POCKET GUIDE TO BS 5839-1:2025

FIRE DETECTION AND FIRE ALARM SYSTEMS FOR BUILDINGS

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THE REGULATORY REFORM (FIRE SAFETY) ORDER (FSO) BECAME LAW ON 1 OCTOBER 2006

LEGALLY YOU MUST COMPLY! WHAT IS THE FSO?

Fire authorities no longer issue fire certificates and those previously in force now have no legal status. The Regulatory Reform (Fire Safety) Order (FSO) replaced most fire safety legislation with one new Order. It means that any person who has some level of control in premises (normally the employer) must take steps to reduce the risk from fire, consider how to contain a fire should one break out and then also make sure people can safely escape if there is a fire.

- All fire alarm designs should be based on an assessment of the risk
- All Fire Risk Assessments should be carried out by a competent person
- Fire Risk assessments must be reviewed regularly

WHAT CONSTITUTES A FIRE RISK ASSESSMENT AND ITS OUTCOME?

- Identifying fire hazards such as sources of ignition, fuel or oxygen
- Identifying all people at risk in and around the premises
- Evaluating the risk of a fire starting and the risk to people from a fire
- Removing or reducing fire hazards or risks to people from a fire
- Protecting people by providing fire precautions
- Recording the significant findings
- Preparing an emergency plan
- Informing and instructing any relevant people, including visitors
- Providing training for staff
- Reviewing the fire risk assessment regularly and make changes where necessary
- Keeping accurate fire risk assessment records

WHERE DOES THE ORDER APPLY?

Virtually all premises and nearly every type of building structure and certain open spaces.

If you would like to find out more about how Apollo products can help you comply with the FSO please contact us on 023 9249 2412 or visit our website on www.apollo-fire.co.uk

THIS GUIDE IS INTENDED TO BE AN AID TO DESIGNERS AND INSTALLERS OF FIRE DETECTION SYSTEMS. IT IS NOT TO BE USED AS A SUBSTITUTE FOR BS 5839-1 WHICH SHOULD BE READ IN FULL. IN ORDER TO HELP IDENTIFY THE RELEVANT SECTIONS, EACH DIAGRAM INCLUDES A REFERENCE TO BS 5839-1

DESIGNER RESPONSIBILITIES

NOTES:

(1) BS 5839-1 recommends that a fire detection system is designed by a competent person, who takes responsibility for completing the design and signing off a 'Design certificate'. This should not be confused with other certificates relating to Installation.

(2) If the contract allows, it is suggested that the Designer witnesses testing of the completed system to ensure the original design is still appropriate; the Design certificate can then be completed after any amendments are included.

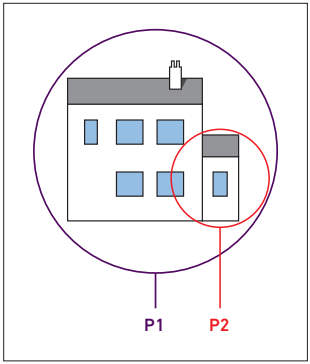
The following recommendations should be followed when designing a fire detection system:

- Establish the level of fire protection suitable to the premises type in agreement with the owner/occupier and relevant interested parties
- Document any reasons to justify variation of design
- Identify detection and alarm zones
- Raise specification document and building plan to show location of: |
  - All manual call points
  - All types of detector
  - All sounders and visual alarms
  - Any other items of detection
- Cable specification for each circuit
- State the System and equipment to be used
- Details of other equipment that may be linked into the system to be specified
- Measures incorporated to limit false alarms
- Provide a fire plan or cause and effect chart
- Design certificate signed

FIRE ALARM AND DETECTION SYSTEMS ARE CATEGORISED IN THE FOLLOWING WAY:

PROPERTY PROTECTION FIRE SYSTEMS

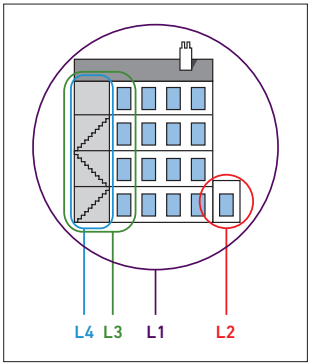
P	AFD designed primarily to protect property
P1	AFD installed throughout all areas
P2	AFD installed only in defined areas



LIFE PROTECTION FIRE SYSTEMS

L	AFD designed to primarily protect Human Life
L1	AFD installed throughout all areas
L2	AFD installed in defined areas in addition to L3
L3	AFD installed in escape routes and rooms or areas opening onto these routes
L4	AFD installed in escape routes comprising circulation area and spaces 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 design to be operated manually (no AFD)

*AFD Automatic Fire Detection

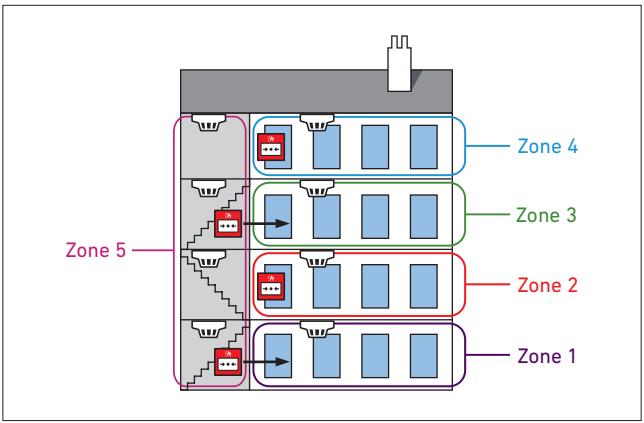


DETECTION ZONES

A detection zone should cover no more than 1 storey, unless total floor area is less than 300 m^2. Voids in the same fire compartment should be included in the same floor zone. The maximum floor area of a zone should not be greater than 2,000 m^2, except for some large open plan areas that incorporate manual call points only, which can be extended to 10,000 m^2.

The maximum search distance for the fire fighters to see the seat of the fire within a zone should not exceed 60 m assuming the route taken is the worst possible option. Vertical structures like stairwells, lift shafts etc., should be considered as separate zones.

A manual call point within a staircase should be connected to the zone associated with that floor and ideally be mounted on the accommodation side of the corridor exit. Automatic sensors on the stairwell remain as part of the stairwell detection zone.

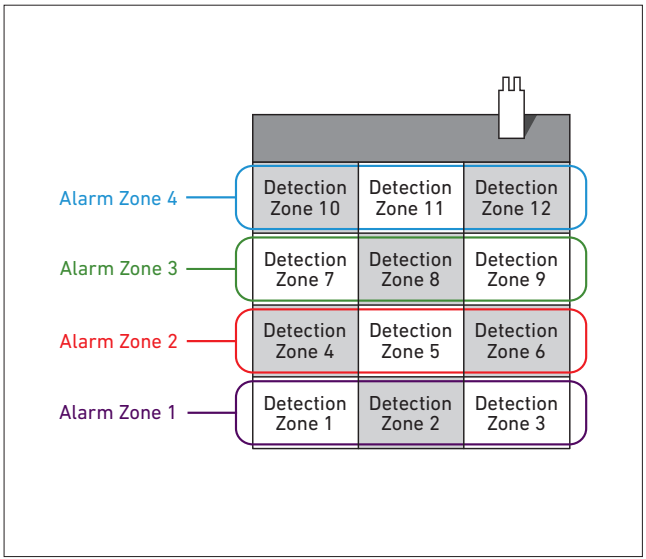


ALARM ZONES

An alarm zone is clearly defined within the standard but generally is an area of the building coinciding with the fire compartment boundaries. There must be a clear break between these alarm zones to ensure alert and evacuation messages are not overheard from adjacent areas.

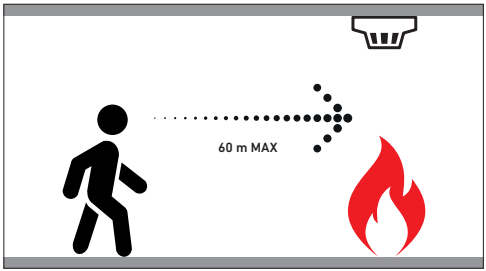
The only other criteria is that an alarm zone may consist of a number of detection zones but not vice versa.

Alarm zones are required when phased or staged evacuation is required. It is therefore important that care should be taken to ensure only one message is heard at any one time particularly where two alarm zones are attached.



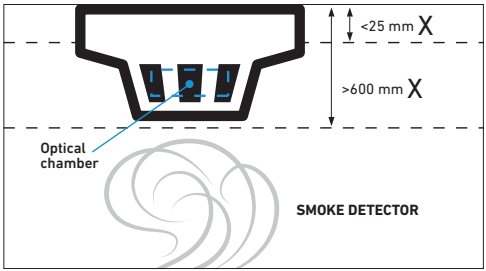
SECTION 2

SEARCH DISTANCES



A person searching a zone for a fire in a non-addressable fire system should not have to travel more than 60m to identify the source of a fire.

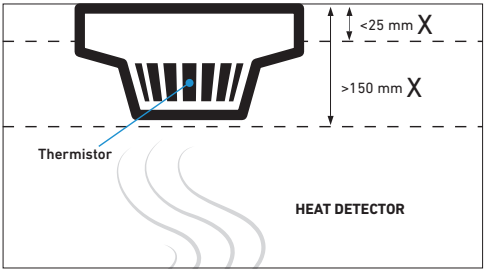
SMOKE DETECTOR CEILING MOUNTING



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

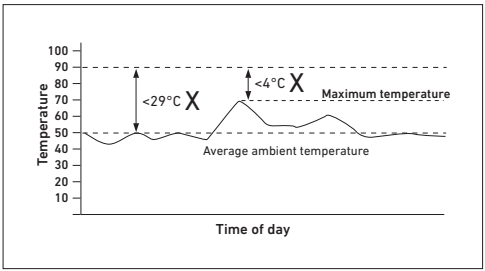
SECTION 2

HEAT DETECTOR CEILING MOUNTING



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

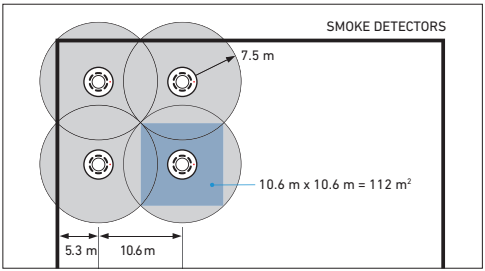
ENVIRONMENTAL CONSIDERATIONS



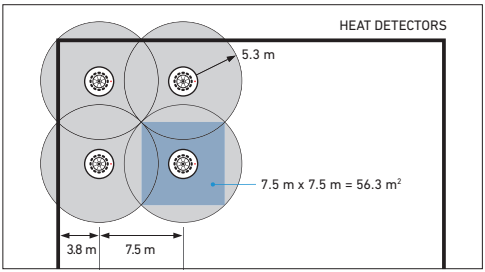
The minimum static response to heat devices should not be less than 29°C above the average ambient temperature, or less than 4°C above the highest temperature the device can expect to experience.

SECTION 2

POINT DETECTOR COVERAGE

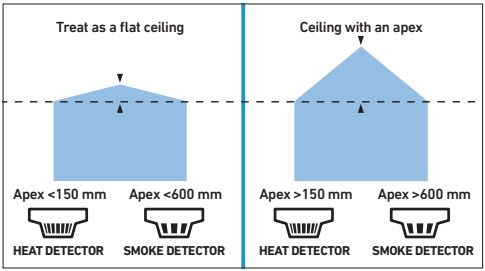


When mounted on a flat ceiling, smoke detection devices have an individual coverage of 7.5 m radius. However these radii must overlap to ensure there are no 'blind spots'. Therefore individual coverage can be represented by a square measuring 10.6 m x 10.6 m giving an actual area coverage of 112 m^2 per device.



When mounted on a flat ceiling, heat detection devices have an individual coverage of 5.3 m 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 m x 7.5 m giving an actual area coverage of 56.3 m^2 per device.

POINT DETECTOR COVERAGE CONT.

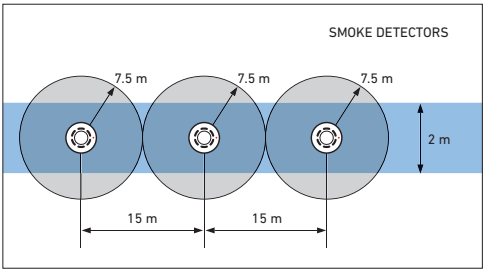


For ceilings that feature an apex: as long as the height of the apex from the rest of the ceiling is less than 150 mm for heat detectors or less than 600 mm for smoke detectors, then these can be treated the same as flat ceilings. For higher apexes, a device should be installed at the highest point.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

Response Max Height	All categories of system	
Detector Type	General Area	10% of Area
Heat RoR	9 m	10.5 m
Heat Fixed	7.5 m	10.5 m
Smoke/CO point	10.5 m	12.5 m
Optical Beam Normal Sensitivity	25 m	28 m
Optical Beam enhanced Sensitivity	40 m*	43 m*
ASD General Limit	10.5 m	12.5 m
ASD Class C with at least 5 holes	15 m	18 m
ASD Class C with at least 15 holes	25 m	28 m
ASD Class B with at least 15 holes	40 m†	43 m†

* Supplemented detection recommended unless risk of stratification is minimal.
† Multi-level detection recommended unless risk of stratification is minimal.

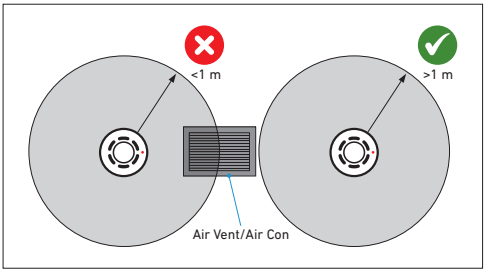
POINT DETECTOR COVERAGE CONT.



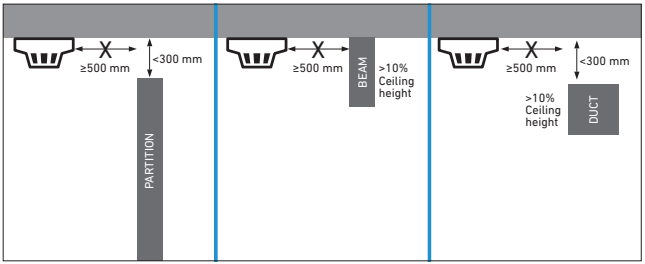
In corridors less than 2 m wide the horizontal spacing of detectors may be increased, the areas of coverage need not overlap as in the case of a room. Any corridor over 2 m wide is deemed a room and device spacing should follow the standard for rooms (see page 9).

SECTION 2

AIR VENTS & CEILING OBSTRUCTIONS



Do not site detectors less than 1 m from air supply points or air circulating units.

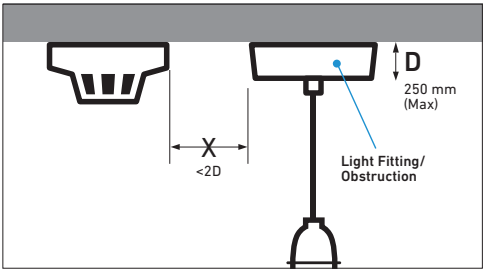


A device should not be mounted within 500 mm of any obstruction.

If the top of a solid partition is less than 300 mm from ceiling then treat it as a wall. Similarly, ceiling obstructions such as beams should be treated as walls if deeper than 10% of the ceiling height.

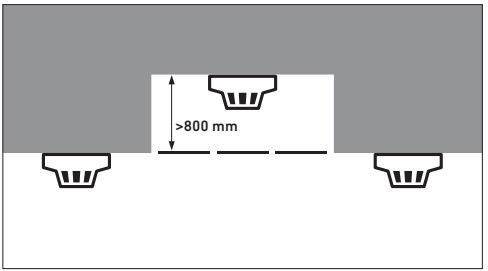
Air handling ducts with less than a 300 mm gap to ceiling and standing down more than 10% of the ceiling height, should also be treated as a wall.

AIR VENTS & CEILING OBSTRUCTIONS CONT.



Never mount devices closer than twice the depth of light fittings or other obstructions on the ceiling.

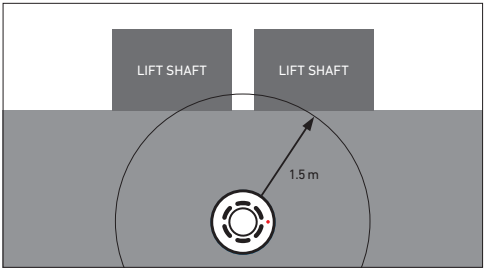
CEILING VOIDS



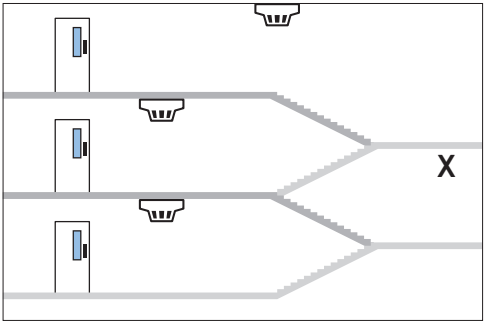
Voids less than 800 mm in height need not have independent coverage, unless fire or smoke is able to spread from one area to another through the void or risk assessment shows AFD (Automatic Fire Detection) to be necessary.

SECTION 2

LIFTS, RISERS & STAIRWAYS



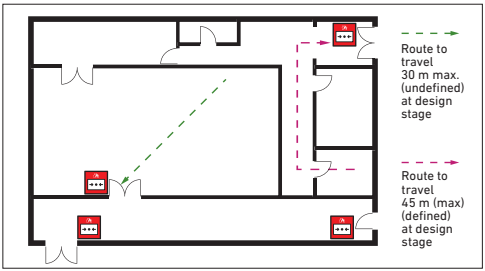
Vertical shafts like lifts, risers and open stairways should have a device mounted within 1.5 m of any opening. (This is not necessary for enclosed stairways, because as noted below, there are detectors on every landing within the stairway).



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

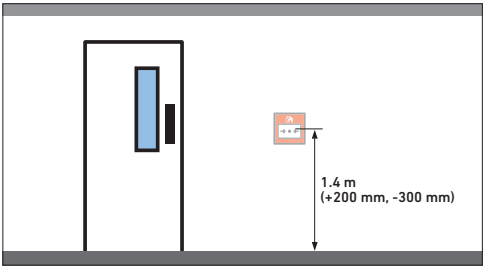
SECTION 2

MANUAL CALL POINTS



A person should not have to travel more than 45 m to reach a Manual Call Point, for a defined escape route.

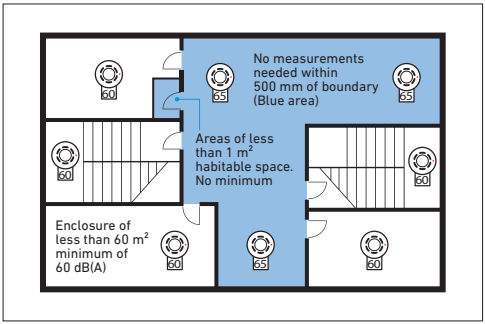
For an undefined route a person should not have to travel more than 30 m to reach a Manual Call Point.



The centre of the element of the manual call point should be positioned 1.4 m (+/-300 mm) from floor level. Unless a wheelchair user is likely to be the first person to raise the alarm. (Between 800-1200 mm according to Doc. M. + Equality Act). BS 5839 states transparent hinged covers should be fitted to all manual call points.

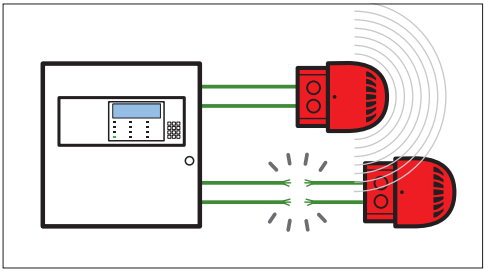
SECTION 2

AV DEVICES



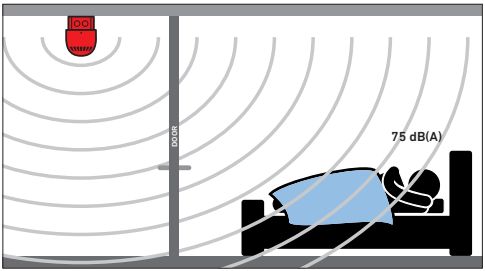
The minimum sound level should be 65 dB(A) or 5 dB(A) above a background noise which is louder than 60 dB(A) (if lasting more than 30 seconds) and at a frequency of between 500 Hz and 1000 Hz. The maximum sound level should not be greater than 120 dB(A) at any normally accessible point. May be reduced to 60 dB(A) in stairways, enclosures up to 60 m^2 and specific points of limited extent.

If using fire alarm as as lockdown alarm this must be a distinctly different tone to that of the fire alarm.

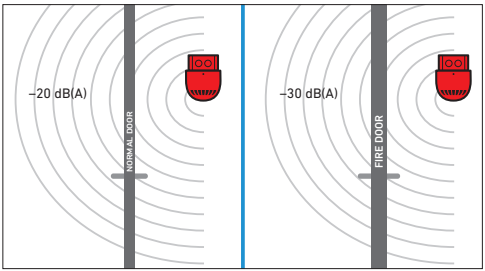


Sounder device cabling should be arranged so that in the event of a fault at least one sounder will remain operational during a fire condition.

AV DEVICES CONT.



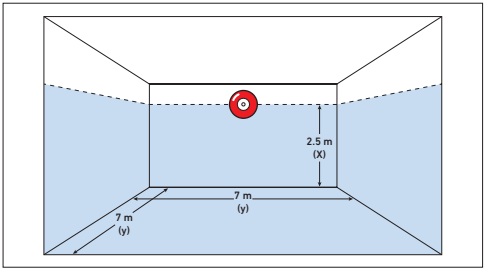
For areas where people are sleeping, sounder devices should produce a minimum 75 dB(A) at the bed-head with all doors shut. In buildings providing sleeping accommodation for deaf or people with impaired hearing, bedrooms should have both audible and visual alarms. (Note: Visual Alarm Devices are not intended to wake sleeping persons).



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

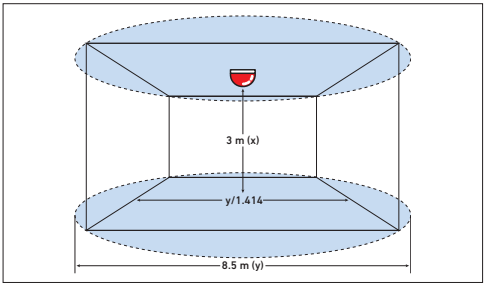
SECTION 2

VISUAL ALARM DEVICES



The coverage volume code is presented as W-x-y.

If the wall mounted Visual Alarm Device (VAD) is installed at the height of 2.5 m from floor level, and the coverage is 7 m x 7 m square, then it would be referred to as W-2.5-7.

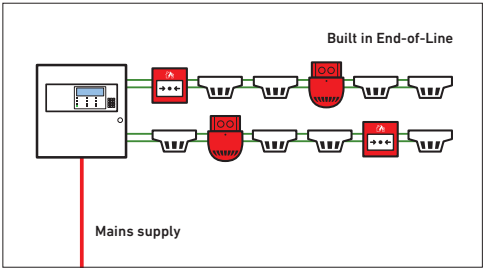


The coverage volume code is presented as C-x-y.

If the ceiling mounted Visual Alarm Device (VAD) is installed at the height of 3 m from floor level, and the coverage diameter is 8.5 m, then it would be referred to as C-3-8.5.

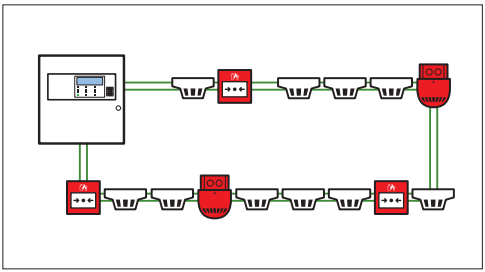
SECTION 2

CABLING REQUIREMENTS



Fire resistant cabling is now required within the whole fire alarm system including the mains supply cables. The use of non-fire resisting cables whether mechanically protected by fire-resisting construction or not, will no longer comply with BS 5839-1. All detection, alarm and mains supply FR cables should be red in colour.

SHORT CIRCUIT ISOLATORS



Short circuit isolators limit the effect of one fault to 2000 m^2 and to a single storey of the building. '2 simultaneous faults on a circuit should not disable protection within an area greater than 10,000 m^2'.

INSTALLATION CONSIDERATIONS AND KEY POINTS

- Suitable means of local safe isolation of the low voltage supply circuit for the power supply and control equipment must be provided (See Section 2 Clause 24.1.4 and also Section 6 Clause 4.3).
- All cables to be fire resistant with a minimum cross-sectional area of 1 mm^2 (see Section 2 Clause 25.7).
- All joints 'other than those within the system components' to be fire resistant. Junction boxes to be labelled 'FIRE ALARM' (see Section 2 Clause 35.4).
- Enhanced cable to be used where more than 4 zones of phased evacuation required, in multi storey systems, hospitals (un-sprinklered over 30m) or risk assessment requires enhanced cable (see Section 2 Clause 35.4).
- Cable using trunking as a means of containment must be clipped using fire resistant supports WITHIN THE TRUNKING (Section 2 Clause 35.3 Note 1).
- Fire Alarm control panel(s) are installed at a location appropriate for staff and firefighters (see Section 2 Clause 22).
- Manual call points are required at all exits to the open air – whether or not the exits are specifically designed to be fire exits unless, for example, the exits lead to an enclosed courtyard from which there is no escape (Section 2 Clause 19.4).
- CO fire detectors should be spaced as per smoke detectors, but cannot be used without smoke detectors on escape routes (see Section 2 Clause 20c).
- Multi-sensors, incorporating smoke detection should be spaced as smoke detectors, if used as individual types, for example heat in the day & smoke at night then detectors are spaced in this case as per heat detectors (see Section 2 Clause 20e).
- Linear heat detecting cables should conform to BS EN 54-22 or BS EN 54-28 as appropriate. (see Section 2 Clause 10.13).
- Unusual ceilings: Cellular ceiling, perforated ceilings or ceilings with closely spaced beams have special spacing & installation requirements (see Section 2 Clause 21.2.13 Fig 16, 17 & Table 1).
- Bells & Electronic sounders cannot be mixed (see Section 2 Clause 15.1.5).
- Sound levels can be reduced to 60 dB(A) in stairs, small cellular rooms or enclosures of no more than APPROXIMATELY 60 m^2. Bedhead levels remains 75 dB(A) (see Section 2 Clause 15.1.1 a).
- Geographical Zone plan required at all CIE and Repeater panel locations on site. Not providing this cannot be listed as a Variation. (see Section 2 Clause 22).

- Where applicable, all areas of the building have been fitted with Sounders and Visual Alarm/Tactile Devices in areas of high ambient noise, or where deaf people or people with impaired hearing may be alone or isolated from others i.e. bedrooms and sanitary facilities (see Section 2 Clauses 17.1 & 17.2).
- A minimum of one sounder is required in each fire compartment (see Section 2 Clause 15.1.10).
- Full documentation required, test results as fitted drawings etc. (see Section 5 Clause 38.1).
- An installation certificate will be required (see Section 5 Clause 39.1).
- Ensure that the installation wiring complies with the BS 5839-1 requirements and the latest edition of the IET Electrical Regulations.
- If an insulation resistance test is carried out, ensure that the field devices are disconnected. Make sure that the loop cables are grounded before field devices are reconnected.
- Once a detector has been fitted, ensure that the dust cap stays on until the system has been commissioned and the environment is clean.

DOCUMENTATION

On completion of commissioning and user training all documentation will have to be collected and handed to the client or their representative. This will include:

- Design, Installation and Commissioning certificates.
- Cable and insulation resistance test records.
- "As fitted" drawings of the final installation, including cable run details.
- Product manuals and user instructions System log book.
- A copy of the fire plan documentation against which the commissioning engineer programmed the system.
- The designer's specification and a written list of agreed Variations.

INSTALLATION AND HANDOVER CHECKLIST

☐	1	The system complies with the original specification / design.
☐	2	Any changes to original specification/design have been referred to the system designer for approval.
☐	3	System has been installed to meet recommendations of category L1, L2, L3, L4, L5, P1, P2, M.
☐	4	Variations to the defined category have been identified and the schedule of variations agreed with the client.
☐	5	Cables meet requirements for standard/enhanced/mixed.
☐	6	Cables are segregated as required and suitably supported (no plastic clips, cable ties or trunking used as sole means of support).
☐	7	Cables are mechanically protected as required.
☐	8	Junction boxes are correctly labelled and identified on drawings. Connector blocks are fire resistant.
☐	9	All cable insulation and continuity resistance measurements are logged.
☐	10	All cable penetrations are sleeved and fire stopped.
☐	11	Mains supply is dedicated, non-switched, correctly fused and labelled.
☐	12	Mains supply is correctly identified at all distribution boards.
☐	13	Standby battery verification has been carried out for all power supplies.
☐	14	All batteries are clearly marked and labelled with date of installation.

☐	15	Field wiring is labelled and correctly terminated in all control and ancillary equipment.
☐	16	Isolators are fitted as appropriate, operate correctly and are marked on drawings.
☐	17	There are a minimum of two sounder circuits installed.
☐	18	Sound pressure levels have been checked and recorded and meet the minimum requirements.
☐	19	Detector type and spacing is appropriate to the system category.
☐	20	MCPs are located correctly and travel distance is appropriate to the system category.
☐	21	Remote signalling has been checked for correct operation to Alarm Receiving Centre.
☐	22	Zone plans have been fitted in all appropriate locations (adjacent to control equipment and repeaters) this must be a plan, a list does not suffice.
☐	23	As fitted drawings are complete and have been updated where required, including cable size and routing.
☐	24	Log book and operating instructions have been issued to the responsible person.
☐	25	The premises management have been adequately trained in the use of the fire alarm system.

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A **Halma** company

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