

BS 5839-1:2013



BSI Standards Publication

Fire detection and fire alarm systems for buildings –

Part 1: Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises

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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 31 March 2013. It was prepared by Committee 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 this committee can be obtained on request to its secretary.

Supersession

This part of BS 5839 supersedes BS 5839-1:2002+A2:2008, which is withdrawn.

Information about this document

This new edition introduces a number of technical changes. It does not constitute a full revision of the document, which will be undertaken in due course. The principal changes introduced by this new edition are as follows.

- a) The title has been modified to more accurately reflect the scope and content of this part of BS 5839.
- b) The importance of providing accurate and unambiguous information to staff in residential care premises about the location of a fire has been highlighted in Clause 4.
- c) A definition of “zone plan” has been added to the terms and definitions (Clause 3), with additional guidance added to subclause 6.1 and Clause 23, and new recommendations added to subclauses 42.2, 46.2 and 47.2. This is reflected in the sample acceptance certificate in H.4.
- d) Item e) of 7.2 has been modified to emphasize the importance of identifying and recording agreed variations.
- e) A definition of “visual alarm device” has been added to the terms and definitions (Clause 3), with a new recommendation on such devices added to subclause 11.2.
- f) Table 4 of the 2002 edition, “Limits of ceiling height (Category P systems and five minute fire and rescue service attendance)”, has been deleted.
- g) Clause 15 has been updated with guidance and recommendations on the provision of automatic transmission of fire alarm signals.
- h) The guidance and recommendations of Clause 19 and subclause 35.2.7 have been updated to address the need to avoid delay in summoning the fire and rescue service when the fire detection and fire alarm system of a residential care premises operates.
- i) The dimension of the width covered by the optical beam detector given in Figure 13 has been corrected to 18.75 m.
- j) Subclause 45.1 now highlights that routine servicing of a fire detection and fire alarm system does not constitute a fresh review of system design, so that non-compliance with this standard might not be identified during such servicing.
- k) The wording of Annex C has been altered to further highlight the normative status of this annex.
- l) A new Annex F has been added containing useful information on visual alarm device illumination characteristics from LPCB CoP 0001 [1]. Copyright is claimed on Annex F. Copyright holders are BRE Global Limited, Bucknalls Lane, Watford, Herefordshire, WD25 9XX, and the Fire Industry Association, Tudor House, Kingsway Business Park, Oldfield Road, Hampton, Middlesex, TW12 2HD. LPCB CoP 0001 is periodically updated and the latest edition needs to be consulted.

- m) It is now recommended that major variations from the recommendations of this standard are recorded in the system logbook [see 7.2e)].
- n) The term “care home” has been substituted throughout the document with “residential care premises”.
- o) The term “fire service” has been substituted throughout the document with “fire and rescue service”.
- p) The term “responsible person” has been removed and replaced with references to “premises management” to avoid confusion with the term defined in legislation.

National building regulations [2, 3, 4] 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 standard 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. The need for a fire detection and fire alarm system, and the nature of the system, is often determined by a fire risk assessment.

The fire and rescue authority can advise on the fire legislation that applies to any building. If a fire detection and fire alarm system is to be installed, or modified, to satisfy the requirements of legislation, early consultation with the authority or authorities responsible for enforcement of the legislation might be appropriate.

The protection of property with a fire detection and fire alarm system could result in an insurance company being prepared to offer a reduced premium, provided that the system is acceptable. Early consultation with the insurer is thus advisable.

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 the likely need for a fire detection and fire alarm system in certain premises is given in BS 9999. For advice on fire engineering solutions, reference can be made to BS 7974 and PD 7974-4.

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

Queries and answers concerning the interpretation of BS 5839-1 are given in PD 6531.

Use of this document

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

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

Presentational conventions

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

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

Contractual and legal considerations

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

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

Section 1: General

1 Scope

This part of BS 5839 provides recommendations for the planning, 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. Recommendations for fire detection and fire alarm systems in domestic premises are given in BS 5839-6.

The term fire detection and fire alarm systems, in the context of this part of BS 5839, includes 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.

The term also includes 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. 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 BS 7273.

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

This part of BS 5839 does not cover systems combining fire alarm functions with other non-fire related functions. Recommendations for such integrated systems are given in DD CLC/TS 50398.

This part of BS 5839 does not cover the 999 (or 112) public emergency call system, or manually or mechanically operated sounders.

This part of BS 5839 does not cover audible or visual way-guidance systems which are designed to complement fire alarm systems.

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.

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

This part of BS 5839 applies to extensions and alterations to existing systems, at least in respect of the design, installation, commissioning and certification of the new work, albeit that the extended or altered system might not, overall, conform to the recommendations of this standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

BS 4678-4, *Cable trunking – Part 4: Specification for cable trunking made of insulating material*

BS 5839-8:2013, *Fire detection and fire alarm systems for buildings – Part 8: Code of practice for the design, installation, commissioning and maintenance of voice alarm systems*

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

BS 5979, *Remote centres receiving signals from fire and security systems – Code of practice*

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

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

BS 7671:2008+A1:2011, *Requirements for electrical installations – IET Wiring Regulations*

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

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 9999, *Code of practice for fire safety in the design, management and use of buildings*

BS EN 54-2:1997, *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, *Fire detection and fire alarm systems – Part 5: Heat detectors – Point detectors*

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

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

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

BS EN 54-12, *Fire detection and fire alarm systems – Part 12: Smoke detectors – Optical beam detectors*

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

BS EN 54-23:2010, *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 and system requirements*
- BS EN 54-26, *Fire detection and fire alarm systems – Part 26: Point fire detectors using carbon monoxide sensors*
- BS EN 50086 (relevant parts), *Specification for conduit systems for electrical installations*
- BS EN 50200, *Method of test for resistance to fire of unprotected small cables for use in emergency circuits*
- BS EN 50281-1-2, *Electrical apparatus for use in the presence of combustible dust – Part 1-2: Selection, installation and maintenance*
- BS EN 60079-14, *Electrical apparatus for explosive gas atmospheres – Part 14: Electrical installations in hazardous areas (other than mines)*
- BS EN 60702-1, IEC 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 61558 (parts relevant to safety isolating transformers), *Safety of power transformers, power supply units and similar*
- BS EN ISO 13943, *Fire safety – Vocabulary*
- BS ISO 7240-8, *Fire detection and alarm systems – Part 8: Multi-sensor, carbon monoxide and heat detectors*
- BS ISO 7240-15, *Fire detection and alarm systems – Part 15: Fire detection and alarm systems – Multisensor fire detectors*
- CEA 4021, *Multisensor detectors, which respond to smoke and heat, and smoke detectors with more than one smoke sensor*
- Scottish Health Technical Memorandum 82, *Alarm and detection systems. NHS Estates*. London: TSO
- Health Technical Memorandum 05-03 Part B, *Fire detection and alarm systems. Department of Health*. London: TSO

3 Terms and definitions

For the purpose of this part of BS 5839, the terms and definitions in BS EN ISO 13943 and the following apply.

3.1 addressable system

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

3.2 alarm receiving centre

ARC

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

3.3 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

3.4 aspirating smoke detection system

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

3.5 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.

3.6 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

NOTE 1 Automatic fire detection and fire alarm systems may be classified as follows:

- a) **two-state fire detection systems:** fire detection and fire alarm systems that are capable of indicating only two output states, namely the "normal" or "fire" conditions;
- b) **analogue fire detection systems:** automatic fire detection and fire alarm systems in which a signal representing the value of the sensed phenomenon is processed (whether within the detector or at the control and indicating equipment) with a view to enabling more than two output states to be given, representing normal, fire and at least one other abnormal condition. The processing may take the form of application of fixed thresholds to the value of the sensed phenomenon, or more complex analysis of the various parameters of the signal, such as measurement of rate of rise, shape of curve, or area under the curve. The purpose of the analysis is normally identification (but not necessarily display to the user) of conditions that are not representative of fire, but that can result in a false alarm from a two-state fire detection system. In most analogue fire detection and fire alarm systems, the value of the sensed phenomenon may also be made available to an authorized person, such as a service technician.

NOTE 2 There are systems with more than two states and these are referred to as multi-state systems.

3.7 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

3.8 circulation area

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

3.9 coincidence

arrangement designed so 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.

3.10 combustion gas detector

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

3.11 commissioning

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

3.12 competent person

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

3.13 control and indicating equipment**CIE**

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

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

3.14 critical signal path

all 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

3.15 designer

person or organization taking responsibility for the work outlined in Section 2

3.16 detection zone

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

NOTE A detection zone will usually consist 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.

3.17 detector

part of an automatic fire detection and fire alarm system that contains at least one sensor which 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.

3.18 false alarm

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

NOTE False alarms may be subdivided into four categories:

- a) *unwanted alarms, in which a system has responded, either as designed or as the technology 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;*
 - 3) *inappropriate human action (e.g. operation of a system for test or maintenance purposes without prior warning to building occupants and/or an alarm receiving centre);*
- 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;*
- 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.*

3.19 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.

3.20 fire alarm sounder

audible fire alarm device

3.21 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

3.22 fire hazard level

likelihood of fire occurring

3.23 fire-resisting construction

construction that is able to satisfy for a stated period of time some or all of the appropriate criteria given in the relevant parts of BS 476 (or equivalent International Standards)

3.24 fire risk

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

3.25 fire signal

signal intended to indicate the occurrence of a fire

3.26 flame detector

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

3.27 heat detector

automatic fire detector which responds to an increase in temperature

3.28 installation

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

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

- 3.29 installer**
person or organization having responsibility for all or part of the process of installation
- 3.30 lantern-light**
construction standing above the surface of a roof and intended to admit light to the space below
- 3.31 line detector**
detector which responds to the phenomenon sensed in the vicinity of a continuous line
- 3.32 low fire risk area or room**
area or room 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.
- 3.33 maintenance**
work of inspection, servicing and repair necessary in order to maintain the efficient operation of the installed system
- 3.34 manual call point**
component of a fire detection and fire alarm system which is used for the manual initiation of an alarm
- 3.35 manual system**
system containing no automatic detectors and in which an alarm of fire can only be initiated manually
- 3.36 maximum alarm load**
maximum load imposed on a fire alarm system power supply under fire conditions, comprising the power required for simultaneous operation of all fire alarm devices, fire signals from all automatic fire detectors and manual call points in the building, any power drawn by other systems and equipment in the alarm condition and any power required for transmission of fire signals to an alarm receiving centre (if a facility for this is provided)
- 3.37 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
- 3.38 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
- 3.39 multi-sensor fire detector**
fire detector that monitors more than one physical and/or chemical phenomenon associated with fire
- 3.40 networked system**
fire detection and fire alarm system in which several items of CIE are interconnected and able to exchange information
- 3.41 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.

3.42 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 will normally require at least a two-stage alarm system.

3.43 point detector

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

3.44 pre-alarm warning

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

3.45 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.

3.46 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

3.47 purchaser

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

3.48 radio-linked system

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

3.49 rate of rise detector

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

NOTE For each class in BS EN 54-5, there are two subclasses: R and S. So-called rate of rise detectors may be taken to correspond to R, and fixed temperature detectors to S.

3.50 repair

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

3.51 search distance

distance which has to be travelled by a searcher within a zone in order to determine visually the position of a fire

NOTE The distance is not measured between the point of entry of the zone and the location of the fire, but only between the point of entry and the location at which a person searching for the fire would first become aware of the location of the fire.

3.52 sector

subdivision of the protected premises normally containing several zones

NOTE A sector may cover more than one building.

3.53 servicing

routine process of work on the system (including cleaning, realignment, adjustment and replacement) carried out at predetermined intervals

3.54 short circuit isolators

device, which may 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 isolating device may be a physically separate device or it may be incorporated into another device (e.g. integrated into a smoke detector or detector base).

3.55 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).

3.56 smoke detector

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

3.57 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

3.58 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

NOTE The use of staff alarms in response to signals from manual call points is not generally acceptable (see 19.2.2).

3.59 staged fire alarm system

fire alarm system 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.

NOTE 3 In this standard, 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.*

NOTE 4 A pre-alarm warning (see 3.44) is not a stage of alarm.

3.60 standby supply

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

3.61 time-related system

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

3.62 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

3.63 visual alarm device

fire alarm device incorporating a flashing light

3.64 voice alarm system

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

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

3.65 voice sounder

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

3.66 zone plan

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

4 Need for a fire detection and fire alarm system and type of system

4.1 Commentary

The need for a fire detection and fire alarm system in any specific building will normally be 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. 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 will be quickly detected by occupants, who will be able to warn others by word of mouth or simple mechanical devices such as hand-operated bells.

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;*
- 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 ensuring 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 alarm receiving centre 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.

The early detection of fire by automatic means, and rapid summoning of the fire and rescue service in the event of fire, is also important in premises in which people cannot readily be evacuated immediately (e.g. hospitals). 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. 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 of 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.

4.2 Recommendations

The following recommendations are applicable.

- a) Where there is uncertainty regarding the need for a fire detection and fire alarm system, or the Category of system to be used (see Clause 5), the developer, potential purchaser or user should make reference to one or more of the following:
 - 1) BS 9999;
 - 2) guidance documents that support fire safety legislation;
 - 3) any authority responsible for enforcing fire safety legislation that applies to the premises;
 - 4) the property insurer;
 - 5) any relevant fire risk assessment.
- b) The purchaser or user should ensure that the designer of a fire detection and fire alarm system is adequately apprised of the objectives of the system and any relevant requirements of enforcing authorities and insurers.
- c) Where occupants of a building are going 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 ten people to sleep.

5 Categories of system

5.1 Commentary

5.1.1 Introduction

Fire detection and fire alarm systems may be installed in buildings to satisfy one, or both, of two principal objectives, namely protection of life and protection of property. The objectives may 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 standard 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 described in 5.1.2, 5.1.3 and 5.1.4.

5.1.2 Category M Systems

Category M systems are manual systems and, therefore, incorporate no automatic fire detectors.

5.1.3 Category L Systems

Category L systems are automatic fire detection and fire alarm systems intended for the protection of life. They are further subdivided into:

- a) *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;
- b) *Category L2: systems installed only in defined parts of the building.*
A Category L2 system ought to include the coverage necessary to satisfy the recommendations of this standard for a Category L3 system; 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 in specified areas of high fire hazard level and/or high fire risk;

- c) *Category L3: systems designed 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;*

NOTE To achieve the above objective it will normally be necessary to install detectors in rooms which open onto an escape route (see 8.2).

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

- e) *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 The protection afforded by a Category L5 system might, or might not, incorporate that provided by a Category L2, L3 or L4 system.

5.1.4 Category P systems

Category P systems are automatic fire detection and fire alarm systems intended for the protection of property. They are further subdivided into:

- a) *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;

- b) *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 The defined parts of the building may be as few as one or more rooms, or as extensive as, for example, complete floors of the building.

5.1.5 Selection of category

Even in buildings with comprehensive fire detection, the provision of manual call points will still normally be of great value; people in the vicinity of a fire will normally be 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 conform to 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.

This part of BS 5839 does not recommend which Category of system needs to be installed in any given premises. The various system Categories need to be regarded as a "menu", from which purchasers, users, specifiers, enforcing authorities, insurers or system designers may 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 the recommendations of this part of BS 5839, the specification of requirements for a system, by a purchaser, user, enforcing authority or insurer, or the description of a system by a designer or installer, by reference to this standard, without a reference to system Category, will have 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 will be little distinction between, for example, a Category P1 system with variations (see Clause 7) and a Category P2 system. In such cases, either description could be used; the designated system Category needs 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.

5.2 Recommendations

The following recommendations are applicable.

- a) Any statutory requirements imposed by enforcing authorities, and any requirements imposed by property insurers, for a fire detection and fire alarm system should clearly state the Category of system required.
- b) The purchaser of the system or their agent should inform the system designer as to the Category of system that is required (e.g. in purchase or tender specifications).
- c) If the designer is not informed as to the Category of system required, the designer should make clear, to the purchaser or their agent, the Category of system that is proposed, prior to an order for the system being placed.
- d) In each of the situations described in a), b) and c), the description of the system should be further amplified by adequate information on the areas of the building that are to be protected, except in the case of a Category L1 or P1 system, for which such further information might not be necessary.
- e) Category L1, L2, L3 and L4 systems should also satisfy the recommendations of this standard for a Category M system.
- f) Where the recommendations of this standard for a Category M system are to be satisfied in conjunction with the recommendations for a Category P1, P2 or L5 system, the combined system should be described as a Category P1/M, P2/M or L5/M system respectively.
- g) Where the objectives of more than one type of system are to be satisfied, the system should be described as a Category X/Y system (e.g. L2/P2 or L3/P2).
- h) The system design certificate (see Clause 41) should clearly state the Category of system that has been designed and should, except in the case of a Category M, L1 or P1 system, provide a brief description of the areas of the building that are protected by automatic fire detection.

6 Exchange of information and definition of responsibilities

6.1 Commentary

The purpose of a fire detection and fire alarm system is to support the fire safety 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. To a large extent, the design of the fire detection and fire alarm system will depend 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 19).

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 carefully 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 will have the highest priority, there are buildings in which other hazards can have higher priorities than fire.

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.

It is advisable that there also 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 may 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 will be a need for extensive consultation between the user or purchaser, the enforcing authority, the system designer and, possibly, specialist consultants.

The design may 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 may 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 23.2.2e)] 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.

It is essential that, at the design stage, avoidance of the potential for false alarms is considered, as well as the effectiveness of the system to give a warning in the event of fire (see Section 3).

6.2 Recommendations

The following recommendations are applicable.

- a) The user or purchaser of the system (or an appointed representative of these parties, such as a consultant) should ensure that, to the extent appropriate, there is consultation at, or prior to, the system design stage with all relevant interested parties within the following list:
 - 1) the authority responsible for enforcing fire safety legislation (e.g. the building control authority, fire and rescue authority, local authority, Health and Safety Executive);
 - 2) 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.

- b) The designer of the system should ensure that, to the extent appropriate, there is consultation at the design stage with all relevant interested parties within the following list:
 - 1) the user or purchaser;
 - 2) consultants (including architects, mechanical and electrical consultants and fire engineering consultants).
- c) The installer of the system should ensure that, to the extent appropriate, there is consultation with all relevant interested parties. These might include the following:
 - 1) the designer;
 - 2) the user or purchaser;
 - 3) the supplier of the system;
 - 4) consultants (including architects, mechanical and electrical consultants and fire engineering consultants).One of these stages should include the provision of a zone plan [see 23.2.2e)].
- d) Before an order is placed for the system, the responsibility for each of the following stages should be clearly defined and documented:
 - 1) system design;
 - 2) installation;
 - 3) commissioning.
- e) 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.
- f) 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.

7 Variations from the recommendations of this standard

7.1 Commentary

This part of BS 5839 is a code of practice and, as such, its contents take the form of recommendations, rather than requirements. The recommendations are primarily based on recognized good practice in the design, installation, commissioning and maintenance of fire detection and fire alarm systems. Accordingly, they are likely to be suitable for the majority of normal applications.

There will, however, be 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 extreme cases, the recommendations might even be inadequate to provide the appropriate level of protection.

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 standard. Variations were described as “deviations” in previous editions of this part of BS 5839. This term is now deprecated, since it implied shortcomings or errors in design, whereas, in reality, the term referred to aspects of design that were appropriate and intentional, albeit not compliant with one or more recommendations of the standard.

This does not, however, imply that the designer or installer has freedom to ignore the recommendations of this standard under circumstances in which a user, purchaser, enforcing authority or insurer seeks compliance with it. Variations always need to be the subject of specific agreement amongst all interested parties and need to be clearly identified 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 may be unprotected by automatic fire detection, albeit that, in the Category of system otherwise deemed necessary, protection is recommended in this standard. 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 standard, without any significant decrease in the integrity of the system.

It also needs to be borne in mind that, while it is necessary for certain limitations or performance levels recommended in this standard to be quantified, so that the relevant recommendations are expressed numerically, the values quoted are often arbitrary. The values are often based on well-established and proven custom and practice, or on the judgement of experts. While they are, therefore, generally applicable, rigid adherence to them might not be appropriate in every case, nor is it the case that minor variations need necessarily have any significant effect.

Examples of arbitrary 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;*
- *performance parameters for standard and enhanced fire-resisting cables, and restrictions on the use of the former type of cable.*

Thus, for example, although this standard 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, say, 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 standard 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.

7.2 Recommendations

The following recommendations are applicable.

- a) Any variations from the recommendations of 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 may be sought, such as the user, purchaser, enforcing authority or insurer.
- b) Any variations from the recommendations of 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), 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 compliance of the system design with this standard. 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 ought to be documented for referral to the designer, user or purchaser for agreement or action.

- c) All variations, whether of the type described in a) or b), should be agreed amongst the interested parties (see Clause 6).
- d) All variations should be listed in the relevant system certificate (see Clause 41).
- e) Major non-compliances (see 46.2) that are agreed 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.

Section 2: Design considerations

8 Relationship between system Category and areas protected

8.1 Commentary

8.1.1 General

Before fundamental system design can begin, it is essential that the system Category is defined, as this will govern 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 need to be such as to enable the objective of the system to be satisfied (see 5.1).

NOTE 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 will normally be determined by a fire risk assessment, rather than a rigid application of system Category to every building of a specific type or occupancy.

8.1.2 Protection of life

If the objective 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 will often be 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 will be necessary for the purchaser or user to inform the designer of rooms or areas that are to be protected [see 5.2d)]. A Category L5 system may 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, may 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 in which people sleep within 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 might be a need to give enhanced early warning to occupants of certain rooms, such as disabled people, of a fire in their own room. In this case, smoke or combustion gas detectors within the rooms in question are necessary; heat detectors will not respond quickly enough.

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 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 or combustion gas detectors need to be provided. In other rooms, heat detectors might be acceptable. An 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 certain 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.

A Category M system, in which there is no automatic fire detection and fire alarm system, is only likely to suffice if no one sleeps in the building and fire is likely to be detected by people before smoke seriously reduces visibility in the escape routes.

8.1.3 Protection of property

If the objective is property protection, there needs to be sufficient provision of automatic fire detectors to ensure that fire is detected at an early stage, that an effective warning is given in time for firefighters to take action before unacceptable damage to property occurs and that an indication of the location of the fire is given to those responding to the alarm signal. The value of the system will depend 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 may, 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 will be afforded 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 may be afforded 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 will depend 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.

8.2 Recommendations

The following recommendations are applicable.

- a) System documentation, including any purchase specification, tender document, design proposal, submission to enforcing authorities or insurers for approval and the certificate issued by the designers (see Clause 41), 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.
- b) Any specification or proposal for a Category L5 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.

- c) In Category L3 and L4 systems, smoke detectors, or a mixture of smoke and combustion gas detectors, should be provided in the following:

- 1) all escape stairways;
- 2) all corridors;
- 3) any other areas that form part of the common escape routes.

NOTE 3 Main access and egress stairways normally form part of escape routes, and ought to be treated as escape stairways.

- d) In Category L3 systems, heat, smoke, combustion gas or multi-sensor detectors should be installed in all rooms that open onto the escape routes described in c), except that rooms opening onto corridors of less than four metres in length need not be protected, provided fire-resisting construction, including doors, separates these corridors from any other section of the escape routes.

NOTE 4 For recommendations on the siting of these detectors, see 22.3e).

NOTE 5 An open-plan area of accommodation, in which occupants will 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. However, in a Category L3 system a heat, smoke, combustion gas detector or multi-sensor detector ought to be installed on the accommodation side of any door that opens into an escape stairway, a corridor of more than four metres in length or, alternatively, where stairways are approached through low fire risk lobbies, any door that opens onto the lobby.

- e) In a Category L2 system, the rooms or areas protected should conform to the recommendations in c) and d) for a Category L3 system, but, in addition, automatic fire detectors should be installed in rooms in which the fire risk (see 3.24) is high enough to warrant individual protection.

NOTE 6 Any reference to a Category L2 system (e.g. in a specification, proposal or submission to an enforcing authority) needs to clearly identify 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.

- f) In a Category L1 or P1 system, automatic fire detectors should be installed in all rooms and areas of the building, but the following rooms or areas need not be protected if they are of low fire risk (see 3.32):

- 1) toilets, shower rooms and bathrooms;
- 2) stairway lobbies and toilet lobbies;
- 3) small cupboards (typically, less than 1 m²);

NOTE 7 In some public buildings, such as hospitals and shopping centres, toilets might not be of low fire risk, owing to the potential for arson.

NOTE 8 A riser in which there is a fire-resisting floor and ceiling may be treated as a cupboard.

NOTE 9 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.

- 4) some shallow voids (less than 800 mm in depth) [see 22.2d)].
- g) In a Category L1 system, the detectors within escape routes should be smoke detectors, or a mixture of smoke and combustion gas detectors.
- h) 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 10 It is not necessarily the case that these physical barriers have a recognized period of fire resistance.

NOTE 11 The physical barriers described above might be unnecessary where detectors are installed to detect fires in specific equipment.

9 Actuation of other fire protection systems or safety facilities

9.1 Commentary

Any of the system Categories defined in 5.1 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 special 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.

It needs to be ensured that the interconnection of other systems or equipment with the fire detection and fire alarm system does not prejudice the reliability of the fire detection and fire alarm system.

9.2 Recommendations

The following recommendations are applicable 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).

- a) The system should conform to the recommendations of any applicable part of BS 7273.
- b) If no part of BS 7273 is applicable, any special requirements for system design should be identified in the purchase specification or design proposals.
- c) If operation of the fire detection and fire alarm system during routine testing would 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.
- d) The other equipment or systems should not draw power from the fire detection and fire alarm system in the non-fire state, other than for indicators and interface devices (e.g. relays). The power consumption of any such indicators and interface devices should be taken into account in the calculation of battery capacity (see 25.4).

10 Systems in explosive gas or dust atmospheres

10.1 Commentary

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 ensure that the potential for ignition of the atmosphere by the fire alarm equipment or wiring is minimized.

10.2 Recommendations

The following recommendations are applicable.

- a) Any system (or part of a system) protecting an area, or with cables passing through an area, in which there may be an explosive gas, vapour or mist atmosphere should conform to BS EN 60079-14.
- b) Any system (or part of a system) protecting an area, or with cables passing through an area, in which there may be an explosive dust atmosphere should conform to BS EN 50281-1-2.

11 System components

11.1 Commentary

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

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

Compliance of an individual component with a recognized standard does not necessarily ensure that it will operate satisfactorily in conjunction with another component that conforms to the relevant standard for that component. It is essential that compatibility between components is taken into account by the designer of the system. BS EN 54-13 can be used to confirm system compatibility.

11.2 Recommendations

The following recommendations are applicable.

- a) Manual call points should conform to the requirements of BS EN 54-11 for Type A ("single action") manual call points.
- b) Point heat detectors should conform to the requirements of BS EN 54-5 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 standard).
- c) Point smoke detectors should conform to BS EN 54-7.
- d) Flame detectors should conform to BS EN 54-10.

- e) Optical beam smoke detectors should conform to BS EN 54-12.
- f) Aspirating smoke detectors should conform to BS EN 54-20.
- g) Components and systems using radio links should conform to BS EN 54-25.
- h) Multi-sensor, optical and heat detectors should conform to either:
 - 1) BS ISO 7240-15;
 - 2) BS EN 54-5 and BS EN 54-7; or
 - 3) CEA 4021.
- i) Multi-sensor, carbon monoxide and heat detectors should conform to BS ISO 7240-8.
- j) Carbon monoxide fire detectors should, in the absence of any relevant British, European or International Standard, be capable of detecting a fire within 60 s if the carbon monoxide concentration exceeds 60 ppm, and should have a fire sensitivity (in combination with any other sensors within the fire detector) sufficient to pass TF5 of BS EN 54-7, where the detector is declared to be suitable for installation instead of a smoke detector, or TF2 and TF3 of BS EN 54-7, where the detector is declared only to be suitable for detecting smouldering fires. Any restrictions in the use of the detectors declared by the manufacturers should be taken into account in the system design.
- k) CIE should conform to BS EN 54-2.

NOTE 1 BS EN 54-2 contains optional performance characteristics which are not necessarily provided in all CIE, even if third-party certificated against BS EN 54-2. It needs to be ensured that the CIE provided has appropriate facilities to enable compliance with all the recommendations of this British Standard.
- l) Audible fire alarm devices should conform to BS EN 54-3.
- m) Visual alarm devices should conform to BS EN 54-23.
- n) Power supply equipment should conform to BS EN 54-4.
- o) Cables should conform to the recommendations of Clause 26.
- p) 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.
- q) Where a PC is used as a user interface, e.g. in networked systems, it should be considered as a supplementary interface and there should be CIE conforming to BS EN 54-2 mounted adjacent, as it is unlikely that a PC would conform to BS EN 54-2.
- r) Radiopaging transmitters and receivers should conform to the relevant British or harmonized European Standards applicable.

NOTE 2 Some elements of a) to p) may be combined to form a single device.

12 Monitoring, integrity and reliability of circuits external to control equipment

12.1 Commentary

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

Measures are incorporated within this code of practice 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 will be identified quickly. Compliance with the recommendations for maintenance arrangements ensures that any such fault is quickly repaired. The probability that a fault will 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 code of practice 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 to ensure 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 ensuring 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 will be 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.

Note that 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, otherwise, be served by a single sounder circuit, additional measures will be necessary to ensure that, if this single circuit fails during a fire, at least one sounder (e.g. on a second circuit) continues to operate.

However, 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. The size of the uncompartmented public space above which additional loudspeaker circuits are recommended by BS 5839-8 is entirely arbitrary but, 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 3.14).

Care needs to be taken 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 in which the failure of more than one circuit as a result of a single fault is precluded by the recommendations of this standard.

12.2 Recommendations

12.2.1 Fault monitoring

The following recommendations are applicable.

- a) A fault indication should be given at the CIE within 100 s of the occurrence of any of the following conditions:
 - 1) short circuit or open circuit in any circuits serving manual call points or fire detectors;
 - 2) the removal of a manual call point or a fire detector that is designed to be detachable;
 - 3) short circuit or open circuit of any circuits serving fire alarm devices;
 - 4) 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;
 - 5) any earth fault that is capable of preventing the system from performing in accordance with the recommendations of this part of BS 5839;
 - 6) 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;
 - 7) 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;
 - 8) 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;
 - 9) 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 alarm receiving centre [see 15.21)];
 - 10) removal from its circuit of a fire alarm device that is designed to be detachable.
- b) A fault indication should be given, within the times indicated below, in the event of any of the following:
 - 1) failure of the main power supply to any part of the system (within 30 min of occurrence);
 - 2) failure of the standby power supply (within 15 min of occurrence);
 - 3) failure of the battery charger (within 30 min of occurrence);
 - 4) reduction of the battery voltage to less than the voltage specified in BS EN 54-4 at which a fault warning shall be given (within 30 min of occurrence).
- c) Visual indications of the faults identified in a)3) and a)9) should continue to be given at the CIE during a fire alarm condition. Other fault indications may be suppressed during the fire alarm condition.

NOTE The recommendations of a), b) and c) will be satisfied by the use of CIE and power supply equipment conforming to BS EN 54-2 and BS EN 54-4, respectively, provided the system installation complies with the recommendations of the manufacturer on which conformity with BS EN 54-2 and BS EN 54-4 may be reliant.
- d) 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).

- e) If the system incorporates a separate voice alarm system or fire warning system for deaf people, 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. In the case of voice alarm systems, reference should also be made to Clause 7 of BS 5839-8:2013.
- f) If the system is used to actuate other fire protection systems or safety facilities (see Clause 9), reference should be made to BS 7273 or other applicable codes of practice for recommendations on monitoring connections between the fire detection and fire alarm system and the other systems or equipment.
- g) Where tactile fire alarm devices provided for people with impaired hearing are installed, the system should conform to Annex C and indicate the failure to receive a monitoring signal correctly [see 18.2.1b)].

12.2.2 System integrity

The following recommendations are applicable.

- a) 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.
- b) Any fault forming a cross-connection between a detector circuit and a sounder circuit should not affect any circuits other than the two circuits involved.
- c) A single short circuit or open circuit fault on an automatic fire detector circuit should neither disable protection within an area of more than 2 000 m², nor 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.
- d) Two simultaneous faults on a manual call point or fire detector circuit should not disable protection within an area greater than 10 000 m².

NOTE 1 The areas quoted in c) and d) are relatively arbitrary; in the case of c), the recommendation is based on custom and practice in non-addressable fire detection and fire alarm systems over many years. Engineering judgement might determine that, in a given system, minor increases in the areas quoted do not significantly impede the system integrity, but this ought then to be regarded as a variation from the recommendations of this standard.

- e) For software controlled CIE that has more than 512 detectors and/or manual call points connected, reference should be made to the manufacturer's instructions regarding the means by which conformity with BS EN 54-2 is to be achieved.
- f) Where detectors are designed to be detachable from their bases for the purpose of routine maintenance of the system:
 - 1) 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 2 This recommendation applies even if all fire detectors in the system are removed from circuit.

- 2) during the design stage, consideration should be given to the possibility of malicious removal of detectors. 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 3 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.

- g) 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.
- h) 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.
- i) Fire alarm devices should be capable of being removed only by the use of a special tool.
- j) 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 15.2c)].

NOTE 4 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 1a)];*
- *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 1b)].*

NOTE 5 The sounder that continues to operate will normally comprise one of the general alarm sounders in the area in which the CIE is housed. In a building without phased evacuation, the alarm sounder will give 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.

- k) 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:
 - 1) greater than 4000 m² in area; or
 - 2) is designed to accommodate more than 500 members of the public.

This should be achieved either:

- i) by means of at least two sounder circuits, which are evenly distributed and interleaved such that adjacent sounders are on different circuits; or
- ii) 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.

NOTE 6 The figures of 4000 m² and 500 members of the public are arbitrary, but are the criteria for duplication of loudspeaker circuits of voice alarm systems conforming to BS 5839-8. Engineering judgement might determine that, in a given system, a single sounder circuit may be used to protect a public space that slightly exceeds these criteria without undue increase in risk to occupants. This would then be regarded as a variation from the recommendations of this standard.

NOTE 7 It is not intended that this recommendation need be applied to small cellular spaces or non-public areas of the buildings in question.

- l) Where two (or more) sounder circuits are necessary in order to satisfy the recommendations of j) or k), the circuits should not be contained within a common cable sheath. For example, two circuits intended to satisfy these recommendations should not be served by a common four core cable, as this would not adequately protect against the simultaneous loss of both circuits.

NOTE 8 This recommendation does not apply to sounder circuits that need not be independent to satisfy the recommendations of this standard (e.g. that are provided purely as a result of electrical engineering considerations).

- m) 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 practical.

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 suitably protected against overcurrent in accordance with BS 7671.

NOTE 9 Where the enclosure is located immediately adjacent to, and in contact with, the CIE, such that cables run directly between the enclosure and the CIE, the enclosure need not be regarded as separate from the CIE; the recommendations of 12.2.2m) do not then apply.

Figure 1 Sounder circuits (1 of 2)

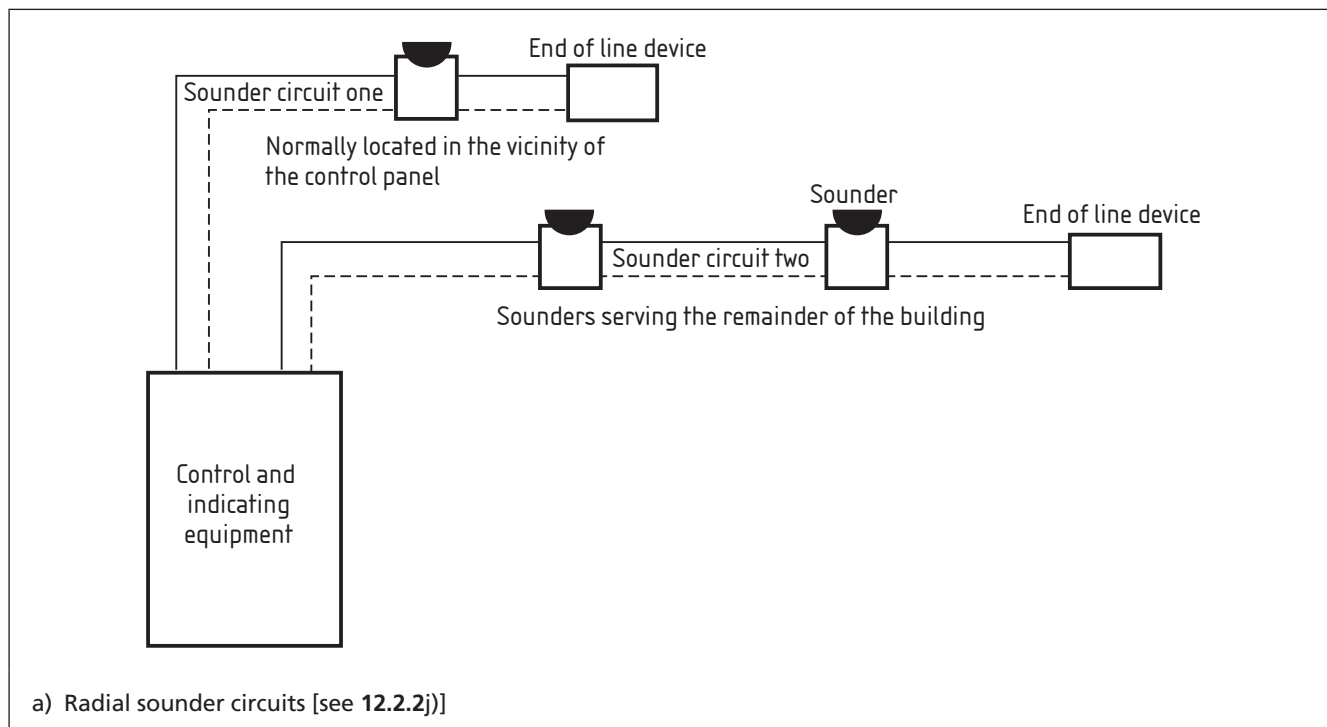
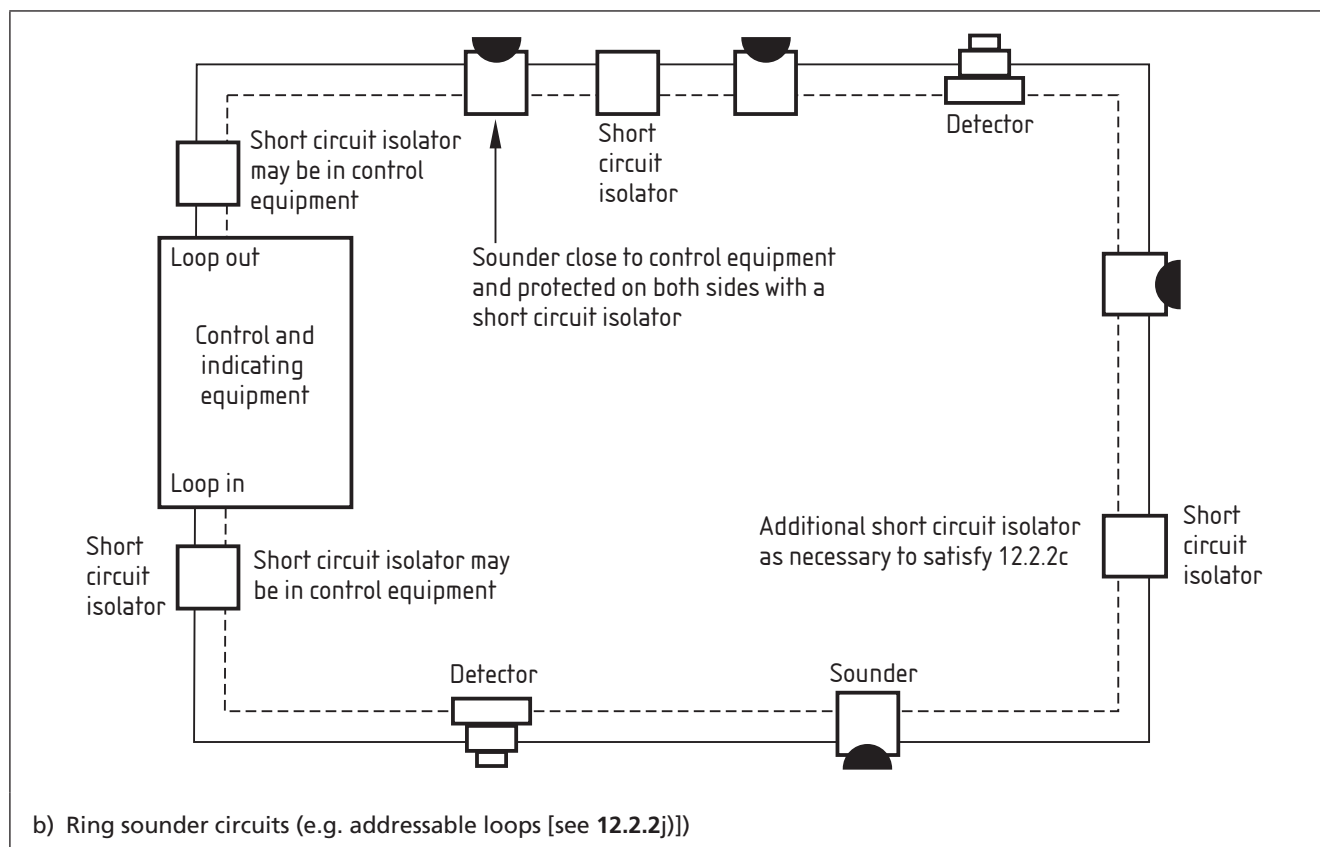


Figure 1 Sounder circuits (2 of 2)



13 Detection zones

13.1 Commentary

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 3.16). Detection zones need to be small enough for a fire to be located quickly.

Even if the system is addressable (see 3.1), 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.

13.2 Recommendations

13.2.1 Recommendations applicable to all detection zones

The following recommendations are applicable.

- a) If manual call points are located on the landings of an enclosed stairway [see 20.2c)], 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. 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 13.2.3c)].
- b) If the total floor area of the building is greater than 300 m², each zone should be restricted to a single storey.
- c) If the total floor area of the building is less than 300 m² a zone may cover more than a single storey.
- d) For voids above or below the floor area of a room, these may be included within the same zone of the room, provided that the voids and the room constitute a single fire compartment.

13.2.2 Additional recommendations applicable to detection zones that contain only manual call points

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.

13.2.3 Additional recommendations applicable to detection zones that contain non-addressable automatic fire detectors

The following recommendations are applicable.

- a) The floor area of a single zone should not exceed 2 000 m².
- b) The search distance (see 3.51) should not exceed 60 m.

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.

NOTE 2 In measuring search distance, the worst case, in which the fire is located at the furthest concealed area from any likely point of entry to the zone, ought to be considered (see Figure 2).

- c) Automatic fire detectors within any enclosed stairwell, liftwell or other enclosed flue-like structure should be considered as a separate detection zone. Manual call points located at final exits to open air from stairwells may be incorporated within these detection zones [but may, alternatively, be incorporated within the detection zone described in 13.2.1a)].

13.2.4 Additional recommendations applicable to detection zones containing addressable automatic fire detectors

The following recommendations are applicable.

- a) Zone indication should be given at the CIE even if addressable text information is also available (see 23.2.2).
- b) The recommendations of 13.2.3 apply, except that 13.2.3b) does not apply 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 may provide a text indication of room number, and a plan adjacent to the CIE may show the location of the room.

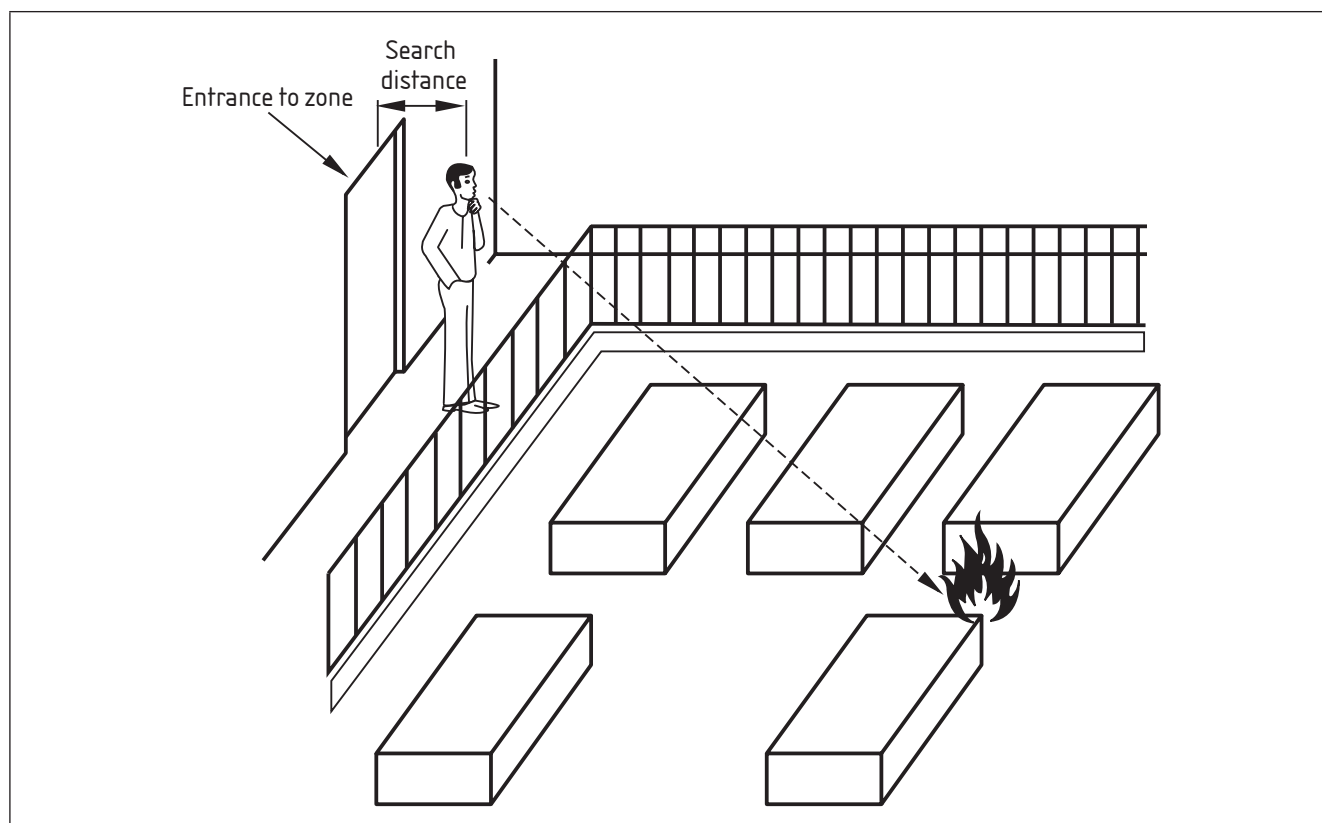
13.2.5 Remote indication of detector operation

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.

Any cable between a detector and a remote indicator required for compliance with this part of BS 5839 should conform to, and be installed in accordance with, the recommendations of 26.2.

NOTE Remote indicators might be required in a specification for areas such as inaccessible voids or locked rooms. See also 40.2 for the as-fitted drawing.

Figure 2 Examples of search distances in an open area [see 13.2.3b)]



14 Alarm zones

14.1 Commentary

In many buildings, the evacuation strategy will be very simple; on operation of any manual call point, or detection of fire by an automatic fire detector, fire alarm sounders will 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 may arise for a number of reasons, including:

- *the use of phased evacuation (see Clause 19);*
- *to avoid unnecessary disruption when false alarms occur (see Section 3);*
- *any other circumstances in which a two-stage alarm arrangement applies.*

Since it will be 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.)

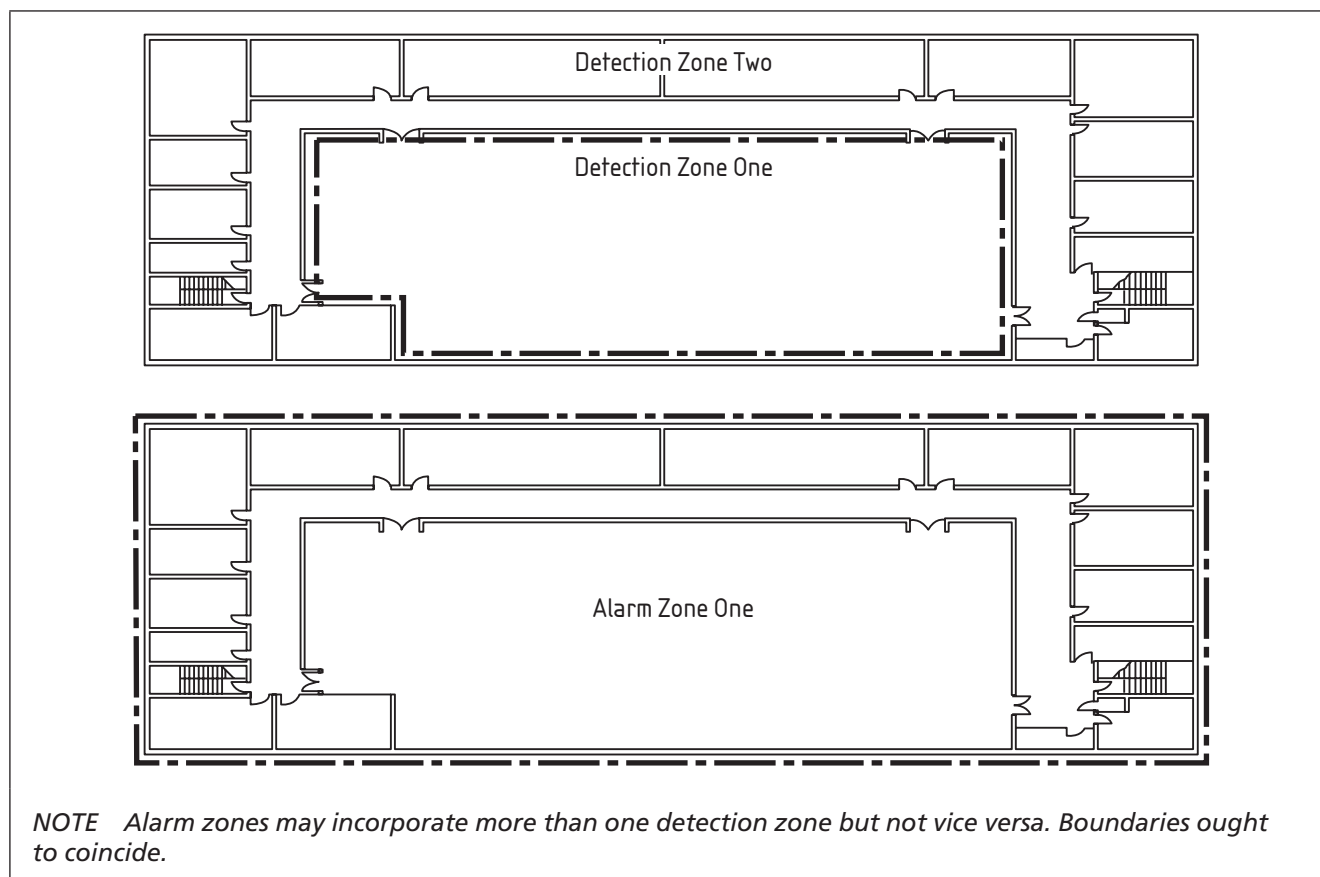
As the subdivision of a building into alarm zones implies that, in the early stages of a fire, occupants in certain areas will not be expected to evacuate, the configuration of alarm zones might require approval by the authority responsible for the enforcement of fire safety legislation in the building.

14.2 Recommendations

The following recommendations are applicable.

- a) The boundaries of every alarm zone (other than external walls) should comprise fire-resisting construction.
- b) The extent of any overlap of signals between alarm zones should not be sufficient to result in confusion of occupants in any area of the building.
- c) 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.
- d) While an alarm zone may incorporate more than one detection zone (but not vice versa), the boundaries of alarm zones should coincide with the boundaries of the relevant detection zones (see Figure 3).
- e) The user or purchaser should ensure that, where appropriate, the configuration of alarm zones is approved by the relevant enforcing authority or authorities.

Figure 3 Alarm zones [see 14.2d)]



15 Communication with the fire and rescue service

15.1 Commentary

For a fire alarm and fire detection 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, unless, in order to avoid false alarms being passed to the fire and rescue service, filtering arrangements are appropriate (see 35.2.7).

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 alarm receiving centre, as any automatic system can fail at the time it is required to operate. It needs to be ensured that the fire alarm sounders cannot interfere with any emergency call to the fire and rescue service.

In the case of manual fire alarm systems, automatic transmission to an alarm receiving centre is usually unnecessary. When the building is unoccupied, the system will not respond to fire; when the building is occupied, the call to the fire and rescue service from occupants will suffice. 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 alarm receiving centre).

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 may, 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), a secondary, automatic means of transmission might be warranted, unless there are adequate arrangements to ensure that there will be no delay at any time in manual summoning of the fire and rescue service by occupants. Automatic transmission of fire alarm signals is also 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 alarm receiving centre. 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 alarm receiving centre is likely to be 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 alarm receiving centre. 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 alarm receiving centre might be warranted.

The reliability of the means for summoning the fire and rescue service, whether by manual or automatic means, always needs to be subject to consideration. Methods for automatic transmission may generally be grouped into four categories, according to the means of communication with an alarm receiving centre:

- *“carrier” systems, in which alarm (and usually line monitoring) signals are transmitted over normal telephone lines, which may be used for normal speech telephony without interfering with the alarm transmission function;*
- *systems that use public or private cellular radio communication;*
- *private communication circuits between the protected premises and the alarm receiving centre;*
- *systems that use the public switched telephone network (“digital communicators”).*

Systems in which the transmission path is continuously monitored are preferred. In these systems, failures in the transmission path can be identified quickly and action taken (see BS EN 50136-1), so minimizing the “down time” of the system. Monitored systems might not, however, be available in all areas of the United Kingdom.

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 considered (e.g. the effect of fire on persons tasked with summoning the fire and rescue services and on communication lines and equipment).

If the services of a commercially operated alarm receiving centre are used, it needs to be ensured that the alarm receiving centre has 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 alarm receiving centre, 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 ensuring that faults on the fire alarm system receive attention when the premises are unoccupied.

15.2 Recommendations

The following recommendations are applicable.

- a) The user should ensure that there are suitable arrangements for summoning the fire and rescue service when the fire detection and fire alarm system operates. The arrangements should be such as to minimize the risk to any person responsible for summoning the fire and rescue service. 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.
- b) 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.
- c) 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 1 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.

- d) The designer should determine from the purchaser or user whether automatic means of transmission of alarm signals to an alarm receiving centre is required by the user.
- e) If the early summoning of the fire and rescue service is considered 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 alarm receiving centre, unless there are reliable arrangements for summoning the fire and rescue service by persons in the building.

NOTE 2 In the case of shopping centres and hospitals, compliance with the Technical Handbooks (see <http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/publications/pubtech>) that support the Building (Scotland) Regulations 2004 [3] necessitate automatic transmission of fire alarm signals to an alarm receiving centre.

- f) In residential care premises, facilities should be provided for automatic transmission of alarm signals to an alarm receiving centre.

NOTE 3 In the case of residential care premises, compliance with the Technical Handbooks (see <http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/publications/pubtech>) that support the Building (Scotland) Regulations 2004 [3] necessitates automatic transmission of fire alarm signals to an alarm receiving centre.

- g) Except in the case of continuously occupied premises, Category P systems should incorporate a means for automatic transmission of fire signals to an alarm receiving centre.
- h) In non-domestic premises in multiple occupation, Category L systems should incorporate an automatic means for transmission of alarm signals to an alarm receiving centre, 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).
- i) Any alarm receiving centre to which fire alarm signals are relayed should conform to the recommendations of BS 5979.

NOTE 4 Schemes exist for third-party certification of alarm receiving centres to BS 5979. However, transmission of fire alarm signals (as opposed to intruder alarm signals) is not always within the scope of the alarm receiving centre's certification; if reliance is placed on third-party certification, it needs to be confirmed that monitoring of fire alarm signals is within the scope of certification.

- j) If a Category L or Category P system incorporates facilities for automatic transmission of fire signals to an alarm receiving centre, 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. As far as reasonably practicable, any cables within the building (including telephone lines) on which communication depends should be:
 - 1) routed through areas of low fire risk; or
 - 2) routed through areas protected by automatic fire detection or an automatic fire extinguishing system; or
 - 3) cables of standard or enhanced fire resistance (see Clause 26).
- k) Automatic transmission of alarm signals should not be prevented by the act of silencing fire alarm sounders, nor should it depend on the state of any silencing switch.

NOTE 5 Although any alarm receiving centre to which fire signals are relayed will normally be 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.
- l) 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. The CIE should conform to BS EN 54-2.
- m) Power supplies for any facility used for the transmission of fire alarm signals to an alarm receiving centre should conform to Clause 25.

16 Audible alarm signals

16.1 Commentary

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 19).

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 in order to ensure that firefighting action is 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 will be more onerous.

In those areas in which audible alarm signals are intended to alert occupants, the sound pressure level and frequency of alarm signals have to be adequate to provide unambiguous warning of fire. Particular care needs to be taken to ensure adequate sound pressure levels in small cellular spaces, such as cellular offices, toilets and plant rooms. If the alarm signal comprises a speech message, it is also necessary to ensure that the message(s) is 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, considered unnecessary to install additional fire alarm sounders if, in open areas, 65 dB(A) is generally achieved. However, if, at specific points of limited extent within

any area, a sound pressure level of at least 60 dB(A) is achieved this is considered acceptable. It is also considered 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 may comprise 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 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.

16.2 Recommendations

16.2.1 Recommendations applicable to Category M and L systems (other than in hospitals and residential care premises)

The following recommendations are applicable.

- a) The sound pressure level of alarm signals should be:
 - 1) generally, throughout all accessible areas of the building [other than as described in 15.2c) and in enclosures of less than 1 m²], not less than 65 dB(A) but, as shown in Figure 4, this may be reduced to 60 dB(A) in:
 - i) stairways;
 - ii) enclosures of not more than approximately 60 m² in area (e.g. cellular offices);
 - iii) specific points of limited extent;
 - 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 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.
 - 3) 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;

NOTE 4 Experience has shown that this normally necessitates the provision of a fire alarm sounder within the room in question.
 - 4) not greater than 120 dB(A) at any normally accessible point.

NOTE 5 All these figures are arbitrary, but are judged to be generally appropriate.

NOTE 6 In carrying out measurements to verify compliance with these recommendations, other than in the case of 16.2.1a)3), account need not be taken of sound pressure levels within 500 mm of any walls or partitions.

NOTE 7 Measurements need to be made with all doors shut.

NOTE 8 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 9 It will often be 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.

- b) The frequency(ies) produced by fire alarm sounders should lie in the range of 500 Hz to 1000 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, although the frequency and amplitude may vary (e.g. as in a warbling note), to indicate the need for evacuation or other immediate response.
- c) 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. For example, a mixture of bells and electronic sounders should not be used in the same building as fire alarm devices. The fire alarm sounders should be distinctive in sound.
- d) 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.

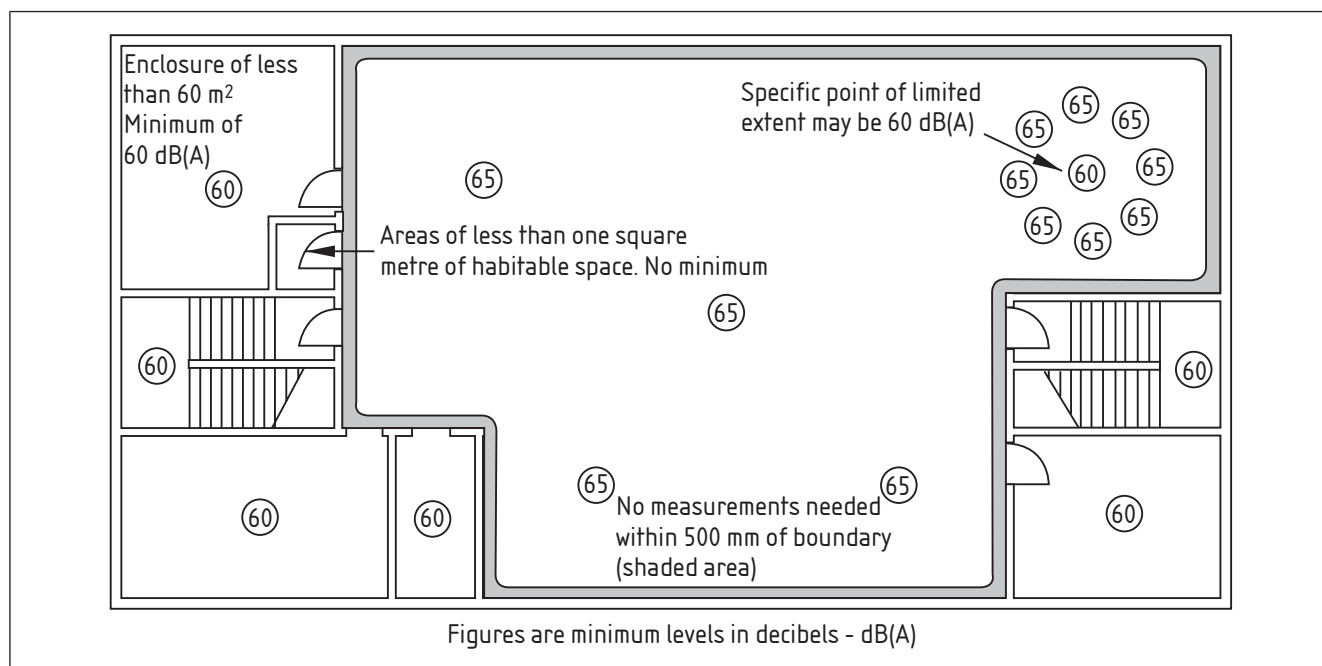
NOTE 10 In premises with two (or more) stage alarm systems, consideration ought to be given as to whether the music is to be muted at the "Alert" or the "Evacuate" stage.

NOTE 11 Where the sound pressure level of the music is likely to be between 60 dB(A) and 80 dB(A), the recommendation of 16.2.1a)2) applies.

- e) 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. The primary sounders should still be sufficient to satisfy the recommendations of 16.2.1a)1) when the machines are silent.
- f) 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 may be provided to direct firefighters to the building or appropriate entrance to the building. Where the provision of such sounders and/or visual alarm devices is considered, there should be consultation with the fire and rescue service to confirm the need of, or benefit from, their provision. The sounder(s) and/or visual alarm device(s) should be clearly marked with the words "FIRE ALARM".
- g) A facility should be provided to enable silencing of alarm signals. The operation of the facility should:
 - 1) require a manual operation;
 - 2) not cancel any visual signal of the alarm at the control equipment;
 - 3) sound any fire alarm sounders configured to that zone if, following silencing of fire alarm sounders, a new zone goes into alarm, and normally should also resound those fire alarm sounders which were previously sounding;
 - 4) not prevent the correct operation of any control for starting or restarting the alarm sounders [see 23.2.3b)];
 - 5) not prevent the transmission of an alarm to an alarm receiving centre.

- h) Alarm signals should not silence automatically (i.e. after a predetermined time period), other than in the circumstances below:
- 1) any external fire alarm sounders [see 16.2.1f)] in Category L and P systems should silence automatically after 30 min, unless the premises are continuously occupied so enabling manual silencing by occupants. After silencing, the sounders might (or might not) restart if, before the system is reset, a further alarm condition occurs;
 - 2) 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. 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;
 - 3) in a two (or more) stage alarm system, alert signals may be silenced automatically after a predetermined period, subject to compliance with 19.2.3d).
- i) The system should incorporate at least two fire alarm sounders, even if the recommended sound pressure levels could be achieved with one sounder. At least one sounder should be provided in each fire compartment.
- j) If audible alarms comprise speech messages generated by a voice alarm system, the relevant recommendations of BS 5839-8 should be followed in respect of message content, sound pressure levels and speech intelligibility. If voice sounders (see 3.65) are used, reference should be made to Annex B of BS 5839-8:2013, as well as complying with the recommendations of this standard.
- k) Fire alarm sounders should not be used for purposes other than warning of fire, unless the response required is identical to that required in the event of fire (i.e. immediate evacuation by use of all escape routes). However, as an established exception, the fire alarm signal may be used in schools to indicate start or finish of predetermined periods. The duration of such signals should not exceed five seconds.

Figure 4 Sound pressure levels [see 16.2.1a)]



16.2.2 Recommendations applicable to Category P systems

The recommendations of 16.2.1 apply in respect of those areas where audible alarm signals are required.

16.2.3 Recommendations applicable to hospitals and residential care premises

The following recommendations are applicable.

- a) Audible alarms in hospitals should conform to the recommendations of the Department of Health publications HTM 05-03 Part B (in England and Wales) or SHTM 82 (in Scotland).
- b) Audible alarms in residential care premises should conform to 16.2.1, except that, if the alarm signal is not intended to rouse occupants of some or all rooms from sleep, 16.2.1a)3) does not apply.

17 Visual alarm signals

17.1 Commentary

Visual alarm signals need to be used 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 may also be used as a means of giving warning of fire to people with impaired hearing (see Clause 18).

Where visual alarm signals are used, consideration might need to be given to the potential effects on photosensitive epileptics.

For more information see the joint LPCB/IFA document CoP 0001, Code of Practice for visual alarm devices used for fire warning [1].

17.2 Recommendations

The following recommendations are applicable.

- a) 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.
- b) 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.
- c) The visual alarm signal should flash at a rate within the range of 30 to 130 flashes per minute.
- d) 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.

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 Care needs to be taken to ensure, as far as reasonably practicable, that visual alarm signals do not cause epileptic seizures in people with photosensitive

epilepsy. In this connection, a flash rate of 3 Hz or less (from a single visual alarm device) is unlikely to result in seizures, but care is necessary to ensure that, in open areas, the field of view from any point is not such that multiple, unsynchronized visual signals can result in an apparent flash rate of a greater frequency; to avoid this, synchronization of visual alarm devices might be necessary. It is important to note that red flashing light is more likely to result in seizures than white (or other coloured) flashing light. Particular care is necessary in, for example, certain health care premises in which a number of people with photosensitive epilepsy may congregate.

- e) 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 3 Guidance on the use and siting of visual alarm devices conforming to BS EN 54-23 is given in LPCB CoP 0001 [1]. This permits two alternative approaches: an engineered, application-specific solution for relatively complex situations, which is described in subclauses 4.6.3 to 4.6.9 of the CoP 0001, and a “predetermined approach” for rooms of simple geometry, specified size and frequently encountered levels of ambient illumination, for which Annex A of CoP 0001 provides look-up tables. For the convenience of the users of this British Standard, these look-up tables are reproduced in Annex F, together with the text of subclause 4.6.3 of CoP 0001.

- f) 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 not be less than 2.1 m.

18 Fire alarm warnings for people with impaired hearing

18.1 Commentary

Impairment of hearing does not mean that a person is completely insensitive to sound. Many people with severe impairment have sufficiently clear perception of some types of conventional audible alarm signals to require no special provision for warning of fire. There will be, in some situations, other people present who can alert those with impaired hearing to the need for evacuation, and in this case it might be necessary to put procedures in place that rely upon others to provide the necessary warning.

However, in circumstances, such as buildings with a significant number of people with impaired hearing, buildings in which one or more persons with impaired hearing work in relative isolation, and buildings in which one or more persons with impaired hearing tend to move around the building to a significant extent (including into toilet areas), additional means of giving warning to people with impaired hearing might be appropriate. If the occupants in question tend to be located for a large proportion of their time within a limited area of the building, visual alarm signals might be appropriate in that area (and associated toilets). If they sleep in the building, tactile devices, with or without associated visual alarm devices, might need to be considered (e.g. for compliance with the accessibility requirement imposed under Building Regulations [2, 3, 4]). These devices, which may, for example, be placed under pillows or mattresses, may be wired into fire alarm device circuits or be triggered by radio signals.

Alarm devices for hearing impaired people may be fixed, movable or portable.

Fixed equipment is equipment fastened to a support or otherwise secured in a specific location, or equipment not provided with a carrying handle and having such a mass that it cannot easily be moved (e.g. a fire alarm system control panel screwed to the wall).

Moveable equipment is equipment which is not fixed equipment and which is not normally in operation while the location is changed (e.g. a local unit or controller which is placed on a table top and operates a vibrating pad in a bed).

Portable equipment is equipment designed to be in operation while being carried (e.g. radio pager or other system using radio communication). For the purposes of this clause, portable alarm devices are:

- *intended for carrying by hearing impaired people;*
- *capable of giving visual and/or tactile signals;*
- *normally radio controlled but other methods are not excluded; and*
- *normally require control equipment for transmission of signals to the portable devices, interfaced to the fire detection and fire alarm control equipment.*

No British Standard specifications for alarm devices for hearing impaired people are available at present in the UK. Nevertheless, wherever possible, the recommendations of this clause ought to be followed and any variations ought to be subject to a risk assessment to ensure that no hearing impaired person is exposed to undue risk.

It is important to note that all radio paging systems used with fire detection and fire alarm systems need to be licensed with OFCOM. There are three types of licence currently available:

- *the short range business paging (SRBP) licence which gives no protection from interference from other authorized or unauthorized users of the same radio frequency;*
- *the self select licence which offers some protection from interference by unauthorized use of the frequency;*
- *the manual frequency coordinated licence which ensures the elimination of interference from both authorized and unauthorized users of the assigned radio frequency.*

18.2 Recommendations

18.2.1 General

The following recommendations are applicable.

- a) Visual alarm signals provided for people with impaired hearing should conform to Clause 17. The visual alarm devices should be regarded as fire alarm devices for the purpose of this standard and, for example, circuits serving the devices should be monitored and protected against fire accordingly.
- b) Tactile alarm devices provided for people with impaired hearing may be fixed, moveable or portable. Fixed or moveable tactile devices should be regarded as fire alarm devices for the purpose of this standard. For example, circuits serving the devices should be monitored and flexible cables attached to devices should be protected against fire if they are greater than 3 m in length.
- c) The intensity of output of tactile alarm devices should be sufficient to attract attention.
- d) Advice should be sought from OFCOM as to the conformity with regulatory requirements for any system using radio signals.
- e) Where tactile devices are provided, control and transmission equipment should comply with the recommendations of Annex C.

18.2.2 Portable alarm devices

Portable alarm devices to supplement the primary means of giving an alarm of fire, if activated by radio signals, should conform to the following recommendations.

- a) The alarm should be given at the portable alarm device within 5 s of the generation of the alarm signal at the fire detection and fire alarm CIE.
- b) The alarm signal emitted by the portable alarm device should continue for at least 60 s after reception of every alarm transmission or until it is