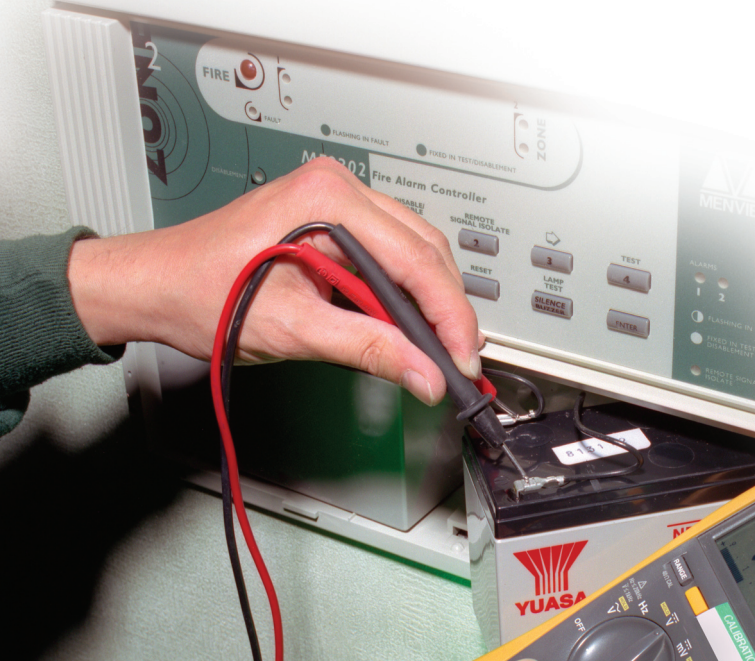


Fire

The Fire Installers Mate



A guide to fire alarm systems design
BS 5839 Part 1:2002

COOPER

COOPER Fire

MENVER

Isb



A guide to BS 5839 Part 1:2002

Disclaimer

This booklet is not intended to be a comprehensive guide to all aspects of fire alarm design but rather a very useful source of background information.

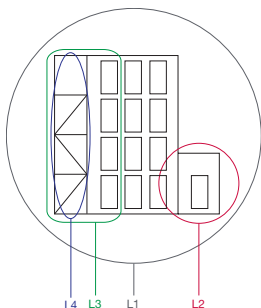
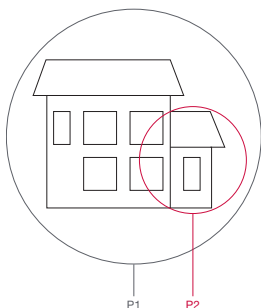
Whilst every care has been taken to ensure that the contents of this document are correct at the time of publication, it should never be used as any form of substitution for the BS 5839 standard itself. Cooper Safety shall be under no liability whatsoever in respect to such contents.

It should be noted that there may be specific additional requirements dependent upon local authority building regulations and/or fire authority.

Please use this guide in conjunction with a current issue of the BS 5839 standard.



Categorisation of fire alarm and detection systems



AFD - Automatic Fire Detection

Property Protection Fire Systems

P AFD designed to primarily protect property categories:

P1 AFD installed throughout all areas

P2 AFD installed only in defined areas

Life Protection Fire Systems

L AFD designed to primarily protect human life categories:

L1 M plus AFD installed throughout all areas

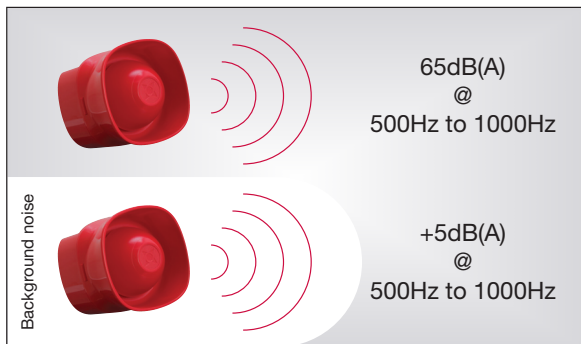
L2 AFD installed in defined areas of higher risk of ignition, in addition to L3

L3 M plus AFD installed in escape routes and rooms opening into these routes

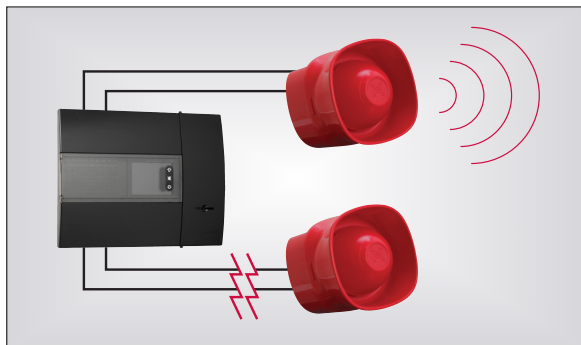
L4 M plus AFD installed in escape routes comprising circulation areas and space such as corridors and stairways

L5 A non-prescriptive system in which protected area(s) and/or the location of detectors is designed to satisfy a specific fire risk objective (other than that of L1 to L4)

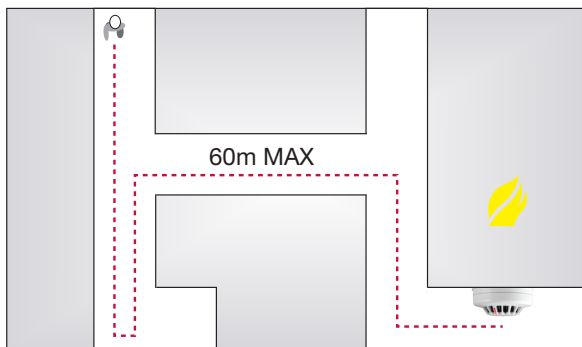
M System designed to be operated manually (no AFD)



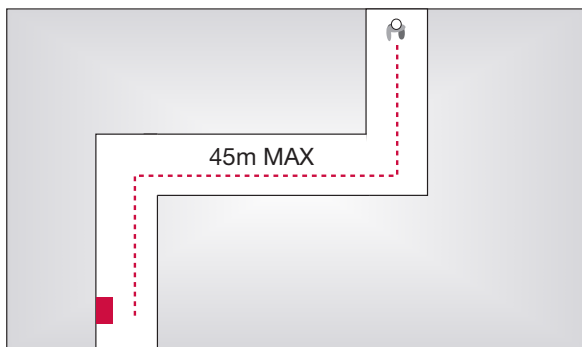
The minimum sound level of a sounder device should be **65dB(A)** or **5dB(A)** above a background noise (if lasting more than 30 seconds) and at a frequency between **500Hz** and **1000Hz**. The maximum sound level should not exceed **120dB(A)**.



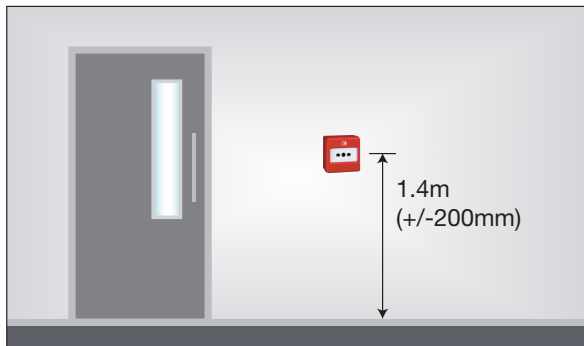
Sounder device cabling should be arranged so that in the event of a fault at least one sounder located within the vicinity of the control and indicating panel will remain in operation.



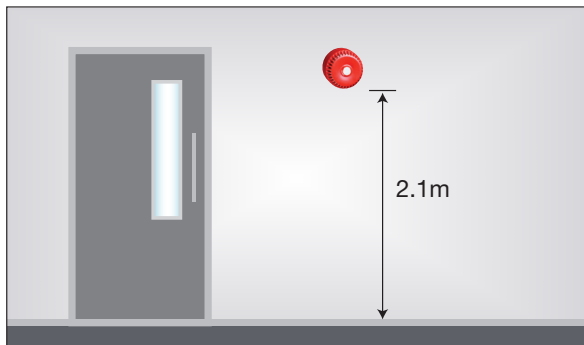
The maximum zone floor area should not exceed **2000m²**. A person searching a zone for a fire should not have to travel more than **60m** from the zone entrance to identify the source of the fire.



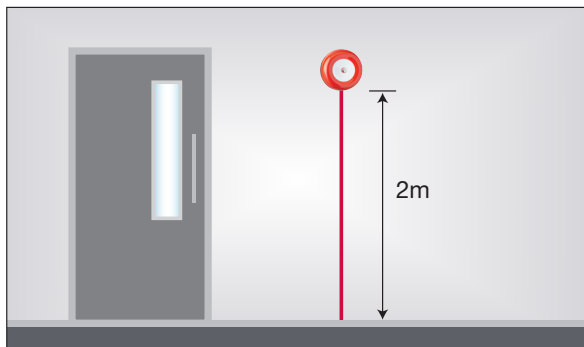
A person should not have to travel more than **45m** along an escape route to reach a manual callpoint, when the layout of the building is known.



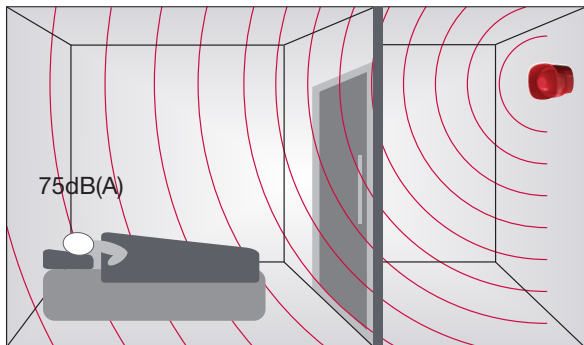
The centre of the element of the manual callpoint should be positioned **1.4m (+/-200mm)** from floor level (unless a wheelchair user is likely to be the first person to raise the alarm, when this is applicable it should be noted on any certification).



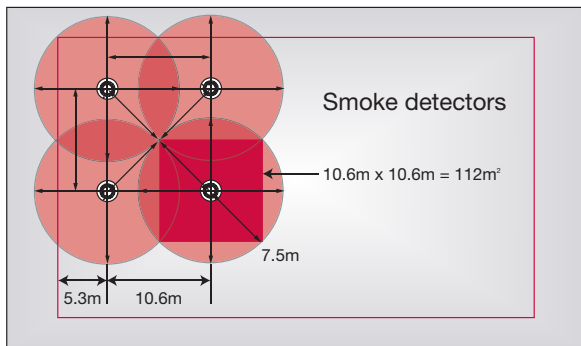
Visual alarms such as beacons should always be mounted at a minimum height of **2.1m** from floor level, in a position that is likely to attract attention.



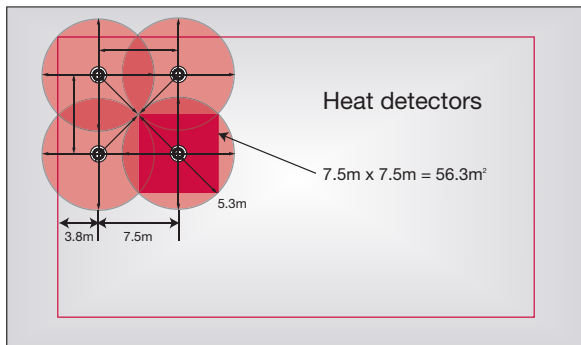
Unless MICC or armoured cable to BS7846 standard is used, consideration should be given to the protection against physical damage from floor level to the height of **2m**. Except in relatively benign areas, such as shops, offices and similar, where cabling can be clipped to robust walls.



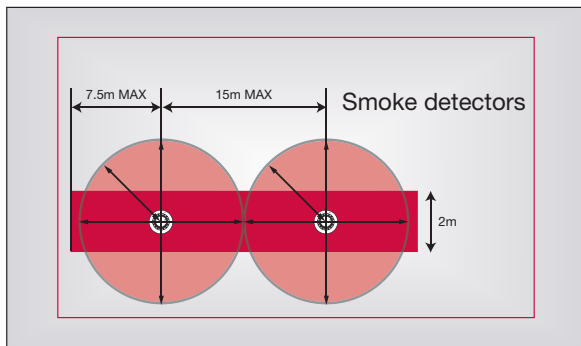
For areas where people are sleeping, sounder devices should produce a minimum **75dB(A)** at the bed-head with all doors shut. In buildings likely to provide sleeping accommodation for the hearing impaired, consideration should be given to the incorporation of both audio and visual devices.



When mounted on a flat ceiling, smoke detection devices have an individual coverage of **7.5m** radius. However these radii must overlap to ensure there are no 'blind spots'. Therefore individual coverage can be represented by a square measuring **10.6 x 10.6m** giving an actual coverage area of **112m²** per device.



When mounted on a flat ceiling, smoke detection devices have an individual coverage of **5.3m** radius. However these radii must overlap to ensure there are no 'blind spots'. Therefore individual coverage can be represented by a square measuring **7.5 x 7.5m** giving an actual coverage area of **56.3m²** per device.



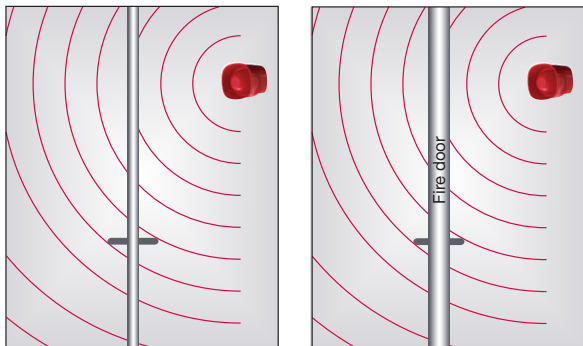
In corridors less than **2m** wide the horizontal spacing of detectors can be increased, the area of coverage need not overlap as in the case of a room. Any corridor over **2m** wide is deemed as a room and must adhere as specified (see page 8).

Please note: Heat detectors are not recommended for use in corridors that may be used as escape routes.

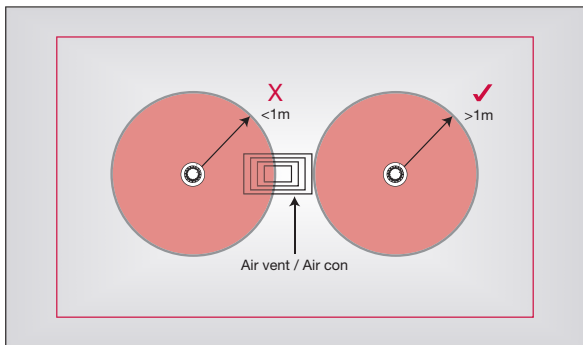
For ease of design and assessment of coverage dimensions used for detectors are usually taken as:

Smoke: 5m to wall / 10m between detectors
Coverage 100m²

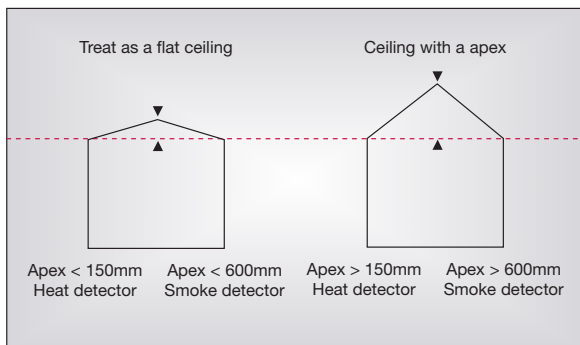
Heat: 3.5m to wall / 7m between detectors
Coverage 50m²



Decibel loss occurs through doors: Approximately -20dB(A) through a normal door, and approximately -30dB(A) through a fire door. Unless a sounder is installed in a bedroom, it is unlikely that 75dB(A) will be achieved.



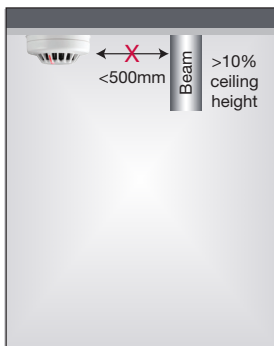
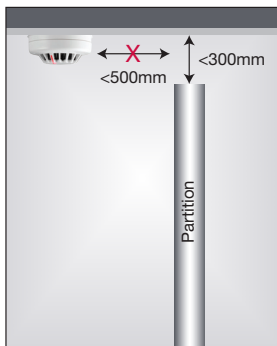
Do not site detectors less than 1m from air inlets or air circulating systems.



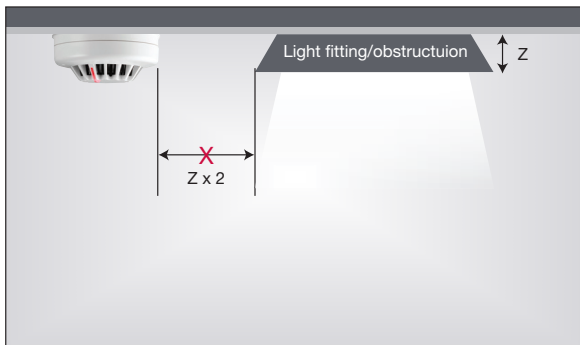
For ceilings that feature an apex: As long as the height of the apex from the rest of the ceiling is less than **150mm** for heat detectors or less than **600mm** for smoke detectors, then these can be treated the same as flat ceilings. For higher apexes, a device should be installed at the highest point. The distance to adjacent devices can be increased by **1%** per degree of angle of the roof up to a maximum of **25%**.

Detector Type	Ceiling Heights (m)	
	General Limits	Rapid Attendance* (category P systems only)
Heat Detectors EN54-5		
Class A1	9.0	13.5
Other Classes	7.5	12.0
Point Smoke & CO Fire Detectors	10.5	15.0
Aspirating Smoke Detection Systems (category 1)	Normal 10.5 Enhanced 12.0 Very high 15.0	Normal 15.0 Enhanced 17.0 Very high 21.0
Optical Beam Smoke Detectors EN54-2	25.0	40.0

* Rapid attendance within 5 minutes



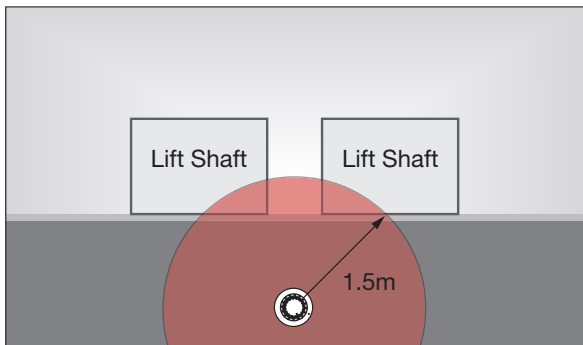
A device should not be mounted within **500mm** of any obstruction. If the top of a solid partition is less than **300mm** from the ceiling then it should be treated as a wall. Similarly, ceiling obstructions such as beams should be treated as walls if deeper than **10%** of the ceiling height (particularly important in voids).



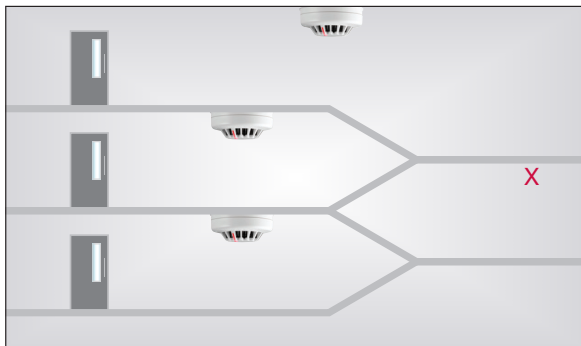
For obstructions less than **250mm** deep never mount devices closer than twice the depth of light fittings or other obstructions in the ceiling.



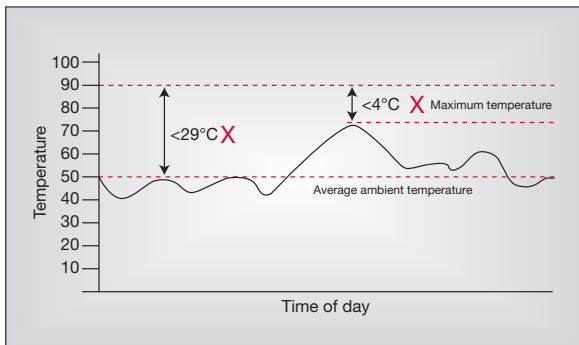
Voids less than **800mm** in height are required to have a risk assessment to determine if AFD is required. Voids in excess of **800mm** do require independent coverage.



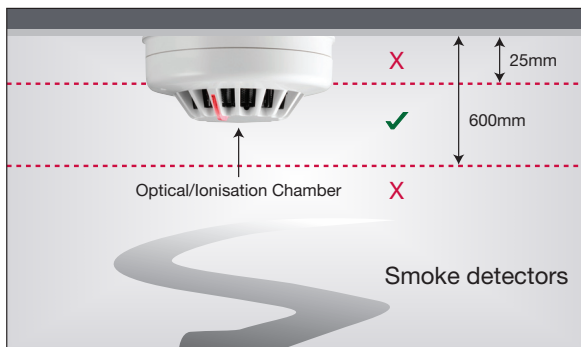
Vertical shafts like lift shafts and stairways should have a device mounted within **1.5m** of any opening.



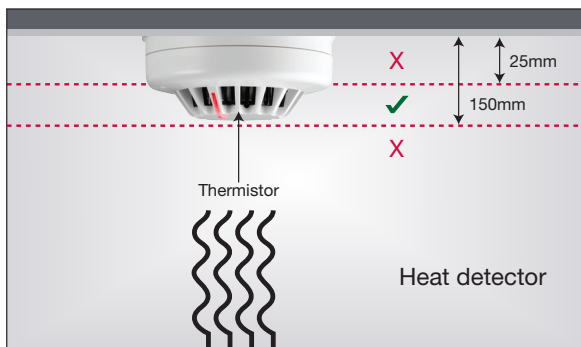
Enclosed stairways should have a detector on the **top** of the stairway and on each **main landing**.



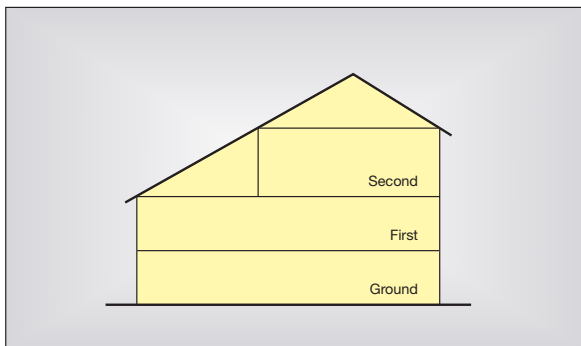
The minimum static response to heat devices should not be less than **29°C** above the average ambient temperature, or less than **4°C** above the highest temperature the device can be expected to experience.



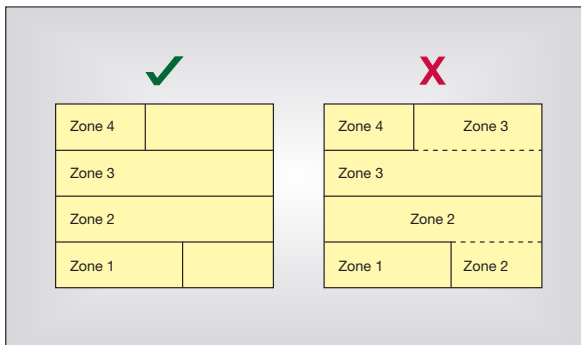
The sensing element of a smoke detection device (optical smoke chamber) should not be less than **25mm** below the ceiling, and not greater than **600mm** below the ceiling.



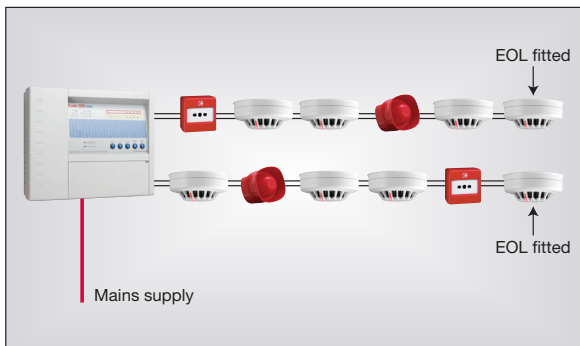
The sensing element of a heat detection device should not be less than **25mm** below the ceiling, and not greater than **150mm** below the ceiling.



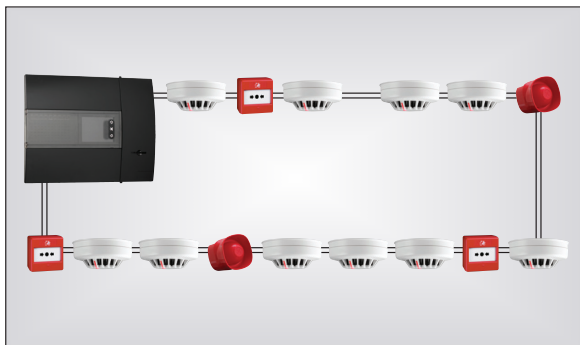
Less than 300m^2 can be covered by a single zone. When the total floor area exceeds 300m^2 , each floor would require a zone (or zones if the floor area exceeds 2000m^2) with access, stairwells or lifts covered by a zone each.



Zones should not cross floors.



To comply with the current version of the BS 5839 Part 1, the use of fire resistant cables are required for all critical circuits, this includes detection, sounders and mains supply.



On a loop system, short circuit isolators are required to limit the effect of one fault to less than **2000m²** floor area. 2 simultaneous faults on a circuit should not disable protection within an area greater than **10,000m²**.

Installation Considerations and Key Points

For local isolation during maintenance, a suitable double pole isolator should be provided, suitably marked (25.2c & f).

Cables used for all critical paths, i.e. detector, sounder and the mains supply should be wired in fire resistant cable with a minimum cross sectional area of 1 mm² (26.2j).

Enhanced fire resistant cables should be used in unsprinklered buildings where evacuation takes place in 4 or more phases, where the building is more than 30 m in height, or the risk assessment deems it necessary (26.2c).

Cables require to be retained in position by a suitable fire resistant method. This requires that should plastic trunking be used, the cables must be clipped inside the trunking. Also plastic cable ties should NOT be used (26.2f).

Control equipment should be sited in a position which is easily accessible to both staff and fire-fighters (23.2.1).

Call points are required at ALL exits to the open air and storey exits. Operation should be of a similar type (20.2).

If multi sensors are used, if it is possible, select the operation of a particular sensor then the detectors require to be spaced to suit the space of the lower coverage sensor i.e. a combined heat / smoke detector, spacing would be as a heat detector (21.1.6).

All sounders in a building should have a similar sound, this precludes the mixing of bells and electronic sounders (16.2.1c).

If the background noise exceeds 90 dB(A) or where hearing protection is likely to be used, then visual alarm devices are required (17.2a).

Disabled persons toilets require to be fitted with visual alarm devices (18.1).

The user of the system should be provided with adequate records and documentation (40.1).

On completion of each process suitable certification should be provided by the organisations responsible for each stage of the system i.e. design, installation and commissioning (41.2).

Suggested Installation / Commissioning / Handover Checklist

☐	1	The system complies with original specification / design, if any changes have been made they have been approved by the designer.
☐	2	System has been installed to meet the requirements of specified category, if not specified or known, commissioning engineer should state category that system appears to be installed to.
☐	3	Wiring of detector / sounder circuits and mains supply wired in required fire resistant cable, standard or enhanced.
☐	4	Cables are segregated and mechanically protected as required, suitably supported (no plastic clips, cable ties or trunking as the sole means of support) as per the cable manufacturers requirements.
☐	5	Mains supply is a dedicated supply, suitably fused, and provides local double pole isolation which is correctly labelled.
☐	6	Junction boxes are correctly labelled, identified on drawings, and use fire resistant terminal blocks.
☐	7	All cable continuity and insulation resistance results are recorded.
☐	8	Current requirements of the system under quiescent and alarm conditions are measured and relevant calculations carried out to ensure standby battery(s) are suitable for system requirements.
☐	9	All standby batteries are clearly marked with date of installation, such that this date can be seen without removing batteries from equipment.
☐	10	Minimum of two sounders are installed on a minimum of two sounder circuits i.e. at least one sounder on each of two sounder circuits.
☐	11	Circuit wiring is correctly labelled and terminated in all control and ancillary equipment.
☐	12	Sound pressure levels have been checked and recorded, and meet the requirements of BS 5839 Part 1.
☐	13	Detector type and spacing have been checked and are installed to meet the required system category.
☐	14	Manual call points are located correctly and travel distance is appropriate to the usage of the building.
☐	15	Remote signalling has been checked to ensure correct operation, to relevant point of reception.
☐	16	Zone chart(s) have been located in all appropriate locations i.e. adjacent to all control equipment and repeaters.
☐	17	As fitted drawings are complete and have been updated where required.
☐	18	Log book and operating instructions have been given to the responsible person.
☐	19	Relevant certification is provided to user or purchaser of the system.
☐	20	Responsible person(s) have been provided with adequate training in the operation of the system and the avoidance of false alarms.

Please note that this check list should only be taken as a suggested list and reference to the appropriate sections of BS 5839 part 1 is advised. Appropriate certification should also be completed.

Cooper Lighting and Safety Ltd - UK

Wheatley Hall Road, Doncaster, South Yorkshire. DN2 4NB.

www.cooperfire.com

Sales

T: +44 (0)1302 303999
F: +44 (0)1302 303333
E: sales@cooperfire.com

Technical

T: +44 (0)1302 303350
F: +44 (0)1302 303332
E: techsupport@cooperfire.com

Export

T: +44 (0)1302 303250
F: +44 (0)1302 303251
E: export@cooperfire.com

Service

T: +44 (0)1302 303352
F: +44 (0)1302 303332
E: mvdo-service@cooperindustries.com

Ireland

T: 00 353 6671 42858
F: 00 353 6671 42861