



BS5839 PART 1: 2017

A GUIDE TO FIRE ALARM SYSTEMS DESIGN



WELCOME

This guide has been developed to highlight the key points of the latest version of the standard:

BS5839 Fire detection and fire alarm systems for buildings – Part 1 2017: Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises.

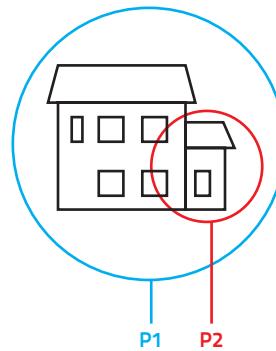
The guide should not be used as a substitute for the standard.

This guide will be of particular interest for those designers and installers that need simple guidance to the selection, spacing and location of fire devices.



CATEGORIES

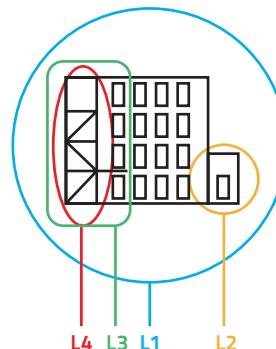
Fire Alarm and Fire Detection systems are categorised in the following way:



P - AFD* designed to primarily protect property

P1 - AFD installed throughout all areas

P2 - AFD Installed only in defined areas



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 opening onto these routes

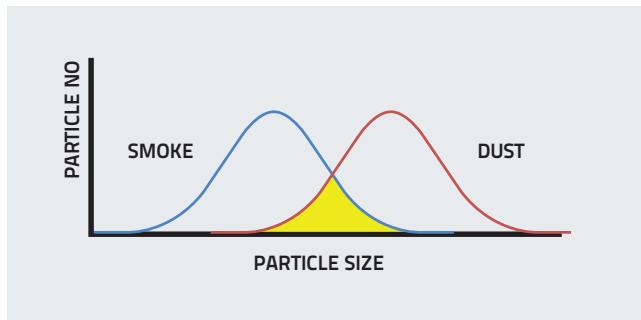
L4 - AFD installed in escape routes comprising circulation areas and spaces such as corridors and stairways

L5 - A non-prescriptive system in which the protected area(s) 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)

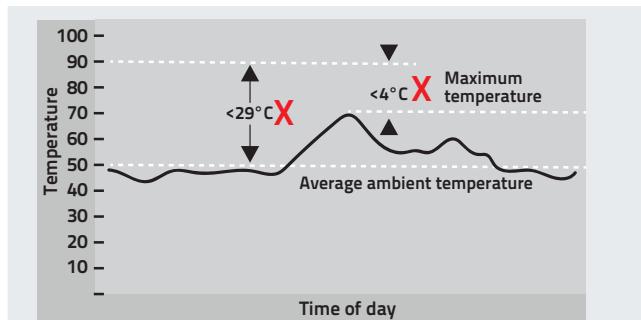
*AFD = Automatic Fire Detection

SMOKE DETECTORS



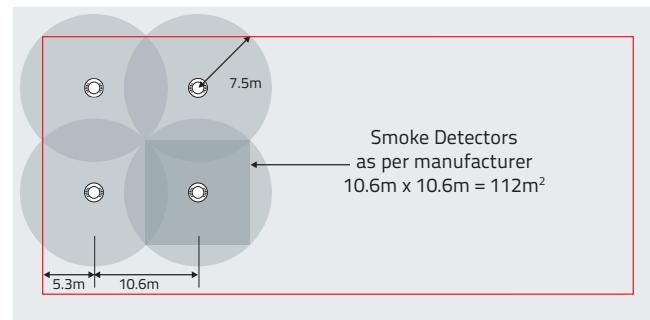
It should be noted that large smoke particles will have a similar particle size to small particle contaminants including some types of dust and aerosols. As such care should be taken when siting smoke detectors to limit subjection to this phenomenon.

HEAT DETECTORS

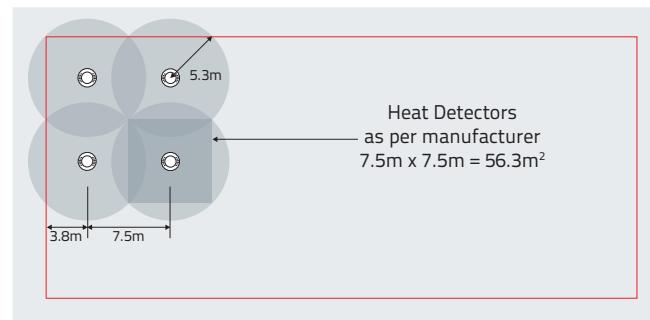


The minimum static response of heat devices should not be less than 29°C above the average ambient temperature, or less than 4°C above the highest temperature the device can be expected to experience.

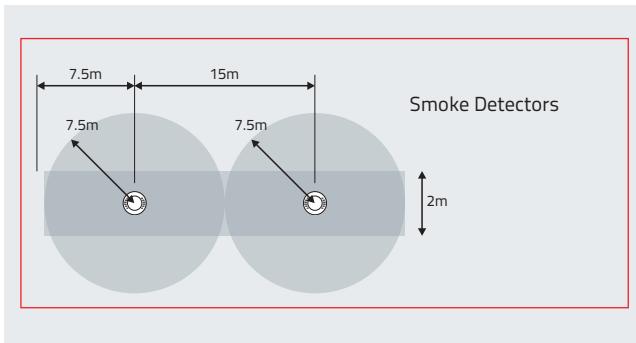
FIRE DETECTOR COVERAGE & POSITIONING



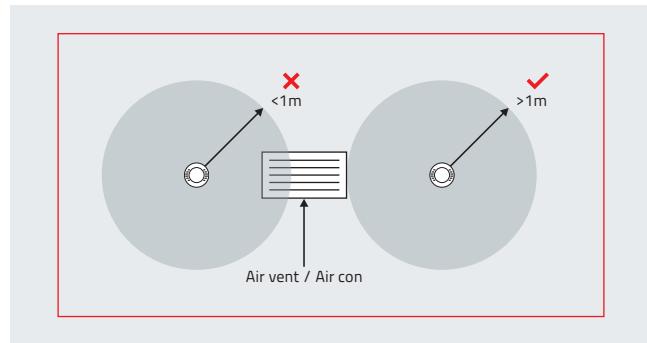
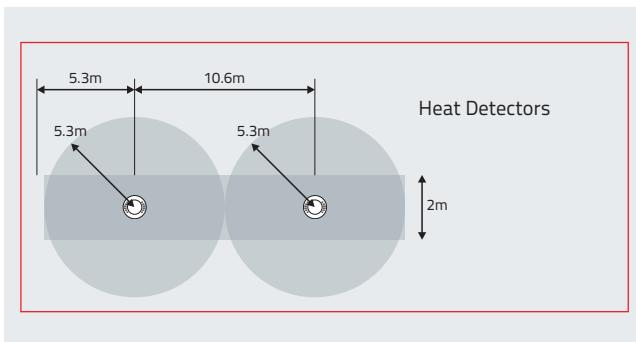
Smoke detection devices have an individual coverage of 7.5m radius. However these radii must overlap to ensure there are no 'blind spots'. Therefore the individual coverage can be represented by a square measuring 10.6 x 10.6m giving an actual area coverage of 112m² per device.



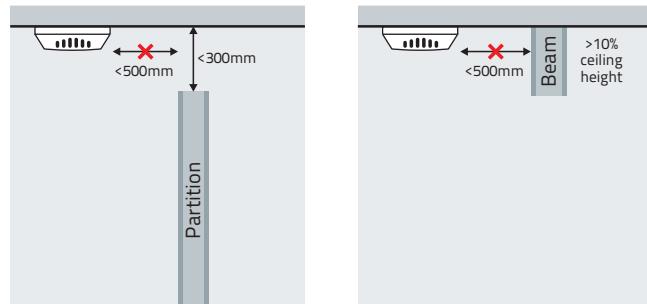
Heat detection devices have an individual coverage of 5.3m radius. However these radii must overlap to ensure there are no 'blind spots'. Therefore the individual coverage can be represented by a square measuring 7.5 x 7.5m giving an actual area coverage of 56.3m² per device.



In corridors less than 2m 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 2m wide is deemed a room and device spacing should follow the standard for rooms (see page 5).

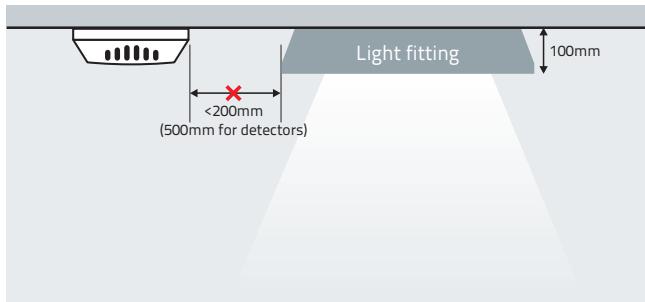


Detectors must not be sited less than 1m from air inlets or air conditioning units.

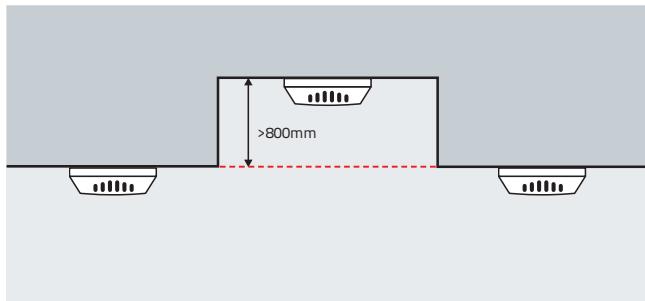


A device should not be mounted within 500mm of any obstruction. If the top of a solid partition is less than 300mm from the ceiling then treat it as a wall. Similarly, ceiling obstructions such as beams should be treated as walls if deeper than 10% of the ceiling height.

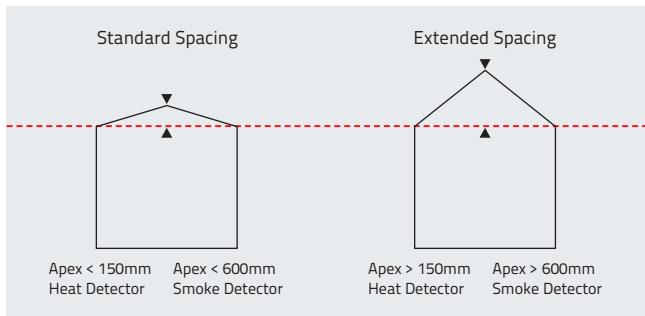
SMOKE DETECTORS



Never mount devices closer than twice the depth of light fittings.



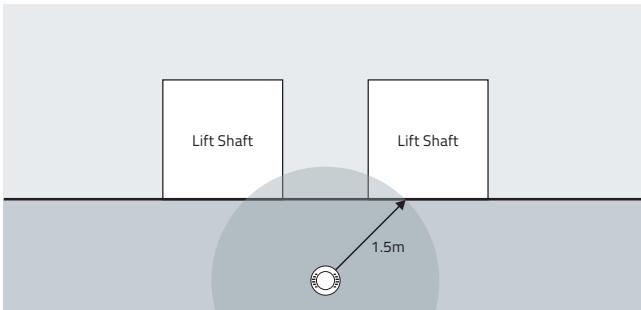
Voids less than 800mm in height need not have independent coverage, unless fire or smoke is able to spread from one area to another through the void or risk assessment shows AFD (Automatic Fire Detection) to be necessary.



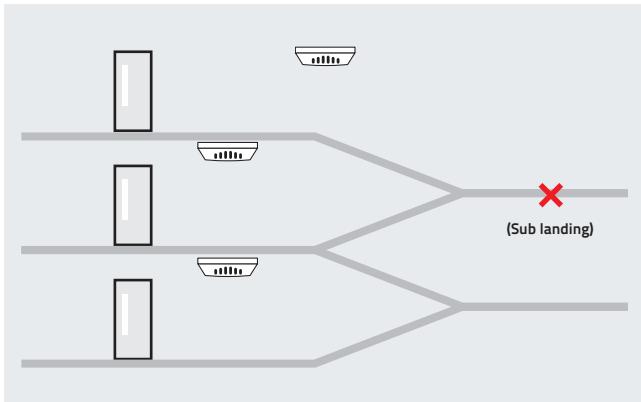
For ceilings that feature an apex: as long as the height of the apex from the rest of the ceiling is less than 150mm for heat detectors or less than 600mm for smoke detectors then these can be treated the same as flat ceilings. For higher apexes, a device should be installed at the highest point. The 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 Height (m)	
	General Limits	Maximum
Heat RoR	9.0	10.5
Heat Fixed	7.5	12.5
Point Smoke Detector	10.5	12.5
Aspirating Smoke Detection Class C with 5 holes	15	18
Aspirating Smoke Detection Class C with 15 holes	25	28
Aspirating Smoke Detection Class B with 5 holes	40	43
Optical Beam Normal Sensitivity	25	28
Optical Beam Enhanced Sensitivity	40*	43

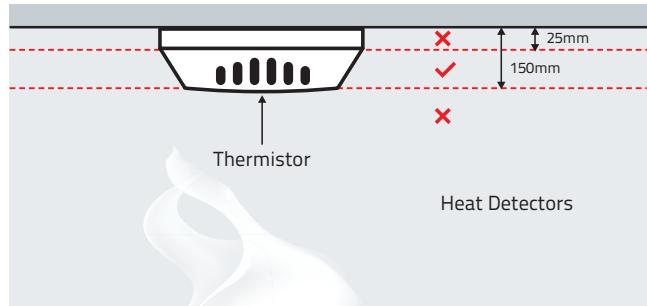
*Supplemented detection recommended unless risk of stratification is minimal.



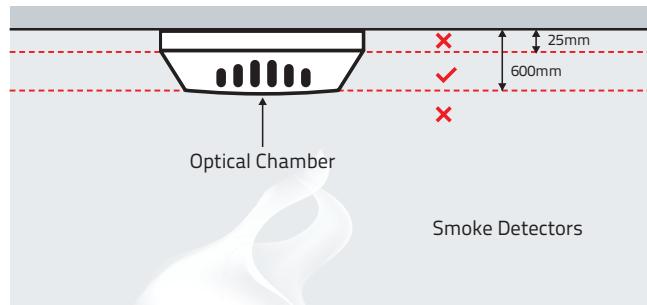
Vertical shafts like lifts and stairways should have a device mounted within 1.5m of any opening.



Enclosed stairways should have a detector on each main landing.

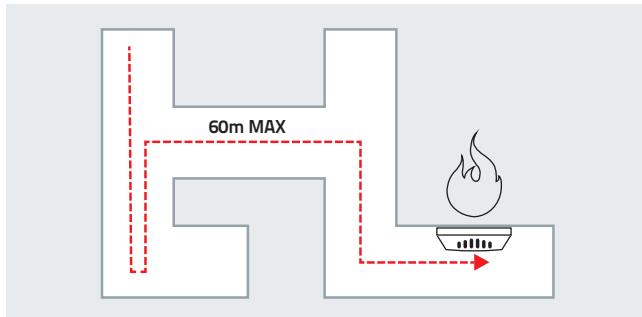


The sensing element of a heat detection device (thermistors) should not be less than 25mm below ceiling, and not greater than 150mm below ceiling.

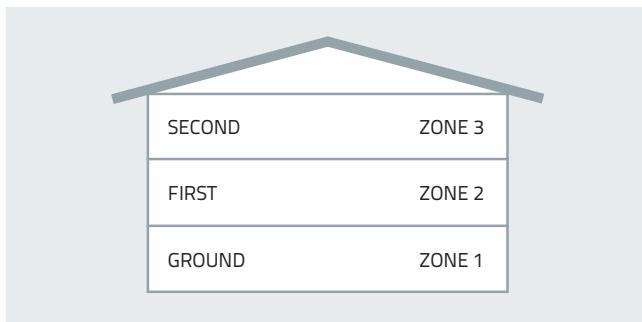


The sensing element of a smoke detection device (photoelectric smoke chamber) should not be less than 25mm below ceiling, and not greater than 600mm below ceiling.

SEARCH DISTANCE



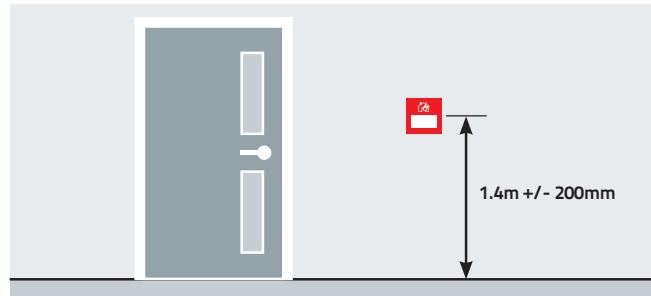
A person searching a zone for a fire should not have to travel more than 60m from the entrance of a zone to identify the source of a fire. Particular attention is required when sighting the detectors LED to minimise the search.



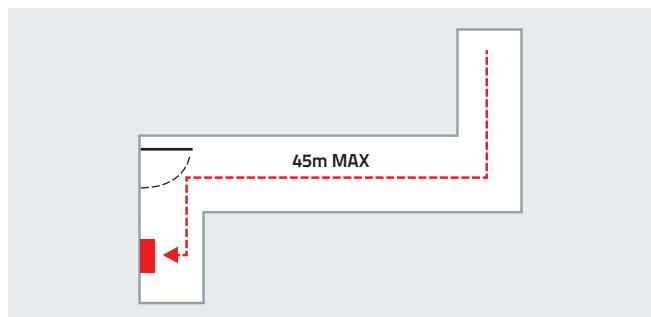
Less than 300m² can be covered by a single zone. When the total floor area exceeds 300m², each floor would require a zone (or zones if the floor area exceeds 2000m²). Stairwells, liftwells or similar should be separate zones.

Zones should not cross floors.

MANUAL CALL POINTS (MCP)



The centre of the element of the manual call point 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). All manual call points should be fitted with a protective cover, which is moved to gain access to the frangible element.

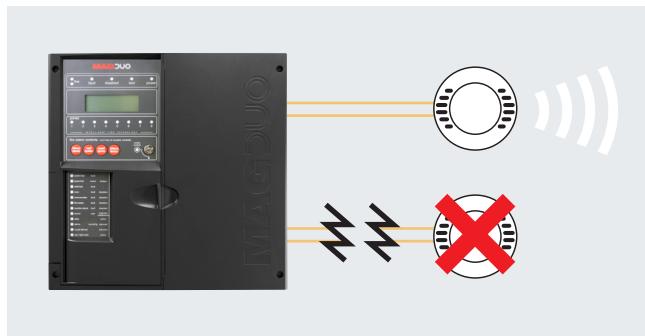


A person should not have to travel more than 45m along an escape route to reach a manual call point (25m if disabled person to operate, or rapid fire development is likely). Manual call points should be sited at all stairwells and exits from the building.

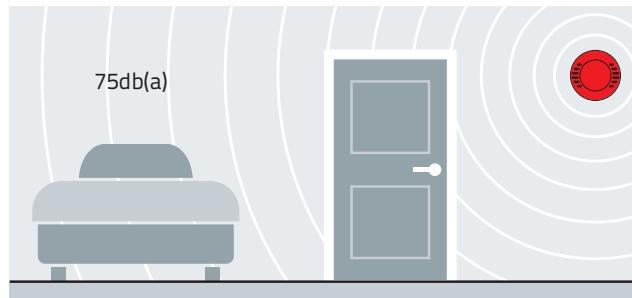
SOUNDERS



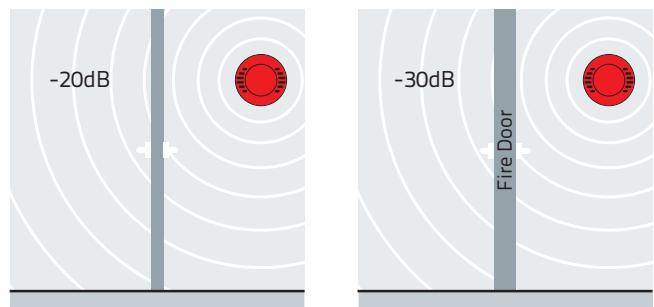
The minimum sound level of a sounder device should be 65dB(A) or 5dB(A) above a background noise which is louder than 60dB(A) (if lasting more than 30 seconds) and at a frequency of between 500Hz and 1000Hz. The maximum sound level should not be greater than 120dB(A) at any normally accessible point.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



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.

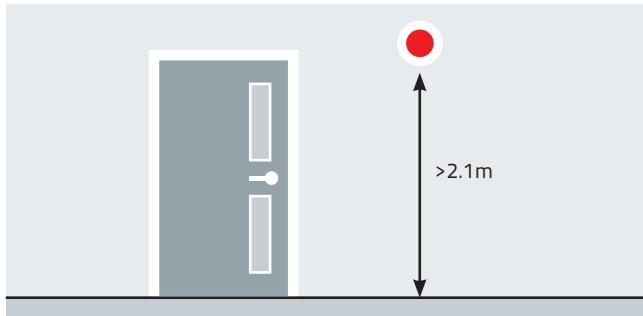


For areas where people are sleeping, sounder devices should produce a minimum of 75dB(A) at the bed-head with all doors shut.

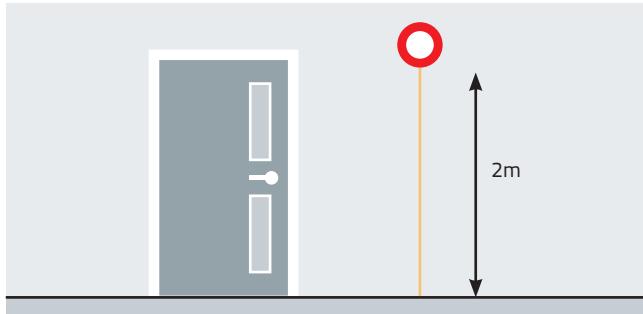


Decibel loss occurs through doors. Approximately -20dB(A) through a normal door, and approximately -30dB(A) through a fire door.

VISUAL INDICATION DEVICES



Visual indication devices (VIDs), such as strobes, can be ceiling or wall mounted. For wall mounting they should always be mounted 2.1m above floor level. Visual alarm devices should conform to BS EN 54-23.



Unless MICC cable is used, all cabling should be mechanically protected from floor level up to a height of 2m.

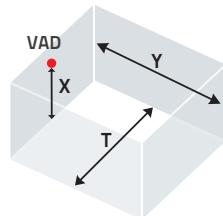
VISUAL ALARM DEVICE CATEGORIES

EN54-23 specifies that the VAD produces an illumination of 0.4 lux on surfaces perpendicular to the direction of the light emitted from the device. They are not designed to wake people that are asleep and can be red or white light. VADs are classified into three categories based on their application:

- W - Wall-mounted
- C - Ceiling-mounted
- O - Open Category

Wall and Ceiling mounting categories are specified at specific installation heights and particular patterns of coverage - see diagrams. For W and C categories, the shape of the volume covered is fixed by the standard. The dimensions of this coverage volume are specified by the manufacturer. For all categories, the volume covered can be used to determine VAD spacing within the building. Open category allows manufacturers to specify the coverage shape and volume and does not put any restriction on mounting height.

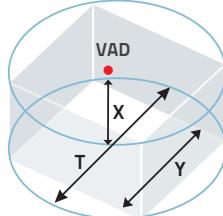
Wall-Mounted - Coverage Volume



Wall-mounted VADs cover a cuboid volume with a square floor area. The coverage volume is presented as a code in the form of **W-X-Y**, where W is Wall-mounted, X is the max mounting height (m) and Y is the width and length (m) of the coverage floor area. The min mounting height is 2.4 m.

E.g. : **W-2.4-12** means it should be mounted at 2.4m from the floor and will cover an area of up to 12 by 12m.

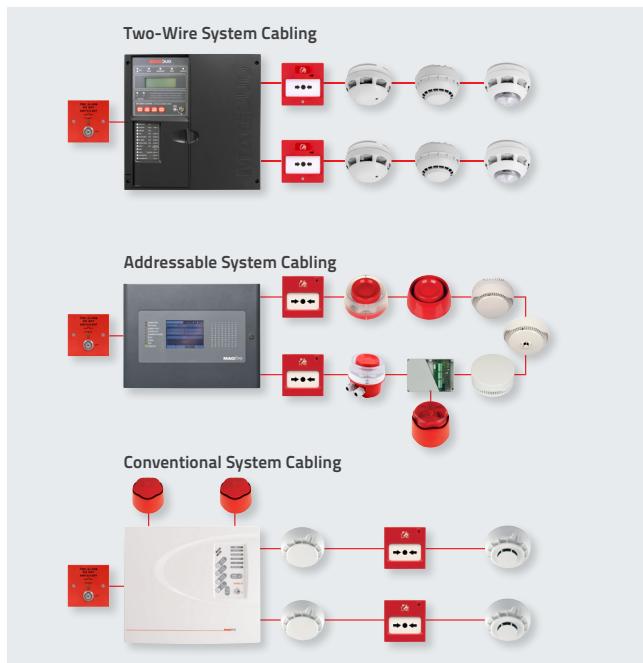
Ceiling-Mounted - Coverage Volume



Ceiling-mounted VADs cover a cylindrical area. The coverage volume is presented as a code in the form of **C-X-Y**, where C is Ceiling-mounted, X is the max mounting height (m) and Y is the diameter (m) of the coverage volume's floor area. The max mounting height can only be specified as 3, 6 or 9m.

E.g. : **C-3-15** means it can be mounted up to 3m from the floor and will cover a cylindrical area of least 15m diameter.

CABLING



Fire resistant cabling is now required within the whole fire alarm system including the main supply cables. The use of non-fire resisting cables, whether mechanically protected by fire-resisting construction or not, will no longer comply with BS5839.

To avoid mechanical damage and electromagnetic interference, fire alarm cables should not be installed in the same conduit as the cables for other services. Where fire alarm cables share common trunking, a compartment of the trunking, separated from other compartments by a strong, rigid and continuous partition reserved solely for fire cables should be implemented.

FIRE DETECTION & ALARM SYSTEMS

2-Wire Fire Alarm System



- Detectors, Call points and sounder/strobes are wired onto the same circuit known as the zone circuits
- In the event of a fire, the fire alarm control panel will indicate which zone has activated, as-well as what device type has gone into fire
- Two wire systems are cheaper to install than conventional systems, but are slightly more expensive to buy

FIRE DETECTION & ALARM SYSTEMS

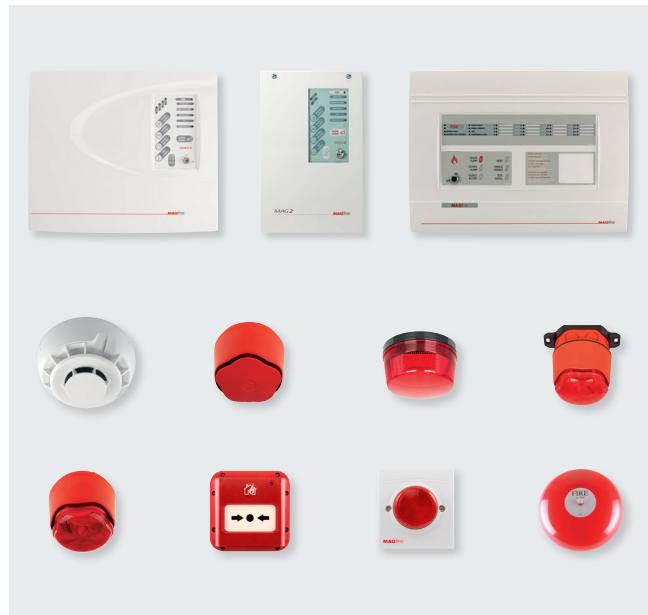
Addressable Fire Systems



- Detectors, Call Points and Sounders are wired onto a 'Loop'
- In the event of a fire, the fire alarm panel will indicate exactly which device has been activated, this will also indicate a specific location, as-well as a zone
- Addressable systems are the most expensive to buy, but are also the cheapest and easiest to install

FIRE DETECTION & ALARM SYSTEMS

Conventional Fire Systems



- Detectors and Call Points are wired onto circuits known as the zone circuits
- Sounders and Strobes are wired onto separate circuits, known as sounder circuits
- In the event of a fire, the fire alarm control panel will only indicate what zone has gone into fire and not the specific location
- Conventional Systems are the least expensive to buy, but will cost more to install



FIRE SYSTEM COMMISSIONING

Alongside ESP's extensive range of fire protection systems, a new commissioning service has now been launched to ensure that an installed ESP system operates correctly in accordance with the recommendations of BS5839-1.



FREE SYSTEM DESIGN

ESP can offer a team of dedicated design engineers who are fully trained & qualified in all of the relevant British Standards.

We are able to provide an in-depth solution to any challenge your building may provide, this is done by visiting sites and studying site drawings.

All of our Computer Aided Design (CAD) is carried out in-house, this enables us to amend our designs as the job progresses.



PRODUCT AWARENESS TRAINING DAYS

Here at ESP we offer free training aimed at electrical contractors and wholesalers who would like to add fire and security equipment to their product portfolio. Most aspects of security will be covered including CCTV, Access Control and Essentials with a separate training day dedicated entirely to Fire Protection products. These training days are held in the new purpose built showroom at our Redditch offices, but we also offer video conference courses when circumstances prevent physical attendees.



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