FIRE PROTECTION SYSTEMS

Contents

Introduction

Active fire protection systems are widely used and normally provide a very reliable means of fire protection. Positive features include:

- Automatic fire detection
- Alarm transmission on system activation
- Suppression or extinguishment of fire
- Operation only as needed in the immediate vicinity of the fire.

Correctly designed, installed and maintained systems are proven to significantly reduce property damage and minimise business interruption.

This document provides guidance on:

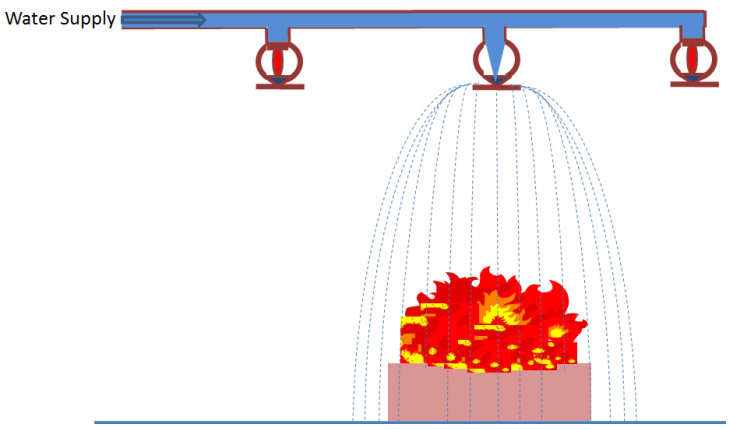
- automatic fire sprinkler systems
- gaseous suppression systems and
- water-mist systems.

Automatic fire detection/alarm systems and wet and dry riser systems are also described.

Some generic guidance is also provided on expected care and maintenance standards for fire protection and detection systems.

Automatic Fire Sprinklers

Fire sprinkler systems provide a network of pipes that deliver pressurised water to a system of sprinkler heads that open when a predetermined temperature is reached, typically around 68°C. Standard sprinkler systems operate one sprinkler head at a time so that water is only discharged directly over a fire and not to other unaffected areas protected by the system. Most fires are controlled by 4 or less sprinkler heads; each sprinkler head covering an area of 12 m² or less.



Sprinkler systems operate one sprinkler head at a time, directly over a fire

Automatic sprinkler systems can be used for both life and property protection. They are suitable for most types of industrial, commercial, storage, public assembly and even residential premises. Property losses from fires in buildings protected with sprinklers are estimated to be 1/10th of those in unprotected buildings

Pressurised water is normally supplied for sprinkler installation using “fire-pumps” drawing water from a dedicated fire water tank. Alternative supplies such as public water mains are also used.

There several different types of sprinkler system.

- Wet sprinkler systems are the most common type of sprinkler installation and have pipes permanently filled with pressurised water. These systems are used where there is no possibility of frost damage to the installation.
- Dry sprinkler systems have pipes normally filled with pressurised air instead of water. Once enough heat is generated to activate one or more sprinklers, the air is released from the system through the open sprinklers and at predetermined pressure, water is released into the pipes, flowing to the open sprinklers. These systems are used to protect areas where there is a possibility of frost damage e.g. outside canopies. Water discharge from dry sprinkler installations takes a little longer than for wet systems, as the air has to be evacuate before water discharges.
- Pre-action sprinkler systems, similarly to dry systems, have pipes filled with air. But with these installations, water is released into the system when an independent fire detection system operates. Operation is then similar to wet systems, with water discharged through individual sprinkler heads when they open due to heat. Pre-action sprinkler systems are typically used when the chance of accidental water discharge must be minimised, e.g. for high-value electronic equipment areas and instead of dry systems when a faster response time is needed.
- Alternate sprinkler systems are combined wet and dry sprinkler installations set to wet during months when there is no possibility of frost damage and dry during months when there is a frost damage risk. However, routine switching between wet and dry operation can worsen internal pipe corrosion, so alternate sprinkler systems are not normally recommended by RSA.
- Deluge systems are different from all of the above inasmuch as all sprinkler / spray heads are open. Water is released into the system on operation of an independent fire detection system. Unlike sprinkler systems, water discharges from the outset through all sprinkler / spray heads. These systems are used to protect high fire challenge hazards such as flammable liquid unloading stations and flammable liquid storage tanks.

Gaseous Systems

Fixed gaseous extinguishing systems are widely used in a variety of commercial applications to protect property and assets from fire. Examples of risks that can be protected include computer rooms, critical electrical switch gear and equipment and high risk production lines.

Current systems now typically use carbon-dioxide (CO2), 'clean agent' (halocarbon-based agents and inert gas agents) and steam. Carbon dioxide is employed at asphyxiant concentrations and as such has restricted applications.

Gaseous extinguishing systems can generally be installed as 'local' or 'total flooding' systems. Total flooding systems are used where a fixed enclosure is available to maintain concentration of the extinguishant gas for a sufficient period to ensure that re-ignition will not occur. Local flooding systems are designed to release a minimum flow of extinguishant gas over the protected hazard for a specified minimum period. Where automatic systems could pose a hazard to personnel in the protected area, they are "locked off" during periods of occupation. Connected reserve supplies of extinguishing agent are advisable for systems protecting critical equipment or when the consequences of non-extinguishment are severe. These are usually arranged to be released manually, should the initial discharge fail to extinguish the fire.

Provided the system is chosen correctly, it will extinguish the fire rapidly, enabling operations to be re-started following removal of the fire source and reinstatement of the protection.

Water Mist Systems

Water mist systems, which discharge a mist of water droplets, comprise components for detection and actuation, water supply, water delivery and water atomization.

Water mist protection has traditionally been developed and used in tightly enclosed areas, for example ships' engine rooms and electrical power areas. Current test standards cover specific hazards, ranging from hotel bedrooms through to industrial deep fat fryers.

Water Mist Systems suppress or extinguish fires by the rapid cooling of surface areas and the reduction of oxygen (known as oxygen displacement) at the flame front. The oxygen reduction is the result of the small water mist droplets turning into steam, which dilutes oxygen levels to below the concentration that supports combustion. The small water mist droplets also reduce the effect of heat radiation from the fire to nearby areas.

Systems can either be high pressure 50 to 140 bar or low pressure up to 20 bar. Pressurised water is provided by pumps or stored gas systems.

In comparison with sprinklers, water mist systems may be seen as attractive because of the greatly reduced water storage requirements. However, unlike sprinklers which are designed using proven well established codes, water mist systems are risk specific, each risk requiring a specific design based on fire tests.

Wet and Dry Risers & Associated Systems

During a fire or other emergency incident, it is important that the fire service can get unobstructed access to all floors of multi-storey buildings, along with adequate fire-fighting water. This is normally achieved by:

- Purpose built fire-fighting shafts, including fire-fighting lifts.
- Dry or wet riser installations.
- Suitable landing valve connections.

Protected shafts are enclosures containing a fire-fighting stair or fire-fighting lobby, a fire main and, if provided, a fire-fighting lift. These shafts must have adequate fire barriers and fire resistance, normally a minimum of 60 minutes.

Risers are water supply pipes installed in a building for fire-fighting purposes, fitted with inlet connections at fire service access levels and landing valves, to which fire hoses can be connected at each floor level. The riser-pipe, which is normally dry (a “dry riser”), is usually charged with water by pumping from fire and rescue service appliances.

Fire Detection and Fire Alarm Systems

Fire detection and fire alarm systems may be required in any specific building by regulation, may be installed as the result of a Fire Risk Assessment carried out by the owner, landlord or occupier, or may be a recommendation of insurers.

Manual fire alarm systems (e.g. break glass call points) may be sufficient in low risk workplaces, but automatic fire detection to raise an alarm is usually required by regulations to supplement manual systems in more complex premises, especially where people sleep.

Automatic fire detection might also be stipulated for life safety under the following circumstances:

- Where the automatic fire detection forms part of a fire engineering solution.
- Where fire control systems, such as fire door closing facilities or smoke control systems, need to be operated automatically in the event of fire.
- Where the low level of occupancy of a building, or part of a building, creates the potential for fire to interfere with escape by the occupants before they are aware of its presence.
- Where people cannot be evacuated immediately in the event of fire (e.g. hospitals, care homes).

As well as protecting lives, automatic fire detection and fire alarm systems are used to protect property. Raising an alarm while a fire is in its early stages, helps ensure the timely attendance of the Fire Service. In combination with good fire compartmentation, timely attendance by the Fire and Rescue Services can reduce both property damage and interruption to business.

Care & Maintenance of Fire Protection Systems

Established international standards have been developed for the majority of fire protection and detection systems. These standards will have sections dedicated to system care and maintenance that should be strictly followed.

In order to minimize the possibility of malfunction, a regular service and maintenance contract should be entered into with either the installing company, their authorised agents or other competent company.

All weekly tests and other periodic testing and maintenance of system components should be integrated into the overall planned maintenance schedule for buildings and services. Only trained personnel should complete this work.

It is vital that the full range of tests, as appropriate to the installed equipment, are undertaken and accurately recorded. It is only by evaluation of such test results that deterioration in equipment performance can be ascertained. Any equipment faults must be immediately rectified or suitable action taken using appropriately qualified contractors.

