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Introduction

Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international and European standards, comments will be reviewed by the relevant UK national committee before submitting the consensus UK vote and comments. If the draft standard is approved, it is usual for the resulting published standard to be adopted as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

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Fire detection and fire alarm systems for buildings

**Part 1: Design, installation, commissioning and maintenance of systems in
non-domestic premises – Code of practice**

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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 **XX Month 202X**. It was prepared by Technical Subcommittee FSH/12/1, *Installation and servicing*, under the authority of Technical Committee FSH/12, *Fire detection and fire alarm systems*. A list of organizations represented on these committees can be obtained on request to the committee manager.

Supersession

This part of BS 5839 supersedes BS 5839:2017, which is withdrawn.

Relationship with other publications

BS 5839 is published in the following parts:

- Part 1: *Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises*;
- Part 3: *Specification for automatic release mechanisms for certain fire protection equipment*;
- Part 6: *Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises*;
- Part 8: *Design, installation, commissioning and maintenance of voice alarm systems – Code of practice*;
- Part 9: *Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems*.

Information about this document

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

- The document has undergone some restructuring, with Clause **4** being moved to a new Introduction and Clause **33** being merged with Clause **31**.
- A new Section **7** has been introduced on extensions and modifications.
- As a code of practice, variations from the recommendations of this part of BS 5839 might be acceptable, subject to the agreement of all interested parties. However, it is now considered, in the light of a number of fatal fires, that variations from the recommendations of certain clauses are unacceptable. Those considered unacceptable are now set out explicitly in Clause **6**.
- The siting recommendations for manual call points have been simplified.
- It is now recommended that, in rooms in which people sleep, preference is given to forms of automatic fire detection other than heat detectors. (It is not implied that this recommendation be applied retrospectively, until systems incorporating heat detection in these rooms are subject to substantial, or complete, replacement, or extension.)

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As a code of practice, this part of BS 5839 takes the form of recommendations and guidance. It is not to be quoted as if it were a specification. Users are expected to ensure that claims of compliance are not misleading.

Users may substitute any of the recommendations in this part of BS 5839 with practices of equivalent or better outcome. Any user claiming compliance with this part of BS 5839 is expected to be able to justify any course of action that deviates from its recommendations.

It has been assumed in the preparation of this part of BS 5839 that the execution of its provisions will be entrusted to appropriately qualified and competent people, for whose use it has been produced.

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Presentational conventions

The provisions of this document 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.

The word “should” is used to express recommendations of this document. The word “may” is used in the text to express permissibility, e.g. as an alternative to the primary recommendation of the clause. The word “can” is used to express possibility, e.g. a consequence of an action or an event.

Notes and commentaries are provided throughout the text of this document. Notes give references and additional information that are important but do not form part of the recommendations. Commentaries give background information.

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

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Section 1: General

Introduction

A principal purpose of a fire detection and fire alarm system is to support the fire evacuation strategy for the building. It is, in particular, important that system design suitably supports the required fire evacuation procedures, rather than those procedures being designed around a predetermined system design.

The need for a fire detection and fire alarm system in any specific building is normally determined by the authority responsible for enforcing fire safety legislation in that building and/or by a fire risk assessment carried out by the owner, landlord, occupier(s) or employer(s), as appropriate. It has therefore been assumed in the preparation of this part of BS 5839, which covers the design, installation, commissioning and maintenance of fire detection and fire alarm systems, that the need for such a system will already have been agreed.

Where there is uncertainty regarding the need for a fire detection and fire alarm system, guidance can be found in one or more of the following:

- BS 9991;
- BS 9999;
- guidance documents that support fire safety legislation;
- insurance documentation; and
- any relevant fire risk assessment.

In general, it is appropriate to install some form of fire detection and fire alarm system in virtually all buildings, other than very small premises that are relatively open-planned, so that any fire is quickly detected by occupants, who will then be able to warn others by word of mouth or simple mechanical devices such as hand-operated bells.

Fire detection and fire alarm systems that incorporate detectors in the communal areas or ancillary accommodation (e.g. plant rooms) within purpose-built flats are not normally required; they are normally undesirable and can even lead to risk to occupants. This does not preclude the provision of fire detection as part of a smoke control system, for which guidance is given in BS 7346-8 and BS 7273-6, nor fire detection for the purposes of alerting certain key personnel.

National building regulations ([1], [2], [3]) require fire detection and fire alarm systems to be installed in many buildings at the time of construction. In addition, legislation requires that, where necessary to safeguard relevant persons in case of fire, existing premises are equipped with “appropriate fire detection and fire alarm systems”.

Although this part of BS 5839 makes recommendations for the provision of fire detection and fire alarm systems in a wide variety of premises, reference to particular types of premises in Annex A does not necessarily mean that all such premises are required by law to have such systems installed. In certain small premises, word of mouth or mechanical devices, such as rotary gongs, might constitute an adequate means of giving warning to occupants in the event of fire.

Manual fire detection and fire alarm systems are often sufficient to satisfy legislation in workplaces in which no one sleeps. Automatic fire detection is usually required by legislation to supplement the manual system in premises in which people sleep. Automatic fire detection might also be necessary to satisfy legislation under the following circumstances:

- a) where the automatic fire detection forms part of a fire engineering solution;

- b) where fire protection systems, such as door closing facilities or smoke control systems, are to be operated automatically in the event of fire; and
- c) where the low level of occupancy of a building, or part of a building, is such as to create the potential for fire to prejudice means of escape by occupants before they are aware of the fire.

Automatic fire detection is also commonly used to protect property by enabling the early attendance of the fire and rescue service, in response to summoning by occupants of the building or by transmission of fire alarm signals to an ARC from where the fire and rescue service will be summoned. Automatic fire detection and fire alarm systems might, therefore, be required or recommended by the property insurers.

Fire protection is not to be confused with fire prevention or other fire precautions, and the provision of a fire detection and fire alarm system can never be regarded as giving complete protection against fire. A fire detection and fire alarm system is, however, likely to form an important component in defence against fire, and can form part of a fire engineering solution. Advice on fire engineering solutions can be found in BS 7974 and PD 7974-4.

1 Scope

This part of BS 5839 gives recommendations for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in and around buildings, other than domestic premises. It does not recommend whether or not a fire detection and fire alarm system should be installed in any given premises.

NOTE 1 Recommendations for fire detection and fire alarm systems in domestic premises are given in BS 5839-6.

This part of BS 5839-1 covers systems that range from those comprising only one or two manual call points and sounders to complex networked systems that incorporate a large number of automatic fire detectors, manual call points and sounders, connected to numerous inter-communicating control and indicating panels. It gives recommendations relating to the interaction between fire detection and fire alarm systems and voice alarm systems, but does not give recommendations for the voice alarm systems themselves.

NOTE 2 Recommendations for voice alarm systems and voice sounders are given in BS 5839-8.

This part of BS 5839-1 also covers systems that are capable of providing signals to initiate the operation of other fire protection systems and equipment (such as fire extinguishing systems, smoke control systems or automatic door release equipment) or safety measures (such as shutdown of air handling systems, closing of oil or gas valves or grounding of lifts). It does not apply to the other systems and equipment themselves, or the ancillary circuits to interface with them.

NOTE 3 Recommendations for the planning, installation and servicing of facilities for operation of certain fire protection systems by the systems addressed within this part of BS 5839 are given in the BS 7273 series.

This part of BS 5839 does not cover systems whose primary function is to extinguish or control fire, such as sprinkler or automatic extinguishing systems, even though they might have a secondary alarm function; it does, however, cover the use of a signal from an automatic extinguishing system as one initiating element of a fire alarm system (e.g. by use of a pressure or flow switch).

This part of BS 5839 does not cover:

- a) systems combining fire alarm functions with other non-fire related functions;

NOTE 4 Recommendations for such integrated systems are given in DD CLC/TS 50398.

- b) the 999 (or 112) public emergency call system, or manually or mechanically operated sounders;
- c) audible or visual way-guidance systems which are designed to complement fire alarm systems; and
- d) temporary fire detection and fire alarm systems.

NOTE 5 Such systems are often customized, using the principles of BS 5839-1, for particular applications, such as buildings with hazardous cladding that are awaiting remediation, and construction sites. Guidance on temporary fire detection and fire alarm systems for blocks of flats in which a temporary simultaneous evacuation is required pending remediation of defects is given in an NFCC publication [4].

NOTE 6 Recommendations for fire detection and fire alarm systems in electronic data processing installations and similar critical electronic equipment rooms are given in BS 6266, which provides recommendations over and above those given in this part of BS 5839.

NOTE 7 Recommendations for fire detection and fire alarm systems in hospitals are given in the NHS Estates publications HTM 05-03 Part B [N1] (in England and Wales) or SHTM 82 [N2] (in Scotland).

This part of BS 5839 applies to extensions and alterations to existing systems, in respect of the design, installation, commissioning and certification of the new work.

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, or limits the application, of this document¹⁾. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

BS 476 (all parts), *Fire tests on building materials and structures*

BS 5839-8, *Fire detection and fire alarm systems for buildings – Part 8: Design, installation, commissioning and maintenance of voice alarm systems – Code of practice*

BS 5839-9, *Fire detection and alarm systems for buildings – Part 9: Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems*

BS 7273 (all parts), *Code of practice for the operation of fire protection measures*

BS 7629-1, *Electric cables – Specification for 300/500 V fire resistant screened, fixed installation cables having low emission of smoke and corrosive gases when affected by fire – Part 1: Multicore cables*

BS 7671:2018+A2:2022, *Requirements for Electrical Installations – IET Wiring Regulations (Eighteenth edition)*

BS 7846, *Electric cables – Thermosetting insulated, armoured fire-resistant cables of rated voltage 600/1 000 V fixed insulation, having low emission of smoke and corrosive gases when affected by fire – Specification*

BS 8434-2, *Methods of test for assessment of the fire integrity of electric cables – Part 2: Test for unprotected small cables for use in emergency circuits – BS EN 50200 with a 930 °C flame and with water spray*

BS 9518, *Processing of alarm signals by an alarm receiving centre – Code of practice*

BS 9999, *Fire safety in the design, management and use of buildings – Code of practice*

BS EN 54-2:1997+A1:2006, *Fire detection and fire alarm systems – Part 2: Control and indicating equipment*

BS EN 54-3, *Fire detection and fire alarm systems – Part 3: Fire alarm devices – Sounders*

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

BS EN 54-5:2017+A1, *Fire detection and fire alarm systems – Part 5: Heat detectors – Point heat 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 54-11:2001, *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 beam*

BS EN 54-20:2006, *Fire detection and fire alarm systems – Part 20: Aspirating smoke detectors*

¹⁾ Documents that are referred to solely in an informative manner are listed in the Bibliography.

BS EN 54-21, *Fire detection and fire alarm systems – Part 21: Alarm transmission and fault warning routing equipment*

BS EN 54-23, *Fire detection and fire alarm systems – Part 23: Fire alarm devices – Visual alarm devices*

BS EN 54-25:2008, *Fire detection and fire alarm systems – Part 25: Components using radio links*

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 54-31, *Fire detection and fire alarm system – Part 31: Multi-sensor fire detectors – Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors*

BS EN 50131-6:2017+A1:2021, *Alarm systems – Intrusion and hold-up systems – Part 6: Power supplies*

BS EN 50085-1, *Cable trunking systems and cable ducting systems for electrical installations – Part 1: General requirements*

BS EN 50200:2015, *Method of test for resistance to fire of unprotected small cables for use in emergency circuits*

BS EN 50518, *Monitoring and alarm receiving centre*

BS EN 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

BS EN 60702-1, *Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V – Part 1: Cables*

BS EN 60702-2, IEC 60702-2, *Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V – Part 2: Terminations*

BS EN 61386 (all parts), *Conduit systems for cable management*²⁾

BS EN 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*³⁾

BS EN 60079-17, *Electrical apparatus for use in the presence of combustible dust – Part 17: Inspection and maintenance of electrical installations in hazardous areas (other than mines)*²⁾

BS EN ISO 13943, *Fire safety – Vocabulary*

BS ISO 7240-8, *Fire detection and alarm systems – Part 8: Point-type fire detectors using a carbon monoxide sensor in combination with a heat sensor*

BS ISO 7240-15, *Fire detection and alarm systems – Part 15: Point-type fire detectors using smoke and heat sensors*

²⁾ This replaces the previously referenced standard BS EN 50086.

³⁾ These replace the previously referenced standard BS EN 50281.

Other publications

- [N1] DEPARTMENT OF HEALTH. *Health Technical Memorandum 05-03: Operational provisions – Part B: Fire detection and alarm systems*. London: The Stationery Office, 2006.
- [N2] NHS NATIONAL SERVICES SCOTLAND. *Scottish Health Technical Memorandum 82: Fire alarm and detection systems*. London: The Stationery Office, 2013.

3 Terms and definitions

For the purpose of this document, the terms and definitions given in BS EN ISO 13943 and the following apply.

3.1 access room

room that forms the only escape route from an inner room (**3.33**)

[SOURCE: BS 9999:2017, **3.2**]

3.2 addressable system

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

3.3 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

3.4 alarm zone

geographical subdivision of the protected premises, in which the fire alarm warning can be given separately, and independently, of a fire alarm warning in any other alarm zone

3.5 area of low fire risk

area containing little or no combustible material and no ignition sources, in which any foreseeable fire is unlikely to spread such as to present any significant threat to escape by occupants or damage to property

NOTE Examples of combustible materials are furniture, fittings, storage or linings.

3.6 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 that can be remote from the protected space

3.7 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.

3.8 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

3.9 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

3.10 circulation area

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

3.11 coincidence

arrangement designed such that an output is obtained only when at least two independent input triggering signals are present at the same time

NOTE This is not to be mistaken for “double knock”, which is a colloquial term often used for an arrangement whereby an output is given only when two successive signals are received from the same device.

3.12 combustion gas detector

automatic fire detector sensitive to gaseous products of combustion and/or thermal decomposition

3.13 commissioning

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

NOTE For example, requirements in a purchase specification.

3.14 competent person

person with the relevant current training and experience for their job role, with relevant continuous professional development (CPD) and with access to the requisite tools, equipment and information, and capable of carrying out a defined task

3.15 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) to monitor the correct functioning of the system; and
 - 6) possibly to record any of this information;
- b) if necessary, are used to give audible and visible warning of any faults (e.g. short circuit, open circuit or fault in the power supply); and
- c) if necessary, are able to pass on the fire alarm signal:
 - 1) to audible or visible fire alarm devices or to a voice alarm system;
 - 2) to the fire alarm routing function to a fire ARC;
 - 3) to the control function for fire protection equipment or systems; and
 - 4) to other systems or equipment, such as a mimic panel

3.16 critical signal path

components and interconnections between every fire alarm initiation point (manual call point or automatic fire detector) and the input terminals on, or within, each fire alarm device and (where provided) transmission equipment within the premises for routing of signals to an ARC

3.17 designer

person or organization taking responsibility for design

3.18 detection zone

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

NOTE A detection zone usually consists of an area protected by several manual call points and/or detectors, and is separately indicated to assist in location of the fire, evacuation of the building and firefighting.

3.19 dual path alarm transmission system

alarm transmission system consisting of one primary alarm transmission system and one secondary alarm transmission system using diverse technology

3.20 false alarm

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

NOTE False alarms can be subdivided into four categories:

- a) *unwanted alarms, in which a system has responded, either as designed or as the technology might 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; and*
 - 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 a 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 signal, whilst knowing that there is no fire; and*
- d) *false alarms with good intent, in which a person operates a manual call point or otherwise initiates a fire signal in the belief that there is a fire, when no fire actually exists.*

3.21 fire alarm device

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

NOTE For example, a sounder or visual alarm device.

3.22 fire alarm sounder

audible fire alarm device

3.23 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.

3.24 fire detector

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

NOTE The decision to give the alarm of fire or to operate automatic fire protection equipment might be made at the detector or another part of the system, for example at the CIE.

3.25 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

3.26 fire hazard level

likelihood of fire occurring

3.27 fire resistance

ability of a component or construction of a building to meet for a stated period of time some or all of the appropriate criteria specified in a standard fire resistance test

3.28 fire-resisting

possessing the ability to resist fire for a stated period of time under specified conditions

3.29 fire risk

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

3.30 fire signal

signal intended to indicate the occurrence of a fire

3.31 flame detector

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

3.32 heat detector

automatic fire detector which responds to an increase in temperature

3.33 inner room

normally occupied room from which the only escape route is through another room

NOTE The room that provides the escape route from an inner room is known as an access room (3.1).

[SOURCE: BS 9999:2017, 3.69]

3.34 installation

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

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

3.35 installer

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

3.36 lantern-light

construction standing above the surface of a roof and intended to admit light to the space below

3.37 line detector

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

3.38 maintenance

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

3.39 manual call point

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

3.40 manual system

system containing no automatic detectors and in which an alarm of fire can only be initiated manually

3.41 maximum alarm load

maximum load imposed on a fire alarm system power supply under fire conditions, comprising:

- a) the power required for simultaneous operation of all fire alarm devices;
- b) fire signals from all automatic fire detectors and manual call points in the building;
- c) any power drawn by other systems and equipment in the alarm condition; and
- d) any power required for transmission of fire signals to an ARC

3.42 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

3.43 minimum static response temperature

minimum temperature at which a heat detector would produce a fire alarm signal if subjected to a very small rate of rise of temperature

3.44 multi-sensor fire detector

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

3.45 networked system

fire detection and fire alarm system in which several items of CIE are interconnected and able to exchange information

3.46 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.

3.47 phased evacuation

system of evacuation in which different parts of the premises are evacuated in a controlled sequence of phases, those parts of the premises expected to be at greatest risk being evacuated first

NOTE A phased evacuation normally requires at least a two-stage alarm system.

3.48 point detector

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

3.49 pre-alarm warning

early warning of conditions which might or might not represent a fire, but indicates an approaching alarm condition

3.50 premises management

persons having day-to-day control of the premises, the fire detection and fire alarm system(s) and implementation of the fire procedures

NOTE In large premises, a single person with specialist knowledge is often delegated the responsibility for the fire detection and fire alarm system and associated matters. In small premises, a person with specialist knowledge is unlikely to be present, but responsibility for the fire detection and fire alarm system can still be delegated to a specific person.

3.51 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

3.52 purchaser

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

3.53 radio-linked system

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

3.54 rate of rise heat detector

automatic fire detector that initiates an alarm when the rate of change of the measured phenomenon with time exceeds a certain value, for a sufficient time

3.55 repair

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

3.56 search distance

distance that has to be travelled by a searcher within a zone in order to determine visually the position of a fire, as measured between the point of entry and the location at which a person searching for the fire would first become aware of the position of the fire

3.57 sector

subdivision of the protected premises normally containing several zones

NOTE A sector can cover more than one building.

3.58 servicing

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

NOTE Servicing includes cleaning, realignment, adjustment and replacement.

3.59 short circuit isolator

device that can be connected into a transmission path of a fire detection and fire alarm system, to limit the consequences of low parallel resistance faults between the lines of this transmission path

NOTE A short circuit isolator can be a physically separate device or it can be incorporated into another device (e.g. integrated into a smoke detector or detector base).

3.60 smoke

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

NOTE In general, the particle diameters range from 1 nm (invisible smoke) to 10 µm (visible smoke).

3.61 smoke detector

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

3.62 soak period

period after a fire detection and fire alarm system has been commissioned, but prior to handover, during which the system's performance in relation to false alarms and faults is monitored

3.63 staff alarm

restricted alarm, following the operation of a manual call point or automatic fire detector, given to certain staff in the premises to permit investigation prior to evacuation and/or summoning of the fire and rescue service

3.64 staged fire alarm

arrangement in which two or more stages of alarm can be given within a given area

NOTE 1 Examples of staged alarm systems are a two-stage system capable of giving "alert" or "evacuate" signals, or a three-stage alarm system capable of giving "staff alarm", "alert" or "evacuate" signals.

NOTE 2 The normal condition, under which no alarm is given, is not counted as a stage of alarm. A pre-alarm warning (see 3.49) is also not counted as a stage of alarm.

NOTE 3 In this part of BS 5839, in order to avoid confusion:

- a) the term "stage" is used to describe the different stages of alarm in part, or all, of the premises;*
- b) the term "phase" is used in describing the sequence of phases of evacuation from different areas of the premises.*

3.65 standby supply

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

3.66 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

3.67 storey exit

final exit, or doorway, giving direct access to a protected stairway or external escape route

[SOURCE: BS 9999:2017, 3.115]

3.68 time-related system

system in which the response or sensitivity of automatic fire detectors is changed with the time of day

3.69 unwanted fire alarm signal

false alarm from an automatic fire detection and fire alarm system that has been passed on to the fire and rescue service

3.70 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

3.71 visual alarm device

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

[SOURCE: BS EN 54-23:2010, **3.1.10**]

3.72 visual display unit

display screen not forming an integral part of the CIE (see **3.15**)

3.73 voice alarm system

sound distribution system that provides means for automatically broadcasting 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.

3.74 voice sounder

fire alarm sounder that contains the components necessary to generate and broadcast digitally recorded speech messages

3.75 zone plan

diagrammatic representation of a building, showing specific topographic information and the division of the building into detection zones

*NOTE This usually comprises a printed plan of the premises, mounted close to the CIE, showing the relevant information. However, for the purpose of this part of BS 5839, an illuminated mimic, or plan shown on an appropriately designed VDU, can be regarded as a zone plan (see **22.2.5**).*

4 Categories of system**COMMENTARY ON CLAUSE 4**

Fire detection and fire alarm systems can be installed in buildings to satisfy one, or both, of two principal objectives, namely protection of life and protection of property. The objectives can differ in time or place. Other possible objectives exist, such as protection against business interruption and protection of the environment; these are likely to be satisfied by the recommendations in this part of BS 5839 for protection of property.

Because of the great variety of applications for systems covered by this part of BS 5839, systems are divided into a number of different categories, as follows.

- a) **Category M systems.** *These are manual systems and, therefore, incorporate no automatic fire detectors.*
- b) **Category L systems.** *These are automatic fire detection and fire alarm systems intended for the protection of life. They are further subdivided as follows.*
 - 1) **Category L1:** *systems installed throughout all areas of the building. The objective of a Category L1 system is to offer the earliest possible warning of fire, so as to achieve the longest available time for escape.*
 - 2) **Category L2:** *systems installed only in defined parts of the building. The objective of a Category L2 system is identical to that of a Category L3 system, with the additional objective of affording early warning of fire to occupants of rooms in which people sleep, and in specified areas of high fire hazard level and/or high fire risk.*
 - 3) **Category L3:** *systems installed in escape routes and in rooms opening on to an escape route. The objective of a Category L3 system is to give a warning of fire at an early enough stage to enable all occupants, other than possibly those in the room of fire origin, to escape safely, before the escape routes are impassable owing to the presence of fire, smoke or toxic gases.*

- 4) *Category L4: systems installed within those parts of the escape routes comprising circulation areas and circulation spaces, such as corridors and stairways. The objective of a Category L4 system is to enhance the safety of occupants by providing warning of smoke within escape routes.*

NOTE 1 The installation of detectors in additional areas is not precluded, and the system could then still be regarded as a Category L4 system.

- 5) *Category L5: systems in which the protected area(s) and/or the location of detectors is designed to satisfy a specific fire safety objective (other than that of a Category L1, L2, L3 or L4 system). Often, the design is based on a localized need for fire detection in only part of a building. Protection might be provided to compensate for some departure from normal guidance elsewhere or as a part of the operating system for a fire protection system. Such a system could be as simple as one that incorporates a single automatic fire detector in one room (in which outbreak of fire would create undue risk to occupants, either in the room or elsewhere in the building), but the system could comprise comprehensive detection throughout large areas of a building in which, for example, structural fire resistance is less than that normally specified for buildings of that type.*

NOTE 2 The protection afforded by a Category L5 system might, or might not, incorporate that provided by a Category L2, L3 or L4 system.

- c) **Category P systems.** *These are automatic fire detection and fire alarm systems intended for the protection of property. They are further subdivided as follows.*

- 1) *Category P1: systems installed throughout all areas of the building. The objective of a Category P1 system is to offer the earliest possible warning of fire so as to minimize the time between ignition and the arrival of firefighters;*
- 2) *Category P2: systems installed only in defined parts of the building. The objective of a Category P2 system is to provide early warning of fire in areas of high fire hazard level, or areas in which the risk to property or business continuity from fire is high.*

NOTE 3 The defined parts of the building might be as few as one or more rooms, or as extensive as, for example, complete floors of the building.

Even in buildings with comprehensive fire detection, the provision of manual call points is still normally of great value; people in the vicinity of a fire are normally aware of the fire, and able to raise the alarm by use of a manual call point, before it is detected automatically.

If a system is intended to fulfil the objectives of more than one category of system, then the system needs to satisfy the recommendations for each of the categories. For example, a system whose sole purpose is to provide property protection throughout the building (a Category P1 system) might not need to give an alarm signal of sufficient audibility to rouse all occupants who might sleep in the building. If, however, the system were also installed for the purpose of life safety (a Category L system), sufficient fire alarm sounders to rouse sleeping occupants would be necessary.

Where a Category M system is to be used in conjunction with a Category P1, P2 or L5 system, the combined system is categorized as a Category P1/M, P2/M or L5/M system respectively. Where the objectives of more than one type of system are to be satisfied, the system is categorized as a Category X/Y system (e.g. L2/P2 or L3/P2).

This part of BS 5839 does not recommend which category of system needs to be installed in any given premises. The various system categories are to be regarded as a “menu”, from which purchasers, users, specifiers, enforcing authorities, insurers or system designers can select a suitable system for any building. However, Annex A provides information on the categories of systems that are typically installed in various types of premises.

Because of the wide range of systems covered by 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, has little meaning.

The category of system to be installed always needs to be included in the specification. Similarly, the specification of any category of system, other than Category L1, M or P1, always needs to include details of those areas of the building that are to be protected.

In some cases, there is little distinction between, for example, a Category P1 system with variations (see Clause 6) and a Category P2 system. In such cases, either description could be used; the designated system category is to be regarded as a shorthand form of description, rather than a rigid form of prescription. Where a choice exists, however, the description needs to be based on the specified objective of the system.

4.1 If the category of system is stipulated in the requirements imposed by an enforcing authority, by property insurers or by the purchaser of the system, that category should be used.

4.2 If the designer has not been informed as to the category of system required, they should make a proposal based on the fire strategy together with professional knowledge and experience, and should discuss this with the purchaser (see **5.4**).

NOTE Annex A provides information on the categories of systems that are typically installed in various types of premises.

4.3 Category L1, L2, L3 and L4 systems should also satisfy the recommendations of this part of BS 5839 for a Category M system.

4.4 Category P1/M, P2/M and L5/M systems should satisfy the recommendations of this part of BS 5839 for a Category M system together with those for a Category P1, P2 or L5 system, respectively.

4.5 Category X/Y systems (e.g. L2/P2 or L3/P2) should satisfy the recommendations of this part of BS 5839 for both the “X” system (e.g. L2 or L3) and the “Y” system (e.g. P2).

4.6 Where a Category P system is to be installed, it should be determined whether there would be benefit in providing manual call points. If this is the case then a Category P/M system should be installed.

5 Exchange of information and definition of responsibilities

COMMENTARY ON CLAUSE 5

It is advisable that there be relevant consultation between the user or purchaser and the system designer. In a small, simple building, the extent to which such consultation is necessary might be minimal; the user or purchaser might have little knowledge of fire safety principles, and system design can involve little more than determination of the appropriate locations of manual call points and fire alarm devices. In complex premises, there is a need for extensive consultation between the user or purchaser, the enforcing authority, the system designer and, possibly, specialist consultants.

*The design can be undertaken by the supplier, the installer, representatives of the user or purchaser (including consultants), or by any combination of these parties. It is desirable that, at the contract stage, a single organization takes responsibility for the design of the system, a single organization takes responsibility for the installation work, including compliance with the design, and a single organization takes responsibility for commissioning of the system. Any two, or all three, of these parties could take the form of one single organization. The responsibility for each of these three stages needs to be clearly defined and documented. Experience shows that the responsibility for provision of a zone plan (see **22.2.5**) is often ill-defined, leading to the absence of a suitable zone plan when an installation is handed over. It is important that this responsibility is defined at an early stage of the planning of an installation.*

The system requirements, including those imposed by the evacuation procedures, the configuration of the building, and the use to which the building is put, need to be ascertained as accurately as possible by consultation between the user or purchaser and other interested parties, such as the enforcing authority or fire insurer. Some specific issues that need to be discussed is as follows.

- a) *If a building contains alarm systems associated with hazards other than fire, the various hazard alarms need to be properly coordinated and be distinct from each other. In these buildings, the relative priorities need to be assessed, and the system arranged so that a higher priority alarm cannot be prevented or obscured by one of a lower priority. Although, in general, fire has the highest priority, there are buildings in which other hazards can have higher priorities than fire.*
- b) *To a large extent, the design of the fire detection and fire alarm system depends on the actions required after the alarm has been given. Particular care is necessary in the case of a system that is to be capable of giving a two (or more) stage alarm (see Clause **18**).*
- c) *An aspect to be determined at an early stage is whether visual alarm devices are necessary and the areas where they are needed to provide warning of fire.*
- d) *The potential for false alarms and unwanted fire alarm signals needs to be taken into account at the design stage, as well as the effectiveness of the system to give a warning in the event of fire (see Section **3**).*

5.1 Consultations should take prior to the design stage between the following relevant interested parties:

- a) the user or purchaser;

- b) consultants (including architects, mechanical and electrical consultants and fire engineering consultants);
- c) the designer;
- d) the authority responsible for enforcing fire safety legislation (e.g. the building control authority, fire and rescue authority, local authority, Health and Safety Executive); and
- e) the property insurer.

NOTE 1 Where any variations from the recommendations of this part of BS 5839 are proposed, they need to be agreed with the relevant interested parties.

NOTE 2 Some of the consultations may be undertaken by parties, such as the designer or consultants, acting on behalf of the user or purchaser.

NOTE 3 Even where none of the above is considered to be an interested party, advice is available from enforcing authorities and, in the case of Category P systems, property insurers.

5.2 Consultations should take place at the design stage between the following relevant interested parties:

- a) the user or purchaser;
- b) consultants (including architects, mechanical and electrical consultants and fire engineering consultants); and
- c) the designer.

5.3 Consultations should take place at the installation stage between the following relevant interested parties:

- a) the user or purchaser;
- b) consultants (including architects, mechanical and electrical consultants and fire engineering consultants);
- c) the designer; and
- d) the supplier/installer of the system.

5.4 If the designer has made a proposal for the category of system (see **4.2**), this should be discussed and agreed with the purchaser.

5.5 The designer of the system should ascertain from the user/purchaser whether the fire detection and fire alarm system is to incorporate a visual alarm device.

5.6 Before an order is placed for the system, the responsibility for each of the following stages should be clearly defined and documented:

- a) system design;
- b) installation;
- c) commissioning; and
- d) handover.

5.7 Before an order is placed for the system, the responsibility for the provision of a zone plan (see **22.2.5**) should be clearly defined, agreed and documented.

5.8 Where a fire detection and fire alarm system is to be integrated with a voice alarm system, one organization should take responsibility for the interface connections and all necessary communications between the fire detection and fire alarm system and the voice alarm system.

5.9 Where a fire detection and fire alarm system is to be interfaced with another system or facility (such as a fire extinguishing system, smoke control system or lift grounding facility) that is the responsibility of an organization other than the installer of the fire detection and

fire alarm system, the responsibility of each organization should be clearly defined and documented.

6 Variations from the recommendations of this document

COMMENTARY ON CLAUSE 6

The recommendations given in this part of BS 5839 are based on recognized good practice and are suitable for the majority of normal applications.

There are, however, applications in which the recommendations are unsuitable and would lead to systems that would be unnecessarily expensive, incorporating measures that could not be regarded as cost-effective, or that could be difficult to install.

In these circumstances, variations from the recommendations might be necessary, even though, in general, the user, purchaser, enforcing authority or insurer requires quite strict compliance with the document. Variations always need to be the subject of specific agreement amongst all interested parties and need to be clearly identified and justified in all relevant system documentation.

Some variations can arise from a fire risk assessment, in which it is determined, for example, that an area of the building might be unprotected by automatic fire detection, albeit that, in the category of system otherwise deemed necessary, protection is recommended in this part of BS 5839. Other variations might be based on the engineering judgement of a competent person, who might, for example, consider that the extent of protection disabled in the event of a single cable fault can slightly exceed the limitations recommended in this part of BS 5839, without any significant decrease in the integrity of the system.

While it is necessary for certain limitations or performance levels recommended in this part of BS 5839 to be expressed numerically, the values quoted are often approximate and based on custom and practice, or on the judgement of experts. While they are generally applicable, rigid adherence might not be appropriate and minor variations might not have any significant effect.

Examples of values include, but are not restricted to, the following:

- *maximum zone size;*
- *maximum area of protection disabled in the event of specified fault conditions;*
- *maximum size of open areas in public buildings above which duplication of sounder circuits is recommended;*
- *maximum travel distance to the nearest manual call point;*
- *maximum area of coverage of an automatic fire detector;*
- *minimum sound pressure levels;*
- *minimum duration of standby power supplies; and*
- *performance parameters for standard and enhanced fire-resisting cables, and restrictions on the use of the former type of cable.*

For example, although this part of BS 5839 recommends that no one be required to travel further than 45 m to reach the nearest manual call point, a competent person might judge that, in a particular building, a distance of 47 m is acceptable because, perhaps, this leads to the most appropriate locations for the manual call points. Similarly, in an office building, it might be judged that sound pressure levels of 57 dB(A) could be accepted in a number of cellular offices, since to achieve the 60 dB(A) recommended in this part of BS 5839 would necessitate a large increase in the number of sounders (and hence in cost), when the difference of 3 dB is only just perceptible to occupants.

6.1 Variations from this part of BS 5839 incorporated within a specification or design proposal should be clearly identified so that they are obvious to any party from whom approval of the specification or design proposal might be sought, such as the user, purchaser, enforcing authority or insurer.

6.2 Variations from this part of BS 5839 identified or proposed during installation or commissioning, but not clearly identified in the documented design, should be documented (other than in the case of errors or “snags” for which rectification is proposed), with justification, for subsequent approval.

NOTE *This recommendation is not intended to imply that it is the responsibility of the installer or commissioning engineer to verify or certificate conformity of the system design to this part of BS 5839. However, if variations are identified by an installer or commissioning engineer, particularly variations related to circumstances that might not*

have been known to the designer (e.g. structural features of the building that affect detector number or siting, or conditions in the building that might result in an unacceptably high rate of false alarms), they need to be documented and referred to the designer, user or purchaser for agreement or action.

6.3 All variations should be agreed amongst the interested parties (see Clause 5).

6.4 All variations should be listed in the relevant system certificate (see Clause 39).

6.5 All variations should be clearly recorded in the logbook so that they are readily available for future reference by maintenance companies and any other interested parties.

6.6 Certain departures from the recommendations of this part of BS 5839 are likely to be so detrimental to the safety of life that they should not be regarded as acceptable variations. For example, the following departures should not be regarded as acceptable variations:

- a) the absence of a zone plan in premises in which there is more than one zone on any storey, particularly premises in which people sleep; and
- b) the absence of a facility for transmission of fire signals to an ARC in a residential care home, or in supported housing in which the facility is necessary to meet the recommendations of BS 5839-6.

Section 2: Design considerations

7 Relationship between system category and protected areas

COMMENTARY ON CLAUSE 7

Before fundamental system design can begin, the system category needs to be defined, as this governs the areas in which the manual call points and any automatic fire detectors are to be installed, along with other design parameters. The areas that are to be protected are those which enable the objective of the system to be satisfied (see Commentary on Clause 4).

System category is simply a shorthand means of describing whether the system is manual or automatic, and, in the case of automatic systems, the object of the automatic fire detection and fire alarm system. The appropriate extent of automatic fire detection is normally determined by a fire risk assessment, rather than a rigid application of system category to every building of a specific type or occupancy.

The objective of the system will be to protect either life or property, as follows.

a) **Protection of life.**

If the objective of the system is to protect the occupants of a building in which no one sleeps, and fire is likely to be detected by people before smoke seriously reduces visibility in escape routes, automatic fire detection might not be necessary: a Category M system might suffice. Whether there is a need for automatic fire detection and, if so, the extent to which it needs to be provided is often determined by a fire risk assessment carried out on behalf of the user; such a fire risk assessment might be required by legislation.

If there is significant probability that a fire in the building, or part of the building, could threaten escape by occupants before it is detected by people in the building, a Category M system is unlikely to be adequate, and the provision of automatic fire detection will be necessary. This could arise from the likelihood of the presence of occupants at special risk (including sleeping occupants), inadequate structural fire protection or the probability of very rapid fire development.

In some buildings, a fire risk assessment might determine that unacceptable risk to occupants can be reduced by the installation of fire detectors in only selected rooms or areas in the building. A Category L5 system might then be suitable, but it would be necessary for the purchaser or user to inform the designer of rooms or areas that are to be protected (see 7.3). A Category L5 system might form part of a fire engineering solution, in which automatic fire detection is just one component of the solution.

If there is a need for a reliable means of warning of the presence of smoke in escape routes, a Category L4 system, in which smoke detectors are installed in escape routes, such as corridors and stairways, might be appropriate. For example, this can arise from the presence of lone workers in a large, generally unoccupied area of a building in which the fire hazard level is assessed to be relatively high.

In buildings with rooms accessed by corridors, other than short lengths of corridor, research has shown that passage of hot fire gases through a door crack can produce smoke sufficiently dense and cool for a corridor to become smoke-logged before adequate warning can be given by detectors in the corridor. In this case, a Category L3 system, in which detectors are installed in rooms that open onto the escape routes, as well as within the escape routes themselves, is likely to be appropriate. The purpose of the detectors in these rooms is to give an early enough warning to occupants, other than, possibly, the person in the room of fire origin, such that they have adequate time to escape before their escape route is impassable as a result of smoke. Accordingly, within the rooms, the use of one or more of the following types of detectors is satisfactory: heat, smoke, combustion gas or multi-sensor detectors.

In some circumstances, even a Category L3 system might not be sufficient to achieve the life safety objective. A fire risk assessment might determine that, in addition to the protection afforded by a Category L3 system, fire detectors need to be installed in rooms or areas that would not be protected in a Category L3 system. The resulting system would then be a Category L2 system. A Category L2 system would be appropriate if a risk assessment determines that the fire risk associated with rooms other than those opening onto escape routes is unacceptable. Alternatively, there will normally be a need to give enhanced early warning to occupants of rooms in which people sleep of a fire in their own room. In this case, smoke, multi-sensor or combustion gas detectors within the rooms in question are necessary; heat detectors will not respond quickly enough.

- b) *The highest possible enhancement of life safety is provided by a Category L1 system. In a Category L1 system, all areas of the building are protected by automatic fire detectors. In rooms, such as bedrooms, or areas, in which there is a need for automatic detection of fire in order to protect the occupants of these rooms or areas, smoke, multi-sensor or combustion gas detectors need to be provided. In other rooms, heat detectors might be acceptable. A Category L1 system might be appropriate in buildings in which there is a significant number of occupants at special risk in the event of fire (e.g. hospitals and residential care*

premises), or in which, throughout the building, structural fire precautions are not of as high a standard as normally specified for buildings of that type.

c) Protection of property.

If the objective of the system is property protection, there needs to be sufficient provision of automatic fire detectors to enable fire to be detected at an early stage, to give an effective warning in time for firefighters to take action before unacceptable damage to property occurs, and to give an indication of the location of the fire to those responding to the alarm signal. The value of the system depends on a combination of the speed of detection, the delay before firefighters are summoned, the attendance time of trained firefighters, and the probable rate of fire spread. If the attendance time of the fire and rescue service (whether private or local authority) is incompatible with the probable rate of fire spread, adequate property protection might not be achieved purely by automatic fire detection, even if a Category P1 system is installed. The system might, however, form one component of a package of fire protection measures, such as compartmentation (to limit the extent of fire spread prior to the arrival of the fire and rescue service) or an automatic fire suppression system (to control or extinguish the fire prior to the arrival of the fire and rescue service).

The highest standard of property protection is provided by a Category P1 system. In a Category P1 system, automatic fire detectors are installed in all areas of the building. This category of system might be appropriate if the system is intended to satisfy the requirements of fire insurers, if the building or its contents are of high value, or if the facilities provided within the building are critical to the operations of an organization.

A lower, but often adequate, standard of property protection is provided by a Category P2 system. In a Category P2 system, automatic fire detectors are provided only in specified rooms or areas of the building. The protected areas are usually those in which the fire hazard level is high, or from which there is significant potential for fire to spread and cause damage to contents of high value. Since the determination of these factors depends on a fire risk assessment, it is important that whoever specifies a Category P2 system qualifies this description with details of the rooms or areas that are to be protected.

The early detection of fire by automatic means, and rapid summoning of the fire and rescue service in the event of fire, is important in premises in which people cannot readily be evacuated immediately. In certain premises of this type (e.g. residential care premises), it is also important to give accurate and unambiguous information to staff regarding the location of a fire, which can be achieved by the use of an addressable system. In general, this part of BS 5839 makes no recommendations as to whether systems need to be addressable; it is possible for addressable and non-addressable systems to satisfy the recommendations in Section 2. However, where accurate and unambiguous information about the location of a fire is critical to the safety of life, it is sometimes necessary to use only an addressable system.

A further benefit of an addressable system is an event log, which is often useful in investigation of past system performance and events that occurred at the time of a fire (e.g. a record of times at which manual call points or fire detectors triggered alarm signals, or action taken at the CIE). This benefit is optimized if the capacity of the event log is large enough that, at the time of a fire, the foreseeable number of events (arising not only from fire detection but faults caused by the fire), is of sufficient size that the record of the earliest events is not overwritten by later events; it is often the record of the earliest events that is of greatest assistance in, for example, post-fire investigation.

7.1 System documentation, including any specification, design proposal, submission to enforcing authorities and the certificate issued by the designers (see Clause 39), should clearly identify the system category as well as, where appropriate, the areas to be protected and any specific proposals for the type(s) of detector to be used.

7.2 Where the system comprises more than one objective, and therefore requires more than one category, the system documentation should identify the relationship between protected areas and proposed category.

7.3 The description of the system should include information on the areas of the building that are to be protected for a Category L2, L5 or P2 system.

7.4 Any specification or proposal for a Category L2, L5 or P2 system should clearly identify the rooms or areas that are to be protected by automatic fire detectors.

NOTE 1 There might also be benefit in giving a simple description of the objective of the protection proposed, particularly in submissions to enforcing authorities.

NOTE 2 The standard of protection (extent of coverage) of a Category L5 system might be lower or higher than that afforded by Category L2, L3 or L4 systems.

7.5 In Category L1, L3 and L4 systems, smoke detectors, multi-sensor detectors conforming to the fire sensitivity requirements of BS EN 54-7 or a mixture of smoke and combustion gas detectors, should be provided in:

- a) all escape stairways, including main access and egress stairways;
- b) all corridors; and
- c) any other areas that form part of the common escape routes.

7.6 Multi-sensor detectors used in Category L1, L3 and L4 systems (see **7.5**) should have the smoke sensor enabled to meet the fire sensitivity requirements of BS EN 54-7.

7.7 In Category L3 systems, heat, smoke, combustion gas or multi-sensor detectors should be installed on the accommodation side of any door that opens onto the escape routes described in **7.5**, except for rooms opening onto corridors of less than 4 m in length. In these cases, either detectors should be installed in the room, or the corridor should be separated by fire-resisting construction, including doors, from any other section of the escape route. Where stairways are approached through low fire risk lobbies, detectors should be installed on the accommodation side of any door that opens onto the lobby.

NOTE 1 For recommendations on the siting of these detectors, see 21.2.4.

NOTE 2 An open-plan area of accommodation, in which occupants quickly become aware of fire, need not be protected in a Category L3 or L4 system, even though occupants within the area clearly need to pass through the area in the first stage of escape, unless it forms part of the escape route from other areas.

7.8 In a Category L2 system, the rooms or areas protected should meet the recommendations in **7.5** and **7.7** for a Category L3 system, but, in addition, automatic fire detectors should be installed in rooms in which the fire risk (see **3.29**) is high enough to warrant individual protection.

NOTE 1 Any reference to a Category L2 system (e.g. in a specification, proposal or submission to an enforcing authority) needs to identify clearly the rooms or areas in which these additional detectors are to be installed and identify the type of detector (e.g. heat, smoke or combustion gas) required.

NOTE 2 The first step in designing a Category L2 system is to design a Category L3 system. Thereafter, a decision is taken as to which unprotected rooms or spaces warrant further detection, or the detector type or siting needs to be modified; for example, whereas, in a Category L3 system, heat detectors might be installed in rooms opening onto escape routes, where these rooms comprise sleeping accommodation, preference needs to be given to other forms of fire detection, as heat detectors would take longer to detect a fire.

7.9 In a Category L1 or P1 system, automatic fire detectors should be installed in all rooms and areas of the building, except that the following rooms or areas need not be protected if they are of low fire risk (see **3.29**):

- a) toilets, shower rooms and bathrooms;

NOTE 1 In some public buildings, such as hospitals and shopping centres, toilets might not be of low fire risk, owing to the potential for malicious ignition.

- b) toilet lobbies;

- c) small cupboards (typically, less than 1 m²); and

NOTE 2 A riser in which there is a fire-resisting floor and ceiling may be treated as a cupboard.

NOTE 3 If detection can be excluded from any room or area in a Category L1 system, it can also be excluded from such rooms or areas in a Category L2, L3 or L4 system.

- d) some shallow voids (less than 800 mm in depth) (see **21.2.3**).

7.10 In a Category L1 system in a room in which there is a need for automatic activation to protect the occupants of the room in the event of a fire in that room (e.g. if they are asleep), smoke detectors, combustion gas detectors or multi-sensor detectors should be provided.

7.11 In a Category P2 system, the rooms or areas to be protected by automatic fire detectors should be clearly identified in the specification or proposal. There should be

physical barriers between protected and unprotected areas to limit the spread of smoke and hot gases in, at least, the early stages of fire.

NOTE 1 These physical barriers might not have a recognized period of fire resistance.

NOTE 2 The physical barriers described in 7.11 might be unnecessary where detectors are installed to detect fires in specific equipment.

7.12 Where occupants of a building are likely to need assistance from staff to evacuate the building (e.g. in residential care premises and hospitals), the fire detection and fire alarm system should be addressable if the building has facilities for more than 10 people to sleep.

8 Actuation of other fire protection systems or safety facilities

COMMENTARY ON CLAUSE 8

Any of the system categories defined in the Commentary on Clause 4 may be used to actuate other fire protection systems or trigger safety facilities, whether for the purpose of life safety, property protection or a combination of the two.

If the system is to be used for the actuation of other fire protection systems or safety facilities, the recommendations of this part of BS 5839 might, or might not, be necessary or sufficient. The system might have specific requirements in respect of the number, zoning and siting of detectors, provision of power supplies, control, indication or other facilities, or monitoring and fire resistance of interconnecting wiring.

The interconnection of other systems or equipment with the fire detection and fire alarm system ought not to prejudice the reliability of the fire detection and fire alarm system.

8.1 The recommendations given in **8.2** to **8.4** should be met in the case of systems intended to actuate other fire protection systems or safety facilities (e.g. by triggering an automatic fire extinguishing system, closing fire-resisting doors, shutting down an air handling system or grounding lifts).

8.2 The fire detection and fire alarm system should meet the recommendations in any applicable part of BS 7273.

8.3 If it is anticipated that operation of the fire detection and fire alarm system during routine testing could have an undesirable effect on other systems or equipment, means should be provided for disabling the automatic actuation of the system or equipment. The facility for disablement, and the indication of disablement, should conform to BS EN 54-2.

8.4 Other systems, where reasonably practicable, should be prevented from drawing power from the fire detection and fire alarm system. Where it is necessary for the fire detection and fire alarm system to provide power to operate other equipment or systems in the quiescent or the alarm state, the power requirements should be quantified and provision should be made by specifying the appropriate rating for the fire detection and fire alarm system primary and secondary power supply or by providing an ancillary power supply.

9 Systems in explosive gas or dust atmospheres

COMMENTARY ON CLAUSE 9

If it is necessary to install fire alarm equipment or wiring in areas where an explosive atmosphere could result from the presence of flammable gases, vapours or mists, or the presence of combustible dusts, special protection measures are essential to minimize the potential for ignition of the atmosphere by the fire alarm equipment or wiring.

9.1 Any system (or part of a system) protecting an area, or with cables passing through an area, in which there might be an explosive gas, vapour or mist atmosphere should conform to BS EN 60079-14.

9.2 Any system (or part of a system) protecting an area, or with cables passing through an area, in which there might be an explosive dust atmosphere should conform to BS EN 60079-17.

NOTE Maintenance requirements for equipment rated for explosive atmospheres, including work schedules, can be found in IEC 60079-17 and FIA guidance document Guide on equipment for use in explosive atmospheres (ATEX) [5].

10 System components

COMMENTARY ON CLAUSE 10

The reliability of the system to perform its functions on demand is, to a significant degree, governed by the reliability of individual components. Under the Construction Products Regulations 2013 [6], many components, such as manual call points, detectors, CIE and fire alarm devices, are required to conform to relevant harmonized European Standards, and need to have undergone type testing to these standards.

Product certification. *Users of this part of BS 5839 are advised to consider the desirability of third-party certification of product conformity to a relevant standard for components, together with assessment of the manufacturer's quality assurance systems against BS EN ISO 9000. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.*

Where there is no relevant British, European or International Standard, it is advisable to verify, as far as possible, that the components are suitable for their intended use. 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 guarantee 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. BS EN 54-13 can be used to confirm system compatibility.

NOTE Some elements of the components mentioned in 10.1 to 10.18 may be combined to form a single device.

10.1 Manual call points should conform to BS EN 54-11:2001 for Type A (single action) manual call points.

NOTE This part of BS 5839 recommends that a protective cover is fitted to a Type A manual call point (see 20.2).

10.2 Point heat detectors should conform to BS EN 54-5:2017+A1 for Class A1 or A2 detectors, unless the foreseeable maximum ambient temperature in the protected area is 40 °C or above, in which case a Class B-G detector should be used as appropriate (see Section 3 of this part of BS 5839).

10.3 Point smoke detectors should conform to BS EN 54-7.

10.4 Flame detectors should conform to BS EN 54-10.

10.5 Optical beam smoke detectors should conform to BS EN 54-12.

10.6 Aspirating smoke detectors should conform to BS EN 54-20:2006.

10.7 Components and systems using radio links should conform to BS EN 54-25.

10.8 Multi-sensor, optical and heat detectors should conform to either:

- a) BS ISO 7240-15;
- b) BS EN 54-29; or
- c) BS EN 54-5:2017+A1 and BS EN 54-7.

10.9 Multi-sensor, carbon monoxide and heat detectors should conform to BS ISO 7240-8 or BS EN 54-30.

10.10 Multi-sensor detectors combining smoke, carbon monoxide and heat sensors should conform to BS EN 54-31.

10.11 If there is a facility in a multi-sensor detector to disable sensors leaving a single active sensor, the multi-sensor detector should also meet the performance requirements of the appropriate part of BS EN 54 relevant to that single active sensor.

10.12 Carbon monoxide fire detectors should conform to BS EN 54-26.

10.13 CIE should conform to BS EN 54-2.

NOTE BS EN 54-2 contains optional performance characteristics which are not necessarily provided in all CIE. The CIE provided needs to have appropriate facilities to enable conformity to all the recommendations of this part of BS 5839 and the project specification.

10.14 Audible fire alarm devices should conform to BS EN 54-3.**10.15** Visual alarm devices should conform to BS EN 54-23.

NOTE Wireless audible and visual alarm devices are outside the scope of BS EN 54-3 and BS EN 54-23 respectively, but this does not preclude their use in a system that conforms to this part of BS 5839, provided the devices satisfy the relevant performance requirements of these standards.

10.16 Power supply equipment should conform to BS EN 54-4.**10.17** Cables should meet the recommendations in Clause 25.

10.18 Those functions of the system that are recommended in this part of BS 5839, for which the storage of programs and data are necessary to control the fire detection and fire alarm system, should conform to the additional design requirements for software controlled CIE in BS EN 54-2.

10.19 Where a computer or similar IT equipment is used as a user interface, e.g. in networked systems, it should be treated as a supplementary interface and there should be CIE conforming to BS EN 54-2 mounted nearby.

10.20 Radiopaging transmitters and receivers should conform to the relevant British or harmonized European Standards.

10.21 Alarm transmission and fault warning routing equipment should conform to the product requirements specified in BS EN 54-21.

11 Monitoring, integrity and reliability of circuits external to control equipment**COMMENTARY ON CLAUSE 11**

External circuits need to be arranged such that the probability of faults that could prevent the system from giving a fire warning is minimized. However, such faults occur occasionally. Work on the system, for the purpose of modification, repair or routine attention, can also cause an impairment of the system to operate as designed in the event of fire.

Measures are incorporated within this part of BS 5839 to limit the probability of impairments, whether as a result of faults or work on the system, and to limit the duration of any impairment. The wiring of all critical signal paths is protected against mechanical damage and damage by fire. Critical signal paths are monitored, so that faults are identified quickly. Compliance with the recommendations for maintenance arrangements enables any such fault to be repaired quickly. The probability that a fault would exist at the time of a fire is, therefore, considered to be extremely low. In the event of fire, fire damage to wiring during the period required for evacuation is unlikely to occur in view of the recommendations of this part of BS 5839 for the fire resistance of cables.

As a result of the above considerations, duplication of, or redundancy in, external circuits is not normally necessary. However, in the case of circuits serving fire alarm devices, special measures need to be taken such that, during or following evacuation, damage to any wiring, with resultant loss of the evacuation signal, does not imply to occupants of the building that it is safe to remain in, or reoccupy, the building.

This can be achieved by configuring the system such that, in the event of a short circuit developing on any fire alarm device circuit during a fire (e.g. at a cable termination), a minimum of one audible fire alarm device continues to sound as a reminder that the system has not been silenced or reset. Normally, this sounder is located close to the CIE, as this equipment is sited in a suitable area (e.g. a reception area, security control room or main entrance foyer) at which the reminder needs to be given.

Duplication of sounder circuits throughout a building is not generally necessary and can even fail to achieve the objective outlined above. In this case, if fire damages one circuit, it is also likely to damage any other circuit in the same area. However, in a large building with multiple sounder circuits, each serving a different area of the building, the above objective is satisfied. In a smaller building, which could be served by a single sounder circuit, it is necessary to take additional measures so that, if this single circuit fails during a fire, at least one sounder (e.g. on a second circuit) can continue to operate.

In buildings designed to accommodate the general public in large numbers, typically within a single space, the threat to life in the event of a fire might be such that additional fire alarm device circuits, over and above those

described above, is justified; this then addresses the remote possibility of failure or impairment of a single circuit serving a large public space at the time of a fire. Frequently, such buildings are served by a voice alarm system. In the case of such systems, BS 5839-8 recommends additional loudspeaker circuits in large, uncompartmented public spaces of public buildings such as transport terminals, shopping malls, places of entertainment, large department stores and leisure centres. For consistency, if such a large public space is protected by audible fire alarm devices, duplicated and evenly distributed fire alarm device circuits need to be installed within the space. Such duplication is, however, not necessary in other parts of the building.

System design needs to be arranged to limit the extent of impairments, whether as a result of faults or work on the system. A fault (but not fire) signal needs to be given at the CIE in the event of any failure in the critical signal path (see 3.16).

Care is needed in the use of multicore cable for the wiring of more than one circuit. It needs to be assumed that any fault that affects a multicore cable affects all conductors of the cable; this precludes the use of multicore cable for certain applications.

11.1 Fault monitoring

11.1.1 A fault indication should be given at the CIE within 100 s of the occurrence of any of the following conditions:

- a) a short circuit or open circuit in any circuits serving manual call points or fire detectors;
- b) a the removal of a manual call point or a fire detector that is designed to be detachable;
- c) a short circuit or open circuit of any circuits serving fire alarm devices;
- d) a short circuit or open circuit of any wiring between any power supply that is in a separate enclosure and the equipment to which it supplies power;
- e) any earth fault that is capable of preventing the system from performing in accordance with this part of BS 5839;
- f) the rupture of any fuse, or the operation of any other protective device, that affects the ability of the system to perform as recommended in this part of BS 5839;
- g) a short circuit or open circuit in the wiring between separate control and/or indicating equipment that is provided in order to satisfy the recommendations of this part of BS 5839;
- h) a short circuit or open circuit in the wiring between main and any repeat control and/or indicating equipment (such as a mimic diagram) that is provided in order to satisfy the recommendations of this part of BS 5839;
- i) a short circuit or open circuit in the wiring between control equipment and any separate enclosure of equipment used for transmission of alarm signals to an ARC (see **14.3**); and
- j) removal from its circuit of a fire alarm device that is designed to be detachable.

11.1.2 A fault indication should be given, within the times indicated below, in the event of any of the following:

- a) failure of the main power supply to any part of the system (within 30 min of occurrence);
- b) failure of the standby power supply (within 15 min of occurrence);
- c) failure of the battery charger (within 30 min of occurrence); and
- d) reduction of the battery voltage to less than the voltage specified in BS EN 54-4 at which a fault warning should be given (within 30 min of occurrence).

11.1.3 Visual indications of the faults identified in **11.1.1c**) and **11.1.1i**) should continue to be given at the CIE during a fire alarm condition.

NOTE Other fault indications may be suppressed during the fire alarm condition.

11.1.4 Where any standby power supply comprises a number of batteries connected in parallel, a fault indication should be given in the event of disconnection of any one battery (within 15 min of occurrence).

11.1.5 If the system incorporates a separate voice alarm system or fire warning system for people who are Deaf or have a hearing impairment, any short circuit or disconnection of the communicating link between the fire detection and fire alarm system and the other system should be indicated at the fire detection and fire alarm system CIE within 100 s.

11.1.6 If the system is used to actuate other fire protection systems or safety facilities (see Clause 8), the recommendations given in the relevant part of the BS 7273 series, BS 7346-8, or other code of practice applicable to the specific system, should be met for monitoring connections between the fire detection and fire alarm system and the other systems or equipment.

11.1.7 Where tactile fire alarm devices provided for people who are Deaf or have a hearing impairment are installed, the system should conform to Annex C and should indicate the failure to receive a monitoring signal correctly (see 17.1.2).

11.2 System integrity

11.2.1 A fault on one circuit containing manual call points, fire detectors or fire alarm devices, or a combination of them, should not affect any other circuit.

11.2.2 A single short circuit or open circuit fault on an automatic fire detector circuit should not disable protection:

- a) within an area of more than 2 000 m²; or
- b) on more than one floor of the building plus a maximum of five devices (automatic detection, manual call points, sounders or a combination of these) on the floor immediately above and five devices on the floor immediately below that floor.

11.2.3 Two simultaneous faults on a manual call point or fire detector circuit should not disable protection within an area greater than 10 000 m².

11.2.4 For software controlled CIE that has more than 512 detectors and/or manual call points connected, the manufacturer's instructions should be followed with regard to the means by which conformity with BS EN 54-2 is to be achieved.

11.2.5 Where detectors are designed to be detachable from their bases for the purpose of routine maintenance of the system:

- a) removal of any detector(s) from the circuit should not affect the operation of any manual call point, regardless of whether locking devices are used to secure the detectors within their bases;

NOTE 1 This recommendation applies even if all fire detectors in the system are removed from circuit.

- b) during the design stage, the possibility of malicious removal of detectors should be taken into account. If malicious removal is considered likely, detectors of a type that can be removed only by the use of a special tool or special technique should be used.

NOTE 2 A special tool in this context is a tool not likely to be carried by a member of the general public. Slot-headed screws would not be acceptable, since various articles can be used as screwdrivers.

11.2.6 Any facility specifically provided for deliberate disablement of manual call point or detector circuits should be such that it is possible to disable protection throughout one zone of the system without disabling protection in other zones. Use of such facilities should not prevent evacuation of the building by use of an evacuate control on, or close to, the CIE.

11.2.7 Removal of any manual call point or detector from its circuit should not affect the ability of any fire alarm device to respond to an alarm signal, other than in the case of fire alarm devices and detectors that are combined at a single fixing position.

11.2.8 Fire alarm devices should be capable of being removed only by the use of a special tool.

11.2.9 In the event of a single open circuit or short circuit fault on any circuit that serves fire alarm sounders, at least one single fire alarm sounder, normally located in the vicinity of the CIE, should still sound correctly if a fire alarm condition occurs anywhere within the building. This fire alarm sounder should have an identical sound to the general fire alarm sounders in the building (see also **14.4**).

NOTE 1 It is possible to comply with this recommendation by at least the following two arrangements, although other arrangements are not precluded:

- wiring all fire alarm sounders within the building on a single sounder circuit, with the additional provision of a second, independent sounder circuit, to which only a single sounder, located in the vicinity of the CIE, is connected (see Figure 1);
- wiring all fire alarm sounders on a ring circuit capable of transmitting signals in either direction; the first (or last) three devices on the circuit would then comprise a short circuit isolator, capable of isolating the circuit in the event of detection of a short circuit, a sounder and a further short circuit isolator (see Figure 2).

NOTE 2 The sounder that continues to operate normally comprises one of the general alarm sounders in the area in which the CIE is housed. In a building without phased evacuation, the alarm sounder gives an "Evacuate" signal until silenced. In a building with multiphase evacuation, the sounder may give an "Evacuate" signal or "Alert" signal until silenced, according to the location(s) from which the fire alarm signal originates and the phase of the evacuation at the time in question.

11.2.10 In buildings designed to accommodate the general public in large numbers (e.g. transport terminals, shopping centres, places of public entertainment, department stores and leisure centres), at least two sounder circuits should be provided in every uncompartmented public space if the space is either:

- a) greater than 4 000 m² in area; or
- b) designed to accommodate more than 500 members of the public.

NOTE It is not intended that this recommendation be applied to small cellular spaces or non-public areas of the buildings in question.

11.2.11 The recommendation in **11.2.10** should be achieved either:

- a) by means of at least two independent sounder circuits, which are evenly distributed and interleaved such that adjacent sounders are on different circuits; or
- b) by means (e.g. a protected loop circuit) such that not more than 50% of sounders in that area are lost in the event of a single open or short circuit fault.

11.2.12 Where two or more independent sounder circuits are required to maintain system integrity [see **11.2.11a**], the circuits should not be contained within a common cable sheath. For example, two circuits intended to satisfy the recommendations in **11.2.9** or **11.2.10** and **11.2.11** should not be served by a common four-core cable, as this would not adequately protect against the simultaneous loss of both circuits.

NOTE This recommendation applies only to those sounder circuits that need to be independent for compliance with this part of BS 5839. For other sounder circuits, e.g. those that are provided purely as a result of electrical engineering considerations, the recommendation does not apply.

11.2.13 If the CIE is supplied with power from power supply equipment contained in a separate enclosure, the cables between the equipment should be duplicated such that a single open or short circuit in the connections does not completely remove power from the CIE. The duplicate cables should be separated by at least 300 mm where practicable.

*NOTE Where the enclosure is adjacent to the CIE, and such that the cables run directly between the enclosure and the CIE with substantial mechanical protection (e.g. closed bush coupling/metal conduit), the enclosure need not be regarded as separate from the CIE; the recommendations given in **11.2.13** do not then apply.*

11.2.14 Where a power supply unit or a standby battery(ies) is housed in a separate enclosure from the CIE, any cable between that enclosure and the CIE should be protected against overcurrent in accordance with BS 7671:2018+A2.

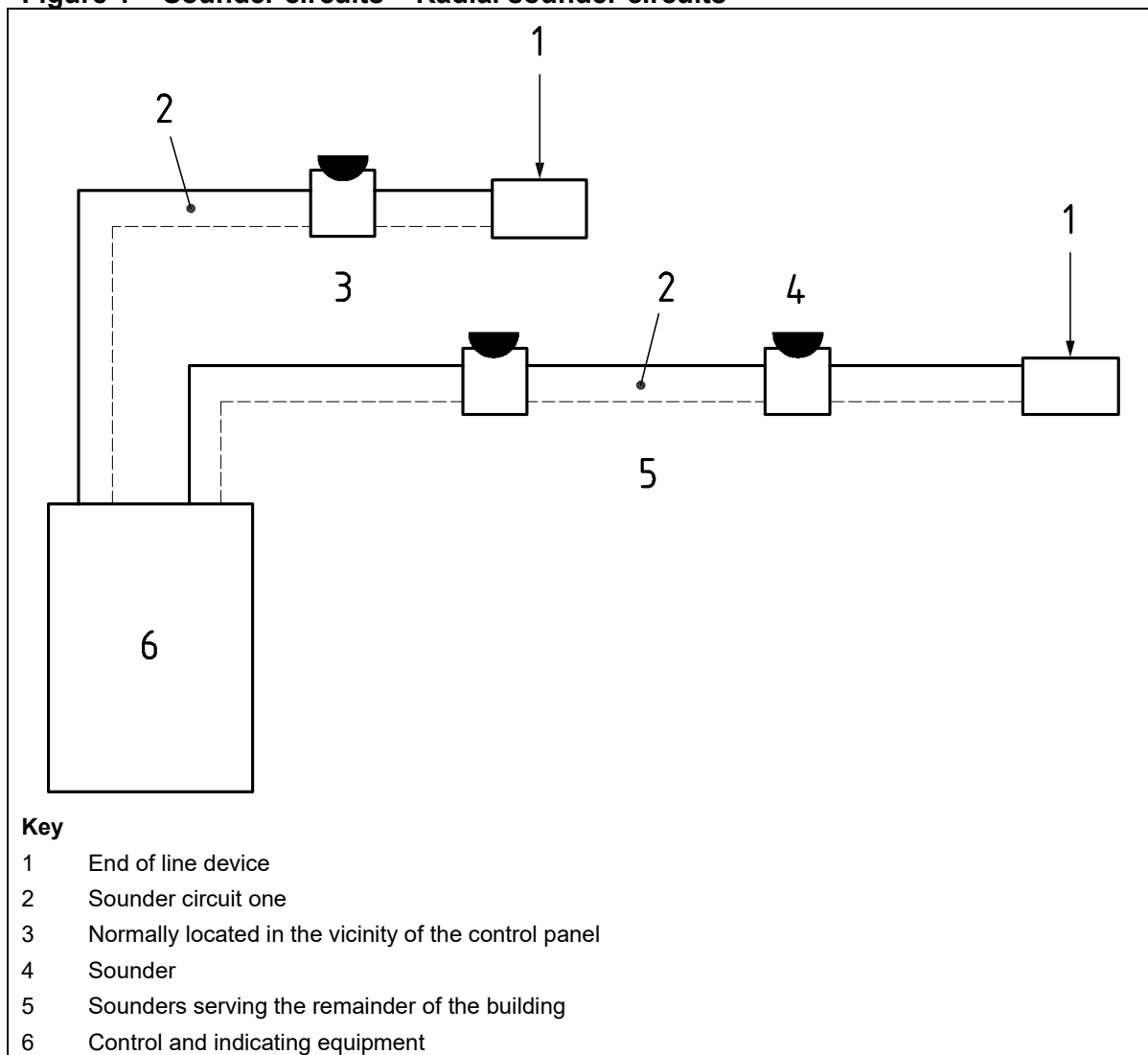
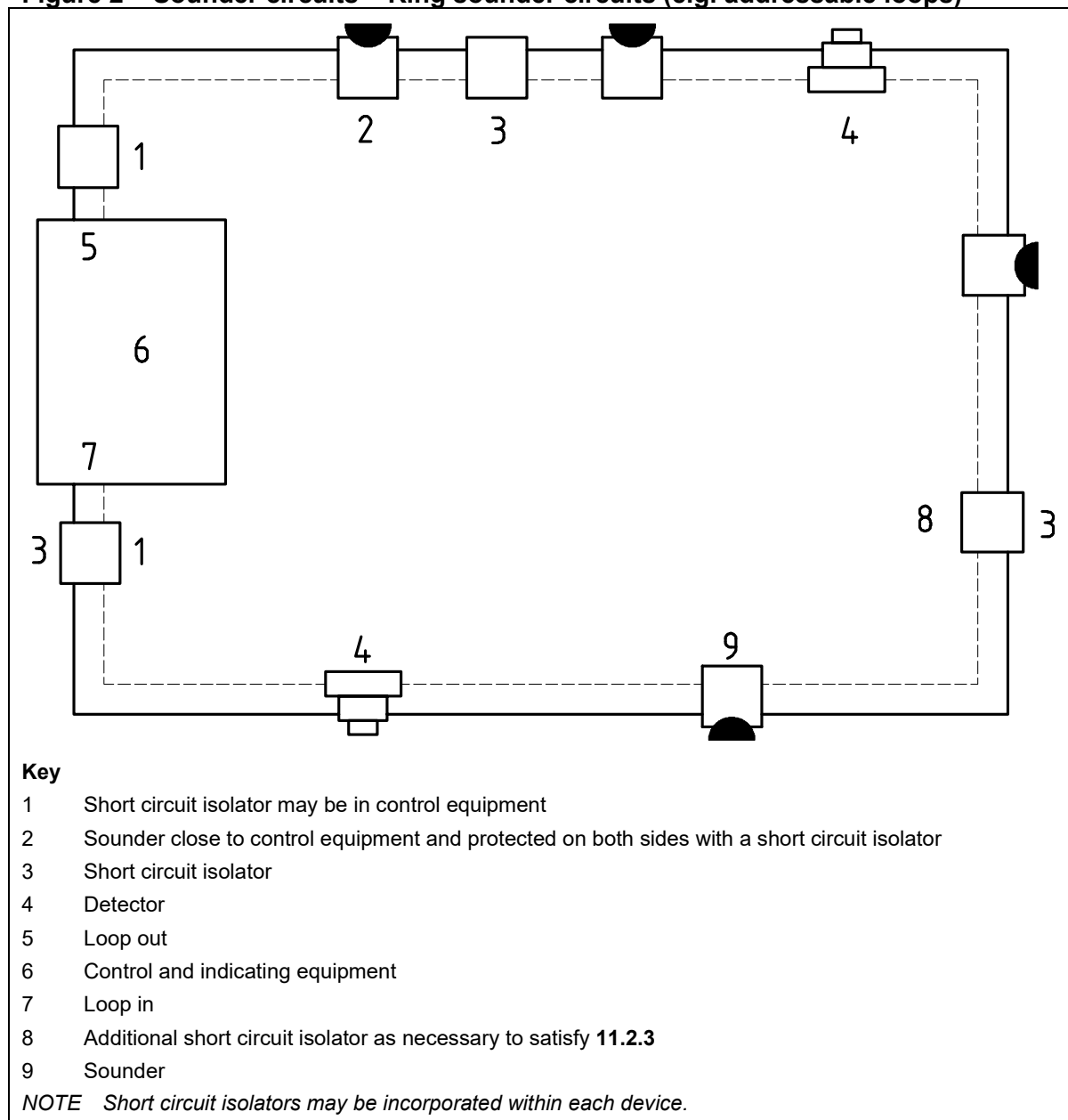
Figure 1 – Sounder circuits – Radial sounder circuits

Figure 2 – Sounder circuits – Ring sounder circuits (e.g. addressable loops)

12 Detection zones

COMMENTARY ON CLAUSE 12

In order to direct those responding to a fire alarm signal, particularly the fire and rescue service, to the area of a fire, all buildings, other than very small buildings, need to be divided into detection zones (see 3.18). Detection zones need to be small enough for a fire to be located quickly.

Even if the system is addressable (see 3.2), detection zone indication needs to be provided, as this often provides a quicker, albeit less specific, indication of the location of a fire than typical addressable text displays. Zone indicators also provide a simple “at a glance” overview of the extent of fire or smoke spread.

If the alarm is raised by a manual call point, as opposed to an automatic detector, detection zone indication might be misleading; on discovery of a fire a person might operate a manual call point that is a considerable distance from the fire. The benefits of zoning in a Category M system are, therefore, less significant.

If a detector is concealed in a relatively inaccessible area (such as a floor or ceiling void), it is normally desirable to provide a remote indication of its operation. In an addressable system, the provision of an individual remote indicator might not be necessary provided that the location of each fire detector is clearly indicated at the CIE.

12.1 All detection zones

The following recommendations should be met in all detection zones.

- a) If manual call points are located on the landings of an enclosed stairway (see **19.5**, the manual call point on each level, other than a final exit level from the stairway, should be incorporated within the zone that serves the adjacent accommodation on that level.

*NOTE 1 A manual call point located within the stairwell at a final exit to open air may be incorporated within the detection zone serving the stairwell [see **12.3c**].*

- b) If the total floor area of the building is greater than 300 m², each zone should be restricted to a single storey.

NOTE 2 If the total floor area of the building is less than or equal to 300 m², a zone may cover more than a single storey.

- c) If voids above or below the floor area of a room are to be included within the same zone of the room, the voids and the room should constitute a single fire compartment.

12.2 Detection zones that contain only manual call points

For detection zones that contain only manual call points, in addition to the recommendations given in **12.1**, the floor area of a single zone should not exceed 2 000 m², other than in the case of a zone comprising mainly a single, open-plan area (e.g. an uncompartmented warehouse), which should not exceed 10 000 m² in area.

12.3 Detection zones that contain non-addressable automatic fire detectors

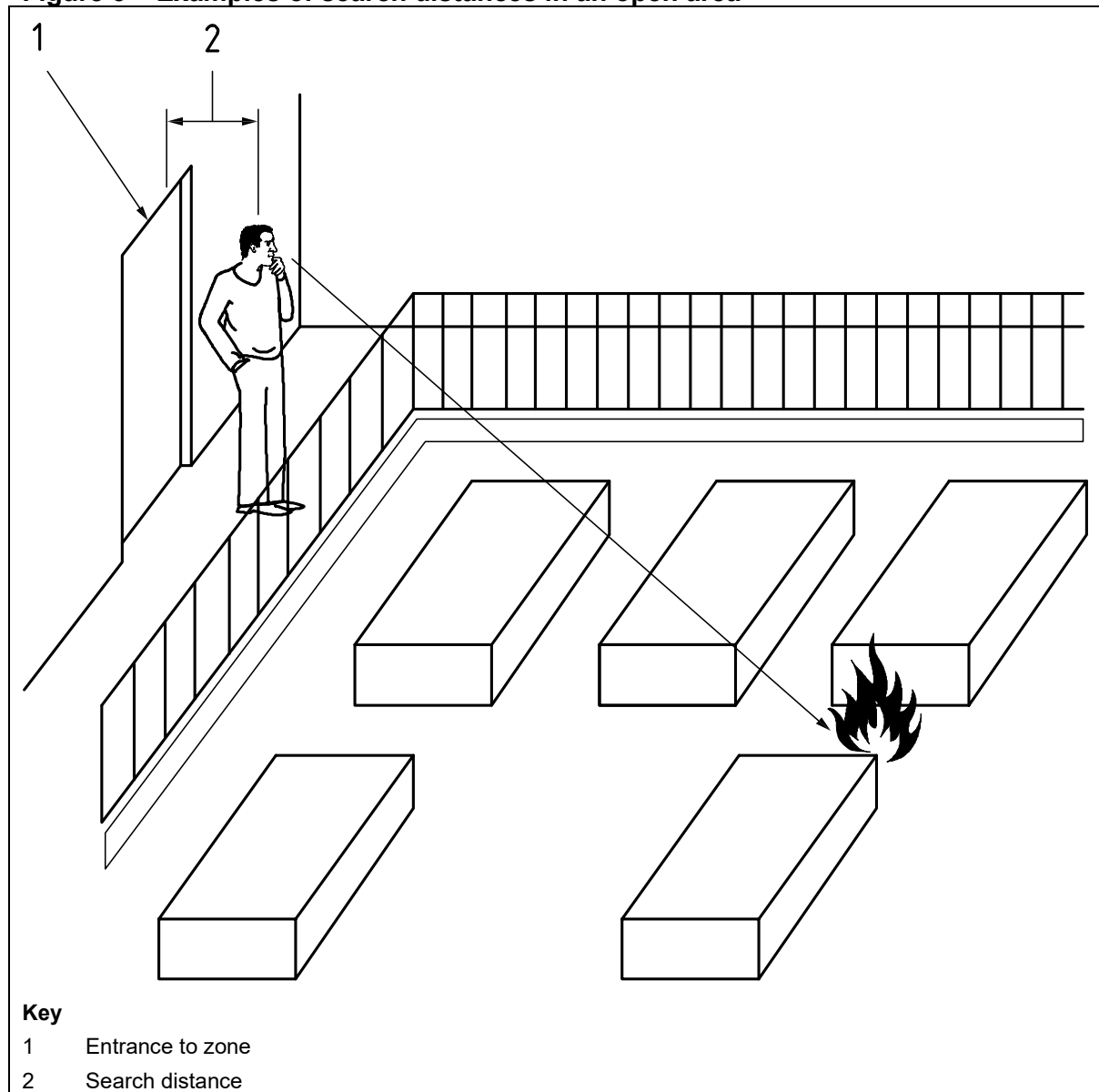
For detection zones that contain non-addressable automatic fire detectors, the recommendations given in **12.1** and the following should be met.

- a) The floor area of a single zone should not exceed 2 000 m².
- b) The search distance (see **3.56**) should not exceed 60 m. The search distance should be measured based on the worst case, in which the fire is located at the furthest concealed area from any likely point of entry to the zone (see Figure 3).

NOTE 1 Having entered the zone, the person responding to the alarm signal need not reach the seat of the fire within the recommended search distance; it is only necessary to become aware of the location of the fire.

- c) Automatic fire detectors within any enclosed stairwell, lift well or other enclosed flue-like structure should be treated as a separate detection zone.

*NOTE 2 Manual call points located at final exits to open air from stairwells may be incorporated within these detection zones, or may alternatively be incorporated within the detection zone described in **12.1a**).*

Figure 3 – Examples of search distances in an open area

12.4 Detection zones containing addressable automatic fire detectors

For detection zones that contain addressable automatic fire detectors, the recommendations given in **12.1** and the following should be met.

- a) Zone indication should be given at the CIE even if addressable text information is also available (see **22.2**).
- b) The recommendations given in **12.3** should be met, with the exception of **12.3b**), which is not applicable if:
 - 1) clear addressable text display of the location of, at least, the first detector to respond to a fire is available at the CIE, without manual intervention; and
 - 2) the display, if necessary in conjunction with other information on, or adjacent to, the CIE, would enable firefighters, unfamiliar with the building, to proceed to the location of the fire.

NOTE For example, the CIE might provide a text indication of room number, and a plan adjacent to the CIE might show the location of the room.

12.5 Remote indication of detector operation

12.5.1 Any remote indicators should be clearly labelled to indicate their function. They should be sited and/or labelled in such a way as to assist in determining the location of the detectors that they serve.

12.5.2 Any cable between a detector and a remote indicator that is needed for conformity to this part of BS 5839 should meet the recommendations in Clause 25.

NOTE Remote indicators might be required in a specification for areas such as inaccessible voids or locked rooms. Recommendations for as-fitted drawings are given in Clause 38.

13 Alarm zones

COMMENTARY ON CLAUSE 13

In many buildings, the evacuation strategy is very simple; on operation of any manual call point, or detection of fire by an automatic fire detector, fire alarm sounders operate throughout the building to indicate the need for evacuation of the entire building.

In larger, more complex buildings, the “Evacuate” signal might, in the first instance, be restricted in extent (e.g. to a single floor, a limited number of floors or a limited area of the building). In other areas, an “Alert” signal might be given to warn occupants of the alarm signal, without any requirement for those occupants to evacuate.

In order to support such arrangements, it is necessary for the building to be divided into a number of individual alarm zones, such that the operating state of fire alarm sounders in any alarm zone is independent of the operating state of fire alarm sounders in all other alarm zones. The fire alarm sounders in the building are thus grouped, so that, at any point in time, all alarm sounders within any given alarm zone are in the same state (i.e. silent, giving an “Alert” signal or giving an “Evacuate” signal).

The need for subdivision of a building into discrete alarm zones might arise for a number of reasons, including:

- *the use of phased evacuation (see Clause 18);*
- *to avoid unnecessary disruption when false alarms occur (see Section 3); and*
- *any other circumstances in which a two-stage alarm arrangement applies.*

Since it is the case that, when occupants of one alarm zone are required to evacuate, occupants of one or more alarm zones above, below or adjacent to that zone will be expected to remain in the building, every alarm zone needs to be separated from all other alarm zones by fire-resisting construction. (In some complex public buildings, such as shopping centres, alarm zones are designed to coincide with smoke control zones, which are separated from each other by smoke curtains, rather than fire-resisting construction. However, in this case, the audible signal is normally given by a voice message, rather than audible fire alarm devices.)

13.1 The boundaries of every alarm zone (other than external walls) should comprise fire-resisting construction.

13.2 Signals between alarm zones should not overlap.

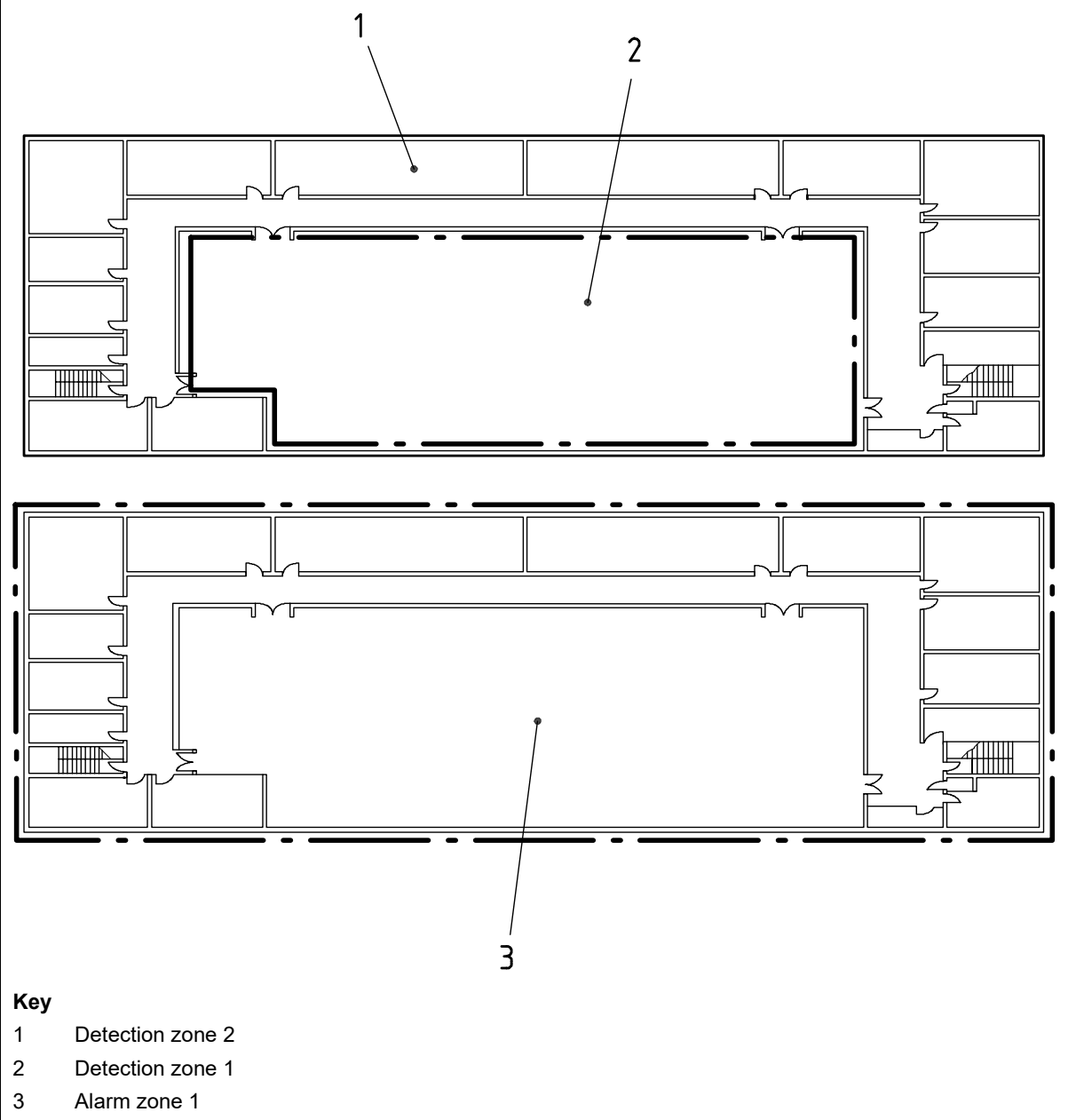
NOTE Overlapping signals could result in the occupants in any area of the building becoming confused.

13.3 A common signal should be used throughout all alarm zones to convey the need for evacuation, and a (different) common signal should be used throughout all alarm zones for any alert signal that can be given by the system.

13.4 The boundaries of alarm zones should coincide with the boundaries of the relevant detection zones (see Figure 4). A detection zone should not incorporate more than one alarm zone.

NOTE An alarm zone may incorporate more than one detection zone.

Figure 4 – Alarm zones



14 Communication with the fire and rescue service

COMMENTARY ON CLAUSE 14

For a fire detection and fire alarm system to give the maximum benefit, the fire and rescue service needs to be summoned as quickly as possible on every occasion that it operates in the event of a fire, unless, in order to avoid false alarms being passed to the fire and rescue service, filtering arrangements are appropriate (see 33.6).

In occupied buildings, the primary means for summoning the fire and rescue service needs to comprise a call to the fire and rescue service by occupants, using the 999 (or 112) public emergency call system. This is the case even if there is a means for automatic transmission of alarms to an ARC, as any automatic system can fail at the time it is required to operate. The fire alarm sounders ought not to interfere with any emergency call to the fire and rescue service.

In the case of manual fire alarm systems, automatic transmission to an ARC is usually unnecessary. When the building is unoccupied, the system does not respond to fire; when the building is occupied, the call to the fire and rescue service from occupants suffices. Automatic means for transmission is only likely to be of benefit, as a secondary means of summoning the fire and rescue service, if factors such as the size or complexity of the building, or low level of occupancy, could result in a significant delay between discovery of fire and summoning of

the fire and rescue service, thereby warranting the duplication of the call to the fire and rescue service (i.e. with calls made manually from the premises and automatically via an ARC).

Since the objective of a Category L system is evacuation of occupants, rather than protection of property, manual summoning of the fire and rescue service by occupants might, again, suffice. However, if the early attendance of the fire and rescue service is likely to be essential to life safety in the event of fire (e.g. in hospitals and residential care homes), a secondary, automatic means of transmission might be warranted, unless there are adequate arrangements to prevent delays at any time in manual summoning of the fire and rescue service by occupants. In practice, automatic transmission of fire alarm signals is necessary in the case of residential care premises.

Even in a Category L system, if the premises are unoccupied at certain times and the system incorporates automatic fire detection throughout a significant proportion of the premises, it can represent a missed opportunity, in respect of property protection, if no means of automatic transmission of alarm signals is provided.

In a Category P system, unless the premises are continuously occupied at all times, the objective of property protection is unlikely to be satisfied unless the system incorporates means for automatic transmission of alarm signals to an ARC. Even in a Category P2 system, unless the extent of the automatic fire detection is minimal, in premises that are not continuously occupied, the absence of an automatic means of transmission of fire signals to an ARC is likely to be a false economy.

In premises in multiple occupation, the responsibility for summoning the fire and rescue service on operation of the fire alarm system always needs to be clearly defined, particularly in the case of Category L or Category P systems.

If a Category L or Category P system is installed in non-domestic premises in multiple occupation, there might be a need for automatic transmission of alarm signals to an ARC. The primary means of summoning the fire and rescue service still needs, if practicable, to comprise a call to the fire and rescue service from persons on the premises. However, in some premises in multiple occupation, the reliability of this arrangement can be insufficient, and a secondary means of summoning the fire and rescue service via an ARC might be warranted.

The reliability of the means for summoning the fire and rescue service, whether by manual or automatic means, needs to be taken into account. Regardless of whether the arrangement for summoning the fire and rescue service is manual or automatic, the effect of fire on the reliability of the arrangement needs to be taken into account (e.g. the effect of fire on persons tasked with summoning the fire and rescue service and on communication lines and equipment).

If the services of a commercially operated ARC are used, the ARC needs to have a formal arrangement with the fire and rescue authority in whose area the protected premises are situated for rapid communication with the fire and rescue service by reliable means.

If provision is made for automatic transmission of fire signals to an ARC, it is often quite simple to arrange for fault signals on the fire alarm system to be transmitted as a separately identifiable signal; this has the benefit of enabling faults on the fire alarm system to receive attention when the premises are unoccupied.

It is common practice for the transmission of fire alarm signals to an ARC to be routed via the alarm routing equipment of an intruder alarm system. Notwithstanding that the mains power supplies, cable types and cable routing for this alarm routing equipment might not necessarily conform to this part of BS 5839, this practice is regarded as acceptable and need not be regarded as a variation from this part of BS 5839. However, standby battery capacity and any cable between the CIE and the alarm routing equipment needs to conform to this part of BS 5839.

In some areas of the UK, the local fire and rescue service do not attend calls arising from actuation of a fire alarm system unless a fire is confirmed. Details of these policies vary from one fire and rescue service to another. It is important for the local fire and rescue service policy to be allowed for in a user's fire procedures and in procedures for safe investigation of fire alarm signals (including investigation by keyholders, alerted by an ARC, outside normal working hours).

In the case of some fire and rescue services, response will vary according to whether the premises are used as sleeping accommodation and/or the type of device(s) that triggered the alarm signal (if known). For example, there might be no response unless it can be confirmed that the device is a heat detector, multi-sensor detector, sprinkler head or manual call point, or unless it is known that the signal has been triggered by a coincidence arrangement. Accordingly, in arranging for transmission of signals to an ARC, it is important that appropriate information regarding the premises is given to the ARC, and that, where practicable, in the event of a fire alarm signal, the source of the signal is communicated to the ARC. In this connection, it is important that the correct terminology is used in communication between the ARC and the fire control (e.g. "coincidence" rather than "double knock").

14.1 The user should be informed that there need to be suitable arrangements for summoning the fire and rescue service when the fire detection and fire alarm system operates, and that these arrangements need to be such as to minimize the risk to any person responsible for summoning the fire and rescue service.

14.2 The user should be informed that in occupied buildings, the primary means of summoning the fire and rescue service should always comprise a call to the fire and rescue service by occupants, using the public emergency call system.

14.3 Systems that automatically transmit a pre-recorded message direct to the fire and rescue service, via the public emergency call system, should not be used.

14.4 In any area specifically designated as that from which the fire and rescue service is to be summoned in the event of fire, the fire alarm signal should not be so loud as to interfere with telephone speech.

NOTE Cases have been reported in which the frequency of the alarm sounders has been such as to corrupt tone dialling systems, leading to failure of the emergency call.

14.5 The designer should determine from the purchaser or user whether automatic means of transmission of alarm signals to an ARC is required by the user.

14.6 If the early summoning of the fire and rescue service is deemed to be critical to the safety of occupants (e.g. on the basis of a fire risk assessment), facilities should be provided for automatic transmission of alarm signals to an ARC, unless there are reliable arrangements for summoning the fire and rescue service by persons in the building.

NOTE In the case of shopping centres and hospitals, conformity to the Technical Handbooks ([7], [8]) (see www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/publications/pubtech) that support the Building (Scotland) Regulations 2004 [2] necessitates automatic transmission of fire alarm signals to an ARC.

14.7 In residential care premises, facilities should be provided for automatic transmission of alarm signals to an ARC.

NOTE 1 In the case of residential care premises, conformity to the Technical Handbooks ([7], [8]) (see www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/publications/pubtech) that support the Building (Scotland) Regulations 2004 [2] necessitates automatic transmission of fire alarm signals to an ARC.

NOTE 2 It is commonly appropriate for such facilities to be provided in supported housing premises, which fall within the scope of BS 5839-6 (e.g. if there are facilities for six or more residents to sleep or if the staff/resident ratio is such that, in the event of fire, early summoning of the fire and rescue service cannot be assured).

14.8 Except in the case of continuously occupied premises, Category P systems should incorporate a means for automatic transmission of fire signals to an ARC.

14.9 In non-domestic premises in multiple occupation, Category L systems should incorporate an automatic means for transmission of alarm signals to an ARC, unless there are arrangements in place for summoning the fire and rescue service by occupants of the building, at all times that the premises are occupied (or partly occupied).

14.10 Where facilities for automatic transmission of fire alarm signals to an ARC are arranged, the ARC should be provided with all relevant information about the premises (e.g. whether they incorporate sleeping accommodation). Where practicable, the alarm signal transmitted to the ARC should indicate the nature of the device that triggered the signal and whether more than one device has operated (e.g. there is coincidence operation of two or more devices).

14.11 Any ARC to which fire alarm signals are relayed should conform to BS EN 50518 and BS 9518 in respect of the processing of alarm signals, and should have in place an agreement with the appropriate fire and rescue service to pass on fire signals from fire alarm systems at the monitored property.

NOTE 1 An ARC that conforms to BS 5979 (withdrawn) or BS 8591 (withdrawn) in respect of monitoring of fire alarm signals is acceptable.

NOTE 2 Schemes exist for third-party certification of ARCs to BS 5979 (withdrawn), BS 8591 (withdrawn) and BS EN 50518. However, transmission of fire alarm signals (as opposed to intruder alarm signals) is not always within the scope of the ARC's certification.

14.12 If a Category L or Category P system incorporates facilities for automatic transmission of fire signals to an ARC, any telephone switch room or frame room on which automatic

transmission depends should be protected by automatic fire detection or an automatic fire extinguishing system. If a Category L or Category P system incorporates facilities for automatic transmission of fire signals to an ARC, the area in which the alarm transmission device is located should be protected by automatic fire detection. As far as reasonably practicable, any cables within the building (including telephone lines and TCP/IP connections) on which communication depends should be:

- a) routed through areas of low fire risk; or
- b) routed through areas protected by automatic fire detection or an automatic fire extinguishing system; or
- c) cables of standard or enhanced fire resistance (see Clause 25).

14.13 Automatic transmission of alarm signals should not be prevented by the act of silencing fire alarm sounders and should not depend on the state of any silencing switch.

NOTE Although any ARC to which fire signals are relayed is normally operated on a commercial basis, the function could, for example, be fulfilled by a fire and rescue service control room or a continuously manned security control room on the same site as the protected premises.

14.14 Where an alarm transmission device is mounted in an enclosure separate from that of the fire alarm CIE, the connection from the CIE to the alarm transmission device should be monitored and comprise cables of standard fire resistance. The CIE should conform to BS EN 54-2.

NOTE Monitoring may be performed by the alarm routing equipment. For example, the connection between the CIE and the alarm routing equipment may comprise a cable from an input in the alarm routing equipment to the common fire relay in the CIE, such that an open circuit fault in the cable results in transmission of a fault signal to the ARC.

14.15 Mains power supplies for any facility used for the transmission of fire alarm signals to an ARC should conform to Clause 24, with the exception of mains power supplies for an intruder alarm system, which should conform to 14.15.

14.16 Where fire alarm signals are routed via the routing equipment of an intruder alarm system, the standby power supplies for the routing equipment should conform to 25.4. The power supply unit should conform to either BS EN 54-4 or BS EN 50131-6:2017+A1, grade 4.

14.17 If it is intended for the CIE to signal a fault from the fire alarm system to an ARC, the CIE should have a suitably monitored means of interfacing with the relevant fault routing equipment.

NOTE 1 Monitoring may be performed by the fault routing equipment. For example, the connection between the CIE and the fault routing equipment may comprise a cable from an input in the fault routing equipment to the common fault relay in the CIE, such that an open circuit fault in the cable results in transmission of a fault signal to the ARC.

NOTE 2 It is common for the alarm routing equipment and the fault routing equipment to comprise a single device.

14.18 Faults in either the alarm transmission equipment or in the alarm transmission path should be displayed on the CIE.

NOTE There might be a temporary loss of service in the alarm transmission path or service provision. The risk associated with loss of communications can be mitigated by use of a dual path alarm transmission system where primary and secondary signal paths are provided. For dual path alarm transmission systems, loss of both signal paths is indicated as a fault at the CIE. However, it is not necessary to indicate loss of a single transmission path at the CIE.

14.19 Where the alarm transmission path relies upon a physical TCP/IP or similar data connection, the following recommendations should be met.

- a) Final connections to the alarm routing equipment should be secured against unauthorized disconnection.

NOTE 1 This part of BS 5839 does not address cybersecurity.

- b) Power supplies for routing equipment within the premises on which alarm transmission depends should meet the recommendations in **24.3.5**.

NOTE 2 Where there is a dual path alarm transmission system, the recommendations in 14.18b) need only be applied to one of the transmission systems.

- c) The physical data network cable used for alarm transmission within the building should be differentiated from other services by colour.

NOTE 3 Where the network cable cannot conform to the recommendations given in 14.18c), or where local data network reliability is a concern, a dual path alarm transmission system would be beneficial.

14.20 Where the functionality is provided for automatic transmission of alarm signals to an ARC, there should be a label on or adjacent to the CIE to avoid a false activation that could summon the fire and rescue service.

NOTE A typical sign is shown in Figure 5. The triangle on the sign usually has a yellow fill.

Figure 5 – Typical false alarm notice



15 Audible alarm signals

COMMENTARY ON CLAUSE 15

It is essential that alarm signals are sufficient in nature and extent to warn all persons for whom the alarm signals are intended. In simple buildings, the alarm produced by a Category M or Category L system needs to be capable of alerting all occupants of the building regardless of their location. If people sleep in the building, the alarm signal needs to be sufficient to rouse them from sleep.

In certain, usually more complex, buildings, a general alarm of the type described above might not be appropriate. For example, in hospitals and certain residential care premises in which occupants might need assistance to evacuate, the fire detection and fire alarm system might not be intended to rouse people from sleep, and it might only be necessary for staff to be aware of the alarm signal. In some large or complex buildings, the extent of the area in which an evacuation signal is given might be restricted, at least initially (see Clause 18).

In Category P systems, the alarm signal might not be intended to alert all occupants; it might be sufficient for the system to alert key personnel so that firefighting action can be taken. In practice, a Category P system is usually combined with a Category M system, in which case the considerations applicable to the Category M system take precedence as these are more onerous.

In those areas in which audible alarm signals are intended to alert occupants, the sound pressure level and frequency of alarm signals need to be adequate to provide unambiguous warning of fire. In small cellular spaces, such as cellular offices, toilets and plant rooms, the sound has to penetrate more walls, doors, etc., and therefore the attenuation of the sound can be greater in these spaces. If the alarm signal comprises a speech message, the message(s) needs to be intelligible.

Traditionally, a sound pressure level of 65 dB(A) has been regarded as the minimum acceptable sound pressure level for fire alarm signals. However, a sound pressure level difference of 2 dB to 3 dB is only just perceptible to the human ear. It is, therefore, unnecessary to install additional fire alarm sounders if, in open areas, 65 dB(A) is generally achieved. If, at specific points of limited extent within any area, a sound pressure level of at least 60 dB(A) is achieved, this is likely to be acceptable. It is also acceptable for the sound pressure level to be as low as 60 dB(A) in small enclosed spaces, such as cellular offices, and in stairways.

In order to prevent excessive sound pressure levels, which can cause disorientation or even damage to hearing, a larger number of quieter sounders is preferable to a few very loud sounders.

Once started, alarm signals generally need to continue until manually silenced by use of a silencing control. In large sites comprising many buildings in single ownership (e.g. industrial sites), an external fire alarm device can be of value in directing firefighters to the correct building; an external fire alarm device can also be useful in directing firefighters to the correct entrance of a large building with many entrances. It is not necessary for an external fire alarm sounder to sound for a prolonged period; for it to do so is unlikely to be acceptable because of disturbance in neighbouring properties, particularly if false alarms occur when the protected premises are unoccupied.

In radio-linked systems in which the power supply for sounders comprises batteries, prolonged operation of sounders (e.g. as a result of a false alarm when the premises are unoccupied) can exhaust the batteries, leaving the premises without an operational fire alarm system when they are subsequently reoccupied. Since this creates a greater risk than that associated with automatic silencing of alarm signals, the alarm signal may be automatically silenced in certain radio-linked systems, subject to the agreement of the enforcing authority.

15.1 Category M and L systems (other than in hospitals and residential care premises)

15.1.1 The sound pressure level of alarm signals should, when measured with all doors shut, be:

- a) not less than 65 dB(A) throughout all accessible areas of the building, with the exception of:
 - 1) specifically designated areas as described in **14.4**, in which there is no minimum;
 - 2) areas of less than 1 m², in which there is no minimum;
 - 3) the following areas, in which the sound pressure should be not less than 60 dB(A) (see Figure 6):
 - i) stairways;
 - ii) enclosures of not more than approximately 60 m² in area (e.g. cellular offices); and
 - iii) specific points of limited extent;
- b) not less than 75 dB(A) at the bedhead within rooms in which the fire detection and fire alarm system is intended to rouse people from sleep; and

NOTE 1 Experience has shown that this normally necessitates the provision of a fire alarm sounder within the room in question.

*NOTE 2 If the alarm signal is not intended to rouse occupants of some or all rooms from sleep (e.g. in residential care premises), **15.1.1b** does not apply.*

- c) not greater than 120 dB(A) at any normally accessible point.

*NOTE 2 In carrying out measurements, other than in the case of **15.1.1b**, account need not be taken of sound pressure levels within 500 mm of any walls or partitions.*

NOTE 3 An instrument conforming to BS EN 61672-1, set to slow response and A-weighting, is suitable for measuring the sound pressure level of the alarm signal.

NOTE 4 It is often necessary to measure the sound pressure level of the fire alarm signal in the presence of background noise. The sound pressure level of the fire alarm signal (in isolation) can be deemed to be 5 dB above background noise if, when the background noise is present, a sound pressure level increase of 6 dB occurs on operation of the fire alarm system.

15.1.2 Where the sound pressure level of background noise is greater than 60 dB(A), the sound pressure level of the fire alarm signal should be 5 dB(A) above the sound pressure level of the background noise.

NOTE 1 Background noise that is unlikely to persist for longer than 30 s may be ignored.

NOTE 2 This recommendation does not apply to noise created by running water in bathrooms and shower rooms.

NOTE 3 Typical noise levels in buildings are given in Annex B.

NOTE 4 In parts of a building with noisy machines, in order to achieve 5 dB(A) above background noise, the fire alarm sounders ("primary sounders") may be supplemented by mains powered sounders, without a standby supply ("secondary sounders"), operated from the same final circuit(s) as the noisy machines, so that failure of the supply to the secondary sounders also results in silencing of the noisy machines.

15.1.3 The fundamental frequency(ies) produced by fire alarm sounders should lie in the range of 500 Hz to 1 000 Hz, unless the frequency of background noise is such as to mask these frequencies, in which case the use of sounder frequencies outside this range is acceptable. The sounders should produce a continuous output.

NOTE The frequency and amplitude may vary (e.g. as in a warbling note), to indicate the need for evacuation or other immediate response.

15.1.4 All fire alarm sounders within a building should have similar sound characteristics, unless particular conditions, such as an area of high background noise, make this impracticable. The sounders should be distinctive in sound from the sounds of other alarm systems in the building. The fire alarm sounders should be distinctive in sound.

NOTE On a site where occupants move regularly between buildings, it is beneficial to adopt a fire alarm signal that has similar sound characteristics throughout all buildings on the site.

15.1.5 In premises designed for public entertainment, retail and similar premises, in which the sound pressure level of music is likely to be greater than 80 dB(A), the music should be muted automatically when a fire alarm signal is given.

NOTE 1 In premises with two (or more) stage alarm systems, it needs to be determined whether the music is to be muted at the "Alert" or the "Evacuate" stage.

NOTE 2 Where the sound pressure level of the music is likely to be between 60 dB(A) and 80 dB(A), the recommendation given in 15.1.2 applies.

15.1.6 The fire and rescue service should be consulted to determine whether there is a need to provide external sounders and/or visual alarm devices. Where external sounder(s) and/or visual alarm device(s) are provided, they should be clearly marked with the words "FIRE ALARM".

NOTE In large sites with many buildings, or in the case of large buildings with many entrances, an external sounder(s) and/or visual alarm devices can be beneficial to direct firefighters to the building or appropriate entrance to the building.

15.1.7 A facility should be provided to enable silencing of alarm signals. The operation of this facility should:

- a) require a manual operation;
- b) not cancel any visual signal of the alarm at the control equipment;
- c) sound all fire alarm sounders configured to an alarm zone if, following the silencing of any fire alarm sounders, a new detection zone goes into alarm, and normally should also resound those fire alarm sounders which were previously sounding;
- d) not prevent the correct operation of any control for starting or restarting the alarm sounders (see **22.3.2**); and
- e) not prevent the transmission of an alarm to an ARC.

15.1.8 Alarm signals should not silence automatically (i.e. after a predetermined time period), other than in the following circumstances.

- a) Any external fire alarm sounders provided to direct firefighters to the building or appropriate entrance to the building (see **15.1.6**) in Category L and P systems should silence automatically 30 min after activation, unless the premises are continuously occupied, so enabling manual silencing by occupants.

NOTE 1 After silencing, the sounders might (or might not) restart if, before the system is reset, a further alarm condition occurs.

- b) Where a radio-linked Category L or P system incorporates battery-powered fire alarm sounders, the sounders should silence automatically after 30 min, unless the premises are continuously occupied, so enabling manual silencing by occupants. The sounders should restart if, before the system is reset, a further alarm condition occurs.

NOTE 2 Where a period longer than 30 min is required, e.g. for phased evacuation, the 30 min period may be extended to meet the requirements of the system specification.

- c) In a two (or more) stage alarm system, if alert signals are silenced automatically after a predetermined period, the recommendation in **18.3.4** should be met.

15.1.9 The system should incorporate at least two fire alarm sounders. At least one sounder should be provided in each fire compartment.

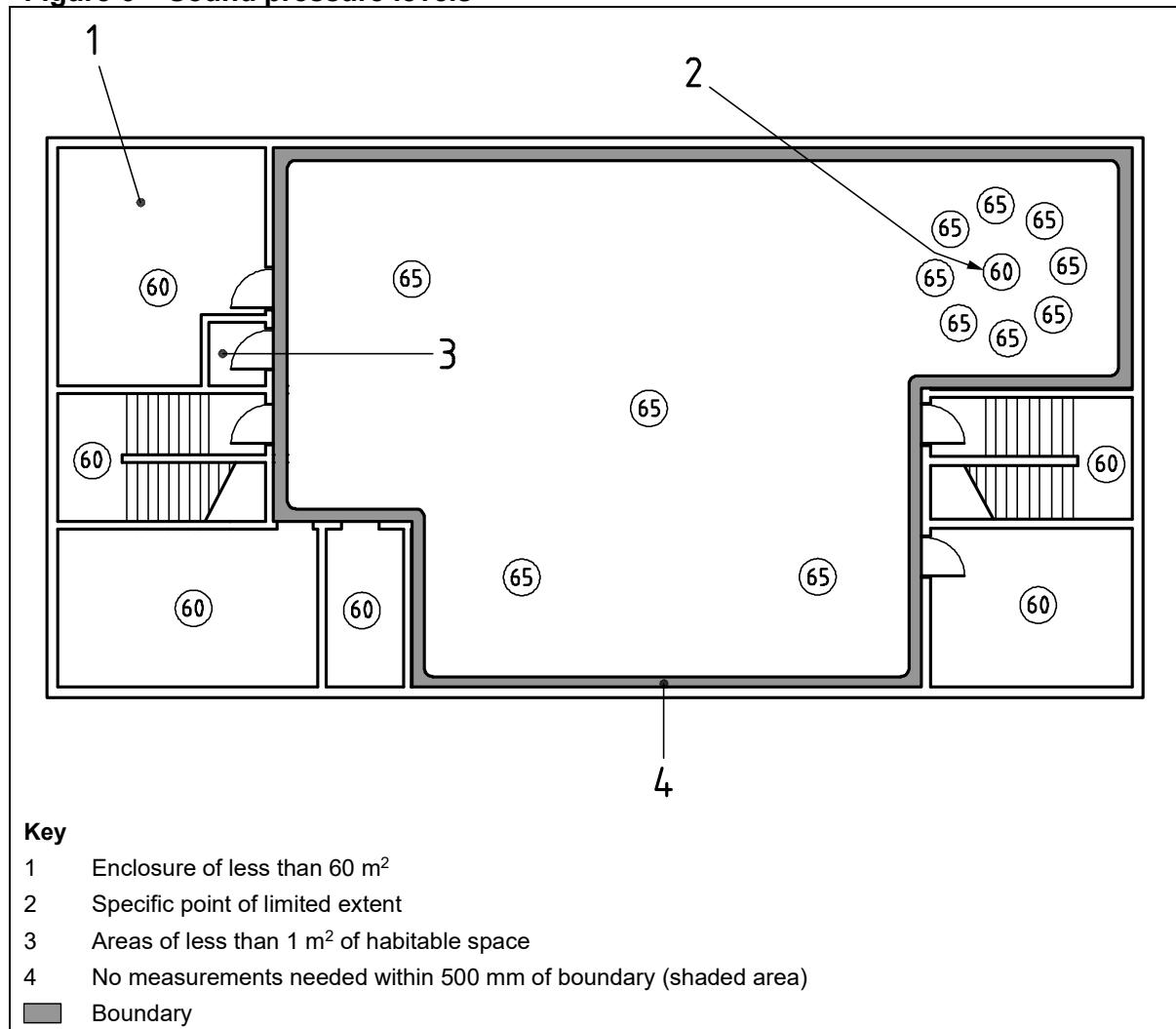
15.1.10 If audible alarms comprise speech messages generated by a voice alarm system or voice sounder (see **3.74**), the relevant recommendations of BS 5839-8 should be followed in respect of message content, sound pressure levels and speech intelligibility.

15.1.11 Fire alarm evacuation tones should not be used for purposes other than warning of fire, except where:

- a) the response required is identical to that required in the event of fire (i.e. immediate evacuation by use of all escape routes); or
- b) in schools, the fire alarm system is used to indicate start or finish of predetermined periods or emergency lockdown. In these cases, the duration of class change signals should not exceed 5 s.

NOTE Guidance on the use of a fire alarm system as a lockdown alarm is available in FIA guidance document Use of fire alarm systems for lockdown (specifically in schools) [9].

Figure 6 – Sound pressure levels



15.2 Category P systems

The recommendations given in **15.1.1** should be met in those areas where audible alarm signals are required.

15.3 Hospitals and residential care premises

15.3.1 Audible alarms in hospitals should conform to Department of Health publications HTM 05-03 Part B [N1] (in England and Wales) or SHTM 82 [N2] (in Scotland).

15.3.2 Audible alarms in residential care premises should meet the relevant recommendations in 15.1.1.

16 Visual alarm signals

COMMENTARY ON CLAUSE 16

Visual alarm signals are needed to supplement audible alarm signals in situations in which the latter are likely to be ineffective, but normally ought not to be used on their own. Their use is principally in areas with high ambient sound levels, where hearing protection is likely to be worn. However, they are sometimes used, as the sole initial warning to staff, in situations in which the disturbance of an audible warning is undesirable (e.g. television and radio studios, cinemas, theatres and hospital operating theatres). Visual alarm signals can also be used as a means of giving warning of fire to people who are Deaf or have a hearing impairment (see Clause 17).

Further information is given in LPCB/FIA CoP 0001 [10].

Visual alarm devices recommended in this part of BS 5839 are intended to apply to circumstances in which the visual alarm is a primary warning of fire, but not to situations in which the visual alarm provides only

supplementary information, such as those recommended in BS 7273-1 for areas protected by a gaseous fire suppression system.

16.1 Visual alarm signals should be provided in areas where ambient noise levels exceed 90 dB(A) and in other areas where hearing protection is likely to be used under normal circumstances.

NOTE These areas are normally defined by the sign shown in Figure 7.

Figure 7 – Sign indicating areas where visual alarm devices are needed



16.2 Visual alarm devices should be sufficient in number and distribution to be readily visible from all normally accessible locations, throughout the area in which they are provided, under normal ambient lighting levels.

16.3 The visual alarm signal should flash at a rate within the range of 30 to 120 flashes per minute.

16.4 The visual alarm signal should be clearly distinguishable from any other visual signal used in the premises. Visual alarm signals should be white or red, or both white and red, in colour, unless use of another colour is necessary to distinguish the signals from other visual signals. The signals should be consistent throughout the premises.

NOTE 1 Labelling the visual alarm device with the word “FIRE”, such that it would be legible from a position standing on the floor, might be adequate to distinguish it from other visual signals.

NOTE 2 Visual alarm signals, if not correctly configured, can cause seizures in people with photosensitive epilepsy. A flash rate of 3 Hz or less (from a single visual alarm device) is unlikely to result in seizures, but in open areas, the field of view from any point needs to be such that multiple, unsynchronized visual signals will not result in an apparent flash rate of a greater frequency; to avoid this, synchronization of visual alarm devices might be necessary. Red flashing light is more likely to result in seizures than white (or other coloured) flashing light.

16.5 The intensity of output of visual alarm devices should be sufficient to attract attention, but not so high as to cause difficulty with vision due to glare.

NOTE Guidance on the use and siting of visual alarm devices conforming to BS EN 54-23 is given in LPCB/FIA CoP 0001 [10]. This permits two alternative approaches: an engineered, application-specific solution for relatively complex situations, and a “predetermined approach” for rooms of simple geometry, specified size and frequently encountered levels of ambient illumination. Normally, Category W or Category C devices are used using the pre-determined approach. Category O devices are only be intended to be used in an application-specific situation in which the manufacturer’s data and system design calculations show compliance with LPCB/FIA CoP 0001 [10], 4.6.3 to 4.6.9.

16.6 Visual alarms should be securely fixed in accordance with the mounting position (ceiling or wall) and orientation specified by the manufacturer. The mounting height should be not less than 2.1 m.

17 Fire alarm warnings for people who are Deaf or have a hearing impairment

COMMENTARY ON CLAUSE 17

Impairment of hearing does not mean that a person is completely insensitive to sound. Many people with severe impairment have sufficiently clear perception of audible fire alarm signals to require no special provision for warning of fire. There will be, in some situations, people with normal hearing present who can alert people who