

Watching the detectors and getting it right

In his look at fire detection and fire alarm systems, *Don Holmes* turns his attention to the kit and where to put it



Fire detectors are designed to detect one or more of the four characteristics of a fire consisting of smoke, heat, combustion gas and flame.

Smoke detectors

The two classes of smoke detectors that are commonly used are ionization chamber and optical smoke. Ionization smoke detectors operate on the principle that electrical current flowing between electrodes in an ionisation chamber is reduced when smoke particles enter the chamber (fig 1).



Fig 1. Ionisation alarm

Optical smoke detectors operate by detecting the scattering or absorption of light by smoke particles (fig 2). Detectors are available which combine both types of sensor.



Fig 2. Optical alarm

Heat detectors

There are two main types of heat detectors, point or line (fig 3).

Point detectors respond to the temperature of the gases in the immediate vicinity of a single point. Line detectors respond to the temperature of the gases in the vicinity of a line.



Fig 3. Heat alarm

Carbon monoxide fire detectors

Carbon monoxide fire detectors are point type detectors that respond to the carbon monoxide that is produced in fires when incomplete combustion occurs – due to a restriction of the amount of oxygen available to support combustion.

Flame detectors

Flame detectors detect infrared or ultraviolet radiation from a flame.

Multi-sensor detectors

Multi-sensor fire detectors contain more than one sensor, each of which responds to different physical and/or characteristics of a fire.

Recommendations for use of fire detectors

Remember smoke detectors may be used in any room or area of a dwelling, other than kitchens, due to amount of heat and fumes created during cooking food, and bathrooms and shower rooms due to amount of steam created. The use of smoke detectors should be avoided in any room or area where they

would be a potential for false alarms – unless the risk of fire warrants the provision. The most suitable locations are circulation areas which are hallways, staircases, landings and corridors. The most suitable type would be optical.

For many years it has been the practice to use ionization chamber smoke alarms in circulation areas. This practice is no longer recommended as a result of false alarms generated when exposed to fumes from kitchens.

Heat detectors should not be used in circulation areas or LD3 systems. They may be used in rooms or areas opening on to escape routes. In the case of LD1, LD2 and PD systems heat detectors may be installed in any room unless it is necessary to give early warning of fire within the room to protect sleeping occupants or high value properties or contents.

Carbon monoxide fire detectors or multi-sensor detectors incorporating a carbon monoxide sensor should not be used in dwellings unless they are incorporated into grade A, B or C systems. That system must be maintained by a competent person at periods not exceeding a year or a fault warning is given to indicate the need to replace the electrochemical cell of the detector before it reaches the end of its life.

Alarm zones

Alarm zones are only required in buildings where the operation of the alarm needs to be different in certain parts. If the only requirement is to activate all alarm sounders to provide a common signal once a fire is detected, then the alarm zones are not needed, as is the case for most domestic dwellings, because the whole building is one alarm zone.

Positioning of detectors

All smoke detectors have similar spacing requirements. Heat detectors also have similar spacing requirements but these are different to smoke detectors. According to BS 5839, for any general area the spacing between any point in a protected area and the detector nearest to that point should not exceed 7.5m for smoke detectors and 5.3m for heat detectors (fig 4).

The above are the maximum areas that can be covered by an individual detector. To ensure that coverage is provided in the corner of rooms the spacing has to be reduced see (fig 5).

In order to ensure complete coverage for rooms or locations with square layouts, the spacing between detectors and walls should be reduced to 5m for smoke detectors and 3.5m for heat detectors, as illustrated in (fig 6).

In order to ensure complete coverage of an area the spacing between detectors should be reduced to 10m between smoke detectors and 7m between heat detectors as illustrated in (fig 7). These distances are

Fig 4

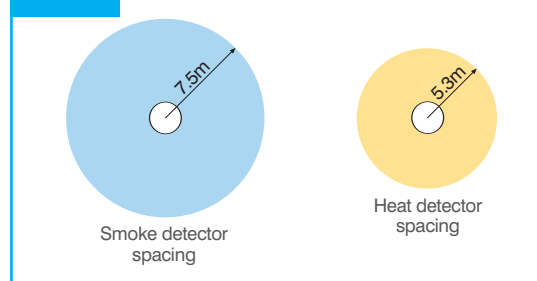


Fig 5

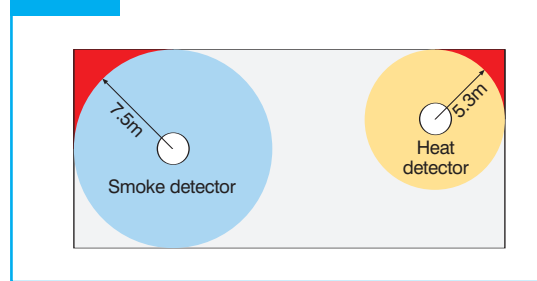


Fig 6

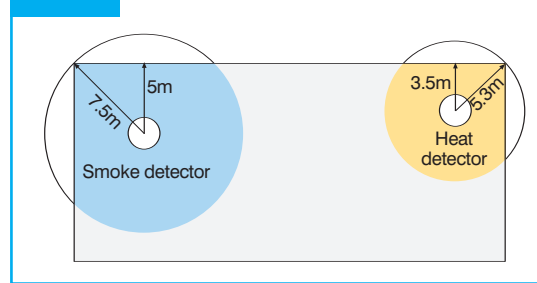
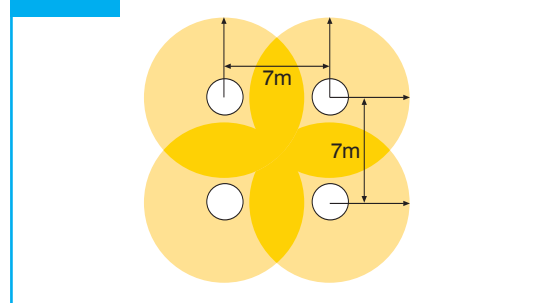


Fig 7 Heat detector spacing



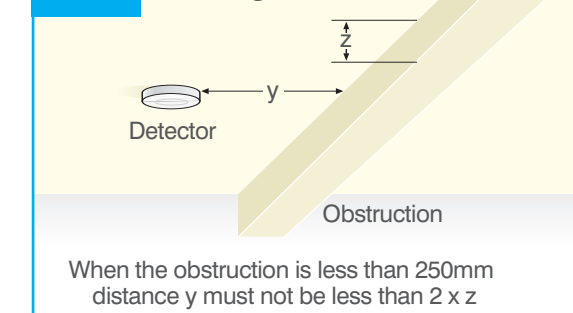
for flat ceilings, for other types of ceiling you need to refer to BS5839.

Where detectors are mounted on a pitched ceiling, the detector should be mounted near to the apex but spacing can be increased by one per cent for each degree of slope up to 25 per cent. Note near is defined as within 600mm for smoke detectors and 150mm for heat detectors.

Dealing with obstructions

Fire detectors should be mounted at least 500mm away from walls or ceiling obstructions greater than 250mm deep and at least twice the depth of obstructions if less than 250mm deep as illustrated in (fig 8). They should also be mounted a metre away from any forced air inlet. In situations where the obstruction is greater than ten per cent of the height of an area it should be considered to be a wall.

Fig 8 Dealing with obstructions



Recommendations of BS5839-6

In a category LD3 system, at least one smoke detector should be fitted in each hallway or corridor and one each main landing of every staircase. In hallways or corridors exceeding 7.5 metres in length, no point should exceed 7.5 metres from the nearest detector. When smoke alarms are installed no bedroom door should be further than three metres from the nearest smoke alarm.

In multi-storey dwellings, at least one smoke detector should be located on the ground floor between each staircase and every room, excluding toilets, bathrooms or shower rooms. Where rooms are located on both sides of the staircase, a smoke detector should be installed midway between the doors.

When the accommodation is open plan where a stair is open to the living/dining room area, this should be treated as a circulation area and protected by a smoke alarm.

Next issue: we will look at the types of power supplies for fire alarm systems and the methods of connecting and wiring

