the occupancy or structure. It is recommended that these inspections be carried out on an annual basis by a Registered Fire Protection Services or Fire Safety Engineer.

### Conclusion

It is important to have a facility's Automatic Fire Sprinkler System regularly inspected, maintained and tested by qualified fire protection services professionals to identify and address any issues promptly. Following building guidelines, adhering to maintenance schedules, good record keeping, and complying with relevant Australian Standards can help mitigate the risk of fire sprinkler system failures.

For more information on Automatic Fire Sprinkler Systems, contact:

**Marcus Royle** – A.G. Coombs Advisory

**P:** 03 9248 2700 **E:** mroyle@agcoombs.com.au