

BRITISH STANDARD

Code of practice for the operation of fire protection measures –

Part 4: Actuation of release mechanisms for doors

ICS 13.220.20



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Summary of pages

This document comprises a front cover, an inside front cover, pages i to vi, pages 1 to 61 and a back cover.

Foreword

Publishing information

This part of BS 7273 is published by BSI and came into effect on 30 April 2007. It was prepared by Subcommittee FSH/12/4, *Automatic operation of fire protection*, under the authority of Technical Committee FSH/12, *Fire detection and alarm systems*. A list of organizations represented on this committee can be obtained on request to its secretary.

Relationship with other publications

BS 7273 is published in four parts:

- Part 1: *Electrical actuation of gaseous total flooding extinguishing systems*;
- Part 2: *Mechanical actuation of gaseous total flooding and local application extinguishing systems*;
- Part 3: *Electrical actuation of pre-action sprinkler systems*;
- Part 4: *Actuation of release mechanisms for doors*.

Parts 1 and 2 give recommendations for the electrical and mechanical actuation of gaseous fire extinguishing systems respectively. Part 3 provides recommendations for electrical actuation of pre-action sprinkler systems. This current part of BS 7273 provides recommendations for the actuation of door release mechanisms.

Recommendations for the design, installation, commissioning and maintenance of fire detection and fire alarm systems are given in BS 5839-1. In order to conform to this part of BS 7273, such systems are, for the most part, expected to conform to BS 5839-1. However, some of the recommendations given in BS 5839-1 (e.g. in respect of provision and siting of fire detectors) are modified by recommendations given in this part of BS 7273. Where this is the case, the recommendations given in this part of BS 7273 take precedence for the purposes of actuation of door release mechanisms.

Information about this document

The devices actuated by the arrangements described in this part of BS 7273 are frequently used, in the event of fire, to open, release, or unlock doors (and, sometimes, shutters) that form part of the means of escape in the event of fire, or that prevent the spread of smoke and fire into escape routes. Their use might also be required to make buildings, and circulation routes within buildings, accessible for some groups of people, such as those with certain forms of disability.

In England and Wales, adequate means of escape in the event of fire, and adequate access to buildings, are required under the Building Regulations 2000 [1]. Similar requirements apply in Scotland and Northern Ireland under the Building (Scotland) Regulations 2004 [2] and the Building Regulations (Northern Ireland) 2000 [3]. Building regulations apply to new buildings and, amongst other things, material alterations to means of escape in the event of fire in virtually all existing buildings. Accordingly, approval to fit devices actuated by the arrangements described in this part of BS 7273 might need approval by the relevant building control body.

In England and Wales, adequate means of escape in the event of fire in existing buildings are required under the Regulatory Reform (Fire Safety) Order 2005 [4]. Guidance on this legislation in England and Wales, including the use of release mechanisms for doors, is published by Communities and Local Government (www.communities.gov.uk). Similar requirements are imposed by equivalent legislation in Scotland¹⁾; in Northern Ireland, it is planned to introduce equivalent legislation in the near future²⁾. Guidance on the Scottish legislation is published by the Scottish Executive (www.infoscotland.com/firelaw). In each case, the legislation requires that fire precautions, including provisions relating to means of escape, be based on a fire risk assessment. Throughout the UK, the Disability Discrimination Act 1995 (as amended) [8] requires that, in most buildings, reasonable adjustments to the physical features of premises are carried out to overcome physical barriers to access. Certain devices actuated by the arrangements described in this part of BS 7273 are used to overcome such physical barriers.

Although this part of BS 7273 gives recommendations for the design of the interface between a fire detection and fire alarm system and devices that open, unlock or release doors in the event of fire, this does not necessarily mean that such devices will be acceptable (e.g. under legislation) in all circumstances in all premises. Guidance on this matter can be found in guidance documents that support legislation and in other relevant British Standards. Often, the acceptability of the devices, and of the type of device used, will be determined by a risk assessment carried out by a competent person. Building control bodies and fire and rescue authorities can give advice in particular circumstances.

Use of this document

As a code of practice, 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.

It has been assumed in the drafting 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.

Presentational conventions

The provisions in 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.

¹⁾ The Fire (Scotland) Act 2005 [5] and the Fire Safety (Scotland) Regulations 2006 [6].

²⁾ The Fire and Rescue Services (Northern Ireland) Order 2006 [7] and regulations made under powers granted by this Order.

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

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

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.

Introduction

It is now commonplace for there to be an interface(s) between a fire detection and fire alarm system and various forms of door hardware. Typically, the facilities with which it is often necessary to interface the fire detection and fire alarm system comprise:

- a) devices to hold open self-closing fire-resisting doors (e.g. magnetic, and acoustically and/or radio-actuated, hold-open devices);
- b) devices to secure doors on means of escape (e.g. magnetically held locking devices and solenoid-operated locks);
- c) powered sliding doors on means of escape, which may be required to open on operation of the fire detection and fire alarm system.

Applications for these facilities are discussed in Clause 4. In this standard, the generic term “release mechanisms” (see 3.33) is used to describe the devices or arrangements described above.

It is essential that the actuation of the door hardware occurs reliably, as a failure to operate might seriously impede the escape of people from fire by, for example, failing to unlock fire exit doors, or by permitting spread of fire or smoke into escape routes. This is particularly the case as, over recent years, codes of practice and enforcing authorities have relaxed some of the previous restrictions on, for example, the use of hold-open devices on fire-resisting doors that protect critical escape routes, such as a single stairway on which all upper floor occupants of a building might depend for escape when fire occurs. Failure of electronically secured doors to open in the event of fire can also hamper fire-fighting and rescue operations by the fire and rescue service.

The wider acceptance of such devices has led to numerous and varying recommendations and requirements in respect of the engineering arrangements for the interface with the fire detection and fire alarm system within codes of practice, guidance documents that support legislation and policies of enforcing authorities. The purpose of this part of BS 7273 is to provide a national code of practice that can be used as consistent guidance by all interested parties.

There is often an assumption that the arrangements for actuation of the devices and facilities to which this standard refers will fail safe; the assumption is made that, in the event of virtually any form of failure of the fire detection and fire alarm system, or of the interconnection between that system and the door hardware, the door hardware will perform as it would in the event of a fire signal at the control and indicating equipment (CIE) of the fire detection and fire alarm system.

This might not always be the case. For example, if the power supply to an electromagnet fails, the electromagnet will cease to operate, and this is normally the situation required in the event of fire. However, on total failure of the main and standby power supplies to the CIE, the power supply to the electromagnet might not necessarily be interrupted, thereby precluding interruption of its power supply in the event of fire, e.g. because the supply to the electromagnet is independent of the supply to the CIE.

No fire protection equipment or facility is totally immune to failure. A (usually subjective) risk assessment, which takes into account the possible failure modes of the actuation arrangements to which this part of BS 7273 applies, the likelihood of such failures, and the potential consequences of such failures, is necessary to determine whether the arrangements are acceptable. The level of reliability of the actuation arrangements needs to be commensurate with the risk to people in the event of fire and simultaneous failure of the actuation arrangements to operate (see Clause 5).

In the case of electronically secured doors, it has been assumed in the drafting of this part of BS 7273 that the only means of releasing the locks is electrical or electronic in nature, and that there is no provision for mechanical release of locks by building occupants (e.g. by means of a thumb-turn or handle). Where such mechanical means of releasing locks is provided, the full application of all recommendations in this part of BS 7273 might not be necessary.

This part of BS 7273 is not intended to be prescriptive in respect of the manner in which the actuation arrangements are facilitated. It is written primarily in terms of recommended performance, thereby enabling different arrangements to be adopted, while not precluding innovations.

1 Scope

This part of BS 7273 gives recommendations for the design, installation, commissioning and maintenance of electrical control arrangements for actuation of mechanisms that unlock, release or open doors in the event of fire. It applies to all aspects of the interface between these mechanisms and a fire detection and fire alarm system, including interfaces that incorporate acoustic coupling and radio transmission. It does not recommend whether the above mechanisms should, or should not, be used in any given premises, or in any particular circumstances.

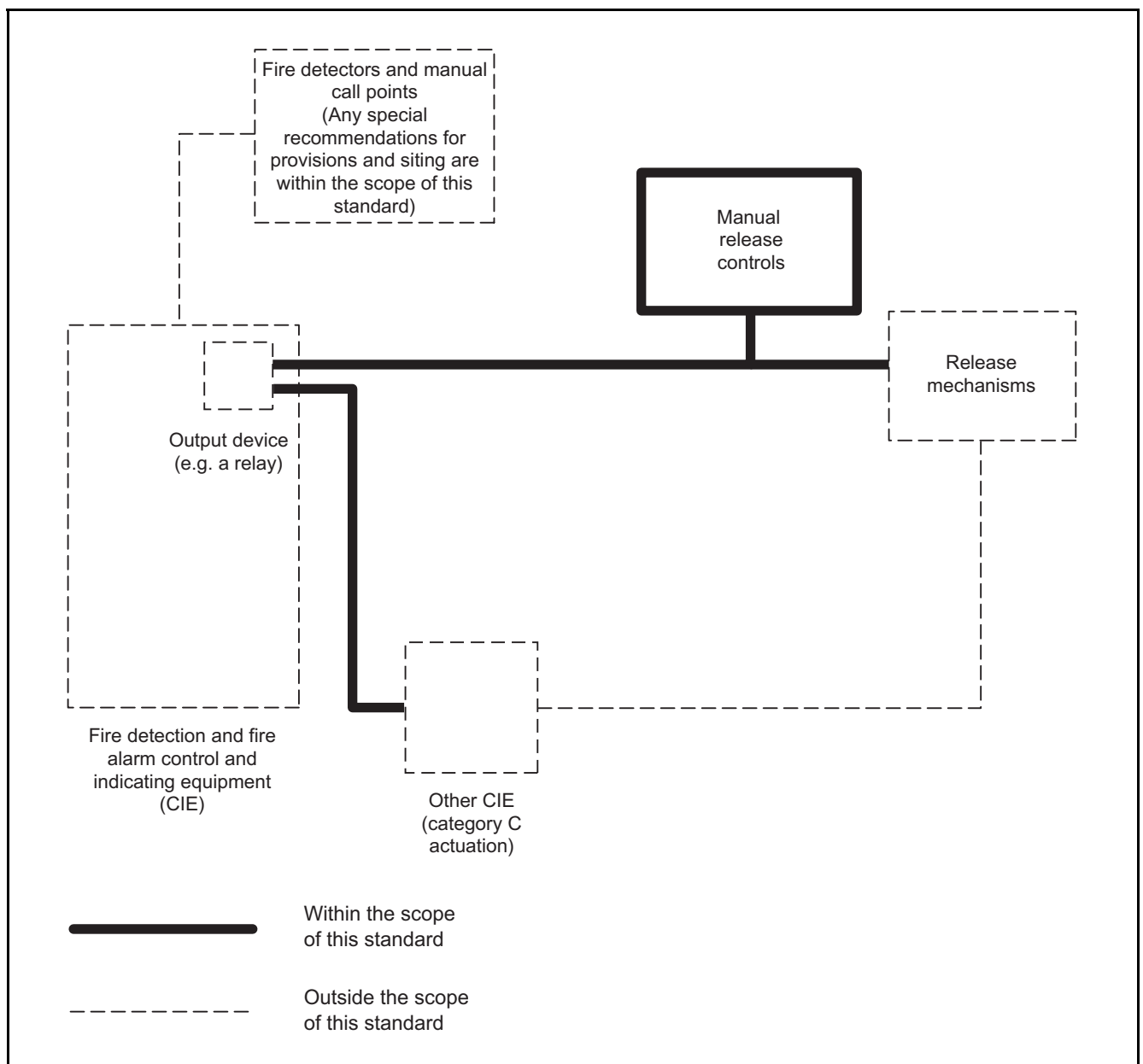
The interface arrangements to which this part of BS 7273 applies include any such arrangements that are designed to release, in the event of fire, fire-resisting doors and shutters that are normally held in the open position, or to unlock doors that are normally locked, or to cause powered sliding doors to open. The standard does not apply to electrically controlled systems that form part of a smoke venting system.

This part of BS 7273 does not apply to the equipment that holds, releases, locks or unlocks the doors, or that facilitates the opening of powered sliding doors. However, recommendations are, where appropriate, given for the standards to which some of this equipment needs to conform.

This part of BS 7273 does not apply to products used within the fire detection and fire alarm system that initiate the signal to actuate the door locking or release mechanisms, nor to aspects of the fire detection and fire alarm system concerned with its primary function to give warning in the event of fire. Recommendations for the design, installation, commissioning and maintenance of fire detection and fire alarm systems are given in BS 5839-1, which refers to BS 7273 for the interface between a fire detection and fire alarm system and other fire protection systems and equipment.

The scope of this part of BS 7273 is shown diagrammatically in Figure 1.

Figure 1 **Scope of this part of BS 7273**



2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced standard (including any amendments) applies.

BS 4422, *Fire – Vocabulary*

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

BS 5499-5:2002, *Graphical symbols and signs – Safety signs, including fire safety signs – Part 5: Signs with specific safety meanings*

BS 5839-1:2002 (Incorporating Amendment No. 1), *Fire detection and fire alarm systems for buildings – Part 1: Code of practice for system design, installation, commissioning and maintenance*

BS 5839-3, *Fire detection and alarm systems for buildings – Part 3: Specification for automatic release mechanisms for certain fire protection equipment*

BS 5839-6:2004, *Fire detection and fire alarm systems for buildings – Part 6: Code of practice for the design, installation and maintenance of fire detection and fire alarm systems in dwellings*

BS 6724, *Electric cables – Thermosetting insulated armoured cables for voltages of 600/1 000 V and 1 900/3 300 V, having low emission of smoke and corrosive gases when affected by fire*

BS 7036-2, *Code of practice for safety at powered doors for pedestrian use – Part 2: Straight and curved sliding doors and prismatic and folding doors*

BS 7671, *Requirements for electrical installations – IEE Wiring Regulations – Sixteenth edition*

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 8434-1, *Methods of test for assessment of the fire integrity of electric cables – Test for unprotected small cables for use in emergency circuits – BS EN 50200 with addition of water spray*

BS EN 54-2:1998, *Fire detection and fire alarm systems – Part 2: Control and indicating equipment*

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

BS EN 54-11: 2001, *Fire detection and fire alarm systems – Part 11: Manual call points*

BS EN 1155, *Building hardware – Electrically powered hold-open devices for swing doors – Requirements and test methods*

BS EN 1527:1998, *Building hardware – Hardware for sliding doors and folding doors – Requirements and test methods*

BS EN 12209:2003, *Building hardware – Locks and latches – Mechanically operated locks, latches and locking plates – Requirements and test methods*

BS EN 50086 (relevant parts), *Specification for conduit systems for cable management*

BS EN 50133-1, *Alarm systems – Access control systems for use in security applications – Part 1: System requirements*

BS EN 50133-2-1, *Access systems – Access control systems for use in security applications – Part 2-1: General requirements for components*

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

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

EN 300 220-1, *Electromagnetic compatibility and radio spectrum matters (ERM) – Short range devices (SRD) – Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels up to 500 mW – Part 1: Technical characteristics and test methods*

EN 300 220-2, *Electromagnetic compatibility and radio spectrum matters (ERM) – Short range devices (SRD) – Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels up to 500 mW – Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive*

EN 300 220-3, *Electromagnetic compatibility and radio spectrum matters (ERM) – Electromagnetic compatibility (EMC) standard for radio equipment and services – Part 3: Specific conditions for short range devices (SRD) operating on frequencies between 9 kHz and 40 GHz*

3 Terms and definitions

For the purposes of this part of BS 7273, the terms and definitions in BS 4422 and the following apply.

3.1 alarm zone

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

3.2 audibility

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

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

3.3 automatic fire detection and fire alarm system

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

3.4 automatic release mechanism

device that can be used for holding a door in the open position against the action of a door closer (3.11), and automatically releasing under conditions recommended in this part of BS 7273

3.5 circuit

assembly of components supplied from a single source and protected against overcurrent by the same protective device(s) or current limitation arrangements

3.6 commissioning

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

3.7 competent person

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

3.8 control and indicating equipment (CIE)

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

NOTE Control and indicating equipment is used:

- a) to receive signals from the connected detectors, manual call points, or any other devices (e.g. input/output units);
- b) to determine whether these signals correspond to a fire alarm condition;
- c) to indicate any such fire alarm condition audibly and visually;
- d) to indicate the location of the danger;
- e) possibly to record any of this information;
- f) 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);

and if required, is able to pass on the fire alarms signal:

- to audible or visible fire alarm devices;
- through suitable transmission equipment to an alarm receiving centre;
- through further control equipment to an automatic fire extinguishing system.

3.9 critical signal path

all interconnections and communications between fire alarm CIE and the input terminals on, or within, (a) device(s) provided to open, release or unlock a door or shutter, or between CIE and other control equipment by which such devices are controlled

NOTE 1 Examples of other control equipment include the control equipment of an access control system.

NOTE 2 In the case of acoustically actuated systems (see Clause 16), fire alarm sounder circuits are not considered to be part of the critical signal path.

3.10 designer

person or organization taking responsibility for specification of the technical requirements for the measures to which this part of BS 7273 relates

3.11 door closer

mechanism attached to a door that will automatically close the door provided that the closing force is not overcome by an automatic release mechanism or obstacle

NOTE This device is often described as a self-closing mechanism.

3.12 electric door magnet

device which uses only magnetic attraction to effect or enable locking and/or unlocking

3.13 electrically controlled hold-open system

NOTE This is also known as a "hold-open system".

combination of compatible components which has the function to hold open self-closing fire/smoke control doors, and, in the case of fire, to release these doors for self-closing, at the earliest practicable moment

3.14 electrically powered free-swing door closer

door closer (3.11) that allows the door, after an initial opening to a predetermined position, to swing freely anywhere from that position to its closed position without any resistance or damping, and which upon removal of the electrical supply returns the door to the closed position

3.15 electrically powered hold-open device

NOTE 1 Examples of suitable devices include electromagnets, solenoid valves and magnetic clutches.

component of a hold-open system that allows a self-closing fire/smoke control door to remain open at either a preset or a chosen angle until electrically released

NOTE 2 This is also known as a "hold-open device".

3.16 electromagnetic automatic release mechanism

automatic release mechanism (3.4) in which electrical energy is converted into a magnetic force that acts directly as the holding force

3.17 electromechanical automatic release mechanism

mechanical holding device that is operated by electrical energy

3.18 electromechanical lock

device using electrically operated means to effect or enable locking and/or unlocking

3.19 electromechanical strike

locking plate using electrically operated means to effect or enable locking and/or unlocking

3.20 fail-safe

NOTE The failure of a manual control push-button or switch has no influence on the effective release of the door under the condition of fire/smoke detection.

<electrically controlled actuation arrangements for (a) release mechanism(s)> designed such that the failure of any of the following results in the release of the door from its pre-actuation state (i.e. held open or locked):

- the critical signal path (3.9) (with the exception of manual control push-buttons or switches);
- defined components of the actuation arrangements;
- the associated fire detection and fire alarm system

3.21 fire alarm device

NOTE For example, a sounder or visual indicator.

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

3.22 fire alarm sounder

audible fire alarm device (3.21)

3.23 fire risk

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

3.24 fire signal

signal intended to indicate the occurrence of a fire

3.25 installer

person or organization having responsibility for all or part of the process of installing the measures to which this standard relates

3.26 maintenance

work of inspection, servicing and repair necessary in order to maintain the efficient operation of the measures to which this standard relates

3.27 manual call point

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

3.28 maximum alarm load

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

NOTE This comprises 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 (including systems and equipment required for compliance with this standard) and any power required for transmission of fire signals to an alarm receiving centre (if a facility for this is provided).

3.29 normal supply

supply from which the 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.

3.30 pre-alarm warning

early warning of conditions which might (or might not) represent a fire

3.31 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 and for actuation of automatic release mechanisms (see **3.4**)

3.32 purchaser

person or organization taking primary responsibility for acceptance of, and payment for, the measures to which this standard relates

3.33 release mechanism

device, mechanism or arrangement which:

- a) holds open a self-closing door or shutter, but releases it on occurrence of a fire signal (see **3.24**);
- b) secures a door, but causes it to unlock on occurrence of a fire signal;
- c) causes a powered sliding door to open on occurrence of a fire signal

NOTE These actions can also occur in the event of circumstances other than a fire signal (e.g. a fault indication at the CIE of the fire detection and fire alarm system).

3.34 servicing

routine process of work on the measures to which this standard relates, carried out at predetermined intervals

3.35 short circuit isolator

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

3.36 smoke alarm

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

3.37 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

3.38 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.

3.39 standby supply

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

3.40 user

person or organization having control of a building (or part of a building) in which the measures to which this standard relates are installed

4 Applications for mechanisms for unlocking and release of doors

COMMENTARY ON CLAUSE 4

The facilities to which this standard refers may be used in a number of applications in buildings, for reasons of:

- a) convenience;*
- b) accessibility;*
- c) security.*

Convenience includes, for example, a situation in which the sliding entrance and exit doors of a building are operated automatically, usually by movement sensors. It would be inconvenient, for reasons of temperature control, energy efficiency, etc., for the doors to remain open at all times that the building is in use. Often, these exits form part of the means of escape in case of fire. In such cases, it is normally required that the doors open permanently in the event of fire or failure of the power supply to the doors, until the fire alarm system is reset or power is restored. Outside normal hours of occupation of the building, additional security measures are applied to prevent the doors opening in these circumstances.

Where the facilities are provided for convenience, false alarms, whether as a result of environmental influences, equipment faults or malicious operation of the fire alarm system, result in, at most, minor inconvenience, but, usually, no additional risk to occupants, nor any reduction in the accessibility of the building or part of the building. Similarly, if the facilities are arranged such that faults on the fire detection and fire alarm system cause the doors to open, such faults will result only in inconvenience.

Use of facilities for accessibility arises from the common use of self-closing fire doors in buildings. These doors are installed, most commonly, to provide protection of escape routes from fire, smoke and toxic gases. Accordingly, the doors are installed at entrances to stairways that need to be used for escape in the event of fire, across long corridors, and, sometimes, at entrances to rooms off corridors (e.g. in premises in which people sleep and in sections of corridor in which escape is possible only in a single direction).

The self-closing nature of these doors can be detrimental to accessibility, particularly for people with certain disabilities. Accordingly, it is often desirable for these doors to be held in the open position, or for them to be fitted with electrically powered free-swing door closers; the latter option is often adopted in the case of doors in residential care premises with frail or elderly occupants, particularly in the case of bedroom doors. In either case, the doors are released in the event of a fire signal, and they close under the action of a door closer. The use of the associated electrically powered hold-open devices might be required for accessibility under building regulations.

Where such facilities are provided for accessibility, false alarms will result in inconvenience. However, in some premises (e.g. with frail occupants) risk to occupants might also result from the sudden release of the doors without prior warning. This risk can also occur when the fire detection and fire alarm system is tested or if the facilities are arranged such that a fault signal on the fire detection and fire alarm system causes release of the doors; such fault signals can arise from events that are not necessarily associated with defects in the system, including removal of an automatic fire detector from its base.

In some buildings, there is a need to secure doors on the means of escape by, for example, use of electric door magnets, electromechanical locks or electromechanical strikes. Such arrangements are common in premises in which large sums of money are handled, certain hospitals, or departments within hospitals, such as post-natal units and mental health units, and in places of lawful detention, but can also be found in many other buildings in which there is a need for a relatively high level of security. Guidance on the security of buildings against crime, including the use of locking devices, is given in BS 8220. In these cases, it is essential that the doors are available for egress in the event of fire. However, false alarms and routine tests of the fire detection and fire alarm system could result in a breach in essential security provisions; such breaches might result in risk to occupants. If the doors are arranged to unlock in the event of a fault signal on the fire detection and fire alarm system, again such fault signals, including those arising from occurrences other than defects, could also result in risk to occupants, associated with the loss of security measures.

It follows from these considerations that the facilities to which this standard applies need to be designed to take account of the application. The design might need to be based on a risk assessment to determine the reliability of operation required (see Clause 5) and the risk to occupants if release mechanisms fail to operate in the event of fire or are actuated as a result of events other than fire.

NOTE *In the case of 4.1b), account might also need to be taken of the risk to persons other than occupants (e.g. the general public).*

4.1 The design of the measures to which this standard applies should take into account the risk to occupants:

- a) if the facilities fail to operate in the event of operation of the fire detection and fire alarm system;
- b) if actuation of release mechanisms occurs as a result of events other than fire.

4.2 At the design stage, there should be adequate consultation with all interested parties (see Clause 6) to ensure that the design of the facilities is suitable for the application.

5 Categories of actuation

COMMENTARY ON CLAUSE 5

All electronic systems have the potential to fail. However, if the recommendations of this standard for electrical actuation of release mechanisms, and the recommendations of BS 5839-1 for the associated fire detection and fire alarm system, are followed in respect of design, installation, commissioning and maintenance, the likelihood of failure of a release mechanism to operate correctly on demand is expected to be very low. Since a fire in a building is normally a very uncommon event, the likelihood of failure of a release mechanism at the time of a fire is then so low as to constitute a tolerable risk in most circumstances.

In the design of the interface between the release mechanism and the fire detection and fire alarm system, account does, however, need to be taken of, at least, a single failure of equipment or power supplies on which the correct transmission of a signal to the release mechanism depends. In some circumstances, in which the fire risk is high and/or the consequences of failure of the electrical actuation arrangements are greatest, account might need to be taken of the possibility of two independent, simultaneous failures of equipment or power supplies at the time of a fire. In these circumstances, if the occurrence of two simultaneous failures would result in unacceptable risk, the use of release mechanisms might need to be limited or restricted, or additional safeguards might need to be incorporated.

Normally, the release mechanisms to which this standard applies are actuated directly by an output signal generated at the CIE of a fire detection and fire alarm system (e.g. change of state of a relay or initiation of an acoustic signal from fire alarm sounders). However, in some cases, the output signal is generated by another system or control equipment, to which a signal is transmitted from the CIE (e.g. the control equipment of an access control system, or control equipment of an electrically controlled hold-open system). In these cases, the additional complexity introduced inherently reduces the reliability of the actuation arrangements. Moreover, the reliability of the other system or control equipment might be less than that of fire detection and fire alarm system CIE, or, more commonly, its reliability might be difficult to determine, as the various potential failure modes might be unknown. Again, the use of this form of interface might need to be limited or restricted, or additional safeguards might need to be incorporated.

As a result of these considerations, the actuation arrangements to which this standard refers are divided into three categories.

5.1 Description of categories

5.1.1 Category A actuation

Category A actuation is fail-safe, within the times specified below, under any of the following conditions:

- a) open or short circuit of wiring that forms part of the critical signal path (within 120 s of occurrence);
- b) reduction of power supply voltage to below the level necessary to maintain the release mechanism in the non-fire state (within 3 s of occurrence, except in the case of self-closing fire doors, for which a time of 60 s is acceptable);
- c) failure of the normal supply to any part of the fire detection and fire alarm system on which the release mechanism depends for its correct operation in the event of fire (within 32 min of occurrence);
- d) failure of the standby supply to any part of the fire detection and fire alarm system on which the release mechanism depends for its correct operation in the event of fire (within 17 min of occurrence);
- e) the simultaneous occurrence of c) and d) (within 120 s of occurrence);
- f) short circuit or open circuit in any circuits serving manual call points or fire detectors on which the release mechanism depends for its correct operation in the event of fire (within 120 s of occurrence);
- g) the removal of a manual call point or a fire detector that is designed to be detachable, if the release mechanism might depend on the manual call point or fire detector for its correct operation in the event of fire (within 120 s of occurrence);
- h) any earth fault that is capable of preventing the fire detection and fire alarm system from detecting fire or initiating a fire signal at the CIE in accordance with the recommendations of BS 5839-1, or from actuating a release mechanism (within 120 s of occurrence);

NOTE 1 BS EN 1155 requires that, upon removal of the electrical supply, and when the applied voltage is reduced to 10% of the rated supply voltage, the device shall release and allow the door to close under the control of the door closing device. BS EN 1155 also requires that the hold-open device shall release within 3 s of the supply being disconnected.

NOTE 2 Where the actuation of a release mechanism relies on change of state of a relay within the fire detection and fire alarm system, care is necessary to ensure that this recommendation (e) is satisfied (see Commentary on Clause 10).

- i) the rupture of any fuse, or the operation of any other protective device, that affects the ability of the fire detection and fire alarm system to detect a fire or initiate a fire signal at the CIE as recommended in BS 5839-1, or to actuate a release mechanism (within 120 s of occurrence);
- j) a short circuit or open circuit between separate control equipment, if the fault could prevent correct operation of the release mechanism in the event of fire (within 120 s of occurrence);
- k) in the case of software controlled fire alarm CIE, the occurrence of a system fault as specified in BS EN 54-2:1998, **13.4** and **13.6** (within 120 s of occurrence);
- l) disablement (e.g. using a control required by BS EN 54-2) of any single manual call point or fire detector (or detection zone), on which the release mechanism depends for its correct operation in the event of fire (within 120 s of occurrence);
- m) In the case of radio-actuated systems:
 - 1) a failure of radio communication between the transmission equipment and the release mechanism (within 6 min of occurrence);
 - 2) short or open circuit of any circuit between the transmission equipment and the fire alarm CIE, external to an enclosure (within 120 s of occurrence).

NOTE 3 A fail safe situation on occurrence of any other fault conditions is not precluded, but the risk to occupants as a result of the unnecessary opening, releasing or unlocking of a door or shutter would need to be considered [see 4.1b)].

NOTE 4 Acoustically-actuated systems (see Clause 16) will not normally be suitable for Category A actuation, as, in the event of fault conditions, fire alarm sounders do not operate.

5.1.2 Category B actuation

Category B actuation is fail-safe under the conditions stated in 5.1.1a), 5.1.1b) and 5.1.1m) except that, in the case of 5.1.1m1), the actuation arrangement should fail safe within 120 min.

NOTE 1 A fail-safe situation on occurrence of any other fault conditions is not precluded, but the risk to occupants as a result of the unnecessary opening, releasing or unlocking of a door or shutter would need to be considered [see 4.1b)].

NOTE 2 Acoustically-actuated systems (see Clause 16) might be suitable for Category B actuation, as faults on the fire detection and fire alarm system need not be taken into account.

5.1.3 Category C actuation

Category C actuation is designed to be fail-safe under the conditions of Category B actuation, but, in Category C actuation, there is no direct communications path between the fire alarm CIE and the release mechanism; actuation of the release mechanism is facilitated by other control, or similar, equipment (e.g. the control equipment of an access control system, or of an electrically controlled hold-open system). Accordingly, any circuit between the fire alarm CIE and other control equipment needs to fail safe (see 10.6). It should be noted that, in