

BASIC GUIDE TO FIRE ALARM INSTALLATION

Introduction to BS5839 Part 1, 2002
BS5839 part 1 is a code of practice for system design, installation and servicing for fire detection for general buildings. The standards have been revised and are effective from mid July 2003. A fire alarm system is generally required to be installed as part of fire certificate required by the The Fire Precautions Act or the workplace regulations after an audit of a fire risk assessment.

Planning the System

The decision of whether a fire alarm system is required or the type of category should not normally be the responsibility of the designer, customer/installer. The local authorities should take these decisions for enforcing legislation in buildings. With all systems there should be an exchange of information and decision process a typical example would be.

- Building control officers
- Fire authorities
- Statuary and insurance requirements

When sufficient information and level of category has been obtained then the system can be designed.

SYSTEM DESIGN:

Process/Decision and exchange of information

- Purchaser specifies the category of system, this would have been provided by the local authorities, if required the designer can propose a category.
- System to be designed
- Consultation
- Any variation of the British Standards to be agreed.
- System proposal to be approved by all parties.

There are different categories of protection within BS5839 Part 1, 2002

Property Protection

(Objective: To summon the fire brigade in the early stages of a fire)

- Type P1: Property protection, automatic detection installed throughout the protected building.
- Type P2: Property protection, automatic detection in designated areas.

Life Protection

(Objective: To protect people from loss of life or injury)

- Type M: Manual system (call points).
- Type L5: Life safety generally when specific fire engineering solutions or where PI insurance is required.
- Type L4: Life safety system, same as a manual system plus smoke detection on escape route.

- Type L3: Life safety system, same as a manual system plus smoke detection on escape route and heat or smoke detection in adjacent rooms.
- Type L2: Life safety system, same as L3 but detection in fire hazard/risk of ignition i.e. kitchens, sleeping areas and other specified areas.
- Type L1: Life safety system, similar to P1 but the audibility is more critical.

Call Points

- They should be fitted in conspicuous and easily accessible points on escape routes, mounted at 1.4 metres +/- 0.2m above floor level.
- Call points should be located at the exits to the open air and all storey exits on each floor.
- You should not have to travel more than 45 metres to operate a call point or 25 metres in any special hazards or high-risk areas.

Zoning

- The floor area of a single zone should not exceed 2,000m².
- Two faults should not remove protection from an area greater than 10,000m² (for addressable systems).
- If the total floor area of the building is 300m² or less then it may be regarded as a single zone.
- If the total floor exceeds 300m² then all zones should be restricted to a single floor level.
- As an exception to the above stairwells, lift shafts or other vertical shafts (non stop risers) within a single fire compartment should be considered as one or more separate zones.
- The maximum distance travelled within a zone to locate the fire should not exceed 60metres.

Stairwell Zone 7	Floor Level	Lift shaft Zone 6
	Zone 5 4th Floor	
	Zone 4 3rd Floor	
	Zone 3 2nd Floor	
	Zone 2 1st Floor	
	Zone 1 Ground	

DETECTORS

Smoke Detection:

There are different types of smoke detectors:- optical/multi-sensor, Ionisation and beam detectors.

Optical

Optical smoke detectors operate on the principal of infra red light refracting off smoke particles entering the chamber.

This makes this type of detector more sensitive to smouldering fires such as modern fabrics or furnishings. Optical detectors are more prone to false alarms from steam or dusty environments (outside bathroom/building works).

Beam Detectors: Beam detectors comprise of a transmitter and receiver. The transmitter emits an infra red beam from the TX (transmitter) to the RX (Receiver), the beam detects obscuration by the smoke.

Ionisation

Ionisation detectors operate on the principal of charred smoke particles passing between two electrodes causing a small current flow. This makes this type of detector more suitable for fast flaming fires such as paper/wood. Ionisation detectors are more prone to false alarms from burning smell i.e. outside a kitchen.

Heat Detection:

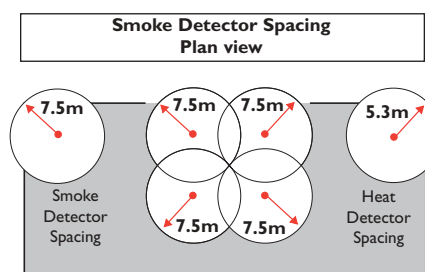
There are two main types, rate of rise & fixed temperature.

Rate of rise heat detectors will respond to a sudden increase in temperature but also have a fixed element in case of a slow smouldering fire. Rate of rise detectors are most suitable for areas where a smoke detector is undesirable i.e. staff room.

Fixed temperature heat detectors have a sensing element fixed at a particular temperature, when this is reached, the detector operates. Fixed temperature is ideal for kitchens, boiler room where a rate of rise heat detector would be unsuitable.

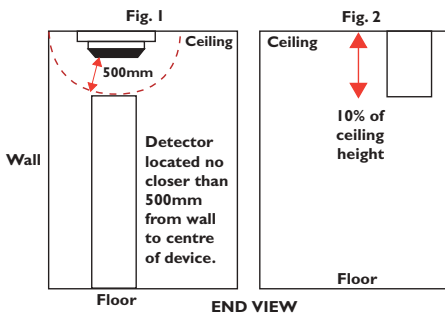
Spacing Of Detectors

- A smoke detector under a flat ceiling has a radius of 7.5 metres.
- Heat detectors have a radius of 5.3 metres.
- A detector radius should reach every part of the room.



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- Detectors should be located a minimum 500mm away from walls.
- There should be a 500mm clear space below and around the detector.
- Detectors should be located at least 1 metre from air conditioning units.
- If an obstacle eg. (beam/RSS) is less than 10% of the ceiling height then ignore. If it is more than 10% of the ceiling height, treat it as a wall for detector spacing locations as shown in fig. 2 below.
- Obstructions from floor to ceiling is more than 300mm ignore, less than 300mm then treat as a dividing wall.



- In a pitched ceiling or in a roof void the spacing of the detector can be increased for 1% for every degree of the pitch angle up to a maximum of 25%. For this increase to be implemented detection should start at the apex.

Detection In Voids

If the system category requires automatic detection in areas where there is a void greater than 800mm then fire detection should also be provided in the void.

Voids less than 800mm generally do not need to be covered with the following exception.

- If a fire or smoke can spread especially between rooms or compartments before detection.
- Or there is high risk which should be determined by a risk assessment as to warrant protection in the voids.

Ceiling Heights

- As the time taken for smoke and heat to reach the detector increases with ceiling height, the code has recommended limitations to automatic detection.

Detector Type	Ceiling Heights General Limits (M)
Point Type Smoke Detectors	10.5m
Carbon Monoxide	10.5m
Heat Detection (Class A1)	9m
Heat Detection Other Classes	7.5m
Optical Beam Smoke Detectors	25m

Audible Alarms

- One sounder should be located near the control panel or entrance on a separate circuit. Addressable systems should be wired from the control to a sounder protected by a short circuit isolator.
- All the sounders should sound similar to avoid confusion.
- A minimum of 65 dB is required in general areas or 5 dB above any background noise which persists for more than 30 seconds.
- Where high noise levels exist, visual indication such as strobes may be required.
- Where sleeping people are to be woken then 75 dB is required at the bedhead.
- A loss of 30 dB per door should be allowed for, to guarantee 75 dB at the bedhead a sounder per bedroom is recommended.
- For areas where there are people with impaired hearing the approval of devices for people with impaired hearing would be the subject of consultation with the users.
- The decibel level decreases -6dB from a sounder every time the distance is doubled as per below. This is just a general rule, this does not take in to consideration doors absorption (warehouse full of cardboard boxes) and weather conditions, for more advice please contact the Technical Department.

Sound @ 1m	2m	4m	8m	16m	32m
100dB	94dB	88dB	82dB	76dB	70dB
105dB	99dB	93dB	87dB	81dB	75dB
112dB	106dB	100dB	94dB	88dB	82dB

Control Equipment

- The equipment should be generally accessible on the ground floor next to the entrance to the building to enable the occupier and the fire brigade to quickly identify the zone in fire.
- A plan of the building should be displayed close to the control panel showing entrances, escape routes and zones.
- Operating instructions and logbook should be available.

Power Supplies

- The power supply for the control panel should be exclusive to the fire alarm system.
- This should be secured from unauthorised use and labelled FIRE ALARM DO NOT SWITCH OFF. (Product Ref: FS1 page 23)

- Upon a mains failure the batteries should continue to power the system for a minimum of 24 hours plus 30 minutes alarm duration after that.
- For an L category system 24 hour battery backup is sufficient, unless otherwise requested.
- For unoccupied premises the battery backup should be up to 72 hour plus the 30 minute alarm duration. For over 72 hours the system should be monitored by a central station.

Cabling & Wiring

- All cables for the fire alarm system should be fire proof including the mains supply, these are split in to two categories, standard and enhanced. The standard cable should be a soft skinned type cable and the enhanced should be an MICC type cable. Please check with the cable manufacturers for compliance with the British Standards.
- For the majority of installations the standard cable will be adequate, for further details please contact the Firesafe Technical Department on:- 01253 760800.

Certification

There are a number of certificates required for a fire alarm installation, these are follows:

- Design Certificate
- Installation Certificate
- Commissioning Certificate
- Verification Certificate
- Acceptance Certificate
- Alteration Certificate
- Test Certificate

For further information please contact technical support on:- 01253 760800

Limitations Of Use

This basic guide is for guidance only and whilst every effort has been made to ensure that all information given is accurate, reference should be made to the current standard. No responsibility can be taken for errors and omissions. The guide does not cover analogue or radio linked systems. If assistance is required in regards to design, please contact the Firesafe technical department. Copies of the current standards can be purchased from the sales department on:- 01253 699500.