



BSI Standards Publication

Fire detection and fire alarm systems for buildings

Part 6: Code of practice for the design, installation,
commissioning and maintenance of fire detection and fire
alarm systems in domestic premises

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Foreword

Publishing information

This part of BS 5839 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 April 2019. It was prepared by Technical Committee FSH/12/1, *Installation and servicing*, under the authority of Technical Committee FSH/12, *Fire detection and alarm systems*. A list of organizations represented on these committees can be obtained on request to their secretary.

Supersession

This part of BS 5839 superseded BS 5839-6:2013, which was withdrawn.

BS 5839-6:2019+A1:2020 supersedes BS 5839-6:2019, which is withdrawn.

Information about this document

This is a full revision of the standard, and introduces the following principal changes:

- removal of Grade B and Grade E;
- subdivision of Grade D and Grade F into Grade D1/Grade D2 and Grade F1/Grade F2, respectively;
- revision of [Table 1](#);
- updating of guidance to take into account the publication of BS 5839-1:2017 and other standards published since the last full revision of BS 5839-6;
- new table on testing and servicing by grade;
- new recommendation to prevent blocking or delaying of fire alarm signals transmitted via social alarm systems in sheltered housing to an alarm receiving centre;
- increase in the recommended standard of protection in sheltered housing flats from Category LD2 to Category LD1;
- new recommendations for fire detection in supported housing;
- new recommendation that communal fire alarm systems should not normally be installed in purpose-built blocks of flats;
- revised and expanded recommendations for Grade C.

In the United Kingdom, around 80% of all fire deaths and injuries occur in domestic premises, over 300 deaths and around 9 000 injuries per annum. Many of those who die are the most vulnerable in the community, namely elderly and socially deprived people. The installation of a fire detection and fire alarm system in premises can substantially reduce the risk of death or serious injury from fire. Indeed, the overall downward trend in annual fire deaths in domestic premises since smoke alarms in domestic premises were first given recognition in BS 5839-1 in 1988 is almost certainly attributable in part to the increasing use of smoke alarms.

The level of deaths and injuries remains, however, above a level that society regards as acceptable. It has been estimated that, in premises without smoke detectors, a substantial proportion of the fatalities from fire could be avoided if smoke detectors were installed. The fatality rate in fires in premises in which there is no working smoke detector is between two and three times the fatality rate in fires in premises in which a smoke detector is present and functions correctly.

The installation of automatic fire detectors is required in new houses, flats and maisonettes in order to satisfy building regulations ([1] to [4]). In existing houses in multiple occupation, the installation of an automatic fire detection and fire alarm system is normally required by the relevant enforcing authorities. This gives rise to the need for a suitable code of practice, as BS 5839-1 does not contain recommendations on domestic smoke alarms, nor does it address the specific design requirements for fire detection and fire alarm systems in domestic premises.

The guidance in this standard is intended for architects and other building professionals, enforcing authorities, designers and installers of fire detection and fire alarm systems and others responsible for implementing fire precautions in domestic premises.

In the case of purpose-built flats, the degree of compartmentation between occupancies is normally sufficient to ensure that fire is contained in the dwelling of origin for a prolonged period. During this time, other occupants can remain in reasonable safety within their own dwellings. Accordingly, this part of BS 5839 does not provide recommendations for fire detection systems that incorporate detectors in the communal areas or ancillary accommodation (e.g. plant rooms) within purpose-built flats. Such systems are normally undesirable and can even lead to risk to occupants. Nevertheless, if the provision of a fire detection and fire alarm system in these areas can be justified, the recommendations in BS 9991 and BS 5839-1 can be followed.

Fire detection is commonly provided in blocks of flats for the purpose of operating smoke control systems, in which case BS 7273-6:2019 - is appropriate. As the fire detectors in these cases are not intended to provide a warning to residents, and are not expected to trigger fire alarm sounders, this fire detection is outside the scope of this part of BS 5839.

Guidance on evacuation strategies and associated detection and warning systems for purpose-built blocks of flats is given in BS 9991, Approved Document B [5] and the LGA guide *Fire safety in purpose-built blocks of flats* [6]. Guidance on fire detection and fire alarm systems in sheltered housing and supported housing is given in the NFCC document *Fire safety in specialised housing* [7].

Following the major loss of life in a fire at Grenfell Tower in London in 2017, temporary fire alarm systems have been installed in blocks of flats, in which cladding does not satisfy the requirements of building regulations in relation to fire spread over external walls. These systems are intended only as a temporary measure, pending removal of the cladding. It is not intended that they will remain as a permanent facility for evacuation of residents; such temporary systems are, therefore, outside the scope of this part of BS 5839.

Communal fire alarm systems are sometimes appropriate in houses that have been converted into self-contained flats. Whether this is the case depends on the legislation in the relevant part of the UK and/or measures such as compartmentation and means of escape. In this connection, attention is drawn to the Housing Act 2004 [8] in England and Wales, the Housing (Scotland) Act 2006 [9] and the Housing (Northern Ireland) Order 1992 [10] in Northern Ireland.

It has been assumed in the drafting of this part of BS 5839 that the execution of its provisions will be entrusted to appropriately qualified and competent people.

Text introduced or altered by Amendment No. 1 is indicated in the text by tags A1 A1. Minor editorial changes are not tagged.

Amendment No. 1 introduces the following principal change:

- a recommendation that instructions to users provided by manufacturers of smoke alarms should include a warning that children might not be woken by fire alarm tones.

Use of this document

This British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. “organization” rather than “organisation”).

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This part of BS 5839 gives recommendations for the planning, design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises that are:

- a) designed to accommodate a single family;
- b) houses in multiple occupation comprising a number of self-contained units, each designed to accommodate a single person or family;
- c) sheltered housing, including both the dwelling units and the common areas;
- d) supported housing.

The recommendations apply to both new and existing domestic premises.

Recommendations for routine attention are also given.

The systems covered in this part of BS 5839 range from those comprising a single self-contained smoke alarm to systems of the type described in BS 5839-1. The recommendations of this part of BS 5839 may also be applied to the fire detection components of combined domestic fire and intruder alarm systems or fire and social alarm systems.

This part of BS 5839 applies to forms of domestic premises, including bungalows, multi-storey houses, individual flats and maisonettes, mobile homes, holiday homes, sheltered housing, mansions, shared houses and houses divided into several self-contained single-family dwelling units. It does not apply to hostels, caravans or boats (other than permanently moored boats used solely as residential premises), or to the communal parts of blocks of flats or maisonettes. It does not apply to any premises used for purposes other than as domestic premises (e.g. small shops, factories or similar premises used solely as places of work).

This part of BS 5839 applies to premises used for self-catering holidays if occupied by not more than ten persons, and premises with short-term paying guests in the home of a resident operator with not more than eight guests. It is limited to premises in which guest accommodation is not located below a ground floor or above a first floor, and in which no storey is greater than 200 m² in area. For larger premises, the recommendations of BS 5839-1 apply.

This part of BS 5839 is intended for use by architects and other building professionals, enforcing authorities, installers and others responsible for implementing fire precautions in domestic premises. It is not intended for occupiers, for whom advice is published by the Government ¹⁾. However, recommendations are given for simple systems that may be installed by non-specialists.

The recommendations refer principally to fire detection and fire alarm systems installed for the purpose of life safety. However, recommendations are given for systems that are also intended to protect property.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

[BS 5446-2](#), *Fire detection and fire alarm devices for dwellings – Part 2: Specification for heat alarms*

¹⁾ The Ministry of Housing, Communities and Local Government (in England and Wales), Scottish Government and the Department of Health, Social Services and Public Safety (Northern Ireland).

[BS 5446-3](#), *Fire detection and fire alarm devices for dwellings – Part 3: Specification for smoke alarm kits for deaf and hard of hearing people*

[BS 5839-1:2017](#), *Fire detection and fire alarm systems for buildings – Part 1: Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises*

[BS 7671](#), *Requirements for electrical installations – IET Wiring Regulations*

[BS 8591](#), *Remote centres receiving signals from alarm systems – Code of practice*

BS EN 54-2, *Fire detection and fire alarm systems – Part 2: Control and indicating equipment*

BS EN 54-4, *Fire detection and fire alarm systems – Part 4: Power supply equipment*

BS EN 54-5, *Fire detection and fire alarm systems – Part 5: Heat detectors – Point detectors*

BS EN 54-7, *Fire detection and fire alarm systems – Part 7: Smoke detectors – Point detectors using scattered light, transmitted light or ionization*

BS EN 54-10, *Fire detection and fire alarm systems – Part 10: Flame detectors – Point detectors*

BS EN 54-11, *Fire detection and fire alarm systems – Part 11: Manual call points*

BS EN 54-12, *Fire detection and fire alarm systems – Part 12: Smoke detectors – Line detectors using an optical light beam*

BS EN 54-26, *Fire detection and fire alarm systems – Part 26: Carbon monoxide detectors – Point detectors*

BS EN 54-29, *Fire detection and fire alarm systems – Part 29: Multi-sensor fire detectors – Point detectors using a combination of smoke and heat sensors*

BS EN 54-30, *Fire detection and fire alarm systems – Part 30: Multi-sensor fire detectors – Point detectors using a combination of carbon monoxide and heat sensors*

BS EN 14604, *Smoke alarm devices*

BS EN ISO 13943, *Fire safety – Vocabulary*

3 Terms and definitions

For the purposes of this part of BS 5839, the terms and definitions in BS 5839-1:2017 and BS EN ISO 13943 and the following apply.

3.1 addressable system

system in which signals from detectors, manual call points or any other devices are individually identified at the control and indicating equipment

NOTE Most addressable systems are of the analogue type, in which a signal from each detector representing the value of the sensed phenomenon is individually processed, usually at the control equipment, with a view to enabling more than two output states to be given, representing normal, fire and at least one other abnormal condition. The purpose of analysis of the signal from each detector is often identification of conditions that are not representative of fire but that can result in a false alarm from a simple non-analogue (“two state”) system.

3.2 alarm receiving centre (ARC)

continuously manned premises, remote from those in which the fire detection and fire alarm system is fitted, where the information concerning the state of the fire alarm system is displayed and/or recorded, so that the fire and rescue service can be summoned

3.3 aspirating smoke detection system

smoke detection system in which a sample of the atmosphere in the protected space is drawn by a fan or pump into a detector which may be remote from the protected space

3.4 audibility

property of a sound which allows it to be heard among other sounds

NOTE Audibility depends upon the relative loudness and frequency content of the sound in comparison with other sounds which are present at the same time.

3.5 automatic fire detection and fire alarm system

system (other than a single self-contained smoke or fire alarm) in which an alarm of fire can be initiated automatically

3.6 circuit

assembly of fire alarm components supplied from the same control equipment and protected against overcurrent by the same protective device(s) or current limitation arrangements

3.7 circulation area

area or space (including a stairway) used mainly as a means of access between a room and an exit from the building or compartment

NOTE This is also known as a circulation space.

3.8 commissioning

process by which it is determined that the installed system meets the defined requirements

3.9 competent person

person with the relevant current training and experience, and with access to the requisite tools, equipment and information, and capable of carrying out a defined task

NOTE For electrical installation and testing work, this is equivalent to the term "skilled person" as defined in BS 7671.

3.10 control and indicating equipment (CIE)

component or components of a fire detection and fire alarm system through which other components can be supplied with power and which:

- a) are used:
 - 1) to receive signals from the connected detectors, manual call points or any other devices (e.g. input/output units);
 - 2) to determine whether these signals correspond to a fire alarm condition;
 - 3) to indicate any such fire alarm condition audibly and visually;
 - 4) to indicate the location of the danger;
 - 5) possibly to record any of this information;
- b) are used to monitor the correct functioning of the system and give audible and visible warning of any faults (e.g. short circuit, open circuit, or fault in the power supply);
- c) if required, are able to pass on the fire alarms signal:
 - 1) to audible or visible fire alarm devices or to a voice alarm system;
 - 2) to the fire alarm routing function to an alarm receiving centre (ARC);

- 3) to the control function for fire protection equipment or systems;
- 4) to other systems or equipment, such as a mimic panel

3.11 designer

person or organization taking responsibility for design

3.12 detector

part of a fire detection and fire alarm system that contains at least one sensor which constantly, or at frequent intervals, monitors at least one physical and/or chemical phenomenon associated with fire, and that provides at least one corresponding signal to the CIE

NOTE This definition is intended to include heat alarms, smoke alarms and multi-sensor fire alarms (see 3.29, 3.56 and 3.43 respectively).

3.13 dispersed social alarm (telecare) system

system that provides facilities for social alarm initiation, signal transmission, alarm reception, reassurance and assistance for use by older and other persons considered to be living at risk within a single private dwelling, using a private phone line or IP connection to an ARC

3.14 domestic premises

dwellings (see 3.15) and buildings used as sheltered housing (see 3.54)

3.15 dwelling

unit of residential accommodation occupied (whether or not as a sole or main residence):

- a) by a single person or by people living together as a family; or
- b) by not more than six residents living together as a single household, including a household where care is provided for residents; or
- c) by persons who do not live together as a family, but who live in self-contained single-family flats, maisonettes or bedsits within the unit; or
- d) as a shared house

NOTE The definitions in c) and d) relate only to some types of house in multiple occupation (HMO) and specifically exclude hostel type accommodation, for which BS 5839-1 is more appropriate. They can, however, include houses with long-term lodgers.

3.16 false alarm

fire alarm signal resulting from a cause(s) other than fire

NOTE False alarms may be subdivided into four categories:

- a) *unwanted alarms, in which a system has responded, either as designed or as the technology can reasonably be expected to respond, to any of the following:*
 - 1) *a fire-like phenomenon or environmental influence (e.g. smoke from a nearby bonfire, dust or insects, processes that produce smoke or flame, or environmental effects that can render certain types of detector unstable, such as rapid air flow);*
 - 2) *accidental damage;*
 - 3) *inappropriate human action (e.g. operation of a system for test or maintenance purposes without prior warning to building occupants and/or an ARC);*
- b) *equipment false alarms, in which the false alarm has resulted from a fault in the system;*

- c) *malicious false alarms, in which a person operates a manual call point or causes a fire detector to initiate a fire alarm signal, whilst knowing that there is no fire;*
- d) *false alarms with good intent, in which a person operates a manual call point or otherwise initiates a fire alarm signal in the belief that there is a fire, when no fire actually exists.*

3.17 final circuit

circuit connected to current-using equipment

3.18 final voltage

<of a battery> voltage at which the cell manufacturer considers the cells to be fully discharged at the specified discharge current

3.19 fire alarm device

component of a fire detection and fire alarm system, not incorporated in the control and indicating equipment, which is used to give a warning of fire

NOTE For example, a fire alarm sounder or visual alarm device.

3.20 fire alarm signal

signal intended to indicate the occurrence of a fire

3.21 fire alarm sounder

audible fire alarm device

3.22 fire detection and fire alarm system

system that comprises a means for automatically detecting one of the characteristic phenomena of fire and a means for providing a warning to occupants

NOTE This definition is intended to include fire detection and fire alarm systems that comprise one or more smoke alarms, as well as systems that comprise separate detectors, alarm sounders and control equipment.

3.23 fire detection zone

subdivision of the protected premises such that the occurrence of a fire within it will be indicated by a fire detection and fire alarm system separately from an indication of fire in any other subdivision

NOTE A fire detection zone is separately indicated to assist in location of the fire, evacuation of the building and firefighting.

3.24 fire engineering solution

application of science and engineering to the achievement of one or more fire safety objectives in such a way that the objectives are achieved without following, in full, prescriptive recommendations of a recognized code of practice

3.25 fire risk

combination of the probability of fire occurring and the magnitude of the consequences of fire

3.26 flame detector

automatic fire detector which responds to the radiation emitted by the flames from a fire

3.27 flat

dwelling, forming part of a larger building, that has all its rooms on one level or not more than half a storey height apart

3.28 habitable room

any room in a dwelling other than a kitchen, utility room, bathroom, dressing room or WC

3.29 heat alarm

device containing within one housing all the components, except possibly the energy source, necessary for detecting heat and for giving an audible alarm

3.30 heat detector

automatic fire detector which responds to an increase in temperature

3.31 house in multiple occupation (HMO)

house that is occupied by persons who do not form a single household

3.32 installation

work of fixing and interconnecting the components and elements of a system

NOTE Installation may be carried out by one or more parties.

3.33 installer

person or organization having responsibility for all or part of the process of installation

3.34 line detector

detector which responds to the phenomenon sensed in the vicinity of a continuous line

3.35 maintenance

work of inspection, servicing and repair necessary in order to maintain the efficient operation of the installed system

3.36 maisonette

dwelling, forming part of a larger building, which includes rooms on two or more levels that are more than half a storey height apart

3.37 manual call point

component of a fire detection and fire alarm system which is used for the manual initiation of an alarm

3.38 maximum alarm load

maximum load imposed on a fire alarm system power supply under fire conditions, comprising the power required for simultaneous operation of all fire alarm devices, fire alarm signals from all automatic fire detectors and manual call points in the building, any power drawn by other systems and equipment in the alarm condition and any power required for transmission of fire alarm signals to an ARC (if a facility for this is provided)

3.39 mimic diagram

topographic representation of the protected premises and their subdivisions, using light-emitting indicators for each subdivision such that the indications of the fire detection and fire alarm system can be rapidly related to the layout of the premises

3.40 mixed system

arrangement whereby two different grades of fire detection and fire alarm system are provided within the same premises for the purpose of satisfying two different fire safety objectives

NOTE Interlinking of these systems is not precluded.

3.41 mobile home

transportable unit of living accommodation that does not meet the requirements for construction and use of road vehicles

3.42 monitored wiring

wiring in which an open circuit will result in a fault warning (but not an alarm of fire), while a short circuit will result either in a fault warning or an alarm of fire

NOTE BS 5839-1:2017 recommends that an open circuit or a short circuit both result in a fault warning but not an alarm of fire; for some systems, this part of BS 5839 recommends compliance with BS 5839-1:2017.

3.43 multi-sensor fire alarm

device containing within one housing, sensors that monitor more than one physical and/or chemical phenomenon associated with fire in conjunction with the means of giving an audible alarm

3.44 multi-sensor fire detector

fire detector that monitors more than one physical and/or chemical phenomenon associated with fire

3.45 normal supply

supply from which the fire detection and fire alarm system is expected to obtain its power under normal conditions

NOTE The normal supply is usually derived from the public electricity supply system.

3.46 point detector

detector which responds to a phenomenon sensed in the vicinity of a fixed point

3.47 principal habitable room

habitable room (see [3.28](#)) that is normally the most frequently used room for general daytime living purposes

3.48 protection

presence of one or more automatic fire detector(s) able to initiate actions needed for the safety of life or property in the event of a fire

3.49 purchaser

person or organization taking primary responsibility for acceptance of and payment for the installed system

3.50 radio-linked system

fire detection and fire alarm system in which some or all of the interconnections between components are made by radio links

3.51 repair

non-routine work necessary to restore the efficient operation of the installed system

3.52 servicing

routine process of work on the system carried out at predetermined intervals

NOTE For example, testing and cleaning.

3.53 shared house

type of house in multiple occupation, normally let to an identifiable group, such as students, work colleagues or friends, in which there is a significant degree of social interaction

3.54 sheltered housing

block or group of dwellings, with each dwelling incorporating its own cooking and sanitary facilities, designed specifically for persons who might require assistance, e.g. elderly people, and where some form of assistance is available at all times

NOTE 1 This does not imply that assistance need be provided on the premises.

NOTE 2 Sheltered housing often includes amenities common to all occupiers, such as lounges and guest rooms, all of which are within the scope of this part of BS 5839.

3.55 smoke

particulate and aerosol products of combustion, whether this be of the smouldering or open flame type

3.56 smoke alarm

device containing within one housing all the components, except possibly the energy source, necessary for detecting smoke and for giving an audible alarm

3.57 smoke detector

automatic fire detector sensitive to particulate products of combustion and/or pyrolysis suspended in the atmosphere (aerosols)

3.58 social alarm system

system that provides facilities for alarm initiation, signal transmission, alarm reception, reassurance and assistance, for use by older people or other people who might require assistance

NOTE Other terms, such as telecare systems, community alarm or personal alarm systems, are also sometimes used.

3.59 standby supply

electricity supply, commonly from a rechargeable battery, which is automatically connected to the fire alarm system when the normal supply fails

3.60 storey

part of a building comprising all the rooms that are on the same level including any gallery having an area of more than half that of the space into which it projects, unless it is accessible only for maintenance or repair

3.61 supported housing

housing (excluding sheltered housing) designed for vulnerable people with common characteristics, living as part of a community with support that is normally, but not necessarily, provided on a 24 h basis

NOTE This includes housing for groups of people with learning or physical disabilities and mental health issues.

3.62 tamper-proof battery

battery that is not designed to be removed

NOTE For example, cells soldered to a printed circuit board.

3.63 telecare-enabled fire detection and fire alarm system

fire detection and fire alarm system that is interfaced with a social alarm system (3.58), such that there is a facility for signal transmission, alarm reception, reassurance and, where necessary, assistance (e.g. summoning of the fire and rescue service)

3.64 user

person or organization having control of the building (or part of the building) in which the fire detection and fire alarm system is installed

3.65 variation

intentional departure from a specific recommendation of this part of BS 5839

NOTE 1 Since this part of BS 5839 is a code of practice, its contents take the form of recommendations, rather than requirements. Accordingly, variations might be appropriate in certain circumstances.

NOTE 2 Variations do not include errors in design, installation or commissioning.

NOTE 3 In many cases, variations will need the agreement of interested third parties, such as the authority enforcing fire safety legislation or the fire insurer.

3.66 visual alarm device

device which generates a flashing light to signal to the occupants of a building that a fire condition exists

3.67 voice alarm system

sound distribution system that provides means for automatically broadcasting audible speech messages and warning signals

NOTE Voice alarm systems commonly include a facility for transmission of live voice messages, as well as automatically generated messages.

4 Fire risk assessment

4.1 Commentary

A fire detection and fire alarm system, although it can do nothing to reduce the incidence of fire, can help to lessen the resultant loss in terms of injury to occupants or damage to property. However, the system needs to take into account the ability of the persons it is designed to protect to react to the warning and to make use of the time for escape that it is intended to give them, and needs to be regarded as just one component of a properly engineered approach to fire safety.

In order to maximize the cost–benefit of a fire detection and fire alarm system, it is essential that the system design be appropriate to the fire risk. Accordingly, the design of any fire detection and fire alarm system installed in accordance with this part of BS 5839 needs to be based on a good understanding of fire risk in domestic premises.

A high fire risk demands high reliability in the early detection of fire and warning of occupants, regardless of where the fire starts, and high reliability on the part of the system to operate correctly when required; a low fire risk might not justify the cost, complexity and extent of such a system. For example, at one extreme, the single occupant of an existing small bungalow might be adequately

protected very simply if the occupier installs one battery-powered smoke alarm, whereas the risk to which the families in a six-storey house in multiple occupation (HMO) are exposed would warrant a more complex and comprehensive system.

It is therefore essential that the design of the system, particularly in respect of factors such as the number and siting of detectors and the form of power supply, takes into account the following probabilities:

- a) the probability of fire occurring;
- b) the probability of injury or death of occupants if fire occurs;
- c) the probability of the system operating correctly at the time of a fire;
- d) the probability of early detection and warning of occupants in the event of fire.

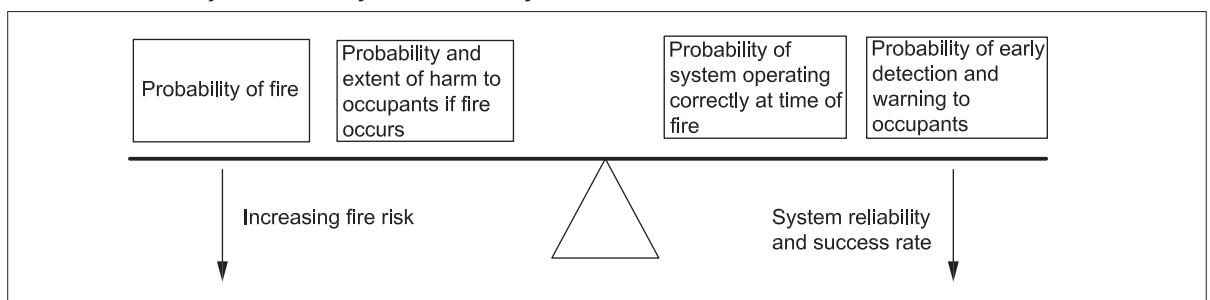
NOTE 1 The combination of items a) and b) may be regarded as the fire risk (see 3.25).

NOTE 2 Item c) may be regarded as the system reliability.

NOTE 3 Item d) may be regarded as a form of success rate for the system.

It is important that system design ensures that there is an appropriate balance between the fire risk and the system reliability and success rate (see Figure 1).

Figure 1 — Balance between fire risk and system reliability and success rate



The factors that are relevant to consider in a qualitative assessment of fire risk are discussed in Annex A; the implications of the various factors on system design are also described. Clause 9 contains recommendations on the grades and categories of system (see Clause 7 and Clause 8) that are considered generally appropriate for generic types of domestic premises covered by this part of BS 5839. The highest level of protection is afforded by detection in all rooms, other than those of negligible fire risk, such as bathrooms and toilets.

Although this part of BS 5839 advocates that, where practicable, the actual design of a fire detection and fire alarm system be based on a fire risk assessment, it is considered that the level of fire risk in domestic premises covered by this part of BS 5839 is unlikely ever to be sufficiently low to obviate the need for some form of fire detection and fire alarm system.

4.2 Recommendations

The following recommendations should be met.

- a) A fire detection and fire alarm system, meeting the recommendations given in this part of BS 5839, should be installed in all domestic premises and dwelling units described in Clause 1, whether new or existing.

NOTE 1 The recommendation for retrospective installation of a fire detection and fire alarm system in existing premises relates primarily to premises in which there is no, or no appropriate, fire detection and fire alarm system. It is not specifically recommended that an existing fire detection and fire alarm system installed

in accordance with previous editions of BS 5839-6 be upgraded to meet the recommendations of this current version of BS 5839-6.

- b) Final design of a fire detection and fire alarm system for any particular domestic premises should, where reasonably practicable, be based on a form of fire risk assessment, particularly if it is proposed to deviate from the recommendations given in [Clause 9](#) or if there are risk factors additional to those encountered in typical examples of the types of premises defined in [Clause 9](#).

NOTE 2 The attention of anyone carrying out a fire risk assessment to determine appropriate system design is drawn to the information contained in [Annex A](#), which is likely to be of value in any such risk assessment and in determining the basic principles for system design, particularly the appropriate grade and category of system (see [Clause 7](#) and [Clause 8](#)).

- c) In many situations, occupant characteristics and other relevant factors are not known to the designer or specifier (e.g. in the case of new domestic premises or upgrading the fire detection and fire alarm systems within a block of flats by the housing provider). In such cases, design should follow the recommendations given in [Clause 9](#).

NOTE 3 At the stage at which approval of system design is granted under building regulations ([1] to [4]), occupant characteristics and other relevant factors are generally unknown.

5 System components

5.1 Commentary

The reliability of whatever form of fire detection and fire alarm system is installed to perform its functions on demand is, to a significant degree, governed by the reliability of individual components. In general, it is advisable that all components, such as manual call points, detectors, CIE (if incorporated in the system) and fire alarm devices, conform to relevant British Standards, and have undergone type testing to these standards. It is advisable to use components having certification under a recognized product certification scheme (comprising third-party certification of product conformity against a relevant standard, based on testing and continuing surveillance, together with assessment of the manufacturer's quality assurance system against BS EN ISO 9000).

Where there is no relevant British, European or International Standard, it is advisable that care is taken to ensure, as far as possible, that the components are fit for their purpose. Third-party approval against an appropriate test standard can provide assurance of this.

Conformity of an individual component to a recognized standard does not necessarily ensure that it will operate satisfactorily in conjunction with another component that conforms to the relevant standard for that component. It is essential that compatibility between components is taken into account by the designer of the system.

5.2 Recommendations

The following recommendations should be met.

- a) Smoke alarms should conform to BS EN 14604.
- b) Heat alarms should conform to BS 5446-2.
- c) Multi-sensor fire detectors should conform to BS EN 54-29, BS EN 54-30, or BS EN 14604 and BS 5446-2.
- d) Smoke alarm systems intended to warn people who are Deaf or hard of hearing in the event of fire should conform to BS 5446-3.
- e) Manual call points should conform to BS EN 54-11 for Type A ("single action") manual call points [see also **18.2d**]].

- f) Point smoke detectors should conform to BS EN 54-7.
 - g) Point heat detectors should conform to BS EN 54-5 for Class A1 or A2 detectors.
 - h) Carbon monoxide fire detectors should conform to BS EN 54-26.
 - i) Beam type smoke detectors should conform to BS EN 54-12.
 - j) CIE for Grade C systems should conform to either BS EN 54-2, or [Annex B](#) in the present part of BS 5839.
- NOTE CIE for Grade C systems may also be incorporated into intruder alarm or social alarm systems meeting the recommendations in [6.2](#), [12.2](#), [15.3](#) and [17.4](#).*
- k) Audible fire alarm devices for Grade C systems should produce a frequency of not greater than 3 500 Hz.
 - l) Where flame detectors are to be installed, they should conform to BS EN 54-10.

6 Monitoring of circuits

6.1 Commentary

In many simple systems that incorporate interconnecting wiring for the supply of power to detectors, or for the interconnection of smoke alarms and heat alarms, the wiring is unmonitored. However, monitoring of wiring reduces the amount of time for which a system is likely to be disabled before a fault in the wiring is discovered. If the risk to life from fire is high, or the wiring is likely to be subject to mechanical damage or damage by rodents, systems that incorporate monitored wiring are of benefit.

Similarly, in simple systems, monitoring of the state of power supplies is not generally warranted. In more complex systems, which tend to be used in premises in which the risk to life is greater, the additional complexity associated with monitoring of power supplies is likely to be justified.

Following a number of fatal fires, it was found that occupiers of the premises of fire origin had tampered with or disabled the smoke alarm, precluding their early warning of fire. It is possible to obtain smoke alarms with the facility for remote indication of tampering or disablement (whether long-distance remote monitoring or local monitoring, such as at a central position in a block of flats). Where residents are particularly vulnerable from fire, the provision of such facilities might be of value.

6.2 Recommendations

The following recommendations should be met.

- a) In Grade A systems, monitoring of power supplies and circuits external to CIE should meet the recommendations given in BS 5839-1:2017, [12.2.1](#).
- b) In Grade C systems, an open or short circuit fault in any circuit, external to CIE, serving manual call points (if present), fire detectors or fire alarm devices should result in a fault warning at the CIE (see [Clause 17](#)), or in a fire alarm signal in the premises, within 100 s of the occurrence of the fault.

NOTE 1 It is preferable that an open or short circuit fault results in a fault warning rather than a fire warning.

- c) In Grade C systems, failure or disconnection of the normal supply (see [3.45](#)) should result in a visual indication at the CIE (see [Clause 17](#)) within 30 min of the occurrence of the fault or disconnection. The indication may take the form of either of the following:
 - 1) a normally illuminated indicator is extinguished; or
 - 2) a fault indicator is illuminated.

NOTE 2 This part of BS 5839 contains no recommendations for monitoring of wiring or power supplies in Grade D or Grade F systems. However, BS EN 14604 requires that mains-powered smoke alarms (which are used in Grade D systems) incorporate a green mains-on indicator, which is continuously illuminated when mains power is present. BS 5446-2 makes the same requirement for heat alarms.

7 Grades of system

7.1 Commentary

This part of BS 5839 covers many types of fire detection and fire alarm system, which differ widely in complexity, reliability and level of self-monitoring (see [Clause 6](#)). Some of the simpler forms of system are not suitable for premises in which the fire risk is judged to be high, while expenditure on the most complex systems might be inappropriate for low-risk premises (see [Clause 4](#)).

For the purpose of specifying a fire detection and fire alarm system and the associated engineering design parameters, this part of BS 5839 groups systems into eight grades. Some of the recommendations of this part of BS 5839 apply to all grades of system, while other recommendations apply only to particular grades.

The grades are defined as follows.

- *Grade A: A fire detection and fire alarm system, which incorporates CIE conforming to BS EN 54-2 and power supply equipment conforming to BS EN 54-4, and which is designed and installed in accordance with all the recommendations of BS 5839-1:2017, Section 1 to Section 4 inclusive, except those in the following clauses, for which the corresponding clauses of this part of BS 5839 need to be substituted.*

Clause/subclause of BS 5839-1:2017	Corresponding clause/subclause of BS 5839-6
16 (Audible alarm signals)	13 (Audible fire alarm devices and audibility)
18 (Fire alarm warnings for people who are Deaf and hard of hearing)	14 (Fire alarm warnings for people who are Deaf and hard of hearing)
20 (Manual call points)	18 (Manual call points)
25.4e (Capacity of standby batteries)	15.2c (Capacity of standby batteries)
27 (Radio-linked systems)	21 (Radio-linked systems)

- *Grade B: Not currently defined.*
- *Grade C: A system of fire detectors and alarm sounders (which may be combined in the form of smoke alarms) connected to a common power supply, comprising the normal mains and a standby supply, with central control equipment.*
- *Grade D1: A system of one or more mains-powered detectors (see [3.12](#)), each with a tamper-proof standby supply consisting of a battery or batteries (see [3.62](#)).*
- *Grade D2: A system of one or more mains-powered detectors (see [3.12](#)), each with an integral standby supply consisting of a user-replaceable battery or batteries.*
- *Grade E: Not currently defined.*
- *Grade F1: A system of one or more battery-powered detectors (see [3.12](#)) powered by a tamper-proof primary battery or batteries (see [3.62](#)).*
- *Grade F2: A system of one or more battery-powered detectors (see [3.12](#)) powered by a user-replaceable primary battery or batteries.*

In the case of Grade D and Grade F systems, where more than one smoke alarm is installed, the smoke alarms normally need to be interlinked [see [13.2c](#)]. Any heat alarms also need to be interlinked with the smoke alarms.

Guidance documents supporting legislation, and written requirements produced by enforcing authorities, often specify only a minimum level of system engineering, rather than a particular form of system. These grades are defined in such a way that a requirement for one grade of system can be satisfied by the installation of a higher grade of system; for example, if the fire risk justified the installation of a Grade D system, it would be acceptable to install a Grade A or Grade C system.

Because of the wide range of systems covered by the recommendations of this part of BS 5839, the specification of requirements for a system by a purchaser, user, enforcing authority or insurer, or the description of a system by a designer or installer, by reference to this part of BS 5839, without a reference to system grade, will have little meaning.

[Annex C](#) provides further information on each grade of system, including the advantages and disadvantages of each grade.

7.2 Recommendations

The following recommendations should be met.

- a) If any party is instructed to design a fire detection and fire alarm system for premises (e.g. by means of a purchase specification), the instruction should include a clear reference to the grade of system required.

NOTE 1 Any statutory requirements imposed by enforcing authorities, and any requirements imposed by property insurers, for a fire detection and fire alarm system for premises are expected to state the grade of system required.

- b) The relevant system certificate (see [Clause 23](#)) should clearly state the grade of system that has been designed or installed.

NOTE 2 In the case of a Grade A system, there is a separate design certificate, which indicates the grade of system that has been designed (see [Annex D](#)). In other grades of system, a single certificate is normally issued, indicating the grade of system that has been designed, installed and commissioned (see [Clause 23](#) and [Annex E](#)).

8 Categories of system

8.1 Commentary

8.1.1 General

Fire detection and fire alarm systems are usually installed in premises to protect life. However, the level of protection afforded to occupants needs to be related to the fire risk (see [Clause 4](#)). The appropriate level can therefore vary considerably. For the purposes of this part of BS 5839, systems are classified as follows, according to the level of protection that they afford.

- a) *Category LD: a fire detection and fire alarm system intended for the protection of life;*

NOTE 1 The designation "LD" is used to distinguish these systems, which are intended only for domestic premises, from Category L systems as defined in BS 5839-1:2017, which are intended for the protection of life in non-domestic premises. Category LD systems are subdivided into:

- *Category LD1: a system installed throughout the premises, incorporating detectors in all circulation areas that form part of the escape routes from the premises, and in all rooms and areas, other than those with negligible sources of ignition, such as toilets, bathrooms and shower rooms;*

- *Category LD2: a system incorporating detectors in all circulation areas that form part of the escape routes from the premises, and in all specified rooms or areas that present a high fire risk to occupants, including any kitchen and the principal habitable room (see [Clause 4](#));*
- *Category LD3: a system incorporating detectors in all circulation areas that form part of the escape routes from the premises.*

b) *Category PD: a fire detection and fire alarm system intended for the protection of property.*

NOTE 2 The designation “PD” is used to distinguish these systems, which are intended only for domestic premises, from Category P systems as defined in BS 5839-1:2017, which are intended for the protection of property in non-domestic premises. Category PD systems are subdivided into:

- *Category PD1: a system installed throughout the premises, incorporating detectors in all rooms and areas in which fire might start, other than toilets, bathrooms and shower rooms;*
- *Category PD2: a system incorporating detectors only in defined rooms or areas of the premises in which the risk of fire to property is judged to warrant their provision.*

A system is rarely installed solely for the protection of property. Accordingly, Category PD systems will normally be designed to meet the recommendations given in this part of BS 5839 for a Category LD system, thereby constituting a combined Category LD and Category PD system.

Because of the wide range of systems covered by the recommendations of this part of BS 5839, the specification of requirements for a system by a purchaser, user, enforcing authority or insurer, or the description of a system by a designer or installer, by reference to this part of BS 5839, without a reference to system category, will have little meaning.

8.1.2 Systems for the protection of life (Category LD)

All domestic premises need to be provided with an appropriate fire detection and fire alarm system. The greatest benefit to life safety is given by a full-coverage system (Category LD1). Such a system gives the earliest practicable warning of fire to occupants, wherever ignition occurs.

However, a good level of protection can normally be obtained from a Category LD2 system, in which detection is only provided at points where the fire risk is high or where combustion products would present a significant hazard to life. A Category LD2 system might, for instance, have detectors only in the circulation areas of premises, the living room and the kitchen; other areas might be left without detector coverage. The areas protected by a Category LD2 system include escape routes, i.e. those areas that would be protected by a Category LD3 system.

A Category LD3 system is intended only to protect circulation areas that would be used as escape routes, by giving a warning if smoke is detected in these areas, so that occupants can escape before heat or smoke make this impossible. A Category LD3 system cannot be expected, with any degree of reliability, to protect people who might be involved with the fire at ignition or in its early stages. This category of system might not therefore prevent the death or serious injury of occupants in the room where the fire originates; it is intended only to ensure escape for those not immediately involved. If no detector is installed in the room in which fire starts, the time available for evacuation of other areas once fire is detected in the circulation area might be quite short. In a large family house adapted to provide accommodation for several households in separate self-contained units (an HMO), a fire in one dwelling unit can be a hazard to occupants of other units. In this case, the fire detection and fire alarm system normally needs to extend across the boundaries between occupancies or be interconnected with systems in other occupancies. In practice, it is often appropriate for there to be a single integrated fire detection and fire alarm system that will alert all occupants before a fire in any premises threatens the communal escape routes, and that will provide early warning of any fire that starts in these escape routes. This objective is additional to that of enabling occupants of the premises in which fire starts to escape before their escape routes become impassable owing to heat or smoke (see also [9.1.6](#)).

In the case of purpose-built flats or sheltered housing, the degree of compartmentation between occupancies is normally sufficient to ensure that fire is contained in the premises of origin for a prolonged period. During this time, other occupants can remain in reasonable safety within their own premises. Accordingly, this part of BS 5839 does not provide recommendations for fire detection and fire alarm systems that incorporate detectors in the communal areas or ancillary accommodation (e.g. plant rooms) within general needs purpose-built flats. However, recommendations are provided for common parts and communal facilities in sheltered housing, unless, architecturally and in terms of facilities, the premises are no different from a general needs block of flats.

8.1.3 Systems for the protection of property (Category PD)

A fire can start virtually anywhere in domestic premises, although the probability of fire varies significantly from one room to another. If the fire is not detected at an early stage, it can grow until it becomes difficult or impossible to extinguish. The highest level of property protection is therefore given by a Category PD1 system (giving full coverage of all parts of the premises). In a large house of high value, or with contents of high value, such a system is generally the only category acceptable to fire insurers. The system normally has a facility for automatic transmission of fire alarm signals to an ARC (see Clause 20).

A lower level of protection, still giving a useful reduction in fire risk, can sometimes be obtained by the installation of fire detectors only in those parts of the building in which there is significant potential for ignition. A Category PD2 system provides partial cover of this nature.

8.2 Recommendations

The following recommendations should be met.

- a) If any party is instructed to design a fire detection and fire alarm system for premises (e.g. by means of a purchase specification), the instruction should include a clear reference to the category of system required.

NOTE 1 Any statutory requirements imposed by enforcing authorities, and any requirements imposed by property insurers, for a fire detection and fire alarm system for premises are expected to state the category of system required.

- b) If a fire detection and fire alarm system is intended to protect both life and property, and specific recommendations for the two categories of system differ, then the system should meet the recommendations for each of the categories.

NOTE 2 For example, a system whose sole purpose is to provide full-coverage property protection (Category PD1) need only have a small number of sounders, but if it is also used to provide coverage of the circulation areas for life safety (Category LD3), the number of sounders needs to be sufficient to give warning throughout the premises.

NOTE 3 The combined system is described as a Category X/Y system (e.g. LD2/PD2 or LD3/PD2).

- c) Any requirement for a Category LD2 system should be supplemented by information regarding the rooms in which fire detectors are to be installed (over and above the fire detectors in the circulation areas required to satisfy the recommendations of this part of BS 5839 for a Category LD3 system). Similarly, any requirement for a Category PD2 system should be supplemented by information regarding the areas of the premises that are to be protected by automatic fire detectors.
- d) The relevant system certificate (see [Clause 23](#)) should clearly state the category of system that has been designed and should, in the case of a Category LD2 or Category PD2 system, provide a brief description of the areas of the premises that are protected by fire detectors.

NOTE 4 In the case of a Grade A system, there is a separate design certificate, which indicates the category of system that has been designed (see [Annex D](#)). In other grades of system, a single certificate is normally issued, indicating the category of system that has been designed, installed and commissioned (see [Clause 23](#) and [Annex E](#)).

9 Choice of system

9.1 Commentary

9.1.1 Grade of system

System grade relates to the engineering aspects of the fire detection and fire alarm system. Higher grades of system tend to provide a greater level of control and monitoring of the system, or greater reliability and availability to perform correctly in the event of fire. The grade of system that needs to be installed depends on the nature of the premises, the level of fire risk and the characteristics of the likely occupants.

Grade F2 systems, comprising one or more battery-powered smoke alarms, are the least reliable in the long term because of the need for battery replacement. Reliability can be enhanced by the use of a Grade F1 system (see [7.1](#)). For new dwellings, a Grade D system (in which the normal supply for each smoke alarm is derived from the mains electricity supply and a standby supply is provided) or higher is justified.

However, because of their low cost and ease of installation, Grade F systems (comprising battery-powered smoke alarms) might be suitable for installation in existing premises [see [13.2c](#)]. Their reliability can be improved by use of batteries that have a long anticipated life and that cannot be removed by the user. Nevertheless, Grade F systems are generally not appropriate in premises in which the fire risk to occupants is high, nor where there cannot be a reasonable certainty that, when the premises are occupied, batteries will be replaced within a short time (typically no more than 5 days) of a battery fault warning indication. Otherwise, a system in which the normal supply is derived from the mains needs to be used (e.g. a Grade D system).

Where there is a need for readily accessible control of the fire detection and fire alarm system, a Grade C system or higher might be provided. Where the fire risk calls for a high standard of system monitoring and availability, or if premises are very large or are subdivided into a significant number of dwelling units (e.g. in an HMO or sheltered housing), a Grade A system is required.

If the purpose of the system is property protection, fire insurers might require a Grade A system. However, for smaller properties, a Grade C system might be sufficient.

9.1.2 Category of system

System category relates to the level of protection afforded to occupants. The category of system that is appropriate depends primarily on the fire risk (see [Clause 4](#)). All dwellings need to be protected to at least the standard afforded by a Category LD3 system. However, for new housing, other than flats in sheltered housing, a Category LD2 system is appropriate. If the risk to occupants from fire in any part of the premises is deemed to be high, a Category LD2 or Category LD1 system is always appropriate. For example, a Category LD1 system needs to be provided in sheltered housing flats and if the occupants have an impairment or disability that could delay their escape from fire. If it is intended to protect reliably any occupant (regardless of impairment/disability or age) in the room where a fire originates, a suitable Category LD2, or a Category LD1, system needs to be provided. For the highest level of protection of all occupants who might occupy the dwelling over the lifetime of the fire detection and fire alarm system, a Category LD1 system would be appropriate.

In an HMO divided into a number of separate units of accommodation, there might not be the same degree of compartmentation as in purpose-built blocks of flats. As it is impossible to control occupants' activities, and there is no overall supervision of the entire premises, it is essential that all occupants are warned before a fire in any self-contained dwelling unit threatens their safety. In order to meet this objective, in all except the smallest such HMOs, communal areas need to be protected by siting detectors generally in accordance with the recommendations of BS 5839-1:2017 for a Category L2 system; these are similar to, but more onerous than, the recommendations of this part of BS 5839 for a Category LD2 system (see [Table 1](#)).

9.1.3 Appropriate systems for typical premises

Premises covered by this part of BS 5839 can be divided into a number of broad classes. [Table 1](#) shows the minimum grades and categories of system recommended for the protection of life in typical premises in each class. Attention is, however, drawn to building regulations ([1] to [4]), which govern fire precautions in new premises, and to other legislation concerning fire precautions in certain types of existing premises (such as HMOs). Where fire precautions are subject to legislative control, the guidance that supports the legislation needs to be consulted before a decision on the appropriate grade and category of system is reached.

[Table 2](#) shows the minimum grades and categories of system appropriate for the protection of property in typical premises. In the case of large premises, the installation of a fire detection and fire alarm system might be required by fire insurers or might be taken into account by the insurer. In this case, the insurer needs to be consulted before a decision on the grade and category of system is reached.

It is important to note that [Table 1](#) and [Table 2](#) relate only to typical premises in each class, and these examples are not intended to be comprehensive. If any doubt exists as to the appropriate system for any premises, the advice of specialists, such as the fire and rescue service, fire consultants or, if appropriate, the fire insurer, needs to be sought, and the choice of system needs to be based on a risk assessment (see [Clause 4](#)). In some circumstances, this might determine that a higher standard of protection (i.e. with additional detectors) is warranted.

9.1.4 Specification of systems

When specifying a system by reference to this part of BS 5839, the grade and category of system always need to be stated.

The specification for a Category PD2 or Category LD2 system always needs to include details of the areas and rooms of the premises that are to be protected. Where mixed or combined grades or categories of system are required in premises, the grade(s) or category(ies) of system required in each part of the premises need to be specified (see also [9.1.5](#)).

9.1.5 Appropriate systems for sheltered housing

Sheltered housing varies greatly in the design of the building, the nature of the residents, the level of support provided or required and the extent of communal facilities. Accordingly, it is not possible to specify a unique, generic form of fire detection and fire alarm system for all sheltered housing blocks.

It is necessary for the specifier to take account of the objectives of the fire warning and evacuation strategy, and to ensure that designs meet these objectives in specific circumstances. Examples of possible configurations are given in this part of BS 5839, but these are not intended to be exhaustive.

Generally, the design of sheltered housing is very similar, or identical, to the design of general needs housing, and each flat is an independent, fire-resisting compartment, within which a fire is expected to be contained. This facilitates a "stay put" policy, in which only the occupants of the flat of fire origin need to evacuate, while it is safe for other residents to remain within their own flat.

However, as in general needs housing, a “stay put” policy is predicated on the assumption that the fire and rescue service will attend and extinguish the fire. It is also assumed that, if necessary, the fire and rescue service will instruct residents, in flats that might ultimately be affected by the fire, to evacuate.

In the case of sheltered housing, some residents might be slower to evacuate if required to do so.

Accordingly, there is a need to compensate for this by early attendance of the fire and rescue service.

On the basis of these considerations, the objectives of fire warning arrangements in sheltered housing are, potentially, threefold:

- a) to alert residents in the flat or room of fire origin to enable their early evacuation;*
- b) to alert the fire and rescue service to the fire, so facilitating early attendance while avoiding, as far as practicable, attendance to false alarms; and*
- c) early detection of a fire in any communal facilities (such as lounges, kitchens or laundries) that might grow to affect common escape routes.*

The first of these objectives can be achieved, as in any housing, by the provision of smoke alarms within each flat (and a heat alarm in each kitchen). In determining the level of fire detection that is appropriate, account needs to be taken of the nature of the residents. In particular, some residents in sheltered housing might have reduced mobility or they might be Deaf or hard of hearing. Older people in particular tend to have hearing loss most severe in relation to high frequencies, such as those produced by most smoke alarms.

This first objective could also be achieved by use of smoke, heat, or multi-sensor detectors connected to a communal fire detection and fire alarm system. However, such an arrangement does not readily facilitate verbal confirmation of fire alarm signals by any ARC to which the system is connected. Such an arrangement normally results in an audible alarm signal in that flat, but not in the common parts or any other flat. Where this arrangement is adopted, it needs to be determined whether access into individual dwellings will be possible for maintenance purposes.

The second objective, namely the early summoning of the fire and rescue service, can be achieved by connection of smoke, heat, or multi-sensor alarms within flats to the social alarm system within the flat, so enabling signals from smoke, heat, or multi-sensor alarms to be transmitted to any on-site scheme manager or remote ARC. In this case, alarm signals can be filtered by two-way speech communication between the scheme manager, or social alarm ARC, and occupants of the flat. However, if an occupant is Deaf or hard of hearing, this might not be practicable.

Certain engineering safeguards are necessary in such an arrangement to ensure reliable alarm transmission. In particular, it is necessary to ensure that a signal is transmitted, regardless of which smoke or heat alarm operates. Fire alarm signals need to be readily distinguishable from social alarm signals by the scheme manager and at the ARC. The normal arrangement for social alarm transmission is that, when the scheme manager is on site, the signal is transmitted without delay to the scheme manager, automatically enabling two-way speech communication between the scheme manager and the flat to permit filtering of alarm signals, so avoiding unnecessary summoning of the fire and rescue service. When the scheme manager is offsite or does not respond to the signal within a specified time (typically not greater than 30 s), the signal is automatically relayed to the ARC. The ARC then establishes speech communication with the flat. If it cannot, with certainty, be determined that the signal is a false alarm within 90 s of receipt of the alarm signal at the ARC, the fire and rescue service are summoned immediately (see Clause 20).

It is anticipated that analogue telephone services will cease to be provided within 5 to 10 years of publication of the 2019 edition of this part of BS 5839, as the UK’s telecoms infrastructure is upgraded to digital connectivity. This shift brings a number of opportunities to improve the speed and flexibility of alarm transmission, but in addition has major implications for existing fire detection and fire alarm

systems that rely on the fire alarm signal to be transmitted to an ARC or other responder. Many services that employ analogue connectivity, such as sheltered housing, supported housing fire detection and fire alarm systems, and dispersed social alarm (telecare) systems, will need to be upgraded, adapted or replaced to ensure that signalling equipment operates correctly. There is a risk that a great number of vulnerable people could lose the technology on which they rely, and it is likely that other health and care services would be significantly impacted as a result. Manufacturers, designers, installers and maintainers, in addition to other persons responsible for these systems, need to ensure that a process is in place to confirm that their equipment is compatible with the changes and that testing protocols are in place to verify that signalling is not compromised.

Smoke (or heat) detection (as appropriate) ought to be installed in any communal facility, such as a communal lounge or laundry, from where fire could spread to affect common escape routes. When a fire detector in one of these areas operates, a signal ought to be transmitted to the scheme manager and/or ARC and sounders operated throughout adjacent (or all) common parts to ensure that these areas are evacuated, while residents can still remain in their own flats.

Where there might be combustible materials, such as chairs and tables, within common parts, smoke or multi-sensor detection ought also to be installed within the common parts. Again, operation of these detectors needs to result in transmission of alarm signals to the scheme manager and/or ARC and trigger an audible alarm only in the common parts.

Based on these considerations, a typical fire alarm configuration might comprise smoke/heat alarms within each flat connected to the social alarm system. The provision of these ought to be in accordance with BS 5839-6. A separate communal system is normally necessary if there are communal facilities located off internal corridors. This system ought to be installed in accordance with BS 5839-1:2017 for the appropriate category of system (Category L4 or Category L5). No communal system is likely to be necessary in simple sheltered housing that, architecturally, is similar to a general needs block of flats with no communal facilities.

If a communal system is installed, as a further enhancement, heat detectors, connected to this system, might be installed within the hallway of each flat [in addition to the smoke alarm(s) within the flat]. The heat detectors could be used as confirmation of a fire within a flat. Under these circumstances, it might be appropriate, according to the fire risk assessment for the premises, to evacuate adjacent (or all) common parts and, if appropriate, certain flats in close proximity to the flat of fire origin (or, in small schemes, all other flats). For example, this might be appropriate in the case of a sheltered housing block that does not incorporate all measures normally provided in purpose-built blocks of flats as the basis for a “stay put” policy. Where the communal system is also used to alert residents to a fire in their own flat, or in another flat in close proximity, account needs to be taken of the necessary sound levels within the flats.

Any ARC to which fire alarm signals from a communal fire detection and fire alarm system in sheltered housing are transmitted may be, but need not necessarily be, the same ARC to which fire alarm signals from flats are relayed, as filtering by two-way speech communication is not normally possible for fire alarm signals within common parts or communal facilities.

9.1.6 Mixed systems

Normally, even in the largest of premises, a single fire detection and fire alarm system serves the entire premises. However, exceptions might arise in some premises in order to meet different objectives.

An example of such an exception is an HMO that has three or more storeys. One objective of installing a fire detection and fire alarm system is to warn all occupants before a fire in any premises threatens the communal escape routes. This objective could be met by meeting the recommendations given in BS 5839-1:2017 for a Category L3 fire detection and fire alarm system, which involves the installation of

smoke detectors within the communal escape routes and either heat, smoke, carbon monoxide or multi-sensor detectors in rooms or areas adjoining the communal escape routes.

The purpose of the detectors in the accommodation adjoining the escape routes is only to give a warning to occupants of other dwellings before the fire breaks through the door of the dwellings in which it originates. The detectors within dwellings may be sited on the ceiling or wall close to the entrance door of the dwellings. The siting and type of detector might not therefore be such as to provide a sufficiently early warning for occupants in the dwellings of fire origin to escape. These occupants could be adequately protected by installing smoke alarms within the circulation areas of self-contained dwelling units, following the principles adopted in purpose-built flats. (If necessary, these smoke alarms could also be supplemented by interlinked heat or smoke alarms in specific rooms.)

An advantage of this arrangement is that false alarms due to, for example, cooking activities in dwellings, are unlikely to result in disturbance of all occupants, particularly if heat detectors are installed in areas adjoining escape routes for the purpose of meeting the recommendations given in BS 5839-1.

Although this arrangement (a “mixed system”) results in a mixture of system grades, it meets both life safety objectives. Alternatively, the objectives could be met by a single system which has detectors sited in accordance with BS 5839-1 and that incorporates smoke detectors in communal escape routes and in the circulation areas within dwellings (and detectors in any rooms in which protection is necessary within dwellings). Other means might then be incorporated to prevent unnecessary disruption to all residents as a result of a false alarm in one dwelling unit (see [Clause 12](#)). This arrangement can also simplify maintenance of the system.

Similarly, in sheltered housing or blocks of flats, detectors installed within the dwellings are not intended to give a warning in other dwellings. If fire detection in either communal escape routes or selected high-risk areas, such as plant rooms or communal living rooms, is required, an entirely separate system could be installed in these areas (see [8.1.2](#)).

Mixed systems might also be acceptable where, for example, a Grade A Category PD2 system is installed for property protection in one part of premises, while, for protection of life, a Grade D Category LD3 system is installed throughout the circulation areas of the premises.

If two separate systems are installed (e.g. a BS 5839-1 system supplemented by smoke alarms), it is essential that occupiers are aware of the separate nature of the systems. For example, occupiers of an HMO need to be aware of the need to maintain any smoke alarms provided in individual dwellings, even though a separate system is installed for protection of escape routes.

9.2 Recommendations

The following recommendations should be met.

- a) Where there is a need to specify a fire detection and fire alarm system for dwellings in which the characteristics of the occupants are unknown (e.g. new dwellings), or for a group of dwellings in which occupant characteristics vary (e.g. when specifying requirements for retrofitting of smoke alarms throughout the properties of a local authority), the recommendations given in [Table 1](#) should be followed.

NOTE 1 Where [Table 1](#) refers to a house with a specific number of storeys (e.g. a two-storey house), basement storeys can be ignored.

- b) Where there is a need to specify a fire detection and fire alarm system for a specific dwelling, in which occupant characteristics are known or can be anticipated (e.g. when imposing requirements for an HMO under legislation, or designing a system on behalf of a specific

occupier), the recommendations in [Table 1](#) should be followed, but may be modified on the basis of a fire risk assessment (see [Clause 4](#)).

- c) If a fire detection and fire alarm system is required under legislation, before selecting the grade and category of system, the recommendations given in any guidance documents that support the legislation in question should be taken into account.
- d) [Table 2](#) provides recommendations for the minimum grade and category of system that should be installed for property protection in typical dwellings. However, if a fire detection and fire alarm system is intended to satisfy the requirements of fire insurers, before selecting the grade and category of system, there should be appropriate consultation with the fire insurers.
- e) Any specification for a system that is intended to satisfy the recommendations of this part of BS 5839 should identify the grade and category of system required.
- f) In sheltered housing, measures should be put in place to prevent receipt of alarm signals by any ARC from being significantly delayed if, prior to the fire alarm signal, a device on the social alarm signal is operated in the flat of fire origin or in any (or all) other flats. At the very least, under these circumstances, the display at the ARC should immediately indicate unambiguously a waiting fire alarm signal, without the need to interrupt speech communication initiated in response to a signal from a social alarm device.

NOTE 2 It is acceptable to install a mixed system (see [3.40](#)) in premises in any situation in which there is more than one fire safety objective that can be satisfied by more than one grade of fire detection and fire alarm system.