

CHAPTER 8 - FIRE DETECTION AND ALARM SYSTEMS

8.1 General

This chapter deals with automatic fire detection and alarm systems and their role in protecting life in hotels/guesthouses. The main functions of fire detection and alarm systems are -

- (i) to detect an abnormal condition, which indicates a fire, by either manual and/or automatic means.
- (ii) to warn occupants and staff in all parts of the building of the existence of a fire.
- (iii) to activate various emergency devices.
- (iv) to alert an appropriate person who will call the fire brigade.

Installation of Fire detection and alarm systems in hotels/guesthouses protect life safety by reducing the period of fire development before occupants become aware of its existence, thus allowing early and safe evacuation. Such a system can also have property protection benefits.

The installation of a fire detection and alarm system should not be regarded as giving complete protection against fire, and should be used in conjunction with other measures recommended in this guide. The installation of a fire detection and alarm system should be part of an integrated fire safety strategy, in which the human response is as critical to safety, as correct design, installation, hardware and maintenance of the system.

Fire detection and alarm systems are a developing and complex field of fire safety engineering, and work connected with them in hotels/guesthouses should only be undertaken by competent persons.

The following sections are intended as a general guide to the installation of fire detection and alarm systems in hotels/guesthouses. Proprietors and technical advisers should consult BS 5839: Part 1: 1988 : Fire detection and alarm systems in buildings - for full information on the design, installation and maintenance of fire alarm systems.

8.2 Requirements for Installation of Fire Detection and Alarm Systems

Hotels/guesthouses should be provided with a fire detection and alarm system, unless the premises is fully covered by an automatic sprinkler system, as discussed in Chapter 9. New installations of automatic fire detection and alarm systems should be in accordance with Type L2 specified in BS 5839 : Part 1 (1988). Existing installations should be assessed for adequacy, and if serious deficiency exists should be upgraded. Adequate existing systems may continue in use, provided they were installed and commissioned as required by BS 5839 : 1980 and are maintained to this standard.

While the installation of automatic fire detection and alarm systems is generally recommended, full automatic systems are not considered essential in the following categories of persons.

- (a) In single-storey premises with not more than six bedrooms domestic detectors, manufactured to I.S. 409: 1988 "Self Contained Smoke Detectors for Private Dwellings" or BS 5446 : Part 1 : 1977 : Point type smoke detectors may be adequate.
- (b) In single-storey premises with more than six bedrooms, a manual electric system with a single zone panel, (Type M) as per Appendix G of BS 5839 : Part 1 (1988), in conjunction with point type smoke detectors may be adequate .
- (c) In two-storey premises with not more than than six bedrooms, the provision of self-contained smoke detectors/alarms to BS 5446: Part 1: 1977, powered by mains supply and with battery back-up, and interconnected so that an alarm condition in one will activate all the units, may be adequate.

8.3 Fire Procedures

The presence of an automatic fire alarm and detection system will not in itself extinguish a fire, or enhance the life safety of the occupants or staff, unless people respond in a rational and pre-determined manner. Fire drills involving response to fire alarms should be carried out at regular intervals as recommended in Chapter 11.

"FIRE INSTRUCTION NOTICES" should be displayed at the following locations to ensure that staff and guests are fully aware the procedure to follow in the event of an alarm :

- (a) adjacent to each manual call point,
- (b) at telephone switchboards,
- (c) on the doors of all bedrooms, and in other information leaflets for guests.

8.4 Installation, Commissioning and Certification

The design and installation of new automatic fire detection and alarm systems should comply with BS 5839 : 1988 : Part 1 - Section 3, and should be carried out by competent persons. A commissioning and installation certificate as detailed in Appendix B of BS 5839 : Part 1 : 1988 should be retained with the Fire Safety Register on the premises.

8.5 Maintenance

After the installation of an automatic fire detection and alarm system, it is vital that the system should operate when required to do so. Automatic fire detection and alarm systems should be regularly and correctly tested, maintained and serviced. See the Section on 'User's Responsibility' in BS 5839 : Part 1 : 1988.

CHAPTER 9 - FIRE SUPPRESSION

9.1 General

The suppression and/or extinction of a fire which has occurred will generally be achieved by one of three methods :

- (i) automatic fire suppression installations,
- (ii) first-aid fire fighting by properly trained staff using correct equipment,
- (iii) the fire brigade.

9.2 Automatic Fire Suppression

Automatic fire suppression systems are utilised to attack an outbreak of fire at an early stage and to suppress or control it. They can provide total coverage of a building as with sprinkler systems, or be used to protect particular hazards such as boilers or deep-fat fryers in kitchens.

9.2.1 Sprinkler systems

Sprinkler systems are designed to provide an automatic means of detecting and extinguishing/ controlling a fire by the application of water in its early stages, through the installation of overhead pipes on to which sprinkler heads are fitted at intervals.

Each sprinkler head is in effect a heat-operated valve designed to open at a predetermined temperature and to discharge water under pressure from the installation. The water emerging from the head is directed into a specific pattern by a deflector incorporated in the head, and the flow of water also causes an alarm to sound. Sprinkler heads function effectively as fire detectors as well as fire controllers, a feature which has been aided by the development of 'fast response' sprinkler heads.

Traditionally sprinklers have been used in a property protection role, but in recent years their value in life protection has been recognised. In the USA especially, the significance of sprinklers in containing fires in a pre-flashover state has resulted in the installation of sprinklers being made mandatory in some situations. Following a series of major hotel fires resulting in multiple-fatalities, there has been a growing lobby for the adoption of sprinkler systems as a standard life protection measure in US hotels.

In existing hotel/guesthouse buildings, which are deficient in some areas of fire safety and where upgrading is required, sprinklers may offer a practical means by which the level of fire safety can be improved.

One of the following standards should be used for the design, installation and maintenance of sprinkler systems, where they are to be used in hotels/ guesthouses.

- (i) Rules of the Fire Offices Committee (FOC) for Automatic Sprinkler Installations - 29th Edition.
- (ii) National Fire Protection Association (NFPA) Code No 13, 1987: Installation of Sprinkler Systems.
- (iii) BS 5306 : Part 2 : 1979 Sprinkler systems
- (iv) Factory Mutual (FM) Loss Prevention Data Sheet 2 - 8N, 1982 Installation of Sprinkler Systems.

When installed, a system should be maintained ready for automatic and efficient operation. This is critical where a life-protection role is intended, and attention is drawn to the additional recommendations in Appendix B of BS 5306 : Part 2 :1979 in this regard.

9.2.2 Non-Aqueous Fire Extinguishing Systems

In situations where use of water as an extinguishing medium would be inappropriate, there are alternative systems available, which generally involve use of halogenated hydrocarbons or carbon dioxide. The selection of a system

should be made in accordance with BS 5306 : Fire extinguishing installations and equipment on premises : Part 0 : Guide for the selection of installed systems and other fire equipment.

Where selected, carbon dioxide systems should be installed to the requirements of BS 5306 : Part 4 : Specification for carbon dioxide systems. The gas should comply with BS 6535 : Fire extinguishing media : Part 1 : Specification for carbon dioxide.

Halogenated hydrocarbons should be installed to BS 5306: Part 5 : Halon systems : Section 5.1 : Halon 1301 total flooding systems or Section 5.2 Halon 1211 total flooding systems. The gas should comply with BS 6535 : Part 2 : Specification for halogenated hydrocarbons.

9.3 First-Aid Fire Fighting

Strategic positioning of extinguishing equipment throughout an hotel/guesthouse enhances the fire protection of the building, by enabling an attack to be made on a developing fire in its early stages. Extinguishing equipment does not itself offer protection, and indeed it may be a safety hazard, unless personnel are trained in its proper, safe, and effective use. (See Table 9.1 and Staff Training in Chapter 11). First-aid fire fighting equipment in hotels/guesthouses is generally provided using one or a combination of :

- (i) hand held portable fire extinguishers.
- (ii) hose reels.

9.3.1 Hand-held portable extinguishers

Portable fire extinguishers can be divided into five categories according to the extinguishing agent they contain, their method of operation and the class of fires they safely extinguish, as specified in Table 9.1. There are four classes of fires :

- (i) Class A - Fires involving ordinary combustible materials such as wood, cloth and paper.
- (ii) Class B - Fires involving flammable liquids (petrol, parafin, paints), or liquefiable solids (oils, greases and fats).
- (iii) Class C - Fires involving gases. (Gaseous fires should only be extinguished by closing or plugging the leak. Extinguishing a gas fire before the supply is cut off could cause a gas explosion).
- (iv) Class D - Fires involving burning metals.

Aerosol operated disposable extinguishers, or types such as soda acid or chemical foams or extinguishers operated by inversion are considered unsuitable for use in hotels/guesthouses.

New hand-held portable fire extinguishers which are provided in hotels/guesthouses should be manufactured in accordance with the requirements of either I.S. 290 : 1986: Portable Fire Extinguishers or BS 5423 : 1987: Specification for portable fire extinguishers. They should be installed to take account of the information summarised in Table 9.1 , and in accordance with the recommendations of BS 5306 : Part 3 : 1985 Code of practice for the selection, installation and maintenance of portable fire extinguishers, and should comply with the following general requirements:

- (i) Extinguishers should generally be located in conspicuous positions on brackets, stands or purpose built housings at designated 'FIRE POINTS' where they can be readily seen by persons travelling along an escape route. Consistent positioning of 'Fire Points' on each floor is desirable. If their location is concealed from direct view, it should be indicated by a suitable sign.
- (ii) The most suitable locations for siting extinguishers are near to room exits, corridors, stairways, lobbies and landings. Extinguishers should not be positioned away from exits unless they are necessary to cover a particular hazard.

- (iii) Extinguishers should be readily accessible and available for immediate use at all times, and should be so sited that it is not necessary to travel more than 30 m from the fire location to reach an extinguisher.
- (iv) Extinguishers provided to deal with special risks should be sited near the risk concerned, but not so close as to be inaccessible in case of fire. If the special risk is contained in a confined space or small room, it is generally advisable to place the extinguisher outside that space or room.
- (v) Extinguishers should be mounted so that the carrying handle of large, heavy extinguishers is about 1m from the floor, and smaller extinguishers should be mounted so that the handle is about 1.5 m from the floor.
- (vi) The operation of extinguishers is affected by temperature, and they should not be exposed to storage temperatures outside the operational range marked on the extinguisher. In particular, extinguishers should not be placed over or close to heat producing appliances.
- (vii) Extinguishers, unless specially treated by the manufacturer or specially housed for the purpose, should not be located where they would be exposed to unduly corrosive atmospheres, or to splashing by corrosive fluids.
- (viii) It is necessary that fire extinguishers are regularly inspected, maintained and recharged in accordance with the appropriate standards. Fire extinguishers that comply with I.S. 290 : 1986 should be inspected and maintained in accordance with I.S. 291 1986, and other extinguishers with BS 5306 : Part 3 : 1985.

TABLE 9.1

Extinguisher to Use

TYPE	COLOUR CODE	HOW IT PUTS OUT FIRES	CLASS OF FIRE	HOW TO USE
Water	Red	Mainly by cooling the burning material	Class 'A' DANGER: do not use on live electrical equipment or on burning oil	Direct jet at the base of the flames and keep it moving across the area of the fire. Seek out any hotspots after main fire is out.
Foam	Cream	Forms a blanket of foam over the surface of the burning liquid and smothers the fire.	Class 'B' fires	Do not aim the jet directly into the liquid. Where the liquid on fire is in a container direct the jet at the edge of the container or on a nearby surface above the burning liquid. Allow foam to build up and flow across the liquid.
AFFF (Aqueous film forming foam Multi purpose)	Cream	Forms a fire extinguisher water film on the surface of the burning liquid. Has a cooling action with a wider extinguishing application than water on solid combustible materials.	Class 'A' and 'B' fires	For class 'A' fires use as directed for water extinguishers. For class 'B' fires use as directed by foam extinguishers.
Dry Powder	Blue	Knocks down flames	Class 'B' fires. Safe on live electrical equipment although does not readily penetrate spaces inside equipment, a fire may re-ignite.	Direct discharge horn at the flames and with a rapid sweeping motion drive the flame towards the far edge until the flames are out. If the extinguisher has a shut-off control wait until the air clears and if the flames are visible attack the fire again. WARNING: this type of extinguishing medium does not cool the fire very well and the fire may start up again.
Dry Powder (Multi Purpose)	Blue	Knocks down flames and on burning solids, melts down to form a skin smothering the fire. Has some cooling effect.	Class 'A' and 'B' fires. Safe on live electrical equipment although does not readily penetrate spaces inside equipment a fire may re-ignite.	Ditto
CO ₂ Carbon Dioxide	Black	Vaporising gas which smothers flames by displacement of oxygen in the air.	Class 'B' fires. Safe and clean to use on live electrical equipment.	WARNING: These types of extinguishers do not cool the fire very well and the fire may start up again. DANGER: fumes from CO ₂ and Halon 1211 (BCF) extinguishers can be harmful to users in confined spaces or if used on hot metal. Ventilate the area as soon as the fire has been controlled.
Halon 1211 (BCF)	Green	Vaporising liquid gas giving rapid knock down by chemically inhibiting combustion.	Class 'B' fires. Clean and light can also be used on small surface burning class 'A' fires. Effective and safe on live electrical equipment.	Ditto
Hose Reel	-	Mainly by cooling the burning material.	Class 'A' fires. DANGER: do not use on live electrical equipment.	Direct jet at the base of the flames and keep it moving across the area of the fire.
Fire Blanket	-	Smothering.	Class 'A' and 'B' fires. Good for small fires in clothing and small spillages of liquid fires.	Place carefully over fire. Keep hands shielded from the fire. Do not waft the fire towards you.

European Standards recommend that the bodies of the water extinguishers should be coloured signal red. Other extinguishers should be predominately red with a second colour to indicate the extinguishing medium covering an area sufficient to be readily apparent.

9.3..2 Hose-reels

Hydraulic hose reels for first-aid fire-fighting should be considered as an alternative to fire extinguishers in larger premises. The advantages of hose-reels are :

- (i) they provide a continuous flow of water, and they are more effective as well as safer for fire-fighting.
- (ii) maintenance costs of hose-reels may be lower than for individual extinguishers, especially if large numbers of extinguishers are used.

Their disadvantages are:

- (i) the initial installation costs may be high;
- (ii) a reliable and adequate water supply is necessary; and
- (iii) areas where the use of water as an extinguishing medium is not suitable still require fire extinguishers of an appropriate type.

Where installed, hose reels should comply with the requirements of BS 5274 : 1976 Specification for fire hose reels for fixed installations - and be installed to BS 5306 : Part I : 1983 Hydrant systems, hose reels and foam inlets.

In general, one hose reel should be provided to cover every 800 m² of floor space or part thereof. Hose reels should be sited in prominent and accessible positions at 'FIRE POINTS' on each floor level adjacent to exits on escape routes, in such a way that the nozzle of the hose can be taken into every room and within 6 m of each part of a room.

Hose reels should not form obstructions on escape routes and should be installed in recessed cabinets if necessary. Doors provided for hose reel cabinets should open approximately 180 degrees, so as not to obstruct the hose being run out in either direction. These doors should not normally be fitted with locks. Where hose reels are located in recessed cabinets to which doors are fitted, the doors (whether glazed or otherwise) should bear the appropriate sign in accordance with the requirements of BS 5499 : Part 1 : 1984 Specification for fire safety signs - with a minimum letter height of 50 mm.

As a minimum, the water supply for hose reels should be such that when the two topmost reels in a building are in use simultaneously, each will provide a jet of approximately 6 m in length and will deliver not less than 0.4 litre/sec or 24 litres/min.

Where the water pressure in hose reel mains needs to be boosted, an electrically driven pump usually provides a convenient method. A duplicate standby pump should also be provided. Both motors and pumps should be sited in fire protected positions and electrical supply should be by exclusive circuit, with the cables following a route of negligible fire risk, or provided with adequate protection. The booster pumps system should come into operation automatically on a drop in pressure or a flow of water. Both pumps should be automatically primed at all times. Pumps should also be capable of being started or stopped manually. The standby pump should be so arranged to operate automatically on a failure for any reason of the duty pump. An audible and visual alarm should be provided at a suitable position to indicate that the equipment and the pumping plant have been operated.

Where water authorities do not permit booster pumps to be connected directly into supply mains, the installation should be fed from a suction tank, or interconnected tanks, having a minimum capacity of 1125 litres. Tanks supplying water for domestic purposes should not be used as suction tanks for hose reel installation, unless arrangements have been made for these domestic supplies to be drawn off in such a manner that the requisite reserve of water for the hose reel installation is always preserved

For hose reels which do not have automatic valve action, a notice should be provided indicating the need to turn on the inlet valve before running out the hose. This notice should be affixed to the wall in a prominent position adjacent to the reel. Such notices should be set out in graphically illustrative form or in letters easily read in adverse conditions.

Hose Reels should be subjected to regular maintenance in accordance with Section 9, paragraph 39 of BS 5306: Part 1: 1976.

**9.4 Facilities
for the Fire
Brigade**

Suitable facilities should be provided to enable effective and successful fire fighting operations to be carried out by the fire brigade. Access roads and hard standing are necessary on the outside of buildings for fire brigade appliances, and in large, high and complex buildings special facilities such as fire lifts and wet or dry riser mains are needed inside the buildings. Such facilities not only ensure that firemen can reach a fire with their equipment without delay, but that adequate water supplies are readily available when they arrive. The areas listed below should be considered, and facilities should be provided or upgraded to take account of the fire hazard and level of fire precautions in the building, and the potential for intervention by the fire brigade.

- (i) Access for fire appliances,
- (ii) Rising mains,
- (iii) Hydrants,
- (iv) Fire lifts,
- (v) Boiler rooms and fuel stores,
- (vi) High voltage discharge lighting,
- (vii) Water supply

Facilities provided in accordance with the recommendations contained in Part 2 of the Proposed Building Regulations, 1983 may be deemed adequate.