

# Section 1

## FIRE ALARM AND FIRE DETECTION SYSTEMS

### Introduction

**1.1** Provisions are made in this section for suitable arrangements to be made in all buildings to give early warning in the event of fire.

Paragraphs 1.2 to 1.22 deal with dwellings and paragraphs 1.23 to 1.32 with other buildings.

### Dwellings

#### General

**1.2** In most houses the installation of smoke alarms or automatic fire detection and alarm systems, can significantly increase the level of safety by automatically giving an early warning of fire.

**1.3** If houses are not protected by an automatic fire detection and alarm system in accordance with the relevant recommendations of BS 5839: Part 1 *Fire detection and alarm systems for buildings, Code of practice for system design, installation and servicing* to at least an L3 standard, or BS 5839: Part 6 *Code of practice for the design and installation of fire detection and alarm systems in dwellings* to at least a Grade E type LD3 standard, they should be provided with a suitable number of smoke alarms installed in accordance with the guidance in paragraphs 1.4 to 1.22 below.

**1.4** The smoke alarms should be mains-operated and conform to BS 5446 *Components of automatic fire alarm systems for residential premises, Part 1 Specification for self-contained smoke alarms and point-type smoke detectors*. They may have a secondary power supply such as a battery (either rechargeable or replaceable) or capacitor. More information on power supplies is given in clause 13 of BS 5839: Part 6: 1995.

**Note:** BS 5446: Part 1 covers smoke alarms based on ionization chamber smoke detectors and optical (photo-electric) smoke detectors. The different types of detector respond differently to smouldering and fast flaming fires. Either type of detector is generally suitable. However, the choice of detector type should, if possible, take into account the type of fire that might be expected and the need to avoid false alarms. Optical detectors tend to be less affected by low levels of 'invisible' smoke that often cause false alarms.

BS 5839: Part 6 suggests that, in general, optical smoke alarms should be installed in circulation spaces such as hallways and landings, and ionization chamber based smoke alarms may be the more appropriate type in rooms, such as the living room or dining room where a fast burning fire may present a greater danger to occupants than a smouldering fire.

#### Large houses

**1.5** A house may be regarded as large if any of its storeys exceed 200m<sup>2</sup>.

**1.6** A large house of more than 3 storeys (including basement storeys) should be fitted with an L2 system as described in BS 5839: Part 1: 1988, except that the provisions in clause 16.5 regarding duration of the standby supply need not be followed. However with unsupervised systems, the standby supply should be capable of automatically maintaining the system in normal operation (though with audible and visible indication of failure of the mains) for 72 hours, at the end of which sufficient capacity remains to supply the maximum alarm load for at least 15 minutes.

**1.7** A large house of no more than 3 storeys (including basement storeys) may be fitted with an automatic fire detection and alarm system of Grade B type LD3 as described in BS 5839: Part 6 instead of an L2 system.

#### Loft conversions

**1.8** Where a loft in a one or two storey house is converted into habitable accommodation, an automatic smoke detection and alarm system based on linked smoke alarms should be installed (see paragraph 2.26).

#### Flats and maisonettes

**1.9** The same principles apply within flats and maisonettes as for houses, while noting that:

- the provisions are not intended to be applied to the common parts of blocks of flats and do not include interconnection between installations in separate flats;
- a flat with accommodation on more than one level (ie a maisonette) should be treated in the same way as a house with more than one storey.

**Note:** Some student residential accommodation is constructed in the same way as a block of flats. Where groups of students share one flat with its own entrance door, it is appropriate to provide an automatic detection system within each flat. In student flats constructed on the compartmentation principles for flats in Section 9 (B3), the automatic detection system will satisfy the requirements of building regulations if it gives a warning in the flat of fire origin. Where a general evacuation is required, the alarm system should follow the guidance in paragraph 1.30.

#### Sheltered housing

**1.10** The detection equipment in a sheltered housing scheme with a warden or supervisor, should have a connection to a central monitoring point (or central alarm relay station) so that the person in charge is aware that a fire has been detected in one of the dwellings, and can identify

the dwelling concerned. These provisions are not intended to be applied to the common parts of a sheltered housing development, such as communal lounges, or to sheltered accommodation in the Institutional or Other residential purpose groups.

**Installations based on smoke alarms**

**1.11** Smoke alarms should normally be positioned in the circulation spaces between sleeping spaces and places where fires are most likely to start (eg kitchens and living rooms) to pick up smoke in the early stages, while also being close enough to bedroom doors for the alarm to be effective when occupants are asleep.

**1.12** In a house (including bungalows) there should be at least one smoke alarm on every storey.

**1.13** Where more than one smoke alarm is installed they should be linked so that the detection of smoke by one unit operates the alarm signal in all of them. The manufacturers’ instructions about the maximum number of units that can be linked should be observed.

**1.14** Smoke alarms should be sited so that:

- a. there is a smoke alarm in the circulation space within 7.5m of the door to every habitable room;
- b. where the kitchen area is not separated from the stairway or circulation space by a door, there should be a compatible interlinked heat detector in the kitchen, in addition to whatever smoke alarms are needed in the circulation space(s);
- c. they are ceiling mounted and at least 300mm from walls and light fittings (unless in the case of light fittings there is test evidence to prove that the proximity of the light fitting will not adversely affect the efficiency of the detector). Units designed for wall mounting may also be used provided that the units are above the level of doorways opening into the space, and they are fixed in accordance with manufacturers’ instructions; and
- d. the sensor in ceiling mounted devices is between 25mm and 600mm below the ceiling (25-150mm in the case of heat detectors).

**Note:** This guidance applies to ceilings that are predominantly flat and horizontal.

**1.15** It should be possible to reach the smoke alarms to carry out routine maintenance, such as testing and cleaning, easily and safely. For this reason smoke alarms should not be fixed over a stair shaft or any other opening between floors.

**1.16** Smoke alarms should not be fixed next to or directly above heaters or air conditioning outlets. They should not be fixed in bathrooms, showers, cooking areas or garages, or any other place where steam, condensation or fumes could give false alarms.

Smoke alarms should not be fitted in places that get very hot (such as a boiler room), or very cold (such as an unheated porch). They should not be

fixed to surfaces which are normally much warmer or colder than the rest of the space, because the temperature difference might create air currents which move smoke away from the unit.

A requirement for maintenance can not be made as a condition of passing plans by the Building Control Body. However the attention of developers and builders is drawn to the importance of providing the occupants with information on the use of the equipment, and on its maintenance (or guidance on suitable maintenance contractors).

**Note:** BS 5839: Part 1 and Part 6 recommend that occupiers should receive the manufacturers’ instructions concerning the operation and maintenance of the alarm system.

**Power supplies**

**1.17** The power supply for a smoke alarm system should be derived from the dwelling’s mains electricity supply. The mains supply to the smoke alarm(s) should comprise a single independent circuit at the dwelling’s main distribution board (consumer unit). If the smoke alarm installation does not include a stand-by power supply, no other electrical equipment should be connected to this circuit (apart from a dedicated monitoring device installed to indicate failure of the mains supply to the smoke alarms – see below).

**1.18** A smoke alarm, or smoke alarm system, that includes a standby power supply or supplies, can operate during mains failure. It can therefore be connected to a regularly-used local lighting circuit. This has the advantage that the circuit is unlikely to be disconnected for any prolonged period.

**1.19** Devices for monitoring the mains supply to the smoke alarm system may comprise audible or visible signals on each unit or on a dedicated mains monitor connected to the smoke alarm circuit. The circuit design of any mains failure monitor should avoid any significant reduction in the reliability of the supply, and should be sited so that the warning of failure is readily apparent to the occupants. If a continuous audible warning is given, it should be possible to silence it.

**1.20** The smoke alarm circuit should preferably not be protected by any residual current device (rcd). However if electrical safety requires the use of a rcd, either:

- a. the smoke alarm circuit should be protected by a single rcd which serves no other circuit; or
- b. the rcd protection of a smoke alarm circuit should operate independently of any rcd protection for circuits supplying socket-outlets or portable equipment.

**1.21** Any cable suitable for domestic wiring may be used for the power supply and interconnection to smoke alarm systems. It does not need any particular fire survival properties. Any conductors used for interconnecting alarms (signalling) should be readily distinguishable from those supplying mains power, eg by colour coding.

**Note:** Smoke alarms may be interconnected using radio-links, provided that this does not reduce the lifetime or duration of any standby power supply.

**1.22** Other effective, though possibly more expensive, options exist. For example, the mains supply may be reduced to extra low voltage in a control unit incorporating a standby trickle-charged battery, before being distributed at that voltage to the alarms.

## Buildings other than dwellings

### General

**1.23** To select the appropriate type of fire alarm/detection system that should be installed into a particular building, the type of occupancy and means of escape strategy (eg simultaneous, phased or progressive horizontal evacuation) must be determined.

For example, if occupants normally sleep on the premises eg residential accommodation, the threat posed by a fire is much greater than that in premises where the occupants are normally alert. Where the means of escape is based on simultaneous evacuation, then operation of a manual call point or fire detector should give an almost instantaneous warning from all the fire alarm sounders. However, where the means of escape is based on phased evacuation, then a staged alarm system is appropriate. Such a system enables two or more stages of alarm to be given within a particular area, eg “alert” or “evacuate” signals.

**Note:** the term fire detection system is used here to describe any type of automatic sensor network and associated control and indicating equipment. Sensors may be sensitive to smoke, heat or radiation. Normally the control and indicating equipment operates a fire alarm system, and it may perform other signalling or control functions as well. Automatic sprinkler systems can also be used to operate a fire alarm system.

**1.24** The factors which have to be considered when assessing what standard of fire alarm or automatic fire detection system is to be provided will vary widely from one set of premises to another. Therefore the appropriate standard will need to be considered on a case by case basis.

**Note:** Where buildings will be controlled under other legislation when occupied, for example premises which are designated under the Fire Precautions Act 1971 and/or are classified as a workplace under the Fire Precautions (Workplace) Regulations 1997, compatibility is essential between what is provided under the Building Regulations at construction stage, and what is needed upon the completion and occupation of the premises.

**This should be achieved by means of early consultation with all relevant interested parties, not least the Building Control Body and the Fire Authority.**

### Fire alarm systems

**1.25** All buildings should have arrangements for detecting fire. In most buildings fires are detected by people, either through observation or smell, and therefore often nothing more will be needed.

**1.26** In small buildings/premises the means of raising the alarm may be simple. For instance, where all occupants are near to each other a shouted warning “FIRE” by the person discovering the fire may be all that is needed. In assessing the situation, it must be determined that the warning can be heard and understood throughout the premises, including for example the toilet areas. In other circumstances, manually operated sounders (such as rotary gongs or handbells) may be used. Alternatively a simple manual call point combined with a bell, battery and charger may be suitable.

In all other cases, the building should be provided with a suitable electrically operated fire warning system with manual call points sited adjacent to exit doors and sufficient sounders to be clearly audible throughout the building.

**1.27** An electrically operated fire alarm system should comply with BS 5839: Part 1 *Fire detection and alarm systems for buildings, Code of practice for system design, installation and servicing*.

Call points for electrical alarm systems should comply with BS 5839: Part 2 *Specification for manual call points*, and these should be installed in accordance with BS 5839: Part 1.

**Note:** BS 5839: Part 1 specifies four types of system, ie type L for the protection of life; type M manual alarm systems; type P for property protection; and type X for multi-occupancy buildings. Type L systems are subdivided into L1 – systems installed throughout the protected building; L2 – systems installed only in defined parts of the protected building (a type L2 system should normally include the coverage required of a type L3 system) and L3 – systems installed only for the protection of escape routes. Type P systems are subdivided into P1 – systems installed throughout the protected building and P2 – systems installed only in defined parts of the protected building.

**1.28** If it is considered that people might not respond quickly to a fire warning, or where people are unfamiliar with the fire warning arrangements, consideration may be given to installing a voice alarm system. Such a system could form part of a public address system and give both an audible signal and verbal instructions in the event of fire.

The fire warning signal should be distinct from other signals which may be in general use and be accompanied by clear verbal instructions.

If a voice alarm system is to be installed, it should comply with BS 5839: Part 8 *Code of practice for the design, installation and servicing of voice alarm systems*.

**1.29** In certain premises, eg large shops and places of assembly, an initial general alarm may be undesirable because of the number of

members of the public present. The need for fully trained staff to effect pre-planned procedures for safe evacuation will therefore be essential. Actuation of the fire alarm system will cause staff to be alerted, eg by discreet sounders, personal paging systems etc. Provision will normally be made for full evacuation of the premises by sounders or a message broadcast over the public address system. In all other respects, any staff alarm system should comply with BS 5839: Part 1.

### **Automatic fire detection and fire alarm systems**

**1.30** Automatic fire detection and alarms in accordance with BS 5839: Part 1 should be provided in Institutional and Other residential occupancies.

**1.31** Automatic fire detection systems are not normally needed in Office, Shop and commercial, Assembly and recreation, Industrial, and Storage and other non-residential occupancies. However, there are often circumstances where a fire detection system in accordance with BS 5839: Part 1 may be needed. For example:

- a. to compensate for some departure from the guidance elsewhere in this document;
- b. as part of the operating system for some fire protection systems, such as pressure differential systems or automatic door releases;
- c. where a fire could break out in an unoccupied part of the premises (eg a storage area or basement that is not visited on a regular basis, or a part of the building that has been temporarily vacated) and prejudice the means of escape from any occupied part(s) of the premises.

#### **Notes:**

1. General guidance on the standard of automatic fire detection that **may** need to be provided within a building can be found in the Home Office guides that support the Fire Precautions Act 1971 and the Fire Precautions (Workplace) Regulations 1997 and, in the case of the Institutional purpose group, in "Firecode".
2. Guidance on the provision of automatic fire detection within a building which is designed for phased evacuation can be found in paragraph 5.20.
3. Where an atrium building is designed in accordance BS 5588: *Fire precautions in the design, construction and use of buildings, Part 7 Code of practice for the incorporation of atria in buildings*, then the relevant recommendations in that code for the installation of fire alarm/fire detection systems for the design option(s) selected should be followed.

### **Design and installation of systems**

**1.32** It is essential that fire detection and fire warning systems are properly designed, installed and maintained. Where a fire alarm system is installed, an installation and commissioning certificate should be provided. Third party certification schemes for fire protection products and related services are an effective means of providing the fullest possible assurances, offering a level of quality, reliability and safety (see paragraph 0.20).