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Regulatory Reform (Fire Safety) Order 2005

Guide to Fire Safety Measures for Persons with Duties

Principles of Fire Safety

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This publication has been approved by ministers and has official status.

Further information can be obtained from legislation.gov.uk

Who should use this guide

This guide is intended for everyone who has duties imposed on them by the Fire Safety Order. It advises persons with duties about how to:

- comply with fire safety law,
- carry out a fire risk assessment (or, how to understand a fire risk assessment carried out by specialists)
- understand the general fire precautions (as defined later in this guide) that must be in place.

The guide may also be useful for:

- employees
- employee-elected representatives
- trade union-appointed health and safety representatives
- enforcing authorities
- persons appointed to carry out fire risk assessments

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About This Guide

This guidance was drafted by C.S. Todd & Associates Ltd, to whom the gratitude of Ministry of Housing Communities and Local Government (MHCLG) is expressed, after which it was subject to review and editing by MHCLG in response to stakeholder in the fire, housing, education, health and business sectors.

Status

The guide is part of a suite of guidance produced by government to assist those with duties under the Fire Safety Order. In this guide, people with such duties are described as “persons with duties”.

It supports the application of the Regulatory Reform (Fire Safety) Order 2005 (as amended) (the Fire Safety Order) and has been produced to satisfy the obligation of the Secretary of State to make guidance available to assist responsible persons to satisfy their duties under fire safety legislation. As such, it is endorsed by the minister responsible for the legislation.

Article 50(1A) of the Fire Safety Order makes it clear that in court proceedings for alleged breaches of the Fire Safety Order or regulations made under it, proof of compliance with, or proof of deviation, from guidance issued under Article 50 may be relied upon to establish whether or not there was such a breach of the Fire Safety Order or regulations.

The technical aspects of the guidance should not be prescriptively applied across all premises. Different designs, construction techniques and manufacturing standards exist throughout the built environment, particularly when it comes to refurbished or modernised properties and heritage buildings. As such, even in a guide that is specific to a certain type of premises, differences between those premises will exist. The recommendations on best practice and practical examples of potential precautions that may be appropriate for your property are provided to assist in satisfying the requirements of the Fire Safety Order and regulations made under it. The exact precautions that need to be taken in each specific premises, will be individual and case specific. These precautions will be defined as part of the suitable and sufficient mandatory fire risk assessment performed by the ‘responsible person’ for that premises.

Some premises will have features that mean they require precautions which are not covered by this guide. It is your responsibility to ensure that you are compliant with the requirements set out in the legislation and to seek independent professional advice if necessary.

How to use this guide

The guide:

- provides an overview of the relevant fire safety legislation,
- explains the fire risk assessment on which compliance with legislation should be based,
- explains the behaviour of fire in buildings and examines the causes of fire in buildings. The fire safety duties imposed by the Fire Safety Order are discussed in 2 parts.

Part 1 explains the fire safety measures that must be adopted within a building to prevent fire and to protect people if fire occurs; these are known as fire prevention measures and fire protection measures respectively.

Having adopted these measures, fire safety needs to be managed on an ongoing basis. While the physical fire safety measures described in part 1 are extremely important, routine management of fire safety is at least as, if not more, important. Multiple-fatality fires in non-domestic premises demonstrates the effect of failures to manage fire safety on loss of life.

Part 2 fire safety duties covers managerial arrangements that must be put in place.

These measures include:

- formulation of fire procedures,
- training of staff,
- fire drills to rehearse evacuation procedures,
- arrangements for routine maintenance and regular testing of fire protection systems and equipment.

Further guides assist in application of the fundamental principles to specific types of premises. Separate guides are produced for each of the following types of premises:

- animal premises and stables
- educational premises
- factories and warehouses
- healthcare premises

- offices and shops
- open air events and venues
- places of assembly
- residential care premises
- sleeping accommodation (principally hotels and similar premises, but excluding blocks of flats and specialised housing for vulnerable people, which are the subject of separate guidance)
- theatres, cinemas, and similar premises
- transport premises and facilities

Special stand-alone guides (which do not rely on this guide) apply to purpose-built blocks of flats and specialised housing including sheltered housing, extra care housing and supported housing). In addition, a further guide provides advice on means of escape for disabled people: Fire safety risk assessment: means of escape for disabled people - GOV.UK (www.gov.uk)

Certain explanatory text within this guide is included within a box, thus:

These boxes are used to provide particular emphasis of fundamental matters, or terminology, that it is essential to understand in the use of this guide and the sector specific guides, particularly where these matters are known to be subject to common misunderstanding.

In this guide, reference is made to British Standards and standards produced by other bodies. References to standards are intended for guidance only, and other standards could be used. Reference to any particular standard is not intended to confer a presumption of conformity with the requirements of the Fire Safety Order (or other fire safety legislation).

This guide should not be used to design fire safety measures in new buildings. That is a matter for guidance that supports the Building Regulations.

Careful application is required in historic buildings as some recommendations may not be practicable and may be highly detrimental to the features of the building. The protection of relevant persons from fire is paramount so certain mitigation measures and specialists solutions may be required to ensure their safety. Expert advice will be required. Further guidance on historic buildings is provided in Appendix C.

This guide applies only to England. Separate guidance is applicable in Wales. The guide is not intended for use in Scotland or Northern Ireland, where different fire safety legislation applies.

Language use in Article 50 guidance

In Article 50 guidance, words such as “must”, “should” and “may” are used to express obligation, recommendation, or permission. The choice of word reflects the level of obligation needed to be compliant.

The following describes the implications and use of these words in Article 50 guidance (these meanings may differ from those of industry standards and legal documents)

- “must” is used when indicating compliance with the law.
- “should” is used to indicate a recommendation (not mandatory or obligatory), that is, among several possibilities or methods, one is recommended as being particularly suitable, without excluding other possibilities or methods.
- “may” is used for permission, meaning a course of action permissible within the limits of the guidance.

Introduction

Scope of this guide

0.1 Because the guide focuses on fundamental principles, it is applicable to all premises that fall within the scope of the Regulatory Reform (Fire Safety) Order 2005.

0.2 However, alternative guidance, produced by government and listed at the end of this guide, may be used in the case of certain small comprising of:

- blocks of flats, of no more than 3 storeys and no more than 6 flats. Making your small block of flats safe from fire - GOV.UK (www.gov.uk)
- small non-domestic premises, such as newsagents’ shops, laundrettes, cafés, hairdressers, workshops, and similar measures, of no more than 280m^2 on any storey, with a travel distance from any point in the building to the nearest exit from the building of no more than 25m, subject to the absence of any hazardous processes and with any cooking process remote from fire exits. Making your small non-domestic premises safe from fire - GOV.UK (www.gov.uk)
- premises providing accommodation for a maximum of 10 paying guests, comprising no more than 2 storeys and with no more than 4 bedrooms on an upper storey Making your small paying guest accommodation safe from fire - GOV.UK (www.gov.uk)

Who should use this guide

0.3 This guide is intended for everyone who has duties imposed on them by the Fire Safety Order. It advises persons with duties about how to:

- comply with fire safety law,
- carry out a fire risk assessment (or, how to understand a fire risk assessment carried out by specialists)
- understand the general fire precautions (as defined later in this guide) that must be in place.

0.4 The guide may also be useful for:

- employees
- employee-elected representatives
- trade union-appointed health and safety representatives
- enforcing authorities
- persons appointed to carry out fire risk assessments

Fire risk

0.5 Deaths and injuries from fire in England have shown a continual decrease over past decades. Most fire deaths and injuries happen in people's own homes, where fire safety is largely outside the scope of the fire safety legislation that this guide is intended to support.

0.6 However, fire remains one of the greatest threats to the operation of any business and continues to result in deaths and serious injuries of those employed to work on premises and those who visit premises (for example like customers of the business).

0.7 In 2023, in England, there were xx deaths and xx injuries from fires in premises other than dwellings. While these figures are relatively low, compared with deaths and injuries from some other accidents, this does not preclude the need for careful attention to compliance with fire safety legislation, which is explained in the next section of this guide, rather, the figures reflect the effectiveness of fire safety legislation in controlling the risk of fire.

0.8 The tragic fire at Grenfell Tower in London in June 2017, which resulted in 72 deaths, was a graphic demonstration of the effects that failures to properly to comply with legislation can have on the safety of the public. While this guide applies only to England, 2 multiple-fatality fires in hotels in Scotland (in 2017 and 2023) demonstrate the ever-present risk that fire presents, particularly to occupants of premises in which people sleep.

0.9 Fire also results in serious economic losses. The most obvious of these is direct damage to property. In 2019 to2020, it is estimated that the value of property damaged by fire was £2 billion. While this includes uninsured damage to property, for which the owner would have received no recompense, it excludes the indirect or consequential losses suffered by industry and commerce due to loss of profits following a major fire.

0.10 Although consequential loss (or “business interruption”) can be insured, the effects of a serious fire on the future revenue earning of a business can be difficult to quantify. The value of loss of output to business as a result of fires in 2019 to 2020 was estimated to be £170 million.

0.11 This guidance is concerned only with fire safety, but many of the measures discussed here will have an effect on other safety issues. It is recognised that these various differing safety demands can sometimes affect one another, and management should consult other interested agencies (for example the local authority) where necessary to confirm that they are not contravening other legislation or guidance.

0.12 It is a legal requirement for those who manage and control premises to take reasonable and appropriate measures to ensure the safety of people from fire. These measures can be divided into 3 groups:

- Prevention - to try as far as practicable to prevent a fire occurring
- Protection - have physical measures in place to safeguard occupants should a fire occur
- Management - to ensure the effective and ongoing management of fire safety to protect occupants.

0.13 For example, to prevent fire, it is important to identify, control and separate combustible materials from potential ignition sources. To protect people in the event of fire, there must be suitable means for their escape from fire, safe and effective means of warning people of fire and suitable equipment to extinguish a fire.

0.14 Management of fire safety involves, but is not limited to, formulation of suitable procedures to follow in the event of fire, training of staff in these procedures and in fire safety more generally, regular fire drills, and inspection, testing and maintenance of fire protection equipment and relevant plant (for example, electrical installations, heating plant, and similar measures).

0.15 The division of fire safety into independent topics in this guide is necessary for explanatory purposes. However, it is not the manner in which fire safety should be approached in any premises, in which it is necessary to view fire safety measures holistically.

0.16 For example, the absence of automatic fire detection in premises in which people sleep is unacceptable. The absence of cross-corridor doors in long corridors of the same building would, in itself, be considered poor fire safety, as would the absence of emergency escape lighting.

0.17 However, the overall effect of these 3 deficiencies is much greater than the simple sum of the individual deficiencies; a fire during the night might develop, undetected, until the undivided corridors are completely smoke logged, so that the means of escape are impassable and, in any case,

difficult to use because the normal lighting has failed due to fire damage to the cables of the lighting circuits.

0.18 Many fire disasters have arisen from a combination of apparently independent deficiencies. At least some of these deficiencies were almost always related to management shortcomings. Any one of which, if it had been rectified, would have mitigated, or even prevented, the situation in which those involved found themselves.

0.19 The result is that it is possible to design and engineer an integrated “package” of fire precautions, whereby a reduction in one measure can be mitigated by enhancement of another measure. However, this approach requires specialist expertise, and persons with duties are advised to seek expert opinion before departing from the recommendations of this guide.

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1. Fire Safety Law

Building Regulations

1.1 When a building is constructed, extended, materially altered, or is subject to a material change of use, the principal fire protection measures must be such as to enable compliance with 5 requirements (technically, known as "*functional requirements*") of the Building Regulations 2010 (as amended).

1.2 Guidance on the Building Regulations is outside the scope of this guide; guidance on measures for compliance with the Building Regulations is given in the government publication Approved Document B (Fire safety: Approved Document B - GOV.UK (www.gov.uk)). However, for completeness, the functional requirements in question relate to:

- means of escape from fire and means of giving warning of fire
- control of internal fire spread via linings (like walls and ceilings)
- control of internal fire spread by measures related to the structure of the building, or by fire suppression systems within the building (such as fire-resisting walls and floors, fire-resisting barriers within concealed spaces in the structure and fabric of the building and, where necessary, sprinkler or other fire suppression systems)
- external fire spread over the walls of the building, or from one building to another
- access and facilities for the fire and rescue service

1.3 In relation to the above measures, at the design stage, approval of their design must be obtained from a building control body, other than in the case of higher risk buildings (HRBs) (such as high-rise blocks of flats or student residences, high-rise residential care homes and high-rise hospitals); for these buildings, approval must be obtained from the Building Safety Regulator (BSR).

1.4 Under the Building Safety Act 2022, in the case of HRBs, a "completion certificate" must have been issued by the BSR before a newly constructed building can legally be occupied as an HRB. Under the Act, all existing high-rise blocks of flats and high-rise student residences were required to be registered with the BSR by 30 September 2023; otherwise, an offence would be committed. Thereafter, the "accountable person" for the purpose of the Building Safety Act was required to submit a building safety case report to the BSR for all high-rise blocks of flats and high-rise student residences, prior to 1 April 2024.

1.5 Guidance on the Building Safety Act can be found on the government website at www.gov.uk/guidance/the-building-safety-act.

1.6 Regulation 38 of the Building Regulations requires that the person carrying out the building work gives the RP sufficient fire safety information on completion of a building or work to change the relevant use of a building, or when a building or extension is first occupied (whichever is the earlier). The fire safety information must enable the responsible person for the building (as defined in paragraphs 1.31 to 1.40) to understand and implement the fire safety strategy of the building, to maintain any fire safety system provided in the building and to carry out an effective fire risk assessment of the building.

1.7 An existing building, constructed before 2013, may have additional fire safety measures that were required at the time of construction under Local Acts, which were a form of building regulation applicable in specific geographical areas of England. These Acts were, in relation to fire safety measures, repealed in 2013. However, some of the measures required may need to be maintained for compliance with the Fire Safety Order.

1.8 Those responsible for premises should note that any material alterations, or material changes of use, in respect of existing buildings are subject to approval by a building control body or, in the case of HRBs, the BSR.

1.9 After occupation of premises (or parts of premises) for a use that falls within the scope of the Regulatory Reform (Fire Safety) Order 2005 (as amended) (“the Fire Safety Order”), the Order imposes fire safety duties on the “responsible person” and any other persons who have control of the premises. In this guide, the generic term “persons with duties” is used to describe responsible persons and other persons who have control of the premises, by virtue of which duties are imposed upon them by the Fire Safety Order.

1.10 This guide is not intended to provide a detailed interpretation of fire safety legislation. For the exact requirements imposed by the legislation, legal terminology and its definitions, reference should be made to the Order and the Regulations themselves. This guide largely avoids the use of legal terminology, but provides practical guidance on actions that should be taken to satisfy the legislation.

1.11 Various measures that might be identified in a fire risk assessment as necessary are likely to need the services of third parties, who can carry out, for example, installation and maintenance of fire alarm systems and emergency escape lighting, work to restore the fire resistance of construction, installation of fire doors, and similar measures. It is important that persons with duties ensure that such contractors are competent to carry out the work for which they are engaged, as the ultimate responsibility, in law, for compliance of their work with fire safety legislation rests with the responsible person. It is also important that the person who carried out the fire risk assessment is competent.

The Fire Safety Order

Background

1.12 The Fire Safety Order came into force on 1 October 2006A major effect of the Order was the repeal (or amendment to delete requirements in respect of fire safety) of virtually all legislation that had previously made specific requirements in respect of fire safety in occupied buildings in England. Accordingly, the Fire Safety Order is the single, consolidated legislative instrument under which fire safety is controlled in virtually all premises, other than private dwellings.

1.13 The responsibility to determine the appropriate fire precautions for premises rests with those who employ people to work on the premises and/or those who have control of the premises. The fire and rescue service enforce the Fire Safety Order (in most premises), but are not responsible for providing detailed advice on the design of the premises and their fire precautions.

1.14 This is very similar to health and safety legislation, under which an enforcing authority (such as the Health and Safety Executive or the local authority) enforce the legislation, but are not responsible for acting in a consultancy capacity to advise employers as to the measures that must be taken to address hazards within a workplace.

Scope of the Fire Safety Order

1.15 The Fire Safety Order applies to "*premises*", the definition of which is very broad and includes "*any place*" and, in particular, "*any workplace*"It includes both permanent and temporary premises, thus, for example, tents and moveable structures (such as might be found, even temporarily, at open air events).

1.16 However, certain premises are outside the scope of the Fire Safety Order. The most common of such premises are domestic premises, comprising a private dwelling. However, parts of premises used in common by the occupants of more than one such dwelling, do not, for the purpose of the Fire Safety Order, fall within the meaning of domestic premises. Accordingly, the common parts of blocks of flats, houses in multiple occupation, sheltered housing and supported housing **do** fall within the scope of the Fire Safety Order.

1.17 In this connection, in blocks of flats, the scope of the Fire Safety Order includes flat entrance doors, the "*structure*" of the building (by which is meant the layout of means of escape and compartmentation) and the external walls of the building (including attachments to external walls, such as cladding and balconies). To note blocks of flats are not in scope of this guide.

1.18 Certain other, less significant, exceptions to the application of the Fire Safety Order are listed in the Order (such as certain fields and woods, mines, borehole sites, certain ships, aircraft, locomotives or rolling stock, and offshore installations). In the case of ships, the exemption from the

scope of the Order applies only to normal ship-board activities of a crew under the direction of a master; so, for example, a ship used as a floating restaurant would be likely to fall within the scope of the Order.

Requirement to provide general fire precautions

1.19 The Fire Safety Order specifies "*general fire precautions*" which are needed to protect "*relevant persons*" in case of fire in and around most premises. The Order requires general fire precautions to be put in place "*where necessary*" and to the extent that is reasonable and practicable in the circumstances of the case.

1.20 For the purpose of the Fire Safety Order, "*general fire precautions*" comprise:

- fire prevention measures to reduce the risk of fire
- measures to reduce the risk of spread of fire (for example, by means of fire-resisting construction and/or fire suppression systems)
- measures for means of escape from fire, that is suitably designed escape routes
- measures to assist people in safe use of escape routes (such as emergency escape lighting and signs)
- measures to warn people in the event of fire (normally, an electrical fire alarm system, which may need to incorporate automatic fire detectors, such as in premises in which people sleep)
- measures for fighting fire (such as portable fire extinguishers)
- measures relating to documented fire procedures for action in the event of fire
- arrangements for training of employees (so that they understand the general fire precautions in the premises and the action to take in the event of fire)
- measures to mitigate the effects of fire (so that there is proper preparedness for any foreseeable fire)

1.21 General fire precautions do not include certain special, technical or organisational measures required in connection with carrying out a work process, such as use of plant or machinery, provided these fall within the scope of other legislation; for example, this might apply to a fire extinguishing system fitted to process plant.

1.22 Similarly, the term "*work process*" includes the use or storage of any dangerous substance (such as explosive or flammable materials, explosible dusts, oxidising agents, and similar measures), which, typically, fall within the scope of the Dangerous Substances and Explosive Atmospheres Regulations 2002.

1.23 The "*relevant persons*", for whom the general fire precautions must be adequate to ensure their safety, so far as is reasonably practicable, comprise anyone lawfully on the premises (such as employees, customers, contractors, residents, and similar measures) and anyone in the immediate vicinity of the premises who is at risk from a fire on the premises

Fire risk assessments

1.24 The responsible person (as defined in paragraphs 1.31 to 1.40) is required to determine the appropriate general fire precautions by carrying out a suitable and sufficient fire risk assessment, or engaging a competent specialists to do so. Fire Risk Assessors should have demonstrable experience of premises of a similar type, size and complexity.

1.25 The fire risk assessment must be suitable and sufficient, and it should demonstrate that all requirements of the Fire Safety Order have been properly considered. This is an important and fundamental requirement of the Fire Safety Order, as a suitable and sufficient fire risk assessment will record both the measures that have been taken to satisfy the Fire Safety Order and the measures that will be taken (which are normally set out in the form of an action plan within the fire risk assessment). Thus, a fire risk assessment is the foundation for ongoing fire safety in any premises. It is a live document that needs to be kept up to date and reviewed regularly.

1.26 Those with duties under the Fire Safety Order must not employ anyone under the age of 18 unless the fire risk assessment has taken account of risks to them because of their age.

1.27 This guide will assist those with a duty to carry out a fire risk assessment in understanding the measures that a fire risk assessment needs to address. More specific guidance on all of these measures for different types of premises is given in the "premises specific guides", which are listed at the end of this guide and can be found on the gov.uk website at Fire safety: guidance for those with legal duties - GOV.UK (www.gov.uk).

1.28 Section 2 of this guide discusses the basic principles of fire risk assessment.

1.29 Detailed guidance on the methodology for carrying out a fire risk assessment can be found in the British Standards Institution ("BSI") publication PAS 79-1, which is the code of practice for fire risk assessments in premises other than housing.

1.30 PAS 79 contains a template that, if completed comprehensively by a competent person, should normally lead to a suitable and sufficient fire risk assessment. However, it is stressed that other templates can be equally suitable, though generally the PAS 79 process (as opposed to the example template included in PAS 79) will constitute good practice in undertaking a fire risk assessment.

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Persons with duties

Responsible persons:

1.31 Responsibility for complying with the fire safety duties imposed by the Fire Safety Order, and for carrying out a fire risk assessment, rests with the "*responsible person*" ("RP")

1.32 RPs must appoint one or more competent persons to assist them to put in place measures identified as necessary for compliance with the Fire Safety Order and identified as such in the fire risk assessment. Where they have sufficient training, experience, knowledge and other qualities, the RP may appoint themselves. . The specific duties, responsibilities and tasks of an assistant will be agreed between the RP and their appointed person.

1.33 Typically, these competent persons will prepare, or input to, an organisation's fire safety policy, fire safety arrangements, arrangements for carrying out fire risk assessments, and similar measures. The role may be undertaken by, for example, an in-house fire safety manager, the organisation's director of health and safety or even a complete department devoted to fire safety and/or health and safety. The role is not fulfilled by, for example, contractors who carry out maintenance of fire protection equipment.

1.34 Where the RP does not appoint themselves as the competent person, those they do appoint must, in the case of a workplace, be someone in the employment of the employer, unless no such person exists, in which case an external consultant can be appointed for the purpose, but this will not commonly be an external fire risk assessor, unless the contract with the fire risk assessor specifically extends to these additional duties.

1.35 In a workplace, the RP is the "*employer*", if the workplace is, to any extent, under the employer's control. Most commonly, the employer is not an actual living person (or what is known, in law, as a natural person), for example, a chief executive or company secretary of a corporate body, the manager of a shop, and similar measures.

1.36 The employer, in, for example, a limited liability company, is the company itself (which is known, in law, as a legal person), because it is the company that employs the employees (typically under a contract of employment) and not any natural person within the company, who is likely to be simply another employee of the company. However, there will be cases where a sole trader engages employees, in which case the RP might, indeed, be a natural person.

1.37 If the premises are not a workplace (because no one is employed to work there for any purpose even including, for example, periodic maintenance of unstaffed premises), the RP is the person who has control of the premises (as occupier or otherwise) in connection with the carrying on of a trade, business or other undertaking (for profit or not).I.

1.38 In very rare cases, premises that do not comprise a workplace could be such that no one has control of the premises for the purpose of carrying on a trade, business or other undertaking (such as a derelict building). The RP would then be the owner of the premises.

1.39 If there is more than one RP in any type of premises (such as a multi-occupied office building), all RPs must take all reasonable steps to cooperate with each other and to coordinate their general fire precautions. This will include circumstances in which a construction site is located within a part of existing premises that fall within the scope of the Fire Safety Order; the employer within the premises will need to cooperate with the construction site contractor.

1.40 Examples of cooperation and coordination include:

- commercial tenants in an office building cooperating with the landlord, who is also a person with duties. Tenants would need to participate in the landlord's fire drills and to follow the landlord's rules regarding fire precautions in common parts (such as maintaining common parts free of combustible materials).
- where construction work is located within an existing occupied premises, the RP will need to cooperate with the construction site principal contractor/contractor.

Other persons having control of the premises

1.41 The duties imposed on the RP are also imposed on any person, **other than the responsible person**, who has, to any extent, control of the premises, so far as the requirements relate to matters under the other person's control. This other person, who may be either a legal person or a natural person, is often described as an "article 5(3) person" (hereafter referred to as *other persons with duties*), because it is under that article of the Fire Safety Order that the duties are imposed.

1.42 Such other persons include any person who has, by virtue of a contract or tenancy, an obligation of any extent in relation to maintenance or repair of the premises, or of anything in or on the premises, or in relation to the safety of the premises. The duties imposed on this other person are only imposed so far as the requirements of the Fire Safety Order relate to matters within the control of the person.

1.43 These persons with duties comprise a broad range of persons, including, for example, the owner and managing agents of a commercial building in multiple occupation, in which various commercial tenants lease their part of the building (such as one or more floors of the building) from the owners, who then appoint managing agents to manage the building on their behalf.

1.44 Assuming that each tenant is an employer, every tenant is an RP, while, commonly, the owners and managing agents are other persons with duties ; under each tenant's lease, the owners will often be responsible for

maintenance and repair of the common parts and communal fire protection systems, such as the building's fire alarm system.

1.45 The contract between the owners and the managing agents will commonly be such that they are tasked with day-to-day management of the common parts, placing contracts for maintenance of fire protection systems and, more generally, the safety of the common parts.

1.46 Contractors with contracts for maintenance of fire protection systems and equipment, such as the building's fire alarm system, fire extinguishers, emergency escape lighting, smoke control, and similar measures. are also other persons with duties , though the duties imposed on them relate only to maintenance of the systems and equipment that they are contracted to maintain.

1.47 Similarly, anyone contracted to carry out a fire risk assessment is another person with duties because their contract relates to the safety of the premises.

1.48 The other duty holders identified above will usually be companies or other legal persons, but in some cases may include certain natural persons. For example, the contract of employment of certain managers may include duties to ensure maintenance or repair of the premises or fire protection systems and equipment on the premises, or to ensure the safety of the premises; under these circumstances, these employees could then be other persons with duties because of the duties contained in their contract of employment.

1.49 The sub-sections above outline some of the main requirements of the Fire Safety Order. Further sections of this guide will explain how you might meet these requirements.

Enforcement of the Fire Safety Order

1.50 The local fire and rescue authority will enforce the Fire Safety Order in most premises. The exceptions are:

- Crown-occupied/owned premises, prisons and certain other premises for lawful detention and premises for which the United Kingdom Atomic Energy Authority is the responsible person, where the Crown Premises Fire Safety Inspectorate will enforce
- The enforcement within the armed Forces/Ministry of Defence is the Defence Fire Safety Regulator (DFSR) and not the Defence Fire and Rescue Service.
- certain specialist premises including construction sites and ships (under repair or construction), where the Health and Safety Executive will enforce
- certain nuclear installations, where The Office for Nuclear Regulation will enforce

- sports grounds and stands designated as needing a safety certificate from the local authority, where the local authority will enforce

1.51 The enforcing authority has the power to inspect premises to check for compliance with the Fire Safety Order. They will look for evidence that a suitable and sufficient fire risk assessment has been carried out and acted upon.

1.52 If the enforcing authority is dissatisfied with the outcome of the fire risk assessment or the actions taken to address the findings of the fire risk assessment, they may issue an enforcement notice that requires certain improvements or, in extreme cases, a prohibition notice that restricts the use of all or part of the premises until improvements are made.

1.53 In the case of minor deficiencies in fire safety, the enforcing authority may issue a non-statutory notice, advising of breaches of the Fire Safety Order and broad actions which should be taken to rectify them. A non‑statutory notice is advisory and is not legally enforceable; however, failure to address the matters raised may lead to statutory enforcement (such as an enforcement notice).

1.54 If premises are considered by the enforcing authority to be, or have potential to be, high risk, albeit that they currently comply with the Fire Safety Order, the enforcing authority may issue an alterations notice, that requires that the enforcing authority be informed before any changes are made to the premises or the way they are used.

1.55 Failure to comply with any statutory notice issued by the enforcing authority is an offence. There is a right of appeal to a magistrates' court against any notice issued. Where the RP agrees that there is a need for improvements to fire precautions, but disagrees with the enforcing authority on the technical solution proposed (for example, what modifications are required to means of escape), the RP and the enforcing authority may agree to refer this for an independent determination by the Secretary of State.

1.56 Further information on enforcement of the Fire Safety Order, and on sanctions for non-compliance (such as prosecution), can be found at www.gov.uk/government/publications/fire-safety-order-enforcement-and-sanctions-for-non-compliance.

The secure information box must contain certain information and building plans specified in the Regulations

- Building plans, as specified in the Regulations, must be provided to the fire and rescue service
- Information on external wall construction must be provided to the fire and rescue service
- Lifts and other specified essential fire-fighting equipment must be subject to simple monthly checks; records of these checks must be kept and be available to residents

- Faults in the above equipment must be notified to the fire and rescue service if it is anticipated that they will not be repaired within 24 hours; the fire and rescue service must then be notified when the fault is repaired

Building Safety Act 2022

1.57 The Building Safety Act 2022 is generally outside the scope of this guide. Guidance on the Act and subsidiary Regulations made under the Act can be found on the gov.uk website at Check your fire safety responsibilities under Section 156 of the Building Safety Act 2022 - GOV.UK (www.gov.uk)

1.58 For the purpose of this guide, it should be noted that Section 156 of the Building Safety Act amended various articles of the Fire Safety Order. These amendments have been taken into account in this guide.

1.59 It should also be noted that, in high-rise blocks of flats (defined as above), the Building Safety Act imposes duties on the "*Accountable Person*" ("AP"), who is the individual or organisation that owns, or has a legal obligation to repair, common parts of the building. In some cases, the AP and the RP will be the same person.

1.60 If the building has more than one AP, the AP responsible for the structure and exterior of the building is known as the "*Principal Accountable Person*" ("PAP"). If a building has a single AP, that AP is also the PAP.

1.61 The duties of the AP and PAP are outside the scope of this guide. However, it should be noted that Article 22B of the Fire Safety Order requires that the RP must take such steps as are reasonably practicable to ascertain whether there are one or more APs in relation to the premises, in which case the RP must cooperate with each AP for the purpose of the AP carrying out their duties under the Building Safety Act.

Summary of Points in Section 1:

- New building work that involves constructing, extending or materially altering an existing building or materially changing the use of an existing building is subject to approval under the Building Regulations or, in the case of a high-risk residential building, the Building Safety Regulator.
- After a building is handed over, virtually all buildings (the main exception being private dwellings) fall within the scope of the Fire Safety Order.
- The Fire Safety Order requires the provision of adequate general fire precautions (as defined in the Order). The appropriate general fire precautions are determined by carrying out a "*fire risk assessment*".

- The person with duties who is required to comply with the Fire Safety Order is the "*responsible person*" ("RP"). In a workplace, the RP is the employer; this is most commonly a company or organisation, rather than a living person.

- However, duties imposed on the RP are also imposed on other persons with duties, comprising any person who, under a contract or tenancy, has responsibility for maintenance or repair of the premises, or of anything in or on the premises, or the safety of the premises. This can include, for example, freeholders, managing agents, facilities management companies, maintenance contractors and fire risk assessors; in some circumstances it can include managers, according to their contract of employment

- For most premises, enforcement of the Fire Safety Order is the responsibility of the local fire and rescue authority (but other enforcing authorities enforce the Fire Safety Order in Crown and certain specialist premises, for example, construction sites, sports grounds and nuclear establishments)

- The enforcing authority is empowered to issue certain notices to persons with duties who are considered to be in breach of the Fire Safety Order

- The Building Safety Act imposes duties on the "*accountable person*" ("AP"). The Fire Safety Order requires the RP to cooperate with the AP(s) to enable the AP to carry out their duties under the Building Safety Act

2. Fire Risk Assessment

2.1 The suitable and sufficient fire risk assessment required by the Fire Safety Order will help to ensure that fire prevention measures, fire protection measures and appropriate managerial arrangements in relation to fire safety are all in place and working properly. The fire risk assessment should identify any issues that need attention.

What is a fire risk assessment

2.2 A fire risk assessment is an organised and methodical look at the premises, the activities carried on there and the likelihood that a fire could start and cause harm to those in and around the premises.

2.3 The aims of the fire risk assessment are:

- to identify the fire hazards (the things that might cause a fire)
- to reduce the likelihood of fire
- to decide what physical fire safety measures and management arrangements are necessary to ensure the safety of people in the premises if a fire does start

2.4 The Fire Safety Order requires that the physical fire safety measures, to which the Fire Safety Order makes reference, are provided "*where necessary*". This is an important qualification, as the intent is that those fire safety measures, provided for life safety, are proportionate to the risk to life from fire.

2.5 Most of the fire safety measures referenced in the Fire Safety Order are likely, in most circumstances, to be "*necessary*", at least to some extent. However, there will be some circumstances in which the fire risk assessment determines that there is no necessity for a particular fire safety measure.

2.6 The terms 'hazard' and 'risk' are used throughout this guide and it is important to have a clear understanding of how these should be used.

- a fire hazard is a source, situation or an unsafe act that could give rise to a fire (such as an ignition source, accumulation of waste that could be subject to ignition, or the act of disposing of a lit cigarette close to combustible materials)
- fire risk has 2 components; it is the combination of the likelihood of fire occurring and the likely consequences of a fire. In the context of the Fire Safety Order, the consequences that must be considered relate to injury to people; damage to property and interruption to the operation of a business (such as the result of destruction of a data centre by fire) are outside the scope of the Fire Safety Order

Context of a fire risk assessment

2.7 A fire risk assessment helps to determine the likelihood of a fire starting and the dangers that the fire then presents for people in the building and people in the immediate vicinity of the building.

2.8 The findings of the fire risk assessment are based on the information available to the fire risk assessor, and on the observations of the fire risk assessor, at the time the fire risk assessment is carried out.

2.9 However where a fire risk assessor believes that there may be a significant risk that requires further investigation, they may recommend that such an investigation is undertaken. The fact that a particular deficiency in some fire safety measure is not identified in a fire risk assessment does not mean that no such deficiencies exist, nor does it mean that the fire risk assessment is not suitable and sufficient, unless the deficiency is of a serious nature and could readily be identified. Normally, the fire risk assessment will not involve intrusive inspection (such as cutting or opening up of construction).

2.10 Moreover, a fire risk assessment cannot identify all potential defects in existing buildings. It is undoubtedly the case that a fire may reveal hidden shortcomings that could not reasonably be identified by a fire risk assessment.

2.11 The occurrence of a serious fire, and even injury to people in the event of fire, is not *in itself* evidence that the fire risk assessment for the premises was not suitable and sufficient, though such incidents will normally result in an investigation of the fire risk assessment.

2.12 It is also important to understand what a fire risk assessment is not. For example, PAS 79, the relevant British Standards Institution code of practice for fire risk assessments, advises that a fire risk assessment is **not** any of the following:

- a full audit of areas of the building that are not readily accessible or visually obvious (such as ceiling voids, roof voids, service risers and external wall construction), though a sample inspection of such areas is normally appropriate, particularly if the evacuation strategy is predicated on a high standard of compartmentation (for example, in the case of progressive horizontal evacuation in a care home)
- a means for verifying compliance with current building regulations
- a disabled access audit
- a means for identifying latent defects in construction or compartmentation
- a means for verifying that the fire resistance of structural elements of the building is adequate

- an examination of the potential for structural collapse of the building in the event of fire
- a fire strategy report (which is a report, normally prepared at the design stage of a building, though it can be prepared retrospectively, setting out the measures proposed, or present, to satisfy specified fire safety objectives, typically comprising means for satisfying the functional requirements of building regulations)
- a pre-occupation fire safety assessment (which is a process of identifying fire precautions in a newly constructed or refurbished building, taking into account the approved fire strategy, and deciding whether or not the new or refurbished premises are likely to be fit for occupation)
- a means for snagging of new construction
- a guide to legislation for the RP
- a fire risk appraisal and assessment of external wall construction and cladding

Carrying out a fire risk assessment

2.13 The assessment method suggested in this guide shares the same approach as that used in general health and safety legislation.

2.14 Anyone carrying out a fire risk assessment for premises other than the very small premises, for which alternative guidance was set out on page 2, needs to be fully familiar with all the principles set out in this guide. They should also understand the more detailed guidance in the sector-specific guide for the premises in question.

2.15 Carrying out a fire risk assessment does not only involve a thorough inspection of the premises (though, of course, that is essential). The RP will need to provide a substantial amount of relevant information and provide sight of relevant documentation (ideally before beginning an inspection of the premises).

2.16 The relevant information provided to the fire risk assessor will depend, to some extent, on the nature of the premises, but is likely to comprise much, or all, of the following (if known):

Building factors

- the RP(s) for the premises (and, in the case of a high-risk residential building, the AP(s), if different from the RP(s))
- basic information regarding the construction of the building, including, where relevant, external walls
- the height of the building and any basement present
- the activities and processes carried out in the premises, and any significant changes that occur according to the time of day

- normal hours of work (or occupation, if different)

Occupancy

- approximate number of occupants, including any variation according to the time of day
- a breakdown of the number of occupants into number of staff, number of members of the public or other persons who are unfamiliar with the premises. Where staff will be required to assist with evacuation of occupants (for example, in a residential care home), it is important to establish the minimum number of staff available (like during the night) and the number of residents that staff will be required to evacuate (at least in the first phase of an evacuation)
- the gross floor area of the premises, or area of a typical floor of the premises
- in the case of non-domestic premises in multiple occupation, the nature of the other occupancies, and any special fire hazards associated with their activities
- occupants especially at risk in the event of fire (such as sleeping occupants, occupants with disabilities, including relevant hidden disabilities, persons working in remote areas and young persons under the age of 18)

Incidents and history

- any fires, or near misses, that have occurred in recent years, and any actions taken as a result of these
- any false alarms that have occurred and their causes
- any further relevant information that has a bearing on fire risk or the validity of the fire risk assessment
- details of any notices issued by the enforcing authority that remain in force, particularly enforcement, alterations or prohibition notices
- action taken in relation to the previous fire risk assessment (if any)

Measures to prevent fires

- control over ignition sources

Fire protection measures

- arrangements for means of escape and measures to assist with escape
- arrangements to give warning in event of fire
- fire-fighting equipment
- any special measures to protect people in the event of fire (such as smoke control or automatic fire suppression systems)

Management arrangements and procedures

- the identity of the competent person(s) appointed by the RP to assist in undertaking the fire safety measures required for compliance with the Fire Safety Order
- management structure
- policies relevant to prevention of fire, such as policies regarding smoking, hot work (involving cutting, welding, use of blowlamps, and similar measures)
- control over combustible and waste materials
- the evacuation strategy for the building (or various parts of the building) (such as simultaneous evacuation, progressive horizontal evacuation, phased evacuation or “stay put”, which will commonly be the strategy in a purpose-built block of flats)
- all fire assembly points
- other aspects of the fire procedures for the premises including, where relevant, personal emergency evacuation plans (“PEEPs”) for disabled employees and generic emergency evacuation plans (“GEEPs”) for disabled visitors
- any security arrangements, relevant to prevention of arson
- arrangements for training employees in fire safety and their specific roles and responsibilities in the event of fire
- arrangements for carrying out fire drills
- identity of persons nominated to respond to fire, including plans for use of portable fire extinguishers and for assisting with evacuation (such as fire wardens or persons nominated to assist with the evacuation of disabled people)
- arrangements for summoning the fire and rescue service in the event of fire
- arrangements for meeting, and liaising with, the fire and rescue service on their arrival in the event of fire
- arrangements for inspection, testing and maintenance of fire protection equipment and systems (such as fire extinguishers, the fire alarm system, emergency escape lighting, any smoke control systems, any fire suppression systems, any fire dampers within ventilation systems, and similar measures)
- any relevant reports in relation to maintenance of the above systems
- arrangements for inspection, testing and maintenance of other equipment and installations (such as portable electrical appliances, the electrical installation in the building, gas and heating installations, any kitchen extract ductwork, any lightning protection system, and similar measures)
- arrangements for routine, in-house inspections (for example, checks of fire doors and fire protection equipment)

- any third parties (such as a catering contractor operating a staff restaurant), with whom it is necessary to coordinate fire precautions
- keeping of relevant records (such as of staff training, fire drills, relevant testing and maintenance, and similar measures). According to the extent of the fire risk assessor's existing knowledge of policies and procedures, the fire risk assessor may wish to have sight of some, or all, of these records.

2.17 Where there is a fire strategy report for the premises, either produced at the time of the original construction or prepared retrospectively, (or relevant fire safety information provided to the RP under Regulation 38 of the Building Regulations), this must be made available to the fire risk assessor. However, a fire risk assessment can still be carried out in the absence of a fire strategy, and it is not necessary that one should be prepared before a fire risk assessment can be conducted.

2.18 Furthermore, by consulting a fire strategy report, a fire risk assessor is not accepting any responsibility for decisions made in a fire strategy report by others. For example, development of the fire strategy may have involved calculations (such as regarding smoke production or structural fire resistance); it would normally be necessary for a fire risk assessor to accept such calculations at face value.

2.19 In the absence of a fire strategy, a competent fire risk assessor should be able to make reasonable assumptions as to the basis of the fire safety design and the evacuation strategy, even if it is necessary to highlight any areas of uncertainty in this regard.

2.20 In carrying out the inspection of the building, the fire risk assessor will need to be given access to all areas of the building, including locked plant rooms and service risers, accessible roof voids, and similar measures. It is the responsibility of the relevant person with duties to provide this for the fire risk assessor. The fire risk assessment will need to record any significant areas into which access was not possible, with reasons where relevant, so that they can be subject to subsequent inspection.

2.21 It is important that the fire risk assessment is carried out in a practical and systematic way and that enough time is allocated to carry out the assessment properly. The Fire Safety Order requires that, for this purpose, there is cooperation between the relevant person with duties and anyone appointed to carry out the fire risk assessment.

2.22 However, the person engaged to carry out the fire risk assessment on behalf of the person with duties relies on the person to afford such cooperation, as, ultimately, the person with duties is responsible for ensuring that the fire risk assessment is suitable and sufficient.

2.23 If the premises have been subject to a fire risk appraisal of external wall construction ("an FRAEW"), it is likely that this would need to be carried out by a specialist, as this is beyond the skills of a typical fire risk assessor. However, the fire risk assessor will need to consider external

wall construction and determine whether an FRAEW is required (if this has not already been carried out). The findings of the FRAEW will then need to be taken into account in the fire risk assessment.

2.24 Carrying out a fire risk assessment is not a “one off” exercise. The fire risk assessment must be reviewed regularly so as to keep it up to date. It must also be reviewed if there is reason to suspect that it is no longer valid (such as after occurrence of a fire) or if there has been a significant change in the matters to which the fire risk assessment relates (for example, following a refurbishment of the premises or part of the premises).

Figure 1 shows the 5 steps that need to be taken in a fire risk assessment.

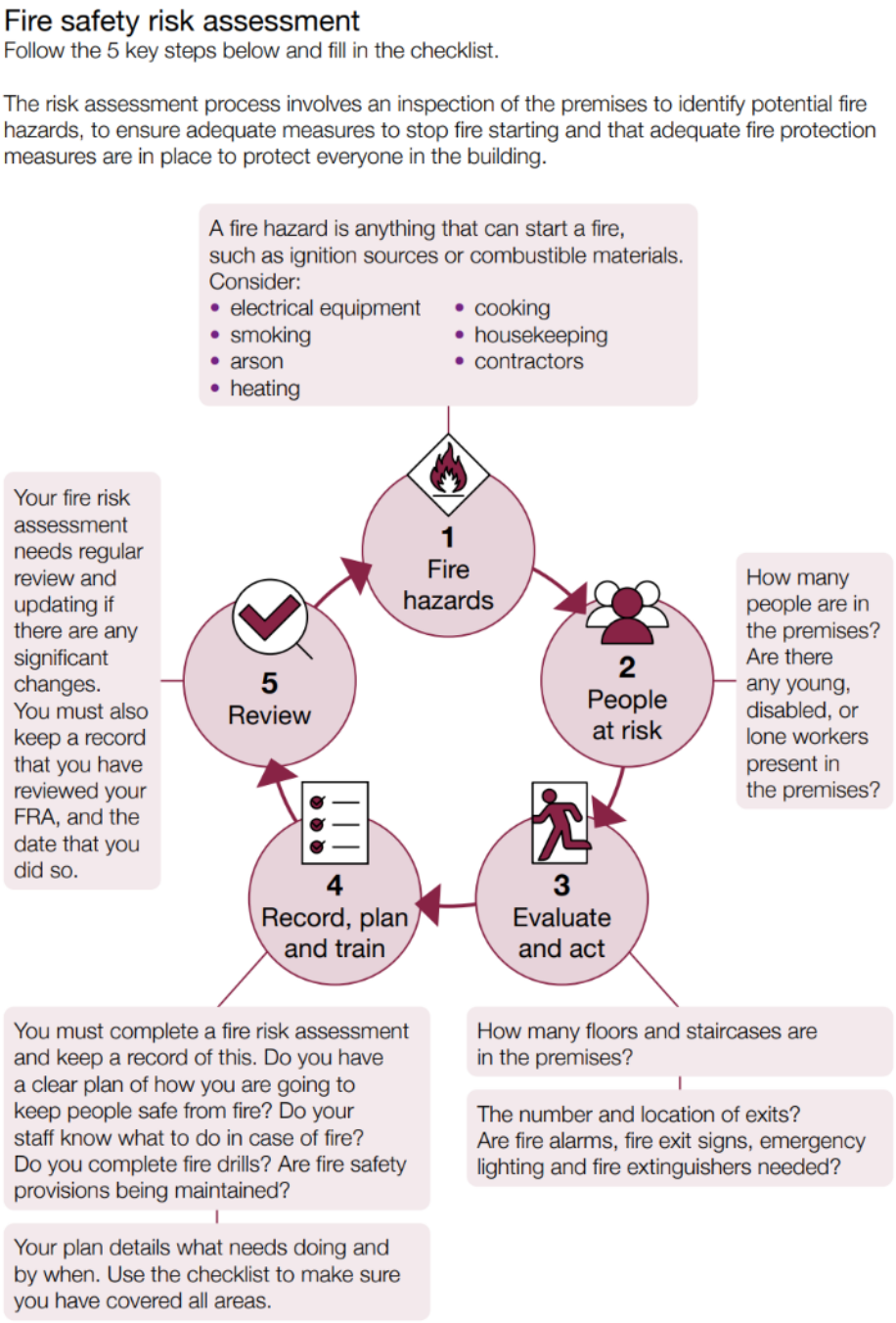

Figure 1: The 5 steps of a fire risk assessment

DRAFT – Not government policy

The 5 steps to fire risk assessment: Checklist

1 Fire hazards

- Have you found anything that could start a fire?
- Have you found anything that could burn?
- How could a fire start?
- Think about heaters, lighting, electrical equipment and hot works
- Have you considered smoking and the use of matches?
- Hot processes, welding and grinding should also be taken into account

2 People at risk

- Everyone is potentially at risk from fire
- Think about night staff or people not familiar with the premises, such as visitors or customers
- Children, the elderly or disabled people are especially vulnerable
- Who could be at risk?
- Who could be especially at risk?

3 Evaluate and act

- Have you assessed the risks in the workplace?
- Do you have enough escape routes?
- Have you planned escape routes?
- Have you made sure people will be able to safely find their way out, even at night?
- Is a fire alarm system needed?
- Are signs, such as fire exit signs, needed?
- Is emergency lighting required?
- Are fire extinguishers needed and, if so, where should they be located?
- Have you kept sources of ignition away from fuel sources?
- Have you made sure that everyone is safe in case of fire?
- Do you have a fire safety plan?
- Who will call the fire and rescue service?
- Could you put out a small fire and stop it spreading?

4 Record, plan and train

- Have you planned what everyone will do if there is a fire?
- Do all your staff know the plan?
- Have staff had up-to-date training and completed a fire drill?
- Have you included temporary staff?
- Are you maintaining everything that is provided or required to keep people safe from fire?
- Formulate your action plan to reduce the fire hazards. The plan is an inventory of actions, normally prioritised and time constrained to devise, maintain or improve controls. Remember, where appropriate, this can be eliminating or controlling hazards (e.g. better separation of combustible materials from ignition sources)

5 Review

- Keep your assessment under regular review. Remember to update it as risks or hazards change. If you make any significant changes, you should review your risk assessment. Have you made any changes to the building since the last assessment?
- Have you had a fire or a near miss?
- Have stock levels changed significantly?
- Have you started to store chemicals or dangerous substances?

Competence of fire risk assessors

2.25 It will be a legal requirement that the person appointed by the RP to carry out a fire risk assessment (who will, commonly, be a specialist in fire safety engaged for this purpose) must be competent (when this is brought into force which is not the case at publication). A competent fire risk assessor will have sufficient training and experience, or knowledge and

other qualities, to enable them to produce a suitable and sufficient fire risk assessment.

2.26 Other than for the very small premises for which the alternative guides set out on page 2 might enable a person with duties , for example, the owner of a small shop (see “Fire Safety in Small Non-domestic Premises”), to carry out a very simple fire risk assessment, persons with duties are advised against attempting to carry out their own fire risk assessments, rather than engaging outside specialists, unless there are competent specialists within their organisation (such as competent in-house fire risk assessors).

2.27 Use of competent fire risk assessors (whether in-house within the organisation or external to the organisation) can be demonstrated by use of fire risk assessors whose competence has been independently verified.

2.28 Verification would comprise appropriate registration by a professional body (like the Institute of Fire Safety Managers, the Institution of Fire Engineers) or certification by a third-party certification body that is accredited for such certification by the United Kingdom Accreditation Service (“UKAS”). The alternative is to use a company (which may be a sole trader) that is third-party certificated as competent to have fire risk assessors it employs carry out fire risk assessments by a UKAS-accredited certification body.

2.29 This does not mean that fire risk assessors who are not registered by a professional body or certificated by a certification body are lacking in competence. However, independent verification of competence provides confidence for persons with duties that the fire risk assessment carried out is likely to be suitable and sufficient.

2.30 Use of such fire risk assessors or fire risk assessment companies is also a potential means of demonstrating due diligence in compliance with the law. This can be important in the event that criminal proceedings are brought against the person with duties under the Fire Safety Order, alleging that the fire risk assessment carried out by specialists is not suitable and sufficient.

2.31 In general, therefore, it is recommended that, in selecting specialists to carry out a fire risk assessment, preference is given to those whose competence has been demonstrated as described above. This is particularly the case if the premises in question are, for any reason, considered to be high risk or complex in terms of safety of life from fire (such as particularly a residential care home or supported housing, but also certain large public assembly buildings, hospitals, and similar measures).

2.32 A list of some of those persons and companies who have been registered by a professional body or certificated by a UKAS-accredited certification body to carry out fire risk assessments can be found on the Fire Sector

Federation website at https://www.firesectorfederation.co.uk/fire-risk-assessment/fire-risk-assesment-directory/

2.33 When appointing an external fire risk assessor, persons with duties should take care to confirm not only the competence of the fire risk assessor, but that their experience in carrying out fire risk assessments extends to the type of premises in question. For example, a fire risk assessor might have substantial experience in carrying out fire risk assessments for offices and shops but might have no experience of carrying out a fire risk assessment for a residential care home or hospital.

Fire risk assessments of premises that do not conform to current standards

2.34 The design of premises and its fire precautions, for which a fire risk assessment is to be carried out, may not conform to current standards for new buildings (such as for compliance with current building regulations) or the sector-specific guides in this suite of guidance documents.

2.35 For example, there might have been significant changes to guidance on means of escape since the premises were constructed; an example of this would be escape routes through a neighbouring building in different ownership, which would not be acceptable under current guidance for new buildings, but was acceptable in the past.

2.36 Similarly, there might have been major changes in guidance on the design of fire alarm systems. For example, from 2013 onwards, the relevant British Standard for fire detection and alarm systems has recommended that the fire alarm system in a residential care home (other than certain small care homes) should be “addressable”, so that, when a smoke detector operates in a bedroom, the exact location of the detector is displayed at the fire alarm control and indicating equipment, rather than simply indicating the zone (such as storey) on which the detector is located, as would be the case in a non-addressable system.

2.37 It is not necessarily the case that failure to comply with current guidance results in an unsafe building, so necessitating upgrading of fire safety measures to current standards. In some cases, upgrading to current standards would not just fail to meet the test of reasonable practicability, it might be architecturally impossible.

2.38 A fire risk assessor will, often, be required to make a judgement as to whether departures from current guidance results in sufficient fire risk to warrant upgrading of fire precautions to current standards. While this normally involves subjective judgements, a departure from current guidance is not, alone, sufficient justification for upgrading fire safety measures; the judgement needs to proportionately balance cost and effort on the one hand with risk on the other hand.

2.39 Figure 2 is intended to assist in a logical approach to fire risk assessment in the case of older premises, constructed before current standards applied.

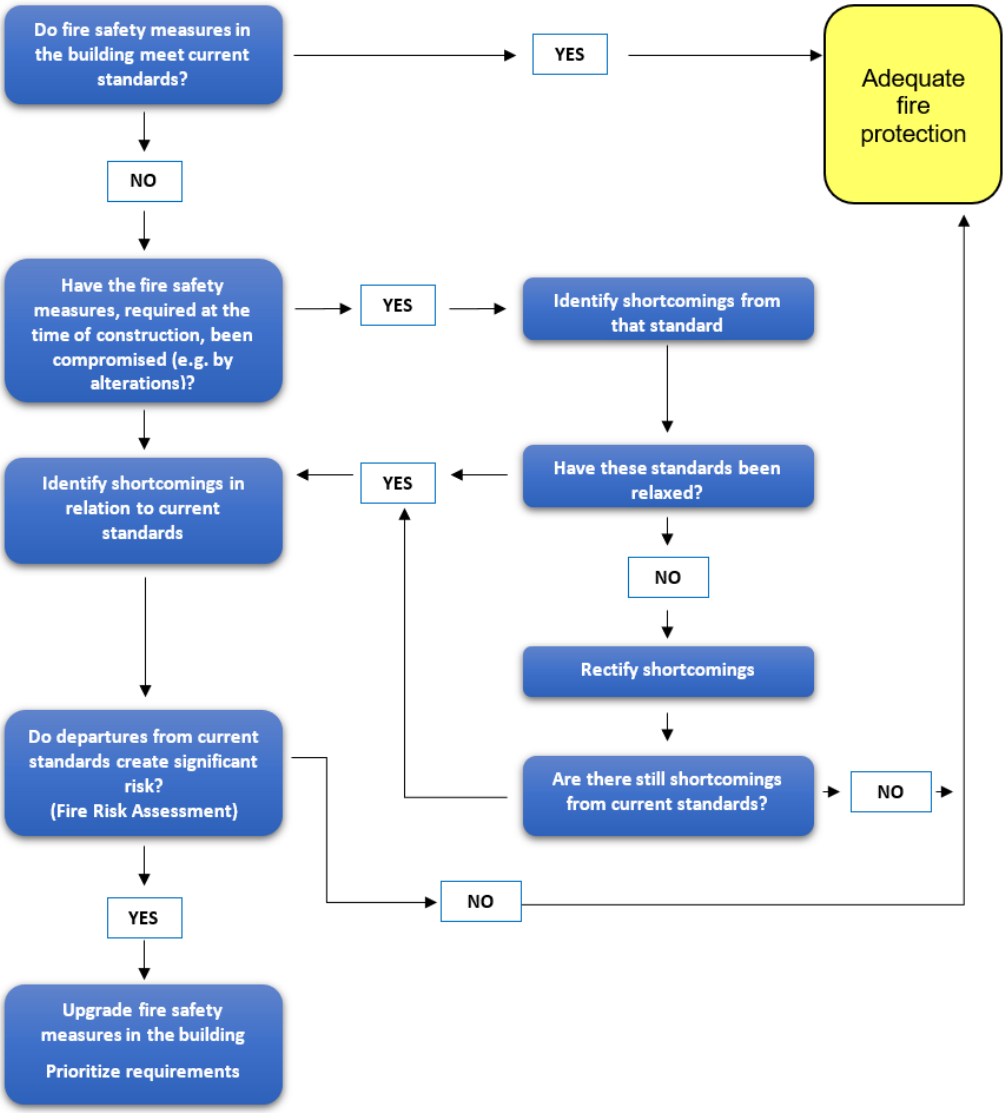

Figure 2: Decision tree for assessing the adequacy of fire safety measures in an existing building

2.40 The first step is to determine whether the fire safety measures satisfy the standards that were applicable at the time of construction; it might be the case that alterations to the premises have undermined these original standardsIn such cases, it will, at least, normally be appropriate to restore the fire safety measures to those originally provided, unless (unusually), there has been a relaxation in guidance on the measures in question.

2.41 The next step is to consider whether remediation of departures from the original standards result, fortuitously, in compliance with current standards. If this is not the case, a judgment will need to be made as to whether departures from current standards result in unacceptable risk.

2.42 : For example, in a hotel, to meet current standards, it is necessary for a fire detector and fire alarm sounder to be installed in every bedroom. An old hotel that might have satisfied the then current legislation 20 years or

more ago might have no fire detectors or sounders in bedrooms. Today, this would be regarded as high risk, and a suitable and sufficient fire risk assessment would, inevitably, recommend upgrading of the fire detection system, as an urgent priority. On the other hand, a very old emergency escape lighting system might not produce sufficient illumination to satisfy current standards. The fire risk assessment might determine that, in the circumstances of the case, the emergency escape lighting could remain acceptable until the existing system is due for replacement.

2.43 In making judgements, all the circumstances of the case need to be taken into account. For example, in the case of a care home for partially sighted people, it might be appropriate to upgrade an old emergency escape lighting system to meet the current standards of illumination.

2.44 A common area for debate and the need for careful consideration relates to the fitting of intumescent strips and smoke seals to fire-resisting doors (or their frames) that were manufactured or installed before the strips and seals were considered necessary. (The role of these components in the performance of a fire door is discussed in a later section of this guide.)

2.45 Again, extremes exist, requiring competent judgement on reasonable practicability for all cases between these extremes. In a care home in which it is known that evacuation of residents via escape corridors will take a prolonged period of time, the retrofitting of these strips and seals to bedroom doors could be one of several possible mitigating measures.

2.46 However, in cellular office premises with extensive automatic fire detection, fitting of intumescent strips and smoke seals to the doors of stairways is likely to be regarded by the fire risk assessor, in many circumstances, as unnecessary. Sometimes, where upgrading is not reasonably practicable, it is appropriate to acknowledge the departure from current standards, so that, at some future time (such as when refurbishment takes place), the current standard can be adopted.

2.47 Persons with duties should challenge recommendations by a fire risk assessor (or requirements of an enforcing authority), if they appear to be generic recommendations that are not supported by justified concern that there are material deficiencies in fire safety.

2.48 For example, a generic recommendation by a fire risk assessor in all fire risk assessments that any fire doors that do not satisfy the current standard test for 30 minutes' fire resistance (and, possibly, are not certificated as such) must be upgraded (such as by retrofitting intumescent strips) or replaced is unlikely to be proportionate to the fire risk in every building. To avoid any doubt, there will be instances where it will be appropriate to replace doors. However, recommendations for replacement should only be based on a judgement that, in the circumstances of the premises, the condition of the door is such as to afford inadequate fire resistance.

Case study

An example, involving a dispute between a person with duties and a fire and rescue authority, which was subject to a determination by the Secretary of State, makes clear the need for proportionality between risk and cost. The premises in question comprised a hotel, in which some bedrooms were fitted with modern fire doors, incorporating intumescent strips and smoke seals, while bedroom doors in the original, older part of the hotel, were not fitted with these components and so would not achieve a fire resistance of 30 minutes (as would be required for a new hotel).

The enforcing authority had issued an enforcement notice requiring upgrading of these older bedroom doors, on the basis of their assessment of means of escape, using the government sector-specific guide for premises in which people sleep.

The Secretary of State determined, on the basis of advice from the government's Chief Fire and Rescue Adviser, that there was no evidence to suggest that the margin of risk reduction that would be afforded by the fitting of intumescent strips and smoke seals to the older bedroom doors would be justified, given the potential expense involved. In this connection, the Chief Fire and Rescue Adviser noted that government guidance should be applied flexibly and that the level of fire protection should be proportionate to the risk posed to the safety of people.

The Chief Fire and Rescue Adviser considered that the RP had provided a suitable explanation to demonstrate that, even though the doors differed from the government's relevant sector-specific guide at the time, the lack of intumescent strips and smoke seals did not place relevant persons at risk.

However, it was considered that the fire risk assessment for the premises was not suitable and sufficient, as the matter in question was not properly explained in the fire risk assessment. Accordingly, it was required that a new fire risk assessment should be prepared, in which the absence of intumescent strips and smoke seals should be recorded and justified.

The full text of the determination can be found at https://www.gov.uk/guidance/determinations-under-the-fire-safety-order.

2.49 On the other hand, from another determination by the Secretary of State, it is clear that the extent to which fire safety measures differ from recognised practice and guidance must have limits, though still striking a balance between risk on the one hand and cost and inconvenience on the other.

Case study

That case involved a Grade I listed building used as a hotel. It was common ground between the RP and the enforcing authority that 6 bedroom doors would not offer more than around 10 minutes' fire resistance, and that the doors were not fitted with self-closing devices. The RP argued that upgrading the doors, as required by an enforcement notice, was unnecessary and would require onerous alterations to the fabric of the building.

On the advice of the Chief Fire and Rescue Adviser, the Secretary of State noted that the doors in question were of poor fit in their frames, with uneven gaps between the doors and the frames. It was considered that, even if self-closing devices were fitted, the doors could not be relied upon to prevent smoke spread from a fire in a bedroom to the adjacent corridor. Accordingly, it was considered that the measures specified in the enforcement notice were commensurate with the risk.

The full text of the determination can be found at: https://www.gov.uk/guidance/determinations-under-the-fire-safety-order.

2.50 Determinations are specific to the case in question. However, the above determinations are useful examples of how fire risk assessments should be applied.

Measures associated with work processes and dangerous substances

2.51 As discussed in Section 1, special, technical and organisational measures associated with work processes are outside the scope of the Fire Safety Order, and hence the fire risk assessment. These are matters for the risk assessment carried out under the Dangerous Substances and Explosive Atmospheres Regulations. However, the fire risk assessment under the Fire Safety Order should confirm that such a risk assessment has been carried out, albeit that the fire risk assessor would not be expected to review that fire risk assessment (and commonly would not be competent to do so).

2.52 In addition, the fire risk assessment will need to consider the effect of the dangerous substances on the general fire precautions, such as procedures in the event of a fire involving the dangerous substances, relevant signage in the area in question, suitable housekeeping in that area, and similar measures.

Summary of Points in Section 2:

- A fire risk assessment is required by legislation. Its purpose is to evaluate the risk to people from fire.
- The fire risk assessment will consider the fire hazards (things that might cause a fire to start), and the fire risk by evaluating the likelihood of fire starting and the consequences to people if it does.
- The fire risk assessment enables the person with duties to determine the general fire precautions required for compliance with the Fire Safety Order.
- The fire risk assessor will need to be provided with substantial, relevant, information by the person with duties, as well as carrying out a thorough inspection of the premises, including locked rooms and (at least by sampling) service risers, accessible roof voids, and similar measures.

- However, a fire risk assessment cannot identify all latent defects in existing fire safety measures, nor does a failure to identify every deficiency mean that the fire risk assessment is not suitable and sufficient to satisfy the Fire Safety Order.

- The fire risk assessment must be carried out by a competent person. Use of individual fire risk assessors who are registered or certificated as competent, or, alternatively, use of fire risk assessment companies (including sole traders) with third-party certification, provides confidence to persons with duties as to the competence of those carrying out the fire risk assessment.

- However, the responsibility for the adequacy of the fire risk assessment rests with the person with duties.

- Fire risk assessments must be reviewed regularly and when circumstances change.

3. Behaviour Of Fire In Buildings

3.1 For a fire to start, 3 things are needed:

- heat (in the form of an ignition source)
- fuel (the combustible material ignited) and
- oxygen (which makes up 21% of air)

This is often described as "*the fire triangle*".

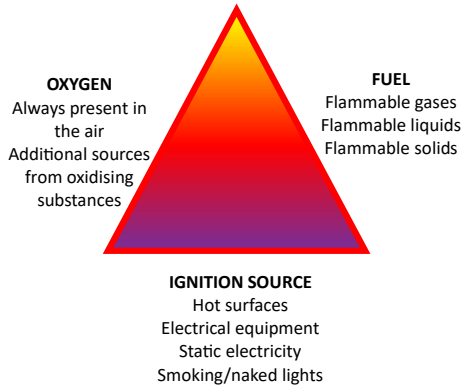

Figure 3: The Fire Triangle

3.2 If any one of these is missing, a fire cannot startTaking measures to avoid the 3 coming together will therefore reduce the chances of a fire occurring.

3.3 This model of ignition, while simple, is a satisfactory explanation for the mechanism by which most common fire extinguishing agents extinguish a fire.

3.4 For example, a carbon dioxide fire extinguisher extinguishes a fire by reducing the oxygen content around the fire. A water-based fire extinguisher cools the fuel, so that it can no longer feed the fire.

3.5 Sources of ignition are, in effect, possible sources of heat which could get hot enough to ignite materials found in the premises. Ignition sources include electrical faults, cooking equipment, smokers' materials, naked flames, hot surfaces, chemical reactions (such as spontaneous combustion as a result of self-heating) or deliberate action (arson).

3.6 Anything that burns is fuel for a fire. This includes furniture and furnishings, packaging materials, stationery, paints, thinners and adhesives, waste products and flammable gases (such as liquefied petroleum gas ("LPG")).

3.7 Complete removal of all potential fuel sources is often impracticable, other than in defined areas, such as escape stairways. However, as discussed in Section 5, measures such as removal of waste, security of flammable liquids storage and the avoidance of unnecessary storage of combustible materials all contribute to the prevention of fire.

3.8 The main source of oxygen for a fire is the air around us. Oxygen to feed a fire comes from natural airflow through doors, windows and other openings, or mechanical air-handling systems. Where flow of air can be stopped (such as by automatically stopping air conditioning in the event of detection of fire), this may assist in slowing the development of a fire.

3.9 After a fire starts, the subsequent development of the fire can be rapid, doubling in size every few minutes. This rapidity of growth is beyond the common experience of most people, as it contrasts sharply with the more commonly experienced, sedate behaviour of a fire in the open (such as a garden bonfire).

3.10 In non-domestic premises, this inability to anticipate the rate of development of a fire in a building has proved to be a major factor in certain multiple-fatality fires, involving members of the public, who failed to appreciate the need for immediate evacuation and died as a result. It is important to explain this behaviour of fire in training of staff; staff training is covered in Section 19 of this guide.

3.11 Fire develops by the transfer of heat by conduction, convection, radiation and through direct burning. Conduction can occur through a poorly insulating element of construction, such as a metal fire shutter. So, for example, where a large warehouse is sub-divided by fire-resisting walls, it is important that combustible materials, such as stock in the warehouse, are not placed close to any uninsulated metal fire shutters that protect openings in the fire-resisting wall.

3.12 Similarly, in some critical situations, fire-resisting glass in partitions enclosing escape routes must provide insulation, as well as preventing spread of fire and smoke, so that people passing along the escape route are not exposed to heat radiated through the glass.

3.13 After ignition, smoke and hot gases from the fire rise vertically by convection. As they rise, air is drawn into the rising plume, so that the volume of smoke and gases increases as the plume rises. When the smoke reaches the ceiling, it spreads out in all directions, forming a rapidly deepening layer below the ceiling. (See Figure 4)

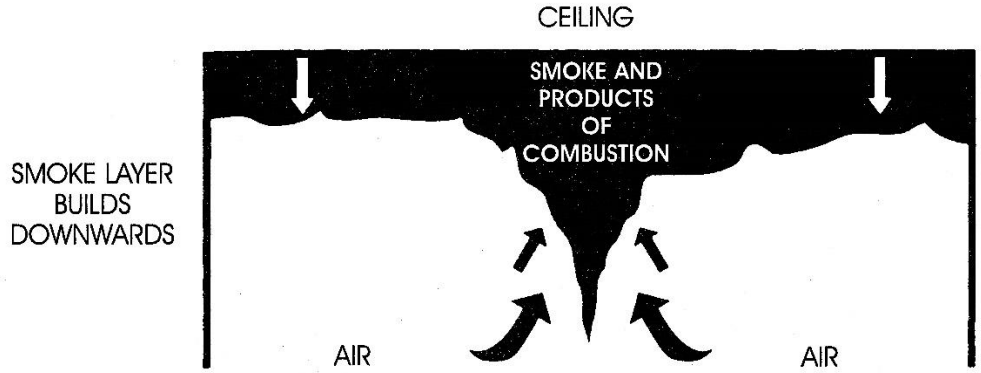

Figure 4: Build-up of smoke layer
(Reproduced with the permission of British Standards Institution[1])

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3.14 As a fire grows, the flames will reach the ceiling; in the case of ceilings of typical height (such as around 3 metres), this can happen quite quickly. The flames are then deflected horizontally, so that there is strong radiated heat downwards over a large area of the space. When this occurs, materials over a large area will reach a temperature at which all combustible materials in the space burst into flames simultaneously.

3.15 This is a stage of a fire known as "*flashover*". In a room of limited size, such as a bedroom or cellular office, flashover can be reached in a few minutes. Escape from a space in which there is a fire needs to be made well before flashover if people are to survive. (See Figure 5)

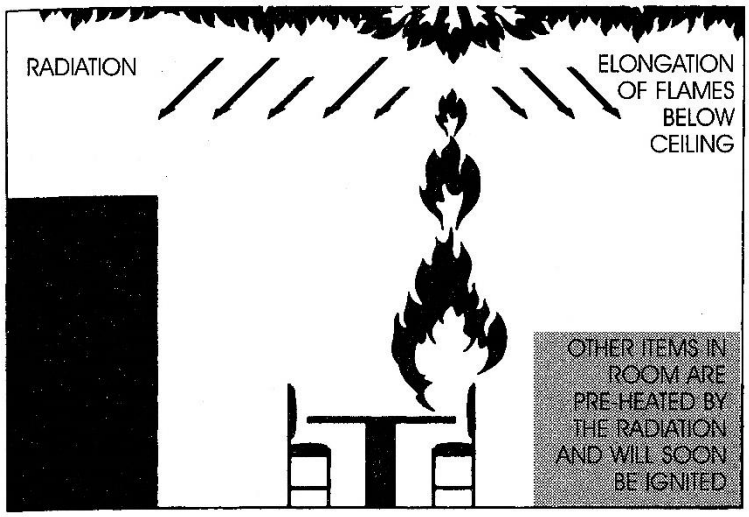

Figure 5: Onset of flashover
(Reproduced with the permission of British Standards Institution[2])

3.16 It is particularly after flashover that the fire resistance of construction, such as partitions, walls, floors, and structural beams and columns, is important, as it is post-flashover that construction is significantly challenged by a fire.

3.17 If the area of fire origin is protected with a properly designed automatic sprinkler system, it would not be expected that flashover would be reached in the event of fireThis reinforces the need for fire safety measures to be considered holistically; sometimes, some reduction in fire resistance can be acceptable in sprinklered premises.

3.18 However, again, this engineered approach to fire safety requires specialist advice, unless the relevant reductions in fire resistance are already specified in recognised codes of practice, such as government guidance that supports building regulations.

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Fire resistance

3.19 In the above paragraphs, and throughout various sections of this guide, there is extensive reference to the concept of "*fire resistance*" (such as by references to fire-resisting construction, fire-resisting doors, and similar measures).

Fire resistance is something that is widely specified in fire safety, but is very commonly misunderstood. It is important to understand that, while fire resistance is expressed in units of time (minutes), there is no suggestion that the time specified represents the time that the element in question (such as a door) will continue to perform, as required, in a real fire.

3.20 Fire resistance may relate to resistance to the passage of flame (which is known as "*integrity*"), resistance to the passage of heat (which is known as "*insulation*") and resistance to loss of capacity to support a load (which is known as "*loadbearing capacity*").

3.21 According to the fire-resisting element in question, the relevant components of fire resistance are likely to be well known. For example, by convention, the fire resistance of a door normally relates only to integrity, but glazing in the door would normally need fire resistance in terms of both integrity and insulation.

3.22 More generally, care needs to be taken in specifying fire-resisting glazing; some fire-resisting glazing, such as Georgian wired glass and certain proprietary glazing, can provide only integrity, whereas other proprietary glazing is fire-resisting in terms of both integrity and insulation. In some circumstances, glazing with insulation is required, whereas, in others, integrity alone is sufficient. Specialist advice may be necessary if fire-resisting glazing is specified.

3.23 The test for fire resistance involves exposure of the element to a furnace, in which the element is subjected to defined heating and pressure conditions. Fire resistance is the time for which the element satisfies appropriate criteria during the test. The times so obtained are a measure of the adequacy of the element in a fire, but have no direct relationship with the duration of a real fire.

3.24 Moreover, to the extent that the conditions in the furnace represent any one possible real fire, it would be a fire that had reached flashover, which may not occur until sometime after initial ignition of a real fire.

3.25 Thus, periods of fire resistance are used (in relation to the standard test), simply to permit a level of performance to be specified and enable one product to be compared with another. For example, it is known that, in a real fire, a 60-minute fire-resisting doorset (door and frame combined) will contain the fire, if prolonged, without permitting undue passage of hot gases (and without sustained flaming on the "safe" face of the door) for longer than a 30-minute fire-resisting door. However, the actual period for

which this performance will be achieved by either door in any particular real fire is unknown.

3.26 It has traditionally been accepted, for more than half a century, that construction with a fire resistance of 30 minutes is normally adequate to protect escape routes. 30-minute fire-resisting doors and partitions often maintain their integrity for the entire duration of a real fire, in which case, there may be little benefit to fire safety, in some circumstances, in enhancing fire resistance from 30 minutes to 60 minutes.

3.27 Care should be taken to avoid falsely accurate calculations in relation to a hypothetical fire scenario, based on the misconception that, for example, a 30--minute door will permit totally unrestricted spread of fire at 30 minutes after ignition of a fire.

3.28 The way in which fire resistance is determined in the furnace test has changed subtly over the years, making the test more onerous. The consequence of these changes was that, for example, doors which previously achieved 30 minutes' fire resistance in the test could no longer do so. However, these doors were known to perform well in real fires, and their failure to achieve 30 minutes' fire resistance did not arise from some change in performance in real fires, but simply from a change in the test conditions.

3.29 As a result, it became necessary for intumescent strips to be fitted to the doors or frames in order to achieve 30 minutes' fire resistance in the test; at temperatures of around 170 ºC (and so beyond human survival), these strips swell and seal the gaps around the door, preventing the passage of hot gases.

3.30 It is indisputable that the intumescent strips improve the fire performance of the doors, such that they need to be fitted to all modern fire-resisting doorsets to achieve 30 minutes' fire resistance in the standard test. However, this does not mean that older fire-resisting doors, which were never fitted with intumescent strips, but satisfied the original tests for 30 minutes' fire resistance, are unacceptable for continued use today in many circumstances.

3.31 The important issue is the fire risk to occupants, rather than rigid compliance with guidance, particularly guidance that supports the building regulations for new buildings, which is often more onerous in its recommendations than guidance applicable to existing buildings.

3.32 These principles, to which there has already been reference in Section 2 of this guide, are considered further in later sections of this guide.

Summary of Points in Section 3:

- For a fire to occur there needs to be an ignition source, fuel and oxygen. There should be vigilance to avoid unnecessary ignition sources and fuel for a fire, while limiting airflow when fire occurs can slow down fire development.

- A fire in a building can develop very rapidly, compared with the more commonly encountered fire in the open, such as a garden bonfire. It is important for all employees to understand this (such as from staff training).

- Fire develops by transfer of heat by conduction, convection and radiation.

- Smoke from a fire rises to the ceiling and then descends downwards, quickly making escape routes impassable, particularly in fully enclosed spaces, such as corridors. People are reluctant to use escape routes unless they can see for several metres ahead.

- Accordingly, corridors need to be enclosed in partitions. In all premises in which people sleep, and all corridors in which there is only a single direction of escape, that fall within the scope of this guide, these partitions must be fire-resisting. Construction enclosing staircases that people will use for escape from upper floors must usually be enclosed in fire-resisting construction.

- All glazing in fire-resisting construction must also be fire-resisting; in certain critical situations the glazing must provide insulation, as well as protection against the passage of fire and smoke.

- Doors in fire-resisting construction must be fire-resisting and self-closing, or be kept locked shut. It is particularly important that these doors are not wedged open and that all self-closing devices are fully effective in closing the door into the frame.

- Holes in fire-resisting construction must be filled with fire-resisting material. (This is known as "*fire stopping*".) This is because the pressure created by the temperature of a fire can cause large quantities of smoke and fire to spread through quite small holes.

- If fire is allowed to develop, it can quickly reach "*flashover*", a stage in a fire in which all combustible materials within the space ignite simultaneously. People must evacuate well before flashover is reached, necessitating means for giving early warning to people in the event of fire.

- If the area of the fire is protected by a properly designed sprinkler system, flashover is unlikely to be reached. In some circumstances, sprinkler protection can reduce the required fire-resistance of construction, but this is normally a matter for specialist advice, unless such reductions are already specified in recognised codes of practice.

- Fire resistance relates to the ability of construction and doors to prevent the passage of fire. However, although fire resistance is expressed as a period of time (minutes), this time relates only to performance in a particular test; it does

not relate to the period for which the construction or doors will resist the passage of flame in a real fire, which may be longer.

- A period of 30 minutes' fire resistance is normally specified for walls, partitions and doors that are required to protect escape routes. Older doors that met early standards might not achieve 30 minutes' fire resistance if subjected to the current fire resistance test. However, this does not make the doors unacceptable; this depends on the findings of the fire risk assessment for the specific premises.

4. Causes Of Fire

4.1 In order to prevent fire, it is necessary to have some understanding of the common causes of fire, which actually fall into quite a small number of categories. From an understanding of these, policies on prevention of fire can be developed. *Fire prevention*, which is one of the important areas in controlling fire risk (in conjunction with *fire protection* and *fire safety management*) is discussed in Section 5 of this guide.

4.2 Many fires are the result of human failings, such as carelessness, malicious intent or simple incompetence in management. Even in the case of a fire started by faulty electrical wiring, greater attention to the inspecting and testing of the electrical installation might have prevented the fire.

4.3 Useful insight into the common sources of ignition is given by:

- annual fire statistics for England, which are analysed and published by the Ministry of Housing Communities and Local Government;[3] these statistics relate to fires attended by fire and rescue services
- analysis of “large fires”, which, by definition, are those resulting in large financial loss, for which insurance claims have been made; these analyses are collated by the Fire Protection Association (“FPA”).

4.4 The number of accidental dwelling fires with a source of ignition of ‘cooking appliances’ accounts for 44% of all accidental dwelling fires in the year ending March 2025, making it the highest recorded source. The number of dwelling fires with ‘other/unspecified’ source of ignition accounts for 15% of all accidental dwelling fires.

4.5 However, the analyses also show that the prevalence of each source of ignition in any type of premises is very much related to the nature of the premises. For example, 20.4% of fires in schools are reported as ‘electrical distribution’ being the cause of ignition. See Figure 6.

4.6 There is growing evidence that certain new technologies are resulting in new risk to people from fire. In particular, lithium-ion batteries have now resulted in a number of fatal fires, and the number of fires involving appliances, including e-bikes and e-scooters, powered by lithium-ion batteries is almost exponentially increasing. Faults in these appliances, particularly during charging, can give rise to rapidly developing and serious fires, which can, very quickly, impede means of escape.

[3] Fire statistics data tables - GOV.UK (www.gov.uk)

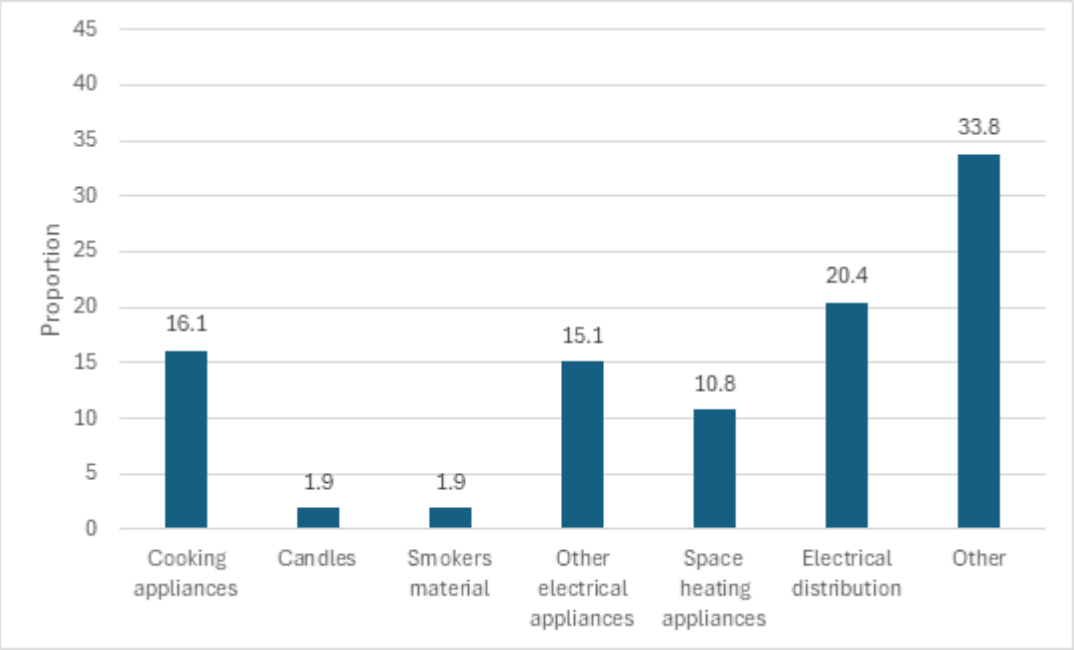

Figure 6: Percentage of incidents in schools by selected sources of ignition (%), England; year ending March 2025

Please note: Groupings have been made in line with MHCLG fire statistics publications. Please see Annex A for groupings.

Building types grouped under 'schools' are pre-school/nursery/infant/primary, secondary school, college/university, and other institutional educations.

Groups included in the 'other' category include but are not limited too industrial equipment, spread from secondary fire, natural occurrence and fuel/chemical related.

4.7 'Deliberate' incidents are not recorded as a source of ignition. Proportions of sources of ignition vary between different building types for various reasons.

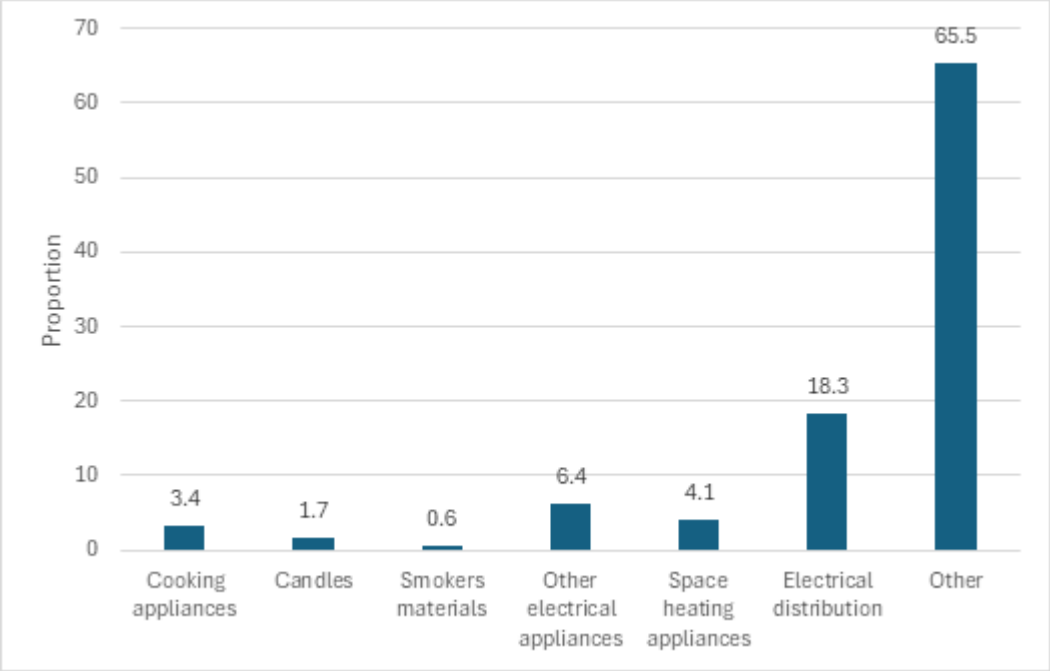

Figure 7: Percentage of incidents in industrial buildings by selected sources of ignition (%), England; year ending March 2025

Please note: Groupings have been made in line with MHCLG fire statistics publications. Please see Annex A for groupings.

Building types grouped under 'industrial buildings' are factory, industrial processing (not including Recycling Centre), Industrial Manufacturing (not including Factory), and warehouses and bulk storage.

Groups included in the 'other' category include but are not limited too industrial equipment, spread from secondary fire, natural occurrence and fuel/chemical related.

4.8 It can be noted that, the most common reported sources of ignition in industrial buildings are:

- Wiring, cabling, plugs (10.4% of all incidents)
- Manufacturing equipment (10.0% of all incidents)
- Apparatus – batteries, generators (7.3% of all incidents)

Please note: 165 incidents recorded the source of ignition as 'unspecified' (15.2% of all incidents)', and 6.3 incidents recorded the source of ignition as 'other' (6.3% of all incidents).

4.9 In view of these significant variations in sources of ignition between premises types, while Section 5 of this guide provides generic advice on measures to prevent the various causes of fire, more specific information on causes of fire, and measures to prevent them in specific types of premises, is given in each sector-specific guide.

4.10 Persons with duties responsible for numerous premises should keep in-house records of all fire losses, including any small fires (and near misses) that did not result in significant damage. Such records can allow the identification of hazards before a serious fire occurs. This may also be of assistance to those carrying out a fire risk assessment.

Case study

Following the major fire at King's Cross underground station in 1987, in which 31 people died, it was revealed that, between 1958 and 1987, over 400 fires had occurred on escalators in underground stations, many of which were caused by smokers' materials, which was the cause of the fire at King's Cross. 46 of these fires were serious and, of these fires, over two-thirds had been caused by smokers' materials.

As a result of lack of recording and analysis, the lessons from these fires were not being learned. The then culture of London Underground Limited was such that these fires were regarded as inevitable and that it was appropriate to address fire risk by measures to ensure the safety of people when these fires did occur, rather than taking steps to prevent the fires. The formal Investigation into the fire, presented to Parliament, was particularly critical of this approach, and the lack of perceived need to prevent fires was described by the Investigation as "flawed".

4.11 It is important to understand that fire safety does **not** just involve measures to keep people safe when fire occurs; all reasonable steps must be taken to prevent the outbreak of fire.

4.12 Prevention of fire is discussed in the following section of this guide.

Summary of Points in Section 4:

- The 4 most common causes of fire are:
  - cooking activities
  - deliberate fires ("arson")
  - electrical faults
  - smokers' materials

- The prevalence of each of these sources varies greatly between different types of premises. Schools and premises to which the public have access experience a higher proportion of fire due to arson than factories and warehouses.

- Persons with duties responsible for numerous premises should keep records of all fire losses, including small fires, and near misses. Such records can allow identification of fire hazards before a serious fire occurs.

Fire Safety Duties Part 1: Fire Prevention and Fire Protection

5. Measures To Prevent Fire

5.1 Having considered in Section 4, some of the common causes of fire and how these vary depending on the use and management of the premises; this section focuses on possible measures to prevent fire. The sector-specific guides provide advice on measures that may be specific to particular types of premises.

Deliberate Fires[4]

5.2 Any premises can be targeted either because of the nature of the premises or the activities carried on, or just because they offer easy access. Some fires are started by those with the deliberate intent of causing serious harm to people (such as in residential premises, in which criminals might target the occupants of a specific dwelling).

5.3 In considering exposure of a building to arson, account should be taken of any known prevalence of vandalism and other anti-social behaviour in the surrounding area of the building.

5.4 Fires started deliberately can be particularly dangerous if accelerants are used, or if they are intentionally started in escape routes. More generally, the fire safety design of a building is based on the assumption that there will only be a single fire at any time; arson sometimes involve multiple fire locations. In terms of risk-reduction measures, considerable benefit may come from efforts to reduce the threat from arson.

5.5 While there is a common belief that fire safety and security directly conflict because of the possible detrimental effects on means of escape from fire, properly designed security measures are, themselves, a fire prevention measure. Guidance on the security of buildings is produced by Secured by Design (http://www.securedbydesign.com), and also BS 8220'.
Further, detailed prevention measures are provided in the companion Arson Guidance [link to be inserted on publication].

5.6 Measures to reduce arson may include the following:

- Secure boundaries to prevent intruders. In the case of a site, this involves the provision, and maintenance, of fences of adequate height and physical strength. For buildings, there is a need for all

[4] A deliberate fire is a fire believed to have been started deliberately for example, suspected arson and some fires started by children, psychiatric patients, suicides and attempted suicides. Whilst we would not expect the fires for “deliberate fires” to match precisely the published figures for arson in tables from the Crime in England and Wales statistical release Crime in England and Wales: Appendix tables - Office for National Statistics (ons.gov.uk), we would expect “deliberate fires” for dwellings, other buildings and vehicles to be similar to the arson figures.

doors to be capable of being securely fastened against access from the outside. This includes fire exits, for which suitable exit devices should be provided on the inside of the door. Security of windows should also be addressed

- Access control, to ensure that only authorised personnel enter the premises, that they can only do so via supervised entry points and that they are properly identifiable. High-hazard areas, including refuse or recycling storage facilities, within any site should be the subject of additional control
- Security lighting, particularly in the case of open yards or large sites with open spaces between the perimeter fence and the buildings on site
- Intruder alarms, to ensure that occupants may be alerted and the police summoned (usually by an alarm receiving centre to which the intruder alarm is connected) if unauthorised access to a building is gained. For a large site or building, CCTV monitoring might also be appropriate
- Periodic patrols, either by on-site security personnel or by a third party guarding company
- Vigilance by staff, who should be aware of the need for security measures and be encouraged to challenge persons whom they consider may be unauthorised

5.7 In addition to these security measures, general good housekeeping contributes to the reduction of this fire hazard. Arsonists require fuel, and an accumulation of combustible material may be tempting to them. Frequently, combustible waste and rubbish present a convenient fuel. These could be denied to an arsonist by regular removal and proper disposal.

5.8 Combustible goods, timber pallets, rubbish bins or skips, and similar measures. should not be stored close (such as within 6m, or preferably 10m for larger items such as skips) to a building; otherwise, an arsonist could, without even having to enter the building, start a fire that ultimately destroys the building.

Case studies

In one fire, in which a supermarket was seriously damaged outside working hours, the item first ignited was simply a rubbish bin located adjacent to an external wall under overhanging eaves. Children started a fire in the bin, which then spread into the building via the eaves and undivided roof void, through which the fire then spread.

In another, much more dangerous, fire, involving a fully occupied hotel, linen on trolleys located against an external wall spread by similar means, resulting in a near miss in terms of loss of life.

In 1973, a very serious fire occurred at the Summerland Leisure on the Isle of Man, which resulted in 50 deaths. The fire was started in a disused kiosk outside the leisure complex, though the fire is believed to have been started accidentally by school children who were smoking in the kiosk. Again, this external fire spread into the leisure centre, resulting in the serious loss of life.

5.9 Security of rooms, such as stores, that contain significant quantities of combustible material is a further measure to prevent arson, particularly in premises to which the public have access. Particular care should be taken to avoid the availability of flammable liquids, such as fuels and solvents, to an arsonist.

Case study

In 1984, a fire occurred at Maysfield Leisure Centre in Belfast. The building was not unusually large or complex, but was typical in design of many local authority leisure centres, and it generally complied with the relevant building regulations. This would be regarded as a building of low fire risk, but, very quickly, the fire resulted in 6 deaths of members of the public, including 2 young children, on the ground floor, where fire deaths would not generally be expected.

The cause of the fire was arson in a room, located off the squash court corridor, used for storage of combustible gym mats and judo mats. Following a similar fire at another leisure centre in Belfast, the local authority had instructed that such stores in leisure centres should be kept secure. In fact, a metal shutter between the store and the adjacent corridor had not been secured during the entire morning on the day of the fire. A simple security measure might have prevented the fire and the deaths.

As well as reinforcing the need for security of storerooms, as discussed above, this is a further fire that could have been avoided by adopting the lessons of a previous fire. The fire also demonstrated the rapidity with which a corridor can become filled with smoke from a fire in an adjacent room, as discussed in Section 3 of this guide.

A later section of this guide contains further discussion of this fire, describing the failures in management of fire safety at the time of the fire.

5.10 Arson is not always committed by outsiders, though this will most commonly be the case. Consideration also needs to be given to the potential for arson by employees or others, such as contractors, with a legitimate need to be on the premises. Arson by disgruntled employees or ex-employees can be a threat. There is a need for monitoring of any small “accidental” fires on the premises and to investigate them fully, while keeping a record of them, as they may indicate wilful fire raising. It should be ensured that facilities for access by an employee cease as soon as the employee leaves the services of the company.

5.11 There is a need for awareness of the threat of arson to an organisation. This will vary from one organisation to another and depend on factors such as:

- The nature of the organisation. For example, as discussed in Section 4, schools are a known target for arson. Many deliberately started fires in schools occur during the night, but can occur during the day, when they present a threat to life
- The activities of the organisation.
- The "softness" of the target. Certain types of premises are inherently more vulnerable than others.

Case study

The bus-operating industry, for example, has a history of major-loss fires in bus garages. These premises are often difficult to secure because there is a need for regular access for vehicles until late at night, and it is common for large numbers of vehicles to be parked in such close proximity that fire can spread readily from one vehicle to another.

- Labour relations. An organisation with good industrial relations is more likely, by definition, to have fewer disgruntled employees
- Geographical location. Premises in inner city and urban areas are often at greater risk than those in predominantly rural areas
- Admission of the public. As discussed in Section 4, public buildings, such as places of entertainment and retail premises, suffer much more from the problem of arson than buildings from which the public are excluded

Electrical faults

5.12 Electrical equipment is a significant cause of accidental fires.

5.13 Much can be done to prevent fires caused by electrical faults without an in-depth knowledge of electrical engineering. Even simple vigilance to identify discoloured or charred electrical plugs and sockets can identify a fire hazard.

5.14 The main causes of fires of electrical origin are:

- overheating cables and equipment (such as due to overloading circuits, bunched or coiled cables or impaired cooling fans)
- overheating due to equipment left on or inappropriately sited (such as irons, kettles, soldering irons, electric blankets)
- incorrect installation or use of equipment
- damaged or inadequate insulation of cables or wiring
- combustible materials being placed too close to electrical equipment which may give off heat even when operating normally or may become hot due to a fault (such as electrical distribution equipment)
- arcing or sparking by electrical equipment

- lack of maintenance or testing
- misuse and overloading of electrical adapters and trailing leads

5.15 Fires of electrical origin can be divided into 3 groups, according to whether they involve:

- the fixed, permanent electrical installation in the building
- electrical appliances, both portable and fixed
- temporary wiring

<u>The fixed electrical installation</u>

5.16 A modern electrical installation, installed and maintained in accordance with good practice, should not present a risk unless it is abused, inadequately modified or mechanically damaged. It is important, therefore, that all electrical installation work, including modifications to an existing installation, conforms to the Institution of Engineering and Technology Regulations for Electrical Installations (commonly known as "BS 7671 Wiring Regulations").

5.17 Competence of electrical contractors in electrical installation, maintenance and inspection and testing work can be assured by using contractors who are third-party certificated by an independent certification body (such as the National Inspection Council for Electrical Installation Contracting ("NICEIC")) or by using a member of the Electrical Contractors' Association.

5.18 Measures to prevent the fixed electrical installation causing a fire include:

- avoiding overloading of circuits (such as by plugging too many appliances into multi-way adaptors)
- correct fusing or rating of circuit breakers, so that the supply is isolated in the event of overload or short circuit; fuses or circuit breakers are matched to the current-carrying capacity of cables, which, in turn, is related to the maximum temperature at which the cable insulation will be safe
- avoiding mechanical damage to wiring, which can result in a short circuit
- avoiding leakage of current to earth, due to failure of cable insulation
- vigilance for loose connections, which result in overheating of components, cables or combustible materials
- vigilance for any signs of arcing
- avoiding overheating due to bunching of several cables, or the presence of thermal insulation

5.19 Fuses and circuit breakers cannot protect against the leakage of very small currents between the cable conductors and earth. This may occur

due to minor cable damage or the onset of failure of old cable insulation. Such small currents can cause local overheating and a fire. It is possible to protect against small earth leakage currents by means of residual current devices (“RCDs”). These compare the current in the neutral and line conductors, which should, under normal circumstances, be the same. “Out of balance current” between these 2 currents represents leakage to earth. At a predetermined value of this current (which depends on the application), the RCD isolates the supply automatically.

5.20 A much more recent innovation is a device called an arc fault detection device (“AFDD”). These are sophisticated electronic devices, which are able to detect dangerous arcing (the passage of current across an air gap between one conductor and another, or between a conductor and earth, other than as would occur in normal operation, such as in the case of a switch).

5.21 The very high temperature of an arc can ignite combustible materials. An AFDD isolates the electricity supply when arcing occurs.

5.22 The most common causes of arcs include worn contacts in electrical equipment, damage to insulation, a break in a cable and loose connections.

5.23 BS 7671 (The Wiring Regulations) require the use of AFDDs on circuits serving socket outlets within certain specific new or altered electrical installations, namely installations in:

- higher risk residential buildings
- houses in multiple occupation
- purpose-built student accommodation
- residential care homes

5.24 More generally, the IET recommend provision of AFDDs on circuits serving socket outlets in all new or altered electrical installations.

Case study

In 2004, arcing was the cause of a fire at Rosepark Care Home in Lanarkshire. The fire resulted in the deaths of 14 elderly and infirm residents, the largest loss of life in a single fire between the King’s Cross underground station fire in 1987 and the Grenfell Tower fire in 2017.

The aperture through which a cable entered a metal electrical distribution board was not provided with a rubber grommet that should have been present, to protect the cable from chafing against the earthed metalwork of the distribution board. In addition, the cable sheath was stripped back too far, so it did not protect the insulated conductors of the cable as they passed through the aperture.

Chafing over a period of years damaged the insulation of the conductors, resulting in arcing between these conductors and the earthed distribution board.

The distribution board was located in a cupboard off a bedroom corridor in the care home. The cupboard contained a significant amount of combustible materials, including aerosols with a flammable propellant. The arcing set fire to the combustible materials, and exploding aerosols behaved like missiles ejected from the cupboard.

In the subsequent Fatal Accident Inquiry ("FAI"), it was determined that, if the electrical installation had been subject to routine inspection and testing by a competent person (typically on completion of the electrical installation work and every 5 years thereafter), the absence of the rubber grommet would have been identified and should then have been noted as requiring urgent attention. The stripping back of the cable sheath would also have been noted.

The FAI determined that, if this inspection and testing had been carried out, as was universally recognised as appropriate practice, the fire, and hence the deaths, might not have occurred.

5.25 Periodic inspection and testing of electrical installations (at periods advised by a competent person, qualified in electrical work) is an essential part of measures to prevent fires of electrical origin. The Risk Assessor should consider any actions raised in this report which may have an effect on fire safety.

5.26 Electrical switchgear and distribution boards should be regarded as a potential source of ignition of a fire. It is essential that combustible materials should be kept clear of all such equipment. Small enclosures designed specifically to house electrical distribution equipment should not be used for storage, particularly of combustible materials.

5.27 In large spaces designed for storage, but housing electrical distribution equipment, a clear space of 500mm should be maintained between the equipment and any storage or other combustible materials. Cupboards containing electrical distribution equipment should not be used to store flammable liquids, flammable gases or aerosols.

<u>Electrical appliances</u>

5.28 An important measure in relation to safety of electrical appliances from fire comprises periodic in-service inspection and testing of appliances (previously known as portable appliance testing or "PAT"). The advice of a competent person should be obtained on the appropriate frequency for this, but the inspection and testing should be carried out in accordance with the IET Code of Practice for In-Service Inspection and Testing of Electrical Equipment.

5.29 Guidance on electrical safety, including FAQs on maintaining electrical appliances is available athttps://www.hse.gov.uk/electricity/ .

5.30 Leads to portable appliances are more exposed to damage than fixed wiring. The electrical installation layouts of many commercial buildings

were not originally designed for the number of electrical appliances that are now commonly in use. As a result, it is common to find trailing leads and multi-way adaptors. Such practices should be avoided as far as possible; long leads create even greater exposure to damage, while multi-way adaptors increase the potential for both overload and bad connections that may lead to overheating.

5.31 These considerations should be taken into account during routine safety inspections. Where the practice is found to be prevalent, consideration should be given to the installation of additional socket outlets and the use of modern cable management techniques. If adaptors need to be used, the type that comprises a portable bank of sockets, connected to a lead with a plug on the end should be used in preference to “cube” adaptors that plug straight into a socket outlet. If cable reel extensions are used (such as for portable tools), no cable should remain on the reel while the tool is switched on; otherwise overheating of the cable may result.

5.32 In the course of safety inspections, all leads to portable appliances should be checked visually. It should be ensured that connections to plugs are tight and that the outer sheath of cables is not stripped back to expose the insulation of the conductors. Cables that are damaged should be replaced rather than repaired; the safety of a lead to an electrical appliance should not depend on a piece of insulating tape. Joints in cables should be avoided; if the cable is not long enough, it should be replaced with a longer cable.

5.33 Every organisation should have a policy regarding employees bringing their own electrical appliances, such as heaters, fans, mobile phone chargers and radios, and similar measures. into the premises. If the use of personal electrical appliances is permitted, they should first be checked for safety (at least visually) and, if they are to remain in the premises, or be brought in regularly, they should be subject to the same maintenance as other electrical appliances in the building.

Temporary electrical installations

5.34 Electrical installations on a construction site, and temporary installations (such as during a refurbishment), present a greater fire hazard than permanent fixed installations. The wiring of such installations is likely to be more exposed to mechanical damage, and is not usually supported in the same manner as a permanent installation. Electrical appliances are also more likely to be subject to abuse.

5.35 Temporary installations should be inspected and tested by a competent person every 3 months.

Electrical installations in flammable and explosive atmospheres

5.36 Where a flammable or explosive atmosphere could be ignited by an electrical fault, special considerations apply to the electrical installation and electrical equipment. This requires specialist advice and should have

been taken into account in the risk assessment required under the Dangerous Substances and Explosive Atmospheres Regulations 2002.

Lithium-Ion Batteries

5.37 Lithium-ion batteries are used in a growing number of consumer products, powering e-bikes, e-scooters, laptops, cameras, smartphones and more. The number of fires caused by this type of battery failure has increased significantly, particularly in e-scooters and e-bikes.

5.38 When a lithium-ion battery fails, it may to result in “thermal runaway,” a chain reaction which can lead to a fire or explosion. This process can be triggered by a number of causes, such as the battery overheating, being punctured or damaged, or a short circuit.

5.39 The storage and charging facilities of lithium-ion powered transport in the premises needs to be risk assessed, and should never be permitted on means of escape.

5.40 Wherever possible LI batteries should not be charged overnight/when persons are not present in the building and charged in accordance with manufacturers instructions'.

Electric Vehicle Charging

5.41 Electric vehicles use lithium batteries and hence, potentially, are subject to the fire hazards described above, particularly in view of the much larger capacity of car batteries.

5.42 A specific risk assessment needs to be undertaken in relation to charging facilities within car parks, particularly those located underground below a building. This may be beyond the skills of a typical fire risk assessor.

5.43 While new extinguishing agents deal with fires involving lithium batteries are becoming available (see Section 12), a fire involving an electric vehicle presents a serious hazard to persons in the vicinity, and first aid firefighting should be discouraged.

Photovoltaic Solar Panel Installations

5.44 Fires involving solar panels are sometimes caused by errors in the installation process. Fire incidents have been attributed to DC isolators, DC connectors and inverters. The occurrence of fire incidents involving solar panels may rise further in tandem with number of new installations.

5.45 The positioning of the DC isolators, DC connectors and inverters should be considered, so that a fire involving the equipment cannot compromise the means of escape.

5.46 Further consideration should be given to the position of the solar panels located on roofs, so that they do not bypass compartmentation within the roof space, particularly in residential accommodation.

Smokers' materials

5.47 The Health Act 2006 introduced prohibition of smoking in all enclosed and substantially enclosed workplaces and premises open to the public, with few exceptions (such as for residents in hotel bedrooms and residents of rooms in care homes). In practice, most hotels prohibit smoking in all bedrooms,

5.48 Even before the legislative requirements to prohibit smoking in premises, prohibition of smoking in workplaces had grown in parallel with concern regarding damage to health from "passive smoking".

5.49 This was one factor contributing to the contrast between statistics on fires caused by smokers' materials in domestic premises and those in non--domestic buildings. The downward trend over the 20 years prior to 2005 is clear. (See figure 8)

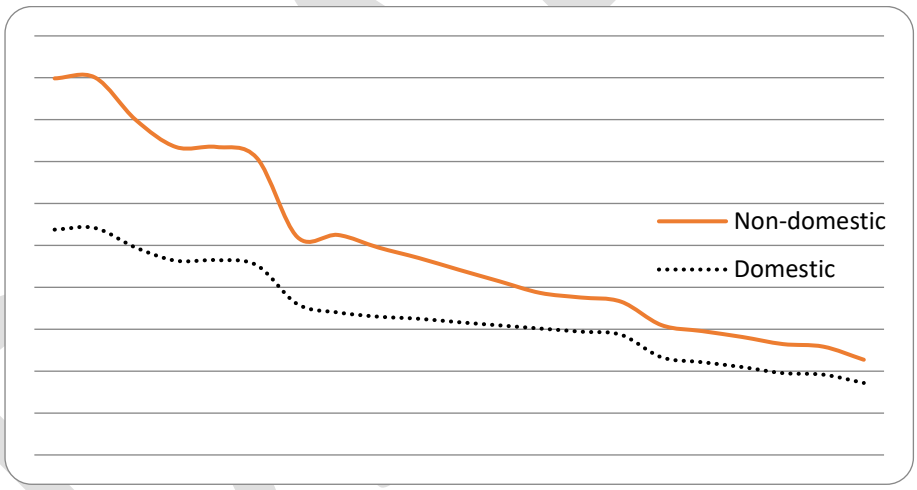

Figure 8: The number of fires caused by smokers' materials and matches in domestic and non-domestic buildings

5.50 Prohibition of smoking in buildings has continued the downward trend in fires that result from careless disposal of smokers' materials in non-domestic premises. This is, of course, dependent on the prohibition not resulting in increased surreptitious smoking, to which consideration should be given in a fire risk assessment.

5.51 Carelessly discarded cigarettes, cigars, pipe tobacco and matches are all capable of starting a fire, but cigarettes are a greater risk than cigars and pipes. Cigarette lighters are safer than matches, simply because no discarded materials are involved. Ignition of various solid combustible materials by smokers' materials is possible, although, other than in the case of a match that is burning, there is unlikely to be immediate flaming,

but rather smouldering that can undergo a transition into flaming after some time. However, a cigarette can act as an immediate source of ignition for highly flammable vapours or gases.

5.52 “Flameless” cigarette lighters use an electric arc to light a cigarette, so these do not use flammable gases, such as butane, with which the lighter needs to be refilled. These may be more suitable for vulnerable people with disabilities, for whom a fire hazard might result from refilling gas-filled lighters.

5.53 Care should also be taken with the charging of e-cigarettes. It should be ensured that the correct mains charger for the particular type of e-cigarettes is used at all times. Failure to do so could cause the internal lithium-ion battery catastrophically to fail and ignite. Batteries and single-use devices should not be placed in general waste. Improper disposal can cause fire and explosion in bins and recycling facilities.

5.54 It is important that prohibition of smoking is properly enforced, and there is a need to ensure that any external locations in which smoking is permitted are suitable (such as not sited in close proximity to combustible material).

5.55 It is a legal requirement that at least one legible no-smoking sign must be displayed in premises that are smoke-free as a result of legislation.

5.56 Vacuum cleaners should not be used to clean up discarded smokers’ materials, as this is a known cause of fires in vacuum cleaners.

5.57 If smoking is permitted in external areas, the area should be assessed for potential fire risk, and care needs to be taken in emptying of receptacles for discarded smokers’ materials. They should be emptied into a non-combustible container, which should, preferably, not be taken into the building.

Case study

In 1993, a fire occurred at Edinburgh Sheriff Court. The fire resulted in the death of a patrolling security officer, who, in the course of his patrol, came across a serious fire in the lobby of a lift, which he had used to reach the floor in question.

A Fatal Accident Inquiry determined that the fire had started in packaging materials left by contractors in the lift lobby, probably as a result of discarded smokers’ materials.

This fire also demonstrates the importance of good housekeeping, which is discussed later in this section of the guide.

Cooking

5.58 As might be expected, fires that occur during cooking are most common in hotels, restaurants and cafés, and similar measures.

5.59 Sensible use of cooking appliances is necessary if fire hazards are to be minimised. Appliances should never be left unsupervised, and staff should be properly trained in the use of the appliances and action in the event of fire. The kitchen should be kept clean, and build-up of grease deposits should not be permitted. A clear space should be kept around each appliance and, in particular, between deep fat fryers and other appliances. There should be clearly labelled facilities to shut off power, fuel and extract systems in an emergency.

5.60 Electric appliances should be installed by a competent person, in accordance with BS 7671 – Wiring Regulations. Gas appliances should be installed in accordance with legislation and BS 6173, by a Gas Safe (previously known as CORGI) registered installer. All appliances should be regularly inspected and maintained.

5.61 Deep fat fryers should be regarded as a particular hazard, as these are a common cause of cooking fires in non-domestic premises. As well as thermostats with a maximum setting of 205ºC, there should be a high temperature cut out in case of thermostat failure. Grease traps should be fitted to any low-level ductwork. There should be a facility to shut down the lids of fryers in the event of a fat fire.

5.62 The risk of a fire associated with deep fat fryers, in particular, but also all commercial scale cooking equipment, is such that consideration should be given to the possible need for a fixed manual/automatic fire extinguishing system. Systems specifically designed for this purpose are very simple, and relatively inexpensive, to install. These systems are in common use in hotels and restaurants.

5.63 An important fire safety measure is to arrange for regular cleaning of grease filters, extract ductwork and grease traps. Often, though filters might be changed regularly, there is insufficient attention to “deep cleaning” of ductwork. A fire, for example, in a deep fat fryer, can more easily spread throughout the ductwork, where there are thick layers of grease deposits.

Case study

In 1997, a fire in extract ductwork at a fast food concession at Terminal 1, Heathrow Airport spread through a considerable length of ductwork within the ceiling void of the terminal. No-one was injured. However, the fire resulted in the temporary closure of Terminals 2 and 3, and closure of Terminal 1 for some hours, causing major air traffic disruption throughout Western Europe.

5.64 Guidance produced on behalf of the insurance industry (commercial-kitchens-fire-safety-guide.pdf (nfumutual.co.uk)) provides recommendations on the frequency at which deep cleaning should be carried out, according to the number of hours of use of cooking equipment each day. Alternatively, contractors who provide deep cleaning services might stipulate the recommended frequency, based on the condition of the ductwork found in their inspection.

5.65 Detailed guidance on fire safety of catering kitchen extract systems (including compliance with the Fire Safety Order) is produced by London Fire Brigade (LFB Letter (london-fire.gov.uk)).

5.66 Kitchens should be provided with suitable fire blankets and appropriate fire extinguishers. Fires involving cooking oil or fat burn at a very high temperature, making them difficult to extinguish with most types of fire extinguisher, other than those containing extinguishing agents specifically intended for this type of fire (which is known as a Class F fire).

5.67 Types of fire extinguisher, other than those suitable for Class F fires, should not be sited in areas where the predominant fire hazard is ignition of cooking oils or fats. Use of other extinguishing media can make the fire worse and/or spread the fire.

5.68 Guidance on fire extinguishing appliances is given in Section 12 of this guide.

Heating

5.69 Central heating installations appear to cause fewer fires than local heating appliances. Fixed heating installations are safer than portable heaters, which should be avoided if at all possible. Electrical installations supplying electric heaters should comply with BS 7671 – Wiring Regulations and should be installed by competent persons. Gas appliances should be installed in accordance with the relevant legislation. The appliances should be installed by engineers on the Gas Safe (previously known as CORGI) Register. In places of work, all gas appliances, pipework and flues must be maintained in a safe condition, in effect necessitating periodic inspection and testing, which should be in accordance with Gas Safe codes of practice. In residential premises, landlords must ensure that appliances and flues are checked annually.

5.70 Sensible use of heating appliances could do much to prevent fires. A clear space should be kept around all sources of heat, so that combustible materials cannot be ignited and there is free circulation of air. Adequate guards may be required to ensure this. There should be no combustible construction in close proximity to hot flue pipes. Local appliances should be fixed to a non-combustible surface. Any heating appliances in areas in which flammable liquids or gases may be present should be of a suitable type.

5.71 If portable heaters need to be introduced for short term heating problems, radiant heaters should be avoided. Heaters should be sited where they cannot be overturned or mechanically damaged and be positioned on a non-combustible surface well clear of any combustible materials. All heating appliances should be subject to regular inspection and maintenance. Staff should not be permitted to bring their own heating appliances into the premises.

5.72 As a general rule, oil-filled radiators and convector heaters should be strongly preferred to radiant bar heaters or any heaters involving naked flame. While fan heaters are generally safer than, for example, radiant bar heaters, fan heaters have been known to start fires (such as because of proximity to combustible materials); they should always be avoided in premises in which people sleep, but, if used, even in a short-term emergency, they should be switched off before residents go to bed.

Case study

In 2018, a resident in the supported living section of premises that also comprised a care home, died in a fire, which started in her bedroom.

The inquest jury determined that the fire was started by the ignition of fabric materials by a fan heater in the resident's bedroom. The coroner expressed concern that "No clear and practical guidance exists on how specialist housing operators should manage the use of high-risk electrical devices such as portable electric fan heaters".

Contractors' operations

5.73 Carelessness by outside contractors is a common cause of fire, including many fires that result in serious financial loss. Cutting, welding and use of blowlamps are particular sources of ignition. Not all of such fires are caused by outside contractors. It has been estimated, however, that perhaps 20 to 25% of all non-domestic fires result from "on-going work", such as refurbishment, repair and construction.

5.74 The range of hazards that contractors may, directly or indirectly, introduce to a building encompass most, if not all, of those previously discussed in this guide. They include:

- Flammable liquids, such as adhesives, paints, thinners, timber preservatives
- Flammable gases, such as acetylene and liquefied petroleum gases
- Hot work, such as cutting, welding and use of blow lamps
- Temporary electrical installations
- Charging of tools with lithium-ion batteries outside of working hours
- Combustible materials, sometimes finely divided, such as sawdust and wood shavings
- Careless disposal of smokers' materials by the workforce
- Exposure to arson due to breaches in physical security
- Burning of waste
- Temporary heating appliances
- Temporary lighting

- Temporary buildings, partitions and screens of combustible construction
- Tar boilers

5.75 The hazards are exacerbated in buildings that are undergoing construction or major refurbishment, in which there may be incomplete floors and walls, inadequate fire stopping, incomplete means of escape and unserviceable fire alarm and sprinkler systems.

5.76 Fire safety requirements should form an integral part of the contract between a client and contractor. Ideally, a company should produce its own standard fire precautions for use in all contracts. Companies that have no such conditions may wish to cite standardLine fire precautions for contractors engaged on Crown works, which is used within central government bodies. The Fire Protection Association also publishes recommendations for fire prevention during contractors' operations (Free Documents | Fire Protection Association (thefpa.co.uk)). In addition, the HSE publishes useful guidance on this subject, and this is aimed primarily at life safety, as opposed to property protection (Fire safety in construction - HSG168 (hse.gov.uk)).

5.77 Contract conditions should cover matters such as:

- Waste removal. All combustible waste should be removed regularly to a safe place away from the building.
- Flammable liquids. Bulk stocks should be kept in a suitable secure location, outside, and away from, the building. Quantities stored inside the building should be kept to a minimum and should be stored in metal lockers. Highly flammable liquids and petroleum spirits should be stored in accordance with the relevant regulations
- Temporary partitions. These should preferably be constructed of non-combustible materials or materials that have a low surface spread of flame
- Gas cylinders. These should be stored in a secure compound outside the building. Cylinders should be kept in the upright position at all times, and be removed from the building at the end of the working day. Liquefied Petroleum Gas (LPG) should not be introduced into basement areas or any enclosed space without adequate ventilation.
- Hot work. A permit-to-work should be required for all hot work, such as cutting, welding and the use of blowlamps. The permit is signed by an authorised person only after ensuring that the work cannot be carried out off site, that the proposed location is safe and that all suitable precautions have been implemented. The area should be checked again on completion of the work, and 30 to 60 minutes following completion. All hot work should stop around 2 hours before the end of the working day
    - Areas in which hot work is to take place should be kept clear of combustible materials as far as possible. Remaining

combustible materials should be protected with non-combustible screens or covers, and all holes in the surrounding construction should be protected to prevent entry of sparks. If possible, 2 persons should be present at all times, at least one of whom should have training in first aid firefighting. Fire extinguishers or hose reels should be kept at hand. Flashback arrestors should be fitted to the cylinders of cutting and welding equipment

- *Tar boilers.* Tar boilers should be kept away from combustible materials and never be left unattended. There should be a permit to work system for their use, and the area should be provided with ample fire extinguishing appliances. Tar boilers should not be used on roofs unless absolutely necessary
- *Workers' huts.* These should be kept well away (such as at least 10 m) from buildings if possible, and an adequate clear space should be maintained between huts. Spaces beneath huts should be enclosed so that rubbish cannot accumulate below the hut
- *Temporary electrical installations.* These should comply with the relevant requirements of BS 7671 - Wiring Regulations, and be inspected and tested every 3 months
- *Temporary lighting installations.* Lamps designed for installation in the pendent position should not be installed in an upright position. All lamps should be kept well clear of any adjacent combustible materials
- *Temporary heaters.* These should be removed when not required. When present, they should be installed on non-combustible surfaces. General space heaters should preferably be fixed in position and kept clear of any combustible materials
- *Security.* It should be ensured that security is maintained during contractors' operations
- *Smoking.* No smoking should be permitted inside any building. If smoking is permitted externally, the precautions described earlier in this section should be followed
- *Combustible materials and packaging.* These should be stored in a suitable location, preferably in a hut 10m away from the building under construction/renovation

5.78 The above precautions are not intended to be exhaustive, and, if formulating detailed contract conditions, reference should be made to the guidance documents referred to above.

5.79 The Construction (Design and Management) Regulations 2015 apply to construction projects and impose duties on construction sites in respect of fire safety, including prevention of fire, emergency procedures, emergency routes and exits, firefighting equipment and fire warning systems.

Case study

In 1990, a major fire occurred in part of the major Broadgate development in London during the final stage of its construction programme. This fire, which, it has been suggested, resulted in one of the largest insurance claims in Europe for ten years, is believed to have started in a sub-contractor's office facility.

A report on the fire by the Steel Construction Institute concluded that many more fires occur in temporary accommodation on building sites than is generally recognised.

Industrial processes

5.80 The measures discussed above would, if successful, contribute to the elimination of around 85% of all fires in non-domestic premises. However, in industrial premises, this figure drops to 60%. The reason for this is that many industrial processes give rise to fire hazards. Many of these hazards are unique to individual industries, and can only be addressed in terms of specific process controls.

5.81 As these are work processes, fire precautions associated with these processes are generally a matter for health and safety legislation, rather than the Fire Safety Order. They should be taken into account in the health and safety risk assessment for the premises.

5.82 However, there should be some consideration as to the effect of certain process hazards on the general fire precautions required by the Fire Safety Order. For example, a fire suppression system fixed to a machine would not be a matter for the Fire Safety Order, but ensuring that the appropriate portable fire extinguishers are provided in the area of the machine is within the scope of the Order.

5.83 Process hazards in industry include:

- shrink wrapping
- battery charging
- paint spraying
- heat treatment
- drying
- use of flammable liquids and gases
- presence of combustible dusts

5.84 It should be borne in mind that good housekeeping can make a contribution to reducing the fire risk in even the most high technology industries.

5.85 For example, common causes of fire in equipment are:

- allowing ventilation points to become clogged or blocked, causing overheating such as driers
- inadequate cleaning of equipment, such as heat-shrink packaging equipment
- allowing excessive deposits to build up in fume and dust extraction equipment
- loose drivebelts or lack of lubrication, leading to increased friction
- disabling or interfering with automatic or manual safety features and cut-outs
- leaking valves, glands or joints allowing oils and other flammable liquids to contaminate adjacent floors or goods

Lightning

5.86 Lightning is a cause of only a very small number of accidental fires and injuries in accidental fires in non-domestic buildings. It is extremely rare for any of the resulting injuries to prove fatal. However, consideration should be given to the hazard of fire as a result of lightning strike.

5.87 Factors to consider in the hazard identification include:

- the size of the building
- the height, particularly in relation to the surrounding buildings and topography
- the form of construction of the building

5.88 It may be the case that the provision of a lightning protection system is not justified. A method of determining whether the risk warrants the provision of lightning protection is given in BS EN 62305-2, which includes a map, indicating the frequency of lightning strikes to ground across the United Kingdom.

5.89 The need for a special lightning protection assessment requires specialist knowledge, and carrying out the assessment is outside the scope of typical fire risk assessors. However, this does not imply that all premises need a lightning risk assessment. A fire risk assessor may decide that, for any particular premises, the risk to life from lightning strike is so low that a specialist assessment of the need for lightning protection is not warranted.

5.90 If a lightning protection system is present, it should be subject to inspection and test by competent persons on an approximately annual basis. An acceptable exception to the yearly test schedule would be to perform the tests on a 14 to 15 month cycle where it is considered beneficial to conduct earth resistance testing over different times of the year to obtain an indication of seasonal variations.

Housekeeping

5.91 Housekeeping relates to the tidiness, order and general conditions within the building. Untidily strewn packaging materials that obstruct an exit route obviously constitute poor housekeeping, but of equal importance is attention to detail (such as the provision of drip trays where flammable liquids are dispensed from drums).

5.92 In this section, various hazards arising from poor housekeeping have already been considered. These included rubbish stored close to buildings, trailing leads to electrical appliances, storage close to light fittings, the build-up of grease deposits in kitchens, and similar measures, all of which increase the probability that a fire will occur.

5.93 Poor housekeeping can also affect the manner in which fire develops. If a fire starts in a neatly stacked pile of timber pallets, around which there is a clear space, the fire may be spotted and extinguished before it can spread. If the same pallets were strewn around in an untidy heap with adjacent rubbish, it is likely that the fire would spread over a larger area and involve further combustible materials.

5.94 Poor housekeeping may also impede the effectiveness of the fire protection measures that would otherwise limit the injury and damage caused by fire. For example, the efficiency of escape routes and exits, fire exit signs and emergency lighting will be threatened if they are obstructed or obscured.

5.95 Rapid access to fire equipment, such as manual call points, extinguishers and hose reels may also be prevented by poor housekeeping. Even if access is not positively prevented, if it takes longer to raise the alarm or reach an extinguisher, the fire will be larger before occupants can escape or extinguishers can be used.

5.96 The effectiveness of automatic fire protection systems may also be impaired by poor housekeeping. The presence of storage in very close proximity to smoke detectors can result in a delay in detection, as the free passage of smoke to the detectors is blocked. Materials stored too close to sprinkler heads can impair both the efficiency of detection and the effectiveness of the water discharge.

5.97 Poor housekeeping may arise from a lack of adequate storage facilities in a building. This may give rise to storage of combustible materials in unsuitable locations (such as electrical intake room or service riser enclosures).

5.98 Finally, poor housekeeping may cause difficulties for the fire and rescue service. Badly stacked goods, once alight, may present a hazard to fire-fighters. The presence of clear aisles, however, may make fire and rescue service operations less difficult when the premises are smoke filled. Moreover, access for fire and rescue service appliances may be made difficult by poor external storage practices.

Summary of Points in Section 5:

- Prevention of arson by outsiders is largely a matter of security (of a site and a building), but good housekeeping also assists by denying fuel to an arsonist, particularly in terms of combustible material in close proximity to the perimeter of a building.
- Fixed electrical installations should be subject to periodic inspection and test, as should electrical appliances. Special precautions should be taken in relation to temporary electrical installations, which need to be inspected and tested much more regularly.
- While smoking is prohibited in all enclosed and substantially enclosed workplaces and premises open to the public (with very few exceptions), there should be vigilance for surreptitious smoking, and suitable signs should be displayed.
- Kitchens should be kept clean and be provided with suitable fire extinguishing appliances. It is important that extract filters are cleaned or changed regularly, and that any ductwork is subject to regular deep cleaning.
- Portable heaters should be avoided, if possible, and should not comprise radiant bar fires or heaters with a naked flame. Fan heaters should always be avoided in premises in which people sleep. Oil-filled radiators and convector heaters should be preferred.
- Care should be taken when work is being carried out by contractors. Contract conditions should clearly specify relevant fire safety measures.
- The need for a lightning protection system is a matter for specialist advice, but any system present should be subject to annual inspection and test.
- More generally, good housekeeping is an important fire prevention measure. It not only avoids the occurrence of fire but limits the development of a fire and any impediments to fire protection equipment.

6. Determining the Appropriate Measures to Protect People from a Fire

6.1 Safe escape in the event of fire in a building is largely about ***time***. Understanding this is the key to operating a building that is safe from fire, in which the fire risk to occupants is minimised, and that sufficient time is available for all occupants to escape safely.

6.2 In Section 3, the behaviour of fire in buildings was discussed. After the ignition of a fire, the fire grows at a rate that is dependent on many factors and conditions within the area in which fire starts, become unsurvivable very quickly. If there are pathways for smoke to spread to more remote parts of the building, these areas may also become hazardous to life.

6.3 If fire continues to grow, smoke, toxic gases and fire will, ultimately, affect escape routes. Commonly, the initial effect is loss of visibility, which, as discussed in Section 3, then prevents the effective use of the escape routes, trapping people within the building.

6.4 This then leads to the risk of serious injury or death from toxic gases produced by the fire, or by direct burns. Most fire deaths occur as a result of inhalation of smoke and toxic gases, rather than burns.

Factors influencing the time available for safe escape

6.5 The time available between the ignition of a fire and the time at which the conditions in escape routes are unsurvivable for occupants can be described as the "*safe escape time*.".

6.6 The fundamental objective of fire protection measures is to ensure that, when a fire occurs (because the fire prevention measures discussed in Section 5 have clearly been unsuccessful), everyone has evacuated the building, or from all areas in which they are in danger from the fire, within the safe escape time.

6.7 Because of the great variation in layout, design and occupancy of buildings, and in the rate of fire development, the safe escape time is often very difficult to predict, other than by means of fire engineering calculations, and computer modelling. While fire engineering of this nature may be used in the design of new, complex buildings, this is outside the scope of this guide.

6.8 For most buildings, the much simpler approach described in this guide will reliably ensure the safety of occupants in the event of fire, such as to enable persons with duties to comply with the Fire Safety Order.

6.9 A "*place of relative safety*" would, for occupants on upper storeys of a building, comprise a "*protected stairway*". Protected stairways are discussed in Section 8 of this guide, but they are stairways devoid of ignition sources and combustible materials (so that a fire cannot start

within them), and that are separated from any area within the building in which a fire might occur by fire-resisting construction, in which there are self-closing, fire-resisting doors.

6.10 A "*place of ultimate safety*" is an area beyond the building, in which there is no further danger to occupants from the fire. A place of ultimate safety is normally reached by passing through a fire exit in the external walls of the building, leading to open air where occupants can disperse.

6.11 In addition to passive fire protection measures such as compartmentation, certain active fire protection measures can be used to increase the time available for safe escape if necessary. These are principally fire suppression systems (such as a sprinkler system) and smoke control systems, which either extract smoke or dilute smoke, in the latter case reducing the effect of smoke on visibility in escape routes. These systems are discussed in later sections of this guide.

Case study

In a sprinklered building, it is common for any fire to be limited to the room, or compartment, of fire origin by the sprinkler system.

In 2015, a fire occurred within a bedroom in a sprinklered residential care home in Dundee. Tragically, the occupant of the bedroom subsequently died in hospital. However, the fire was extinguished by a sprinkler head before the arrival of the fire and rescue service. There was no fire spread beyond the bedroom of fire origin; most of the furniture in the room was completely undamaged.

This is a classic case in which a sprinkler system greatly increased the time available for safe escape for other occupants of the building, which is an important fire safety measure in a care home in which the evacuation might be prolonged because of the disabilities of residents.

Steps between ignition of a fire and evacuation of occupants

6.12 After ignition of a fire, the events that follow may be thought of as a series of steps.

Step 1: Detection of fire and raising the alarm

6.13 When fire occurs, occupants cannot begin evacuation unless they are alerted to the fire and the need to evacuate. So the first step, following ignition, is for occupants to be alerted.

6.14 In very small open-plan premises, the fire will be obvious to people. Indeed, people may become aware of initial fire cues, such as a smell of burning, before a flaming fire has commenced. However, in most premises, there will be a need for a fire alarm system, allowing occupants to be alerted by anyone discovering a fire, by operating the fire alarm system.

6.15 Again, in the smallest of premises, the fire alarm system might comprise of ‘shout fire’ or operation of a hand-operated rotary gongs, provided these are audible throughout the premises and those operating them would not be in danger from a fire. Such cases will be very uncommon; virtually all premises within the scope of this guide will need an electrically operated fire alarm system, which enables the alarm to be raised by means of manual call points (often referred to as ‘break glass’ call points).

6.16 In premises in which people sleep, and some premises in which detection of fire by people would be unreliable or could be delayed, the fire alarm system should incorporate automatic fire detectors. Fire alarm systems are discussed in Section 7 of this guide.

6.17 Early warning of fire is clearly important in maximising the safe escape time; nothing happens after the outbreak of fire until the fire is detected, whether by people or automatic fire detectors, and the fire alarm system sounds. Delayed detection of fire and/or delayed warning of occupants can dangerously decrease the safe escape time, so preventing escape before the fire places people in severe danger.

6.18 These delays can occur for a number of reasons; if there are unoccupied or unsupervised areas in which there is no automatic fire detection, or a reluctance of occupants to take what they perceive to be a drastic step of operating a manual call point, knowing that the step will result in evacuation of a building. Similarly, even if fire is very quickly noticed by people in the area, there may still be a significant delay before they operate the fire alarm system due to taking other actions, such as attempting to fight the fire or informing someone who is better able to decide on the action to be taken. The correct decisions and actions of staff in raising the alarm must be addressed by staff training, which is discussed in Section 19 of this guide.

6.19 One benefit of automatic fire detection is a warning of fire at its earliest stage, due to the detector detecting the smallest quantity of smoke or products of combustion.

6.20 Whether fire is detected by people or an automatic fire detector, the nature of the alarm signal must be appropriate for occupants. Audible alarm signals must be loud enough to alert people. In certain premises where audible alarms may not be heard due to background noise levels, systems should be supplemented with visual alarms such as beacons or flashing lights.

6.21 If people sleep on the premises, it must be loud enough to rouse them from sleep. If some occupants are deaf or have a hearing impairment, the audible alarm may need to be supplemented by flashing beacons or vibrating pagers (for those who are awake) and vibrating devices located under pillows or mattresses of those who are asleep. This is discussed further in Section 7.

Step 2: Recognition of alarm signal

6.22 When the fire alarm system operates, all staff must have been trained to be aware of the meaning of the alarm signal.

6.23 However, visitors and contractors in a building may not always recognise the fire alarm signal and the need to evacuate. This would normally be addressed by trained staff supervision.

6.24 A benefit of a voice alarm system is that the recognition time is reduced (to zero), as the fire alarm signal takes the form of a speech message broadcast over loudspeakers, thereby eliminating any ambiguity regarding the meaning of a simple alarm tone.

6.25 Guidance for those with hearing impairments can be found in: Fire safety risk assessment: means of escape for disabled people - GOV.UK (www.gov.uk)

Step 3: Response to the alarm signal

6.26 After people realise that the fire alarm system is operating, in an ideal world, they should begin their evacuation immediately. In practice, this does not always happen. People may have low motivation to evacuate because they wish to finish an activity, such as eating a meal or completing a piece of work, before evacuating. This is particularly the case where there is no obvious fire in their vicinity.

6.27 This “response time” can often be the longest time interval in the steps between ignition and final evacuation. It can be addressed by better staff training (such as training of staff in managing urgent customer evacuation in retail and entertainment premises), together with the use of voice alarm systems to broadcast clear instructions to evacuate.

6.28 Response times can vary significantly between different people when the actions of staff or other building occupants are not readily observable (such as in the case of guests in hotel bedrooms).

Case study

Since 1960, there have only been 3 notable, multi-fatality fires in department stores in the UK. These occurred in 1960, 1979 and 1993, in Liverpool, Manchester and Chesterfield respectively.

A common factor in all 3 fires was the difficulty experienced by staff in persuading customers to leave the café in the store. It was not that the public dismissed the incident as a false alarm; they were aware that there was a fire, but they wished to continue, for example, queuing to pay for a meal or completing their meal before evacuating.

These fires demonstrate potentially long response times in some types of premises in which the public are engaged in various activities, because as discussed in

Section 3, the general public do not have experience, or hence understanding, of the speed with which fire can develop.

As the public cannot be trained, this goes to the issue of training of staff (such as in shepherding the public). This is discussed further in Section 19 of this guide.

Step 4: Travel time

6.29 When people make a decision to evacuate, there is then a time interval for travel from their location to a place of relative safety or a place of ultimate safety.

6.30 In building design, this time can be limited by limiting what is known as "travel distance", which is the maximum distance of travel from any point on a storey to the nearest exit from the storey. Travel distance is discussed in Section 8 of this guide.

Assessing and extending the safe escape time if necessary

6.31 This simple analysis shows that, if it is (subjectively) determined (such as in a fire risk assessment) that people will not be able to evacuate before conditions become unsurvivable, then additional fire safety measures will need to be implemented. There are various different means to address the problem.

- Additional measures which could ensure occupants are able to escape in time could include
  - a suppression system or smoke control system
  - earlier detection of fire and raising of the alarm (such as by installing smoke detection)
  - reducing the recognition and response time (such as by enhanced training of occupants and/or a voice alarm system)
  - reducing the maximum distance of travel to the nearest fire exit (such as by installing an additional exit)
  - increasing the level of fire resistance surrounding the compartment/escape route

Although this guide (and each relevant sector specific guide) recommends maximum travel distances for different types of premises, these should not be regarded as hard and fast limits; a small increase in travel distance may have very little effect on the overall time between ignition and evacuation. Furthermore, it is possible to compensate for longer travel distances by adopting additional fire safety measures that will ensure that people can still safely evacuate the premises. However, these adjustments would require assessment by a competent person, such as a fire engineer or a fire risk assessor, before implementing.

6.32 Similarly, it may be the case that a building with satisfactory travel distances, but poor housekeeping that would result in rapid fire development, no automatic fire detection and poorly trained staff is not as safe as an identical building with longer travel distances, but automatic fire detection, good housekeeping, a voice alarm system and well-trained staff.

6.33 As discussed in the Introduction to this guide, the fire protection measures discussed in further sections of this guide should be considered as a whole, rather than in isolation, as they form an integrated “package” of measures, the sole objective of which is to ensure that evacuation occurs before it is prevented by a fire.

Summary of Points in Section 6:

- It is a simple truism that, when fire occurs, everyone affected must evacuate before the fire prevents escape. The sole purpose of the fire protection measures, described in later sections of this Guide, is to achieve this objective.
- Fire protection is all about time. After a fire starts, there is a window of time, during which it is safe for people to escape. This can be described as the *"safe escape time"*, but, other than in the design of complex buildings, this cannot be determined accurately.
- After fire starts, there will be a period of time before everybody affected has evacuated. The purpose of a fire risk assessment is, in effect, to ensure that the safe escape time is assessed to be appropriate for the building and occupancy.is. Following the recommendations in this Guide will normally ensure that this is the case, without any need to calculate these times.
- However, that is not to say that the recommendations should be followed without any possible variation.
    - The safe escape time can, if necessary, be achieved by:
        - increased by fire protection measures, such as fire suppression systems (such as a sprinkler system or a smoke control system).
        - earlier detection of fire and raising of the alarm (such as by installing smoke detection)
        - reducing the recognition and response time (such as by enhanced **training of occupants and/or a voice alarm system)**
        - reducing the maximum distance of travel to the nearest fire exit (such as by installing an additional exit)
    - This very simple analysis provides the basis for means by which a safe escape time can, if necessary, be achieved, particularly in circumstances in which any of the above steps (such as distance of travel to an exit) materially varies from this Guide and/or the relevant sector-specific guide."

7. Fire Alarm Systems

7.1 As discussed in Section 6, if people are to escape from a fire, the first step is to give them a warning of the fire. So, in all premises, there must be some means of giving a warning to occupants in the event of fire.

7.2 In a very small, single storey building, means of giving warning might comprise of manually operated mechanical devices, such as turn-handle rotary gongs. If the premises were small (such as a single storey shop), it might even be sufficient for persons to shout ‘Fire!’ in order for an adequate warning to be given.

7.3 In practice, most buildings within the scope of this guide are likely to require an electrically operated fire alarm system that will alert all occupants, indicate the location of the fire and, in some buildings, automatically summon the fire and rescue service. Technically, these systems are known as “fire detection and fire alarm systems”, but, for simplicity, in this guide, they are described simply as “fire alarm systems”.

Components of a fire alarm system

7.4 The components of a typical fire alarm system are shown in Figure 10.

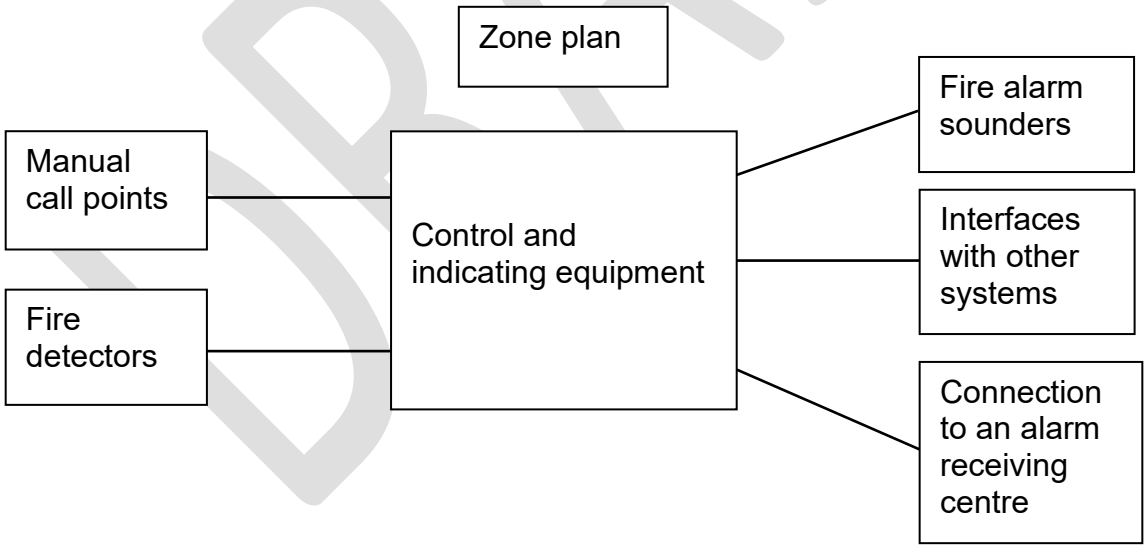

Figure 10: Components of a typical fire alarm system

Control and indicating equipment

7.5 The *control and indicating equipment* (“CIE”) provides power to all field devices, including manual call points, fire detectors, fire alarm sounders. It also incorporates controls for silencing of fire alarm sounders or starting fire alarm sounders and resetting the system after an incident. The CIE is often, colloquially, described as the “the fire alarm panel”.

7.6 The CIE should be sited at a location where it would be readily accessible to the fire and rescue service and staff in the building who need to determine the location of a fire. This is normally an area close to the entrance of the building, but, in more complex buildings, such as a shopping centre, the CIE might be located in a permanently staffed control room; there might then be a need for repeat CIE to be sited at the entrance(s) that will be used by the fire and rescue service.

Manual call points

7.7 The *manual call points* take the form of units that enable occupants to trigger a fire alarm signal by breaking (or displacing) the glass (or plastic element) on the front of the unit.

7.8 The correct siting of manual call points is important. No one should be able to leave any storey of a building, or any exit from a building, without passing a manual call point; this means that there should be a manual call point at every exit from a storey and every exit from the building. If necessary, additional manual call points should be provided to make sure that no one would ever need to travel for more than 45m to reach the nearest manual call point.

7.9 Manual call points should be fixed at around 1.4m above floor level, but they may be mounted a little lower than this (such as 1.2m) to assist access for people in wheelchairs.

7.10 In all recently installed systems, manual call points will be fitted with a transparent cover that should be lifted to access the glass operating element. This is to prevent accidental operation or casual malicious operation (such as by people walking past a manual call point and pressing the glass element).

7.11 There is no requirement to fit these covers to manual call points that were installed without them. However, in many designs of manual call points, covers can be retrofitted, simply by clipping compatible covers onto the front of these devices. This can sometimes be useful in eliminating, or reducing, casual malicious operation.

Fire detectors

7.12 Fire detectors respond automatically to products of a fire (e. g. heat, smoke, flame and carbon monoxide).

7.13 Heat detectors are relatively slow to respond because they only operate when a fire is quite large (such as with flame height of around one third of the ceiling height). However, this means that they are relatively immune to false alarms.

7.14 So, heat detectors mostly tend to be used in areas in which smoke detectors would cause an unacceptable rate of false alarms. Examples are kitchens and dusty environments.

7.15 On the other hand, heat detectors cannot be used where there would be a need for the earliest possible warning of fire. The most common example of this comprises escape routes (corridors and stairways) in a building.

7.16 Smoke detectors are the most commonly used type of fire detector. They (and multi-sensor fire detectors, which are discussed below) tend to be the default type of fire detector, unless there is some reason to use another type of detector (such as discussed above, in kitchens).

7.17 Carbon monoxide fire detectors are very uncommon. As the name implies, they respond only to carbon monoxide, which is produced in a fire in which the supply of oxygen to feed the fire is insufficient. The sensors used in carbon monoxide fire detectors are more commonly incorporated within multi-sensor fire detectors.

7.18 Flame detectors only respond to the flames from a fire, but cannot detect smoke. Their use tends to be limited to special applications, such as plants handling flammable liquids and gases, or, sometimes, very high spaces in which smoke from a fire would not reach smoke detectors at roof level.

7.19 Multi-sensor fire detectors contain sensing elements that respond to more than one product of fire. For example, the most common multi-sensor fire detectors contain sensors that respond to heat and to smoke, but some proprietary systems incorporate a heat sensor, a smoke sensor and a carbon monoxide sensor.

7.20 Some multi-sensor fire detectors are designed to provide optimum response to different types of fire. However, many multi-sensor fire detection systems are specifically designed to minimise false alarms (such as by algorithms that are designed to determine whether signals from each sensor correspond to the pattern of a fire).

Fire alarm sounders

7.21 *Fire alarm sounders* produce an audible signal when the fire alarm system operates. They may take the form of bells, or more commonly in modern systems, electronic sounders. The audible signal must be different from any other warning signal in use on site.

7.22 Regardless of the type of fire alarm sounder used, the important thing is to be certain that the fire alarm signal is loud enough to be heard in all parts of the building, and to rouse people who are asleep.

7.23 For people who are awake, the sound level in all areas should be at least 60 to 65 dB(A). In premises in which people sleep, the sound level at every bedhead should be at least 75 dB(A).

7.24 The sound level of 60 to 65 dB(A) will, subjectively, sound about twice as loud as normal conversation. As a rule of thumb, if there is more than one door between any point in a building and the nearest fire alarm sounder, this sound level will not be achieved. So, it is common, for example, to install a fire alarm sounder in a toilet if there is a lobby between the toilet and an adjacent corridor, where other fire alarm sounders would be located.

7.25 As a further rule of thumb, it is very unlikely that 75 dB(A) can be achieved in a bedroom unless there is a fire alarm sounder within the bedroom itself.

Case study

In 2007, a fire occurred in a hotel in Newquay, Cornwall, resulting in 3 deaths.

In many of the bedrooms, there were no fire alarm sounders, so the fire alarm signal was not loud enough to rouse all people from sleep.

In prosecution of the hotel owners for the inadequate fire alarm system, it was not alleged that the poor audibility of the alarm signal led to the deaths. However, a number of guests might have been placed in danger, had it not been that 2 sisters ran along corridors, banging on bedroom doors, to wake guests from sleep.

7.26 Different (lower) sound pressure levels apply in hospitals to avoid disruption to patients. This is discussed in the relevant sector-specific guide. The sound pressure of 75 dB(A) might not be necessary in the bedrooms of a residential care home, where the fire alarm signal is primarily to alert staff, rather than residents.

Voice alarm systems

7.27 In some premises, instead of fire alarm sounders, the fire warning is given by a *voice alarm system.* A voice alarm system is a specially designed public address system, which is designed like a fire alarm system, so, for example, all wiring to loudspeakers is fire-resisting, and there is a standby power supply to cater for mains failure.

7.28 Voice alarm systems are commonly used in large assembly buildings, such as air and rail terminals, shopping complexes, large auditoria and in buildings with phased evacuation (see Section 8).

7.29 It is known that, in these types of building, members of the public do not always react quickly if fire alarm sounders operate. However, a more rapid response is likely to occur when people are given a clear spoken instruction to evacuate.

Interfaces with other systems

7.30 It is common, particularly in larger and complex buildings, for the fire alarm system to be interfaced with other systems in order to satisfy the fire safety strategy for the building. For example, when the fire alarm system operates, there is often a need for:

- lifts to return to ground level and then be taken out of action
- air handling systems to stop, to prevent the spread of smoke
- fire doors that are normally held open (by a suitable device) to close automatically
- electronic access control systems to release locks on fire exit doors
- powered sliding doors on means of escape to open and remain permanently open
- smoke control systems to operate
- gas valves to be closed (according to location of the fire)
- fire suppression systems to discharge

7.31 Specialist advice is necessary to ensure that these interfaces operate reliably and that, for example, electronic locks release if faults occur on the fire alarm system. Various parts of BS 7273 provide guidance on this matter.

Connection to an alarm receiving centre

7.32 An *alarm receiving centre* (“ARC”) is a 24 hour-staffed, secure monitoring centre, to which fire alarm signals from premises are relayed automatically when the fire alarm system operates.

7.33 There is no requirement under the Fire Safety Order for this facility to be provided, as it is most commonly provided for protection of property by ensuring fire and rescue service attendance in the event of a fire outside normal working hours.

7.34 However, it is recommended that this facility is provided in all residential care premises, certain supported housing and some hospitals. Further guidance on this is provided in the relevant sector-specific guides.

7.35 It should be stressed that, in occupied buildings, the primary method of summoning the fire and rescue service should always comprise a call, via the 999 (or 112) system, from persons on the premises; a call from the ARC is then simply a “back up” to this call.

7.36 If an ARC connection is to be provided, the RP should ensure that the ARC in question has a suitable, formal arrangement with the relevant fire and rescue service to receive calls from the ARC.

7.37 Some fire and rescue services will not attend calls from an ARC unless it can be confirmed that there is a real fire. Fire and rescue service policies vary greatly in this respect; some services will attend calls to any premises during the night, others only attend calls to specific types of premises, such as those in which people sleep, others will only attend calls to even more limited premises, such as sheltered housing.

7.38 Persons with duties should ensure that, if there is a connection to the ARC, they are familiar with the policy of their local fire and rescue service. For example, in circumstances in which the fire and rescue service will not attend, the ARC will alert a keyholder to investigate. It is important that persons with duties then have a suitable procedure for safe investigation of a potential fire by the keyholder.

Zone plan

7.39 The CIE provides an indication of the zone of the premises in which there is a fire (or false alarm). A zone is a sub-division of the premises (such as a storey or, in large premises, part of a storey). The purpose of dividing premises into zones is to enable rapid identification of the location of a fire for both staff on the premises and the fire and rescue service.

7.40 To further assist with this, a zone plan should be located adjacent to the CIE. This normally takes the form of a paper or engraved plan. The plan should clearly show the division of the premises into zones, circulation routes (such as corridors and stairways) and building entrances. Information may, alternatively, be shown on an illuminated “mimic diagram”, which shows the same information, but in which each zone is shown by an indicator that illuminates to show the zone of alarm origin.

7.41 The need to provide a zone plan does not only apply to new premises or new fire alarm systems. If a zone plan is not already present, then it is essential that it should be provided.

It should be stressed that a simple written list of zones, with a description of the location of each zone, is not sufficient.

Case study

In 2018, a resident in supported housing died when a fire occurred in a bedroom within her flat in the premises. It is likely that the fire was detected rapidly by a smoke detector within the bedroom, so the fire alarm system would have sounded very quickly.

There was a significant delay before care staff attended her flat, because there was confusion as to the location of the fire as a result of misleading information at the CIE.

There was no zone plan. A suitable zone plan would have clearly shown the location of the zone that was displayed on the CIE, so potentially reducing the delay in an attempt to rescue the resident, which occurred too late to save her life.

Fire warning for people who are Deaf or have a hearing impairment

7.42 Consideration needs to be given as to how people who are Deaf or hard of hearing are to be given warning in the event of fire, including those who sleep on the premises, such as guests in a hotel.

7.43 If people who are Deaf or hard of hearing are never alone while on the premises (such as customers in a shop or place of entertainment, or people working alongside colleagues in an office building), this may not be a serious problem.

7.44 If a person with hearing difficulties is likely to be alone or background noise levels are high, other means of warning them of fire need to be considered. These can include, for example, flashing beacons and/or vibrating pagers linked to the fire alarm system.

7.45 In the case of sleeping occupants, vibrating pads, linked to the fire alarm system, can be provided to go beneath pillows or a mattress cover.

7.46 Further guidance is given in: Fire safety risk assessment: means of escape for disabled people - GOV.UK (www.gov.uk)

Staged fire alarms

7.47 In the vast majority of premises, operation of the fire alarm system should trigger the immediate and total evacuation of the building.

7.48 However, in some large or complex buildings, the audible fire alarm signal might be given in stages. Such staged fire alarms broadly fall into 2 groups.

7.49 Firstly, there might be an arrangement whereby those potentially at greatest danger from a fire, usually those closest to where the fire alarm system was activated, will be immediately evacuated in response to operation of the fire alarm sounders. In other areas, a readily distinctive alarm signal (known as an “alert signal”) is given to indicate that their subsequent evacuation might become necessary.

7.50 This arrangement is known as a “two-stage alarm”. It is sometimes used, for example, in high-rise office buildings, in which, to avoid overcrowding of stairways, only 2 floors are evacuated at the same time. Ultimately, the entire building will commonly be evacuated, but only 2 floors at a time.

7.51 This is known as “*phased evacuation*”. Commonly, the two-stage alarm that supports phased evacuation takes the form of a voice alarm system, so that clear instruction can be given to those who need to evacuate,

while instruction and reassurance is given to those who should, for the moment, remain in place.

7.52 The second form of staged alarm is one in which, when a smoke detector operates, a restricted alarm is given only to staff, who can then investigate before evacuating the building and/or summoning the fire and rescue service in response to what might be a false alarm. This is known as a "*staff alarm*" arrangement. A staff alarm is suitable for many types of buildings, but not care homes.

7.53 Staff alarms need careful management and suitable procedures for safe investigation of fire alarm signals. A staff alarm arrangement should incorporate various safeguards to prevent occupants being exposed to danger. Normally, these comprise:

- an immediate alarm if the fire alarm system is triggered (whether as the initial signal or subsequent to the start of the staff alarm) by a manual call point (as this is likely to indicate discovery of fire), or by a heat detector or sprinkler system (as these do not tend to produce false alarms, while indicating a significant fire at the time of their operation)
- a limit to the time for investigation, after which, if the fire alarm system is not silenced or reset, an evacuation signal is given automatically by the fire alarm system. A typical time for investigation is around 3 minutes, but should not generally be more than 6 minutes
- if a second detector operates during the investigation period, the investigation period is ended and an evacuation signal is given automatically by the fire alarm system. This is known as a "coincidence" arrangement (but is commonly, though incorrectly, described as "double knock")

Types of fire alarm system

7.54 There are, fundamentally, 2 basic types of fire alarm system, described as:

- conventional (or non-addressable) systems
- addressable systems

7.55 When the fire alarm system operates, a non-addressable system is unable to identify, at the CIE, which of the devices (manual call points or fire detectors) within the particular zone has triggered the alarm; the CIE only indicates the zone in question. It is then necessary for people to search the zone (such as an entire storey of a building) to find a fire.

7.56 In an addressable system, as well as indicating the relevant zone, the signals from each device are individually identified at the CIE. A text display describes the exact location of the manual call point or fire

detector that triggered the fire alarm signal. This enables people to reach a fire much sooner.

7.57 Both types of fire alarm system can satisfy the requirements of the Fire Safety Order. However, in practice, non-addressable systems are mainly used in relatively small buildings, in which the need to search a zone to find a fire might not be a major disadvantage.

7.58 Recognised good practice (as recommended in the relevant British Standard) is that, where occupants of a building are likely to need assistance from staff to evacuate the building (such as in residential care premises and hospitals), the fire alarm system should be addressable if the building has facilities for more than 10 people to sleep.

Case study:

In Section 5, the serious, multiple fatality fire at Rosepark Care Home in Lanarkshire was discussed (by reference to the cause of the fire).

When the fire occurred, staff were confused as to the location of the fire. There was no zone plan, the fire alarm system was non-addressable, and the description of the zone, as set out in a list adjacent to the CIE, was ambiguous. This resulted in a delay of around 9 minutes, before staff confirmed that there even was a fire and summoned the fire and rescue service.

It is as a result of this fire that the relevant British Standard not only recommends the provision of zone plans in all premises, but makes the recommendation described above for use of addressable fire alarm systems for care homes and hospitals.

7.59 It is not suggested that all existing non-addressable systems in care homes need to be replaced with addressable systems; this may involve substantial cost. However, the recommendation for addressable systems applies to all new care homes facilities for more than ten people to sleep, and to replacement fire alarm systems in existing premises of this nature.

Codes of practice for fire alarm systems

7.60 Virtually all fire alarm systems in non-domestic premises are designed, installed and maintained in accordance with BS 5839-1.

7.61 In the case of hospitals, guidance on the design of fire alarm systems is published by the Department of Health in the form of HTM 05-03: Part B (NHS England » Health Technical Memorandum 05-03: Firecode – Fire Safety in the NHS – Operational provisions). This supplements BS 5839-1, modifying or adding to the recommendations of the British Standard, but needs to be read in conjunction with BS 5839-1.

Categories of non-domestic fire alarm systems

7.62 BS 5839-1 defines 8 categories of fire alarm system, according to the extent of fire detection, ranging from none to complete coverage

throughout a building. 2 of the categories are concerned solely with property protection, so have no bearing on compliance with the Fire Safety Order; these are not considered further in this guide.

7.63 The remaining 6 categories are described below. In each sector-specific guide, the appropriate category of system is specified for the particular type of premises. As the purpose of the categories is really just to provide a shorthand way of describing the level of automatic fire detection, the sector-specific guides do not repeat the definitions below.

- Category M systems are, by definition, “manual fire alarm systems” and, therefore, incorporate no automatic fire detectors.
- Category L1 systems incorporate fire detectors throughout all areas of the protected building (with minor exceptions). This is the highest standard of fire detection for protection of life. This category is appropriate for high-risk premises, such as care homes and hospitals.
- Category L2 systems incorporate fire detectors only in defined parts of the building, which include those parts in which fire detectors are provided in a Category L3 system, plus defined high hazard areas and areas in which a fire would present a high risk to occupants. This category is the minimum appropriate for premises in which people sleep, such as hotels.
- Category L3 systems are installed only for the protection of escape routes; the objective is to ensure that occupants evacuate before escape routes are impassable owing to the presence of fire, smoke or toxic gases. To satisfy the objective, detectors need to be installed in all rooms or areas that open onto escape routes, as well as within the escape routes themselves.
- Category L4 systems incorporate smoke detectors only within those parts of the escape routes forming the circulation areas and spaces, such as corridors and stairways. The purpose of a Category L4 system is simply to enhance the safety of occupants by providing warning of fire within the escape routes. Such a system would not, however, be sufficient to protect sleeping occupants.
- Category L5 systems are systems intended to satisfy a specific fire safety objective related to protection of life. These are 'tailor-made' systems, in which the areas protected by automatic fire detectors are carefully specified for the purpose of meeting the defined objective.

7.64 Category M systems are very common. They are usually sufficient to satisfy the requirements of the Fire Safety Order in common places of work in which no one sleeps, but may need to be enhanced by fire detectors in certain unsupervised areas; the system is then described as Category M/L5.

7.65 Categories L1 to L4 are designed to also satisfy all requirements for a Category M system since they incorporate manual call points as well as fire detectors.

7.66 In view of the existence of these different categories of fire alarm system, it is meaningless to specify the provision of a system complying with BS 5839-1. Any reference to the British Standard needs to be accompanied by a reference to system category.

Categories of domestic fire alarm systems

7.67 BS 5839-6 defines 3 categories of fire alarm system for protection of life. As in the case of BS 5839-1, these categories are really just a shorthand way of describing the level of fire detection, so, again, the definitions are not repeated in the sector-specific guides.

- Category LD1 systems incorporate fire detectors throughout the premises, so giving the earliest practicable warning of fire to occupants, wherever fire breaks out. This category is appropriate for high-risk domestic premises, such as supported housing for vulnerable people, and in self-catering premises or premises with short-term paying guests.
- Category LD2 systems incorporate fire detectors within escape routes and in rooms or areas in which fire risk is high (such as lounges and kitchens). This category is the minimum appropriate for premises, such as the communal areas of a house in multiple occupation.
- Category LD3 systems incorporate fire detectors only in the circulation areas that form the escape routes. They are unlikely to be sufficient for premises that fall within the scope of this guide.

Grades of domestic fire alarm system

7.68 While the categories of domestic fire alarm system relate to the extent of coverage by fire detectors, BS 5839-6 defines 6 “grades” of fire alarm system for use in domestic premises. These are defined as follows:

- A Grade A system is effectively a fire alarm system that is virtually identical to the types of fire alarm system described in BS 5839-1, so there will be CIE, fire detectors and fire alarm sounders, though the provision of manual call points might be less than recommended in BS 5839-1, and lower sound pressure levels might be acceptable in bedrooms.
- A Grade C system is a system incorporating fire detectors and fire alarm sounders connected to a common power supply, with central control equipment, but this equipment might be significantly less sophisticated than the CIE required for compliance with BS 5839-1. An example would be a number of smoke detectors incorporated within an intruder alarm system.

- Grade D1 and D2 systems comprise one or more mains-powered domestic smoke alarms of the type typically found in most single-family homes, so there is no control equipment. In Grade D1 systems, within each smoke alarm, there are tamper-proof standby batteries, which cannot be removed by the user. In Grade D2 systems, the standby batteries are user-replaceable.
- Grade F1 and F2 systems comprise battery-powered smoke alarms. In Grade F1 systems, the batteries are tamper-proof, whereas, in Grade F2 systems, the batteries are user-replaceable.

7.69 Only Grade A and Grade D systems are likely to be suitable for the premises that fall within the scope of this guide. Grade D systems are likely to be suitable for only the smallest of premises, such as self-catering premises, bed and breakfast establishments and very small, supported housing units. Further guidance on the appropriate fire alarm system is given in the relevant sector-specific guide, or the guides for small premises, to which there is reference on page 212 of this guide.

Radio-linked fire alarm systems

7.70 It is possible to link components of a fire alarm system by radio, so avoiding the need for wiring.

7.71 Such radio-linked systems are sometimes regarded as an attractive solution for buildings in which wiring would be detrimental to the aesthetics of the building, and can be used to provide temporary protection that is quick to install and adaptable.

7.72 However, one disadvantage of these systems is that manual call points, detectors and fire alarm sounders are all battery-powered (with a second standby battery in each device). Thus, there is a need to change batteries in all devices periodically.

7.73 If a radio-linked system is contemplated, it is essential that installation takes place only after a comprehensive radio survey has been undertaken to ensure adequate signal strength throughout the installation and that no other radio transmissions are likely to interfere with the communication. Where the nature of the building construction or the size of the building could result in poor signal strength, radio repeater units can be used.

False alarms

7.74 False alarms from fire alarm systems are a major problem and result in many unwanted calls to the fire and rescue service every year.[5]

7.75 If there are excessive false alarms, people may become complacent and not respond correctly to a warning of a real fire. In such circumstances, there might be a breach of the Fire Safety Order. All false alarms should be investigated to identify the cause of the problem, which is then noted in the fire alarm logbook, and remedial action taken.

7.76 To help reduce the number of false alarms, the system design and location of detectors should be reviewed against the way the premises are currently used. For example, if a storeroom has been converted to a staff area with cooking facilities (such as a microwave and toaster), then the likelihood of a smoke detector in the area producing false alarms is increased.

7.77 Similarly, if a manual call point is placed in a storage area where there is continual movement of stock, it is likely to be accidentally damaged. In this case, re-siting the manual call point, or installing a simple, fabricated hinged metal guard around it is likely to solve the problem.

7.78 Occasionally people set off a manual call point in the genuine, but incorrect, belief that there is a fire. Nothing should be done to discourage such actions and the number of false alarms generated this way is not significant.

7.79 Guidance on reducing false alarms can be downloaded from the website of the Fire Industry Association at Reducing False Alarms (fia.uk.com).

Summary of Points in Section 7

- A fire alarm system comprises control and indicating equipment ("the control panel"), manual call points and fire alarm sounders. For some premises, such as those in which people sleep, the system also needs to include fire detectors.
- A zone plan should be provided adjacent to the control panel.
- The system can interface with other systems, such as door hold-open devices (so that the doors close automatically in the event of fire), electronic locking (so that electronically locked fire exits unlock in the event of a fire), and other systems, such as smoke control systems, and similar measures.

[5] In the year ending March 2024 there were 254,046 fire false alarms incidents (42% of the yearly incidents attended by the fire services in England). There has been an increase of 4% of fire false alarms incidents from the year ending March 2023 to the year ending March 2024 (from 244,514 to 254,046). In the last 10 years there has been an increase of 13% of fire false alarms incidents (from 224,122 in the year ending March 2014 to 254,046 in the year ending March 2024).

- The system may also be provided with a facility to transmit fire alarm signals to an alarm receiving centre (“ARC”), from where the fire and rescue service will be summoned when the fire alarm system operates. However, when premises are occupied, the fire and rescue service should always be summoned by people on the premises; there should never be sole reliance on a connection to the ARC.

- The provision of a connection to an ARC is not a requirement under the Fire Safety Order, but is strongly recommended for care homes, certain supported housing and some hospitals.

- It is essential that the fire alarm system is loud enough to alert people who are awake and to rouse people who are asleep. In the former case, the sound level should be at least 60 to 65 dB(A), but, in bedrooms, a sound level of 75 dB(A) is needed to rouse people from sleep; this will invariably necessitate the provision of a sounder in every bedroom.

- Lower sound pressure levels may be acceptable in the bedrooms of care homes, and are always appropriate in in-patient areas of hospitals.

- People who are Deaf or have a hearing impairment and are awake can be alerted by flashing beacons and/or vibrating pagers. If they are asleep, they can be roused by vibrating devices connected to the fire alarm system.

- Voice alarm systems, in which the alarm is given by a speech message, rather than by fire alarm sounders, are particularly suitable for large assembly buildings, as they support a better response to fire alarm signals by the public.

- Addressable fire alarm systems, in which the exact location of a fire is indicated at the control panel, rather than only the zone in question (such as a storey), are particularly suitable for care homes and hospitals if there are facilities for more than 10 people to sleep.

- In radio-linked fire alarm systems, manual call points, detectors and fire alarm sounders are connected to the control panel by radio, rather than wiring. However, as these devices are then battery-powered, there is a need to change batteries periodically.

- It is important to minimise the occurrence of false alarms, as these can result in complacency by occupants and cause a burden for the fire and rescue service. If the number of false alarms is high, advice should be obtained from specialists on reducing their number.

- In many premises (but not care homes), it may be appropriate for there to be a short delay, pending investigation, if an alarm signal is triggered by a single smoke detector (but not other types of device). This requires careful management and suitable arrangements for safe investigation of alarm signals.

8. Means Of Escape from Fire

8.1 As discussed in Section 6, after a fire warning is given to people (typically by a fire alarm system), the next step is for people to evacuate using defined escape routes, known as the "means of escape from fire" (or, simply, "means of escape").

8.2 The Fire Safety Order requires that, where necessary, in the event of danger, it must be possible for persons to evacuate the premises as quickly and as safely as possible. To achieve this, there must be suitable means of escape.

Escape route layout

8.3 The Fire Safety Order requires that, where necessary, emergency routes and exits must lead as directly as possible to a place of safety.

8.4 Escape routes should be obvious to all building occupants, and should not be tortuous or complicated. People will be more confident in using escape routes that are part of the normal circulation routes.

8.5 There is a tendency for people to leave a building by the same route that they entered it. Thus, escape routes via, for example, fire exits and stairways that are not in use as normal circulation routes may satisfy the Fire Safety Order, but they may not, in practice, be used to an adequate extent in the event of fire, particularly by those who are unfamiliar with the building and have not received adequate instruction, or are not shepherded towards all relevant exits by staff.

8.6 The Fire Safety Order requires that, where necessary, the RP must ensure that routes to emergency exits from premises and the exits themselves are kept clear at all times.

8.7 Escape routes should not be obstructed by obstacles that narrow the escape route in width or contain trip hazards. There should be no significant fire hazards that might cause outbreak of fire within the escape routes. This is essential in "protected escape routes" (which are, for example, provided in premises in which people sleep); protected escape routes are discussed later in this section of the guide.

8.8 In multi-occupied premises, escape routes should normally be independent of other occupiers, meaning people should not have to go through another occupier's premises, as the route may be secured or obstructed. Where this is not possible, then comprehensive legal agreements should be in place to ensure their availability at all times.

8.9 The most fundamental principle in design of means of escape is that, ideally, people should be able to turn their back on a fire, and walk away from it towards safety wherever practicable.

8.10 This will not be practicable in a small room, in a building with only one stairway, or within a corridor where escape is only available in a single direction (“a dead end”), or indeed in any other circumstances where dead ends exist. Measures are necessary to restrict the circumstances in which this is permissible (such as by restricting the length of a dead end corridor), or to better protect the means of escape (such as in a building with only one stairway, separating accommodation from the stairway by means of a lobby.)

Alternative means of escape

8.11 Escape in only one direction should be avoided where practicable, but is acceptable in limited circumstances. However, to avoid the possibility that a person’s escape route may be cut off by the fire, an alternative escape route should generally be available.

8.12 Alternative escape routes are defined as: 'Escape routes sufficiently separated by either direction and space, or by fire-resisting construction, to ensure that one is still available should the other be affected by fire.'

8.13 Note that fire-resisting construction was discussed in Section 3 of this guide.

8.14 In a room or storey of a building, in which escape routes are not physically separated by fire-resisting construction (such as an open plan area), 2 exits are only considered to be sufficiently separated by direction to be alternatives if, from any point, the angle between the exits is at least 45º (“the 45º rule”).

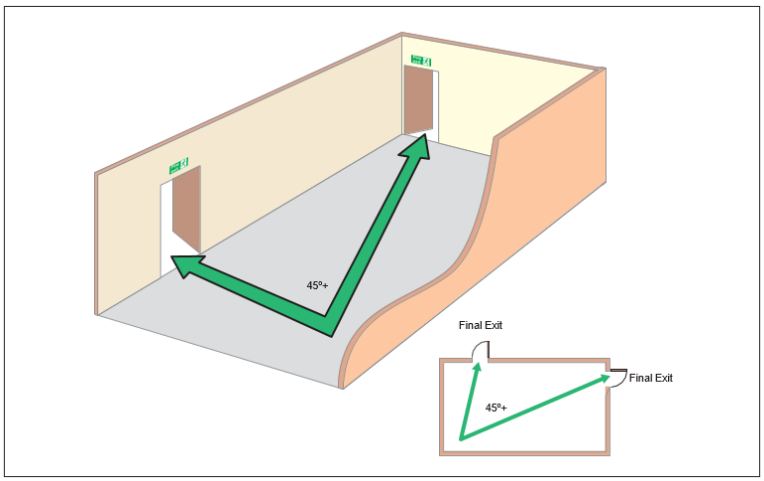

Figure 19: Alternative exits

8.15 If the angle between the routes to the 2 exits is less than 45º, it is a simple convention to assume that the routes to both exits could be obstructed by a single fire, so the 2 exits are not alternatives; thus people are, in effect, located in a dead end.

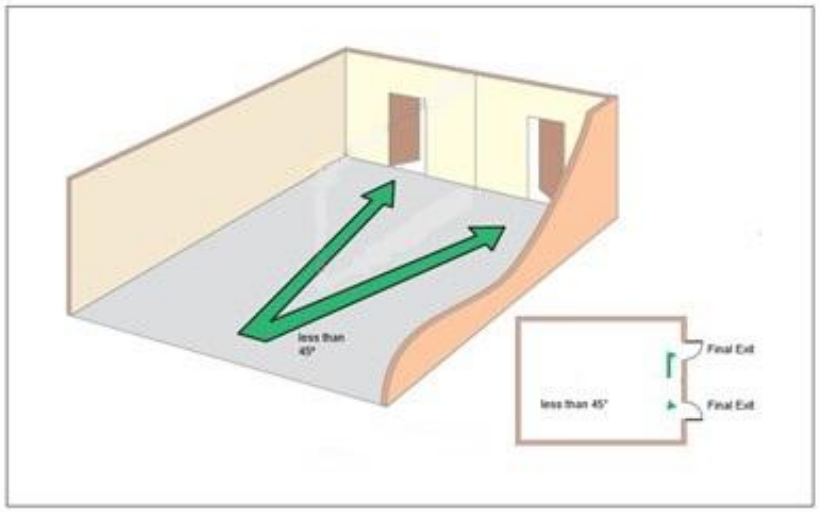

Figure 20: 2 exits, but not alternatives

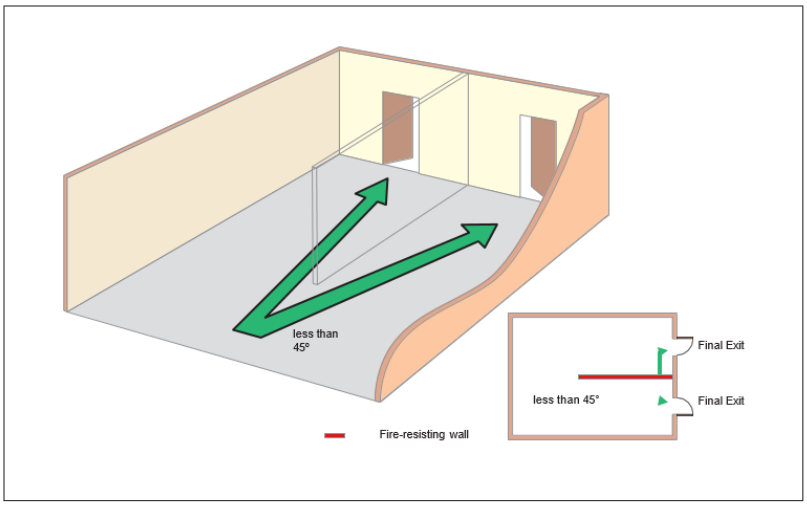

Figure 21: 2 alternative exits separated by fire-resisting construction

8.16 At least 2 exits should be provided if a room or area is to be occupied by more than 60 persons. This number should not be regarded as hard and fast, and can be varied slightly in proportion to the risk. So, if it is expected that any fire would grow slowly after detection, slightly more than 60 persons might be accommodated in a room or area with one fire exit. Conversely, if rapid fire development is anticipated, it might be appropriate to reduce the number to below 60.

8.17 In a building in which some or all upper storeys are served by only a single stairway, clearly there are no alternative exits from these storeys. If the stairway is impassable due to smoke, there would then be reliance on rescue of trapped occupants by the fire and rescue service. For this reason, the sector specific guides give limits on the height and number of storeys of a building that is served by a single stairway. In addition, as discussed later in this section, to enhance the protection of the stairway,

in most buildings there should normally be 2 fire-resisting, self-closing doors between any room or area in which fire could occur and the stairway. Normally, the maximum number of persons on any storey served by a single stairway should be limited to 60.

Inner rooms

8.18 Special requirements apply in the case of “inner rooms”. These are rooms from which escape is possible only by passing through another (“access”) room. The purpose of these requirements is to ensure that the escape route for occupants of the inner room is not cut off by a fire in the access room before they can escape.

8.19 In the case of inner rooms, there must be either:

- a clear vision panel between the inner room and the access room, of suitable size, such that occupants of the inner room can see a fire in the access room or
- smoke detection in the access room to give early warning of fire to occupants of the inner room. (In very small premises, in which no fire alarm system is provided or required, a mains-operated domestic smoke alarm may be used in the access room for this purpose.)
- a large enough gap between the diving wall and the ceiling, such as 500mm, so that smoke will be seen,

8.20 The 2 alternative arrangements are shown in Figure 18; only one is required.

8.21 The access room must not be an area of high fire hazard, such as a kitchen. An inner room must not act as an access room for another inner room.

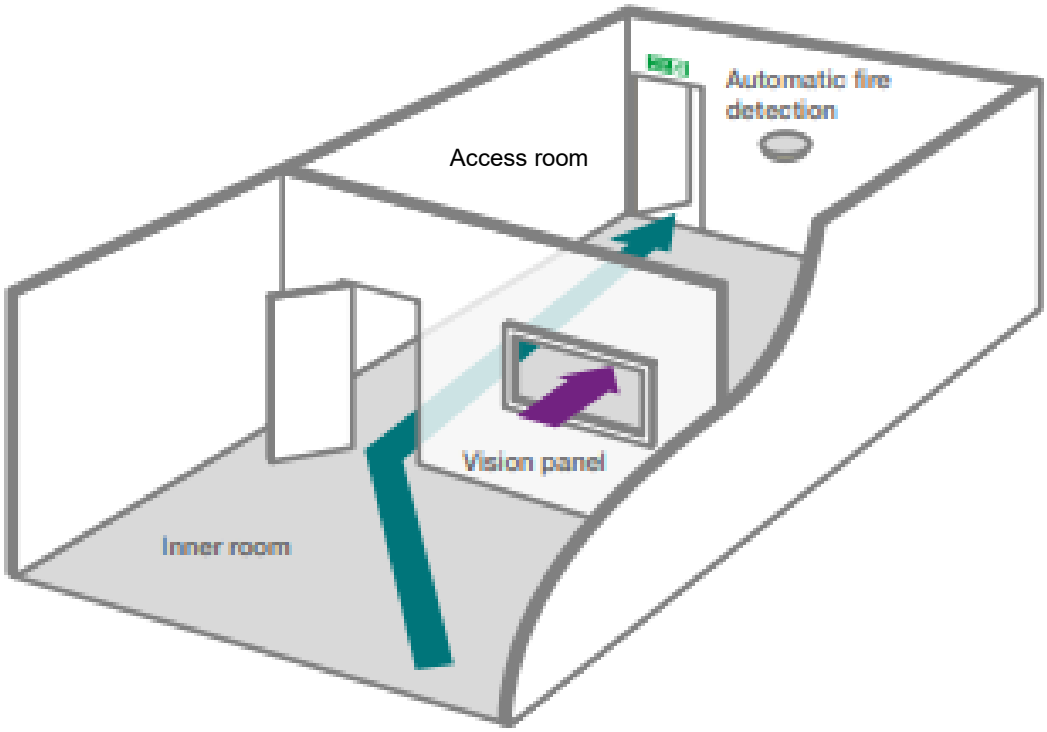

Figure 18: Inner room and access room

8.22 Where the option of a vision panel is adopted, it is important to ensure that the vision panel (which can be located in the door of the room, subject to providing adequate vision to the access room) is not obscured (such as by clothing hung on coat pegs, papers, and similar measures). If the vision panel is, or is likely to be, intentionally obscured for reasons of privacy, the automatic fire detection alternative should be adopted.

8.23 Where the option of automatic fire detection is adopted, care should be taken in buildings with a "staff alarm" arrangement (see Section 7) to ensure that operation of the smoke detector in the access room provides an immediate warning in the inner room.

Direction of opening of doors

8.24 The Fire Safety Order requires that, "where necessary", all doors on escape routes must open in the direction of escape. This is to avoid a situation in which a crush of people at an exit prevents opening of an inward opening door. If more than 60 people will need to use an exit in the event of fire, it is essential that the exit opens in the direction of escape. It is also essential for all other premises unless otherwise identified in the fire risk assessment. Where doors open outwards into escape route the risk of injury to people passing by should be assessed.

Protected escape routes

8.25 As stated above, the escape routes must lead to a place of ultimate safety, invariably open air outside the building. However, as it may be a considerable distance between, for example, the upper storeys of a multi-storey building and open air, it is normally necessary to first reach a place of relative safety, such as a "protected stairway" (see Figure 22 below).

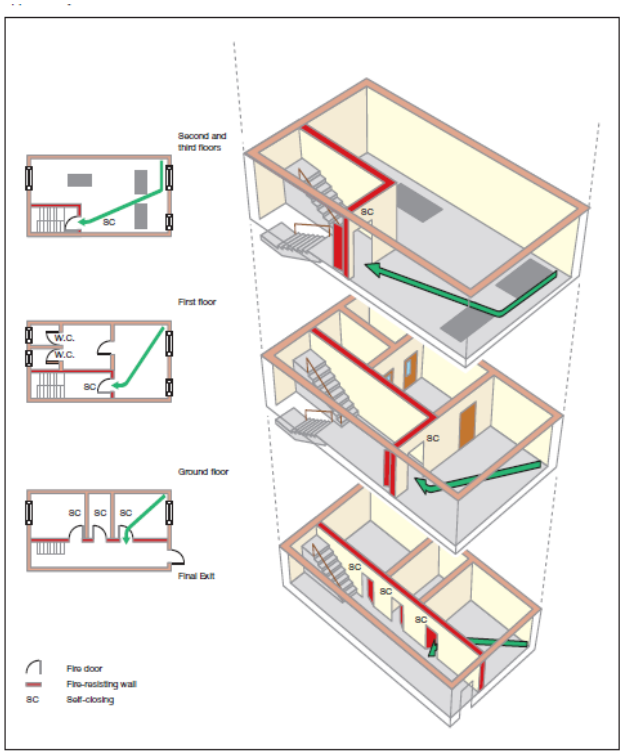

Figure 22: Protected stairway

The term "*protected*" has a special meaning in fire safety. A stairway (corridor or other route) is described as "*protected*" if it is a sterile area, devoid of combustible materials and ignition sources that could start a fire, and separated from the rest of the building by fire-resisting construction.

8.26 Accordingly, in Figure 22, people have reached a "place of relative safety" when they enter the protected stairway shown in the figure.

8.27 While protected stairways must never contain combustible materials (such as storage) or likely ignition sources (such as a cooking appliance or portable heater), the sole exception to this is that, by long-standing convention, a reception or enquiry area may be located within a protected stairway, provided the stairway is not the only stairway serving the upper storeys, the reception area is small (less than 10m^2) and is of low fire hazard.

8.28 It is important that the walls or partitions enclosing a protected stairway or a protected corridor extend to the soffit of the floor slab above. Care needs to be taken that, for example, above false ceilings, the wall or

partition does not stop short of the floor slab (such as at the false ceiling). Within any ceiling void, it should be ensured that any penetrations for services between the void and adjacent accommodation are “fire stopped”.

Sub-division of corridors linking protected stairways

8.29 Where 2 (or more) protected stairways are linked by a long corridor, there is a need to ensure that smoke travel along the corridor does not threaten more than one stairway at the same time. Accordingly, if a section of corridor that links 2 stairways is more than 12m long, a cross-corridor self-closing fire door should be installed, within the middle third of the corridor, to separate the 2 stairways (see Figure 23). This has the additional benefit of limiting the length of corridor along which people might need to travel in the presence of smoke. Whilst assessing cross corridor doors, consideration should be given to previous approved documents which only required cross corridor separation in corridors of 30 meters in length. However, there should always be separation between 2 stairwells.

8.30 These cross-corridor doors should normally be fitted with smoke seals, though it would be acceptable for their fire resistance to be less than 30 minutes (such as 15 to 20 minutes), provided the doors are of substantial construction, making the presence of intumescent strips less important, as a fully developed fire in a corridor is not usually reasonably foreseeable. If there is a false ceiling above the cross corridor doors, it is important to ensure that there is a fire-resisting barrier, in line with the doors, within the false ceiling.

8.31 It needs to be ensured that a fire within an adjacent room that spans the section of corridor that is divided cannot “bypass” the cross-corridor door; this may necessitate either fire-resisting sub-division of the adjacent room or a fire-resisting partition between the room and one section of the corridor (see Figure 23).

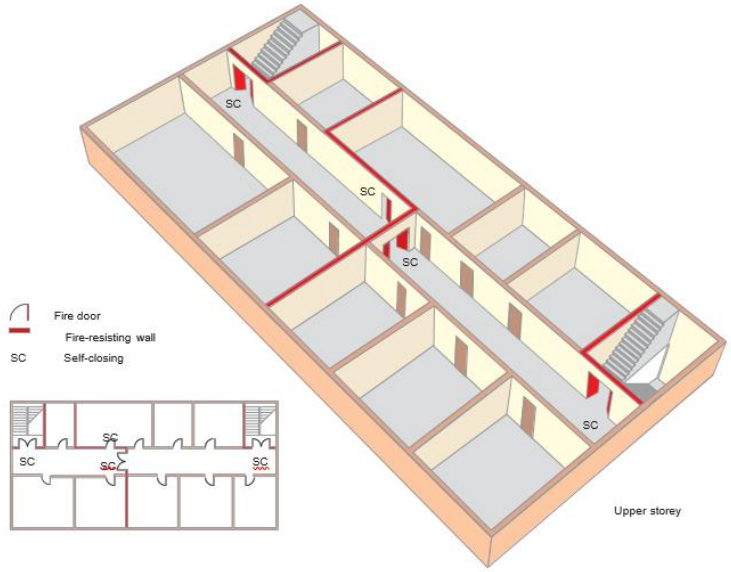

Figure 23: Subdivision of corridor between 2 stairways
(The cross-corridor door need not be installed exactly halfway along the corridor, but should be located within the middle third of the corridor)

Need for stairway by-passes

8.32 Where more than one stairway is required in a building, no one should have to pass through a protected stairway to reach another stairway; otherwise, the 2 stairways are not true alternative escape routes.

8.33 Options to avoid this include:

- using intercommunicating doors between rooms adjacent to the stairway, such doors should be available at all times when the building is occupied (see Figure 24)
- using balconies and other features to bypass the stairway
- as long as there is enough space, create a bypass corridor around the stairway enclosure

8.34 Note: Bypass routes should not normally be provided through bedrooms. However, in some existing premises (such as historic or listed premises) there may be no other alternative measure without considerable alterations to the premises.

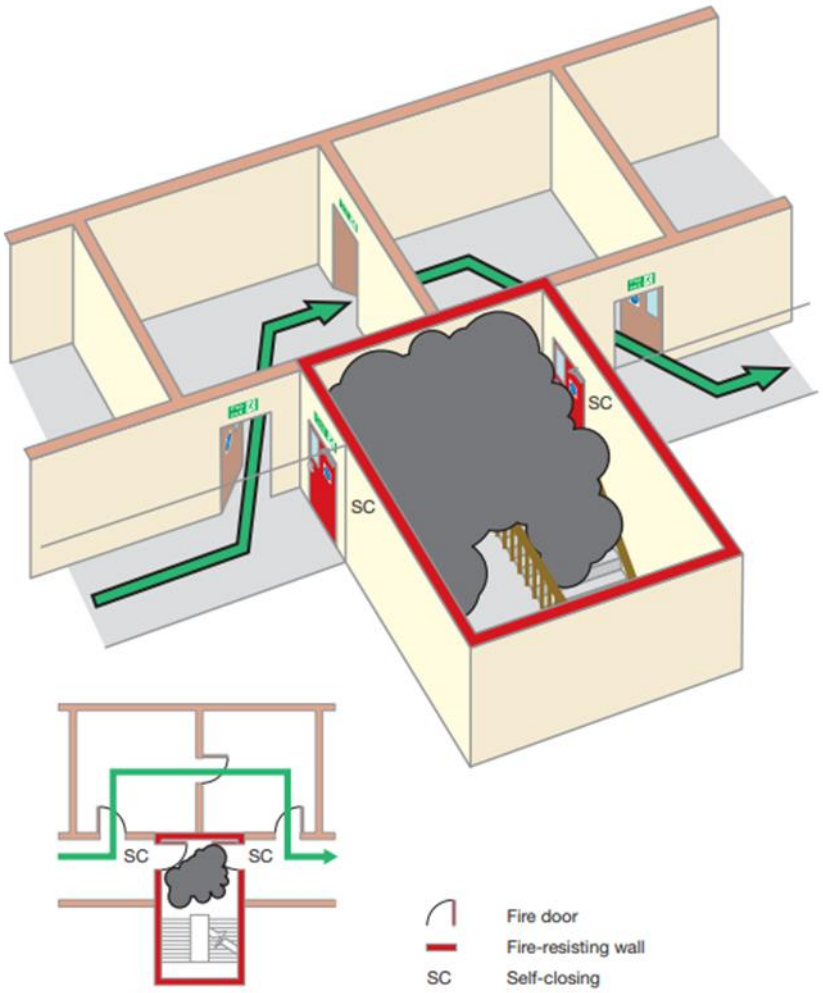

Figure 24: Stairway bypass route

8.35 The only horizontal route from one part of the premises to another should not be through a stairway enclosure, as this will encourage the wedging of the stairway doors and increase wear and tear on these critical doors, unless it is acceptable for automatic door release units to hold the doors open under normal circumstances. (See later guidance on automatic door hold-open devices.)

Additional protection of protected stairways

8.36 Additional protection to a protected stairway can be provided if the door to the stairway is approached only by means of a “protected lobby” or a “protected corridor” (see Figure 25).

8.37 An arrangement whereby a protected stairway is approached only by a protected corridor or a protected lobby is sometimes described as “2 door separation”, because there will always be 2 fire-resisting doors between any fire and the protected stairway.

8.38 The principle of 2 door separation acknowledges that a small amount of smoke may pass through a single fire-resisting door (either through gaps

between the door and the frame, or when people open the door to make their escape). If there is then a second door, only a negligible amount of smoke will reach the protected stairway, enabling an assumption that the protected stairway will always remain available for escape.

8.39 This additional protection is necessary in a number of circumstances, namely:

- In tall buildings, all protected stairways should be approached by protected lobbies or protected corridors; this is because of the difficulty of external rescue of any trapped occupants by the fire and rescue service. This additional protection is necessary in all buildings over 18m in height.
- In buildings, or parts of buildings, in which the upper storeys are served only by a single stairway, that stairway is clearly critical to the safety of occupants of upper floors. Accordingly, the stairway should be approached only by a protected lobby or a protected corridor.
- However, in some lower risk premises of limited height (such as an office building of 4 storeys), the protected lobby or corridor may be omitted if there is suitable automatic fire detection. The possibility of providing automatic fire detection in lieu of protected corridors or lobbies in single stairway buildings is considered in the relevant sector-specific guides.
- Where, in calculating the capacity of stairways to determine the maximum acceptable number of people who can occupy upper floors, there is a need to avoid discounting a stairway in order to maximise the capacity of the available stairways in the building where either lobby protection or a pressurisation system are provided (see later guidance on calculating stairway capacity).
- Where there is a phased evacuation strategy (but excluding the top storey served by the staircase)

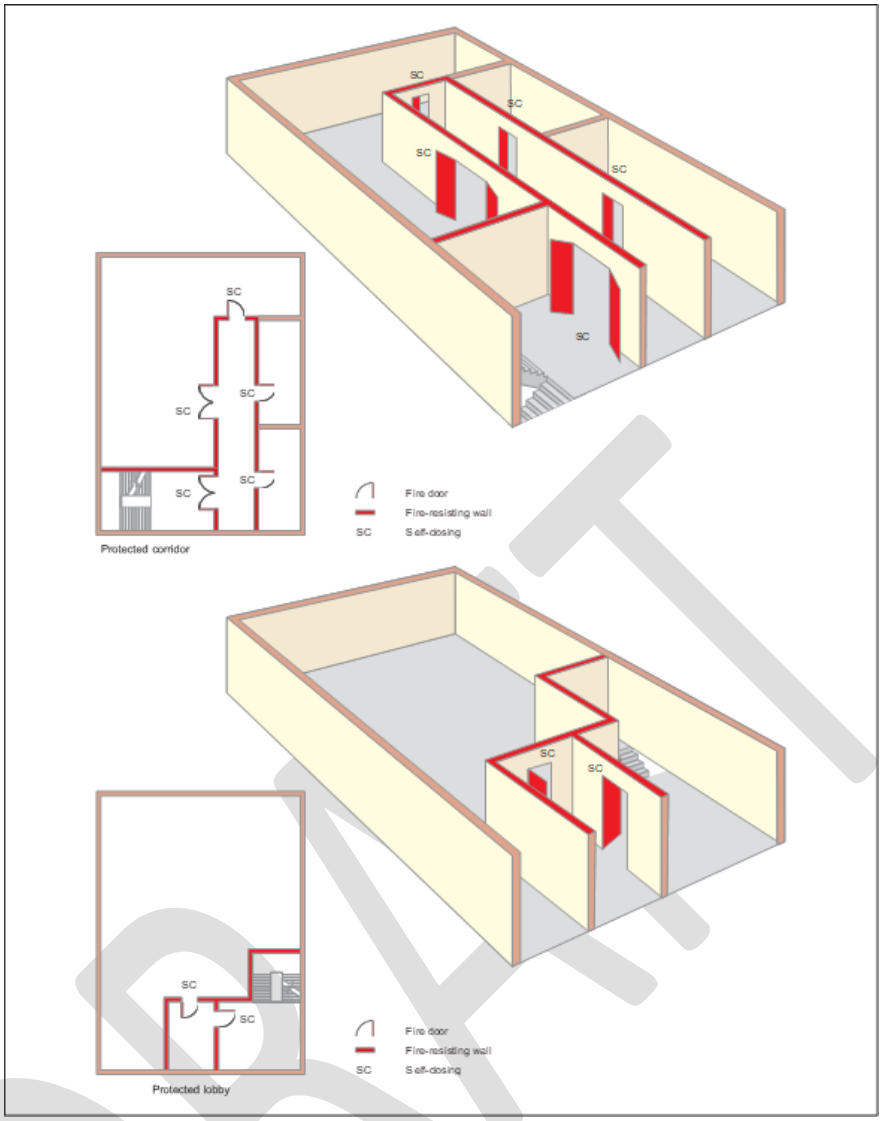

Figure 25: Protected corridor and protected lobby

8.40 In the “protected corridor” shown in Figure 25, the corridor is enclosed in fire-resisting construction, and all doors opening into the corridor are fire-resisting and either self-closing or kept locked shut.

8.41 In the “protected lobby” shown in Figure 25, the lobby is enclosed in fire-resisting construction, and the door between the accommodation and the lobby is fire-resisting and self-closing.

8.42 Both protected corridors and protected lobbies are sterile areas, devoid of any combustible materials that could be ignited and enable development of a fire.

8.43 Again, as in virtually all aspects in the design of means of escape, any necessary protected corridors or protected lobbies would have been provided when the building was designed, so as to ensure compliance with the Building Regulations. However, it is important that, when alterations are carried out, these protected corridors or protected lobbies

are not undermined (such as by a re-arranged layout, in which rooms or areas open directly onto a protected stairway).

Other protected corridors

8.44 As well as one means of providing additional protection for protected stairways, there are 2 other situations in which corridors need to be designed as protected corridors, namely:

- All corridors serving bedrooms (such as in a hotel, care home, and similar measures) or accommodation (such as individual dwellings in multi-dwelling premises) in premises in which people sleep
- All corridors in which there is only a single direction of escape ("dead ends"), in which, therefore, people might need to pass a room in which there is a fire to reach a place of relative (or ultimate) safety

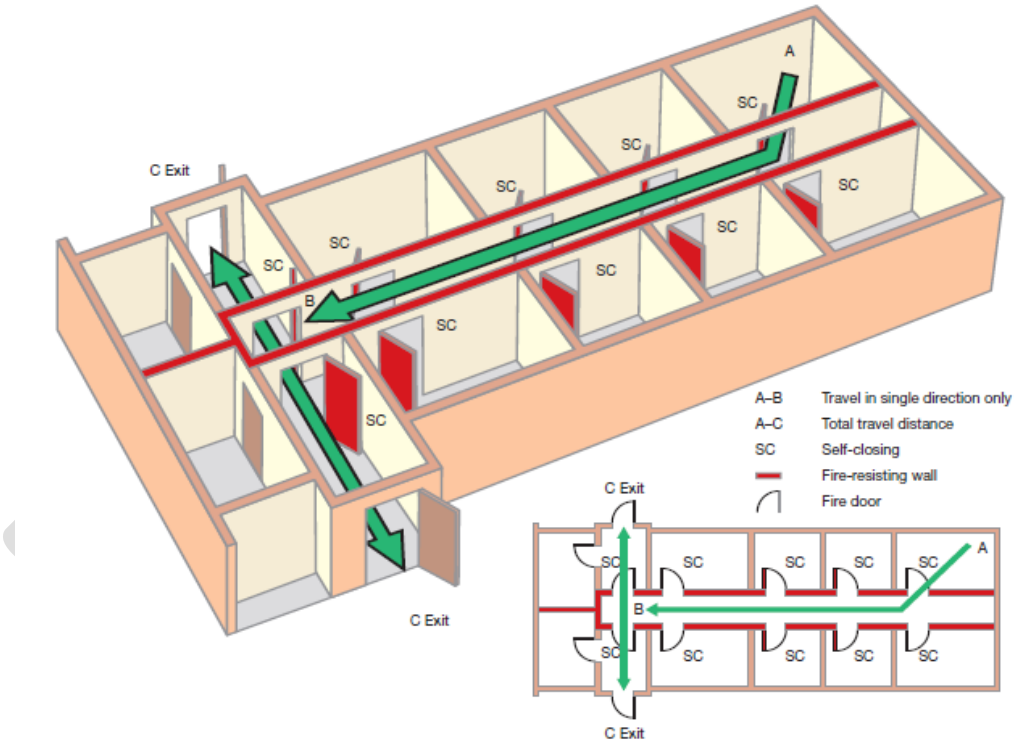

Figure 26: Protected corridors in dead end conditions

8.45 As shown in Figure 26, where the dead end reaches another corridor in which there are 2 directions of escape, fire-resisting, self-closing doors must be provided to separate these 2 directions of escape, so that they are true alternatives.

8.46 In some premises, rather than provision of a protected corridor, it may be acceptable to install automatic fire detection in all rooms opening onto the dead end, and within the dead-end corridor itself. Where this alternative is acceptable, this is discussed in the relevant sector-specific guide.

Automatic door hold-open devices for self-closing fire doors

8.47 Means of escape rely greatly on fire-resisting doors (such as in protected stairways and protected corridors). These should be self-closing, so that they will always be closed at the time of a fire (other than when people are passing through the doors), thereby providing an effective barrier to smoke and fire.

8.48 However, self-closing fire doors are often inconvenient for the occupants of buildings. For example, in a hotel, they can be inconvenient for guests carrying luggage along a corridor, and for housekeeping staff, who require to move linen trolleys along the corridor; if the trolleys need to pass through closed fire doors, the doors will inevitably suffer damage from impact by trolleys.

8.49 Self-closing fire doors may also affect on the freedom of residents in a care home to use the building. For example, they may have difficulty in opening their bedroom door against the force of the self-closing device, and they may have difficulty in passing along a corridor that is sub-divided by self-closing doors.

8.50 These issues commonly lead to occupants inserting a wedge to hold the doors permanently open. This is totally unacceptable and can result in a breach of the Fire Safety Order, for which persons with duties are then exposed to prosecution.

8.51 The issues can be overcome by fitting suitable door hold-open/release devices. These devices are designed to hold open self-closing fire doors or allow them to swing free during normal use. When the fire alarm system operates, the devices will then release the doors automatically, allowing the self-closing mechanism to close the doors.

8.52 Examples of such devices comprise:

- electromagnetic devices fitted to the wall adjacent to the fire-resisting door. The electromagnet holds the door open by magnetic attraction to a metal plate fitted to the door. When the fire alarm system operates, the power to the electromagnet is cut off, permitting the door to close under the action of a separate self-closing device

  To avoid a twisting force over the whole height of the door, between an overhead self-closing device pushing the door in one direction and the -hold open device applying a force in the opposite direction, the 2 devices should be installed at the top of the door

- electromechanical devices within the door closing device, the latter of which is disabled until the fire alarm system operates

- “free swing” door closing devices, which allow the door to behave like a normal door, meaning there is no resistance to prevent opening or closing of the door, which can then stand open at any angle). When the fire alarm system operates, the device acts as a

self-closing device and closes the door. These are particularly suitable for bedroom doors in care homes, as the devices create no impediment for residents in opening or closing their bedroom doors

- Acoustically actuated, or radio-actuated, door hold-open devices, fitted to the bottom of the doors. These normally hold the door open, against the action of the self-closing device on the door, by means of friction between a small plunger, which descends from the device, and the floor surface or footplate. The plunger is retracted when the fire alarm system operates, either by sensing of the audible fire alarm signal by the device, or by radio communication between the fire alarm system and the device

8.53 In all cases, the automatic device should release the fire-resisting door allowing it to close effectively within its frame when any of the following conditions occur:

- the detection of smoke by a smoke detector
- the actuation of the fire alarm system by manual means such as operation of manual call point
- any failure of the power supply to the device

8.54 It should be ensured that there is sufficient automatic detection for reliable release of the held open doors in the event of fire. Guidance on this subject is given in BS 7273-4, and is likely to require the advice of competent specialists, though, normally, the smoke detection incorporated in a Category L1, L2 or L3 system (see Section 7) will be sufficient.

It should be noted that, for example, in corridors, the provision of one smoke detector on each side of a held open fire door will not normally be sufficient.

8.55 In premises in which people sleep, it is normal practice for held-open fire doors to be closed at night (typically 11pm) by disabling the hold-open devices. This ensures that the doors will always be closed at the time of greatest risk to occupants from fire. This can be arranged to occur automatically at the pre-determined time, or by use of a manual control.

8.56 In premises designed for older or infirm people (such as a care home), caution is required to ensure that, if a manual control is operated, the closing of the doors cannot injure any persons passing through the doorway. A warning sign to this effect should be erected close to any central control provided for the purpose, as a reminder of the potential hazard.

Case study

In a residential care home in the North East of England, cross-corridor fire doors were normally held open, but were closed by use of a central manual control at 11pm.

On the evening in question, the control was operated at 10pm. At the time, an elderly and infirm lady was passing through the doorway. She was struck by the closing door, fell over and broke her hip. She died after surgery on the next day.

The local authority, which operated the care home, were fined for breach of the Health & Safety at Work, and similar measures. Act 1974, and they paid undisclosed damages to the lady's family.

It is for this reason that BS 7273-4 stresses the need for caution in the use of such controls and recommends the provision of the warning sign discussed above, which is described in BS 7273-4 as a "knockdown cautionary" (or "KC") sign.

In certain critical situations, the doors should be released automatically when any fault occurs on the fire alarm system, as this may affect the reliability with which the doors will close in the event of fire. Such situations comprise the following:

- Any doors in a compartment wall, separating 2 buildings (such as to permit escape from one building to another in the event of fire)
- Doors to protected stairways in any premises in which people sleep
- Doors to protected stairways in public entertainment or similar premises
- Doors to any protected stairway that is the only stairway serving a building (or part of a building), which has more than one storey above or below the ground storey
- Flat entrance doors in a building containing flats (such as these doors are sometimes held open in sheltered housing blocks)

8.57 In the case of acoustically actuated door release devices (and some radio-actuated devices), this cannot be achieved, as, if the fire alarm system is not working, there will be no signal to actuate the devices. Also, in some fire alarm systems, because of engineering constraints, it may not be possible to arrange for doors to close when any possible fault occurs on the fire alarm system. In any of these circumstances, hold-open devices should not be used in the critical situations described above.

8.58 In all cases where a door hold-open device is used, it should be possible to close the door manually.

Changes of level within an escape route

8.59 Movement of persons up or down a group of not less than 3 steps will be so obvious to those following that they will be prepared for the change in level, but movement up or down one step is not so readily observed and may easily lead to a fall.

8.60 Wherever practicable, differences of level in corridors, passages and lobbies should be overcome by the provision of inclines or ramps of gradients not exceeding 1:12 or steps not having less than 3 risers in any flight. Corridors and passages should be level for a distance of 1.5m in each direction from any steps.

8.61 Where there is a change of level within an escape route, it is important that there is adequate illumination at the change of level. For example, there should be an emergency light fitting in close proximity. (Emergency lighting is discussed in Section 10 of this guide.)

Final exits

8.62 The fire exits through which people leave the building and reach a place of ultimate safety are known as “final exits”. All final exits should be obvious or clearly signposted (with directional arrows if necessary).

8.63 Ideally, protected stairway enclosures should lead directly to a final exit. In some (normally older) buildings, this is not the case. If a protected stairway does not lead directly to a final exit, one of the following arrangements should be adopted:

- a protected route should be provided from the foot of the stairway enclosure to a final exit (see Figure 27)
- on the ground floor, there should be 2 exits from the stairway, each giving access to a final exit via routes which are separated from each other by fire resisting construction (see Figure 28); this is usually the least desirable of the alternatives, as care needs to be taken to ensure that both routes are suitable for the nature and number of people who will need to use the routes, but it may be the only reasonably practical solution, particularly in some older buildings.

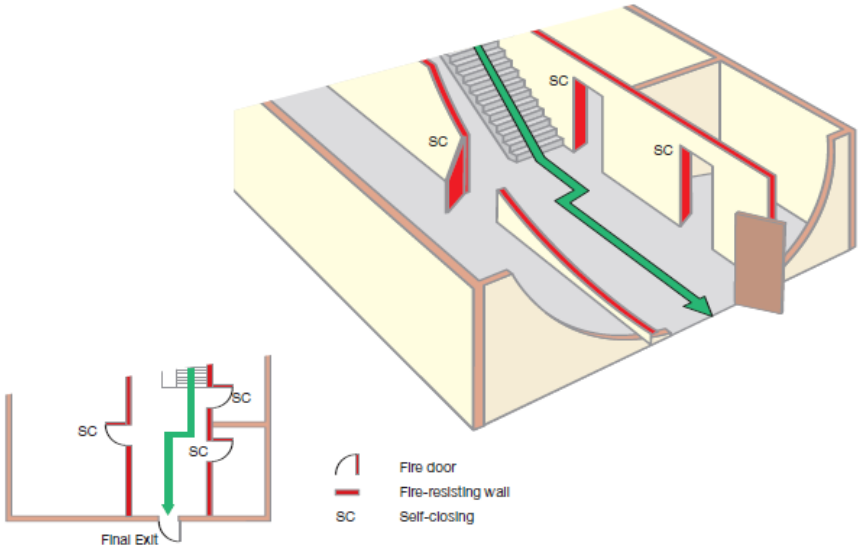

Figure 27: Example of a protected route from a protected stairway to a final exit

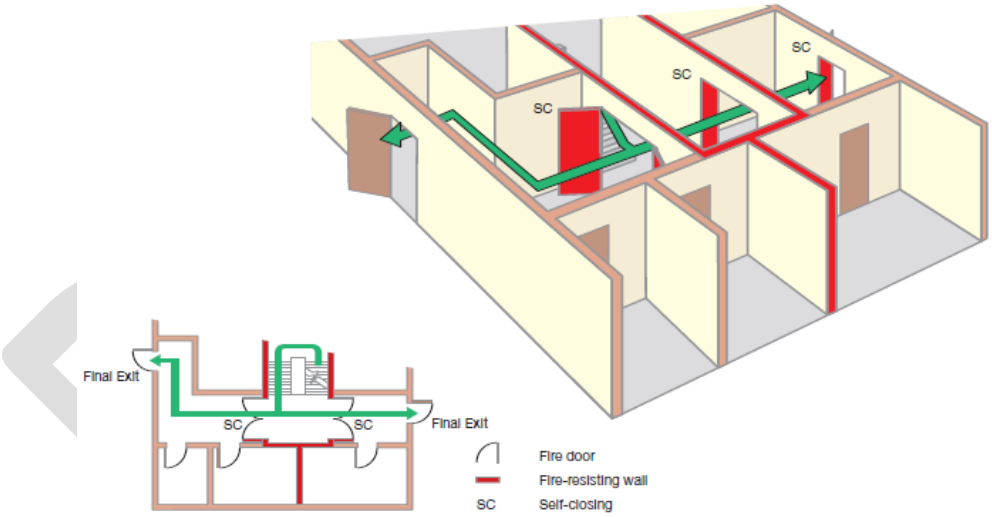

Figure 28: Example of 2 alternative escape routes from a protected stairway to final exits

Securing fire exits

8.64 The Fire Safety Order requires that, where necessary, emergency doors must not be so locked or fastened that they cannot be easily and immediately opened by any person who may require to use them in an emergency.

8.65 The relationship between the securing of doors against unwanted entry and the ability to escape through them easily in an emergency has often proved problematic. Any device that impedes people making good their escape, either by being unnecessarily complicated to manipulate or not being readily openable, will not be acceptable.

8.66 It will always be unacceptable for fire exits to require the use of a key to unlock the exit, even if the key is located, for example, in a glass-fronted box adjacent to the fire exit.

Case study

In 1979, a fire occurred in Woolworths' large department store in Manchester, resulting in 10 deaths. A recommendation of the Inquiry into the fire was that keys in glass-fronted boxes should not be permitted in the future, as it was considered that a locked fire exit could not be used by some customers because the glass-fronted box, in which a key for the exit was located, was not visible in smoke.

8.67 Equally, there is a legitimate need to secure buildings against unauthorised access by outsiders. Aside from this general requirement in commercial premises, security of exits to open air may be required for safety of occupants (such as refuges for those subject to domestic violence, hostels for young females, and similar measures). Within buildings, certain areas may need to be secure (such as where people are handling large amounts of cash).

8.68 Moreover, given that arson is a common cause of fire, in some premises (such as schools), security of entrances to the premises can be an important fire prevention measure.

8.69 Guidance on fire exits starts from the position that doors on escape routes should not be fitted with any locking devices. However, it is accepted that in many cases the need for security will require some form of device that prevents unlimited access but still enables the occupants of a building or area to open the door easily if there is a fire.

8.70 These devices can take many forms but, in the majority of cases, premises where there are members of the public present, or others who are not familiar with the building, should use panic locks or latches. These locks are released by pressure on a bar that runs across the full width of the door, known as a "panic bar". Panic bars should also be used where the door will be used by more than approximately 60 people. (See Figure 15)

Figure 15: Panic bar

8.71 In other situations, the only requirement is that devices that release the locks are simple, easy to use and require only a single action to open the door. Multiple forms of locking that each require a separate action to enable escape are not normally acceptable. Acceptable devices include push pads and lever handles. (see Figure 16)

Figure 16: Push pad

8.72 Whatever device is used, there should be suitable signage to indicate the method of operation of the lock release device.

8.73 If security remains a concern, consideration can be given to fitting an alarm device to fire exit doors that are not in normal use and/or, in large premises, monitoring the doors with CCTV.

Electronic locking devices

8.74 Electrically controlled locking devices fall into 2 main categories, namely electromechanical and electromagnetic.

8.75 Electromechanical devices comprise electromechanical lock keeps and draw bolts. Experience has shown that these devices can fail to open in a number of ways. They are dependent on a spring mechanism to return the lock keep or draw bolt(s) and can jam when pressure is applied to the door, particularly if they are not fitted correctly.

8.76 Electromagnetic devices comprise an electromagnet fixed at the head of the door frame and a simple fixed retaining plate at the head of the door. The door is held secure by very strong force of electromagnetic attraction between the electromagnet and the retaining plate. The door is released by interrupting the power supply to the electromagnet.

8.77 Because there are no moving parts, electromagnetic devices (often described as “maglocks”) are generally considered to be more reliable than electromechanical devices. However, for some applications, either type of device may be suitable.

8.78 Where electronic locking is provided, normally, while entry (to a building or an area of a building) requires entry of a code, or use of a fob, exit can be effected by a suitable door release control, such as “mushroom head” push button (see Figure 17).

Figure 17: Typical exit push button

8.79 While these devices are provided for convenience in the normal use of the exit, they are not sufficiently reliable to ensure safe egress in the event of fire. Accordingly, an emergency door release, comprising a green emergency door release (break glass type), already described for use with powered sliding doors on means of escape, must also be provided (see Figure 13).

Figure 13: Emergency door release

8.80 Similarly, other than in premises in which only trained staff are likely to use this control, adjacent to the control there should be a sign bearing the words “In emergency break glass to open door” in white letters of at least 20mm in height on a green background. The sign should incorporate a suitable pictogram (see Figure 14).

8.81 If, as will normally be the case the building is provided with a fire alarm system, electronic locks should release automatically on operation of the fire alarm system.

8.82 In premises open to the public (such as hotels, shops, cinemas, theatres, museums, and similar measures), and schools, when people are on the premises, the electronic locks should release when any fault occurs on the fire alarm system (though, for such premises, electronic locking is often inappropriate, particularly if a fire exit will be used by a large number of members of the public). This may be unnecessary in the case of common places of work that are not occupied by significant numbers of members of the public (such as offices, factories, and similar measures), where staff are trained in the fire procedures and fire safety measures in the building.

8.83 In general, electronic locks should fail to the unlocked state in the event of failure of the power supply to the lock. However, this is not essential if the lock is released on the inside (so enabling escape) by means of a mechanical device, such as a lever handle.

8.84 Electronic locking is particularly suitable for some care homes and supported housing, such as those in which residents are living with dementia, as risk can occur to these residents if they pass through a door that is not secured or is secured only be a device such as a panic bar. Deaths have occurred as a result of people living with dementia passing through a doorway, secured only by a panic bar, and subsequently falling down a stairway.

Restriction of available exits

8.85 In some larger premises, when only a limited number of staff are on the premises and there is a security issue, it may be acceptable to restrict the number of emergency exits immediately available (such as when only security staff are present at night, or prior to opening the premises for business in the morning, when only cleaners, and similar measures. are on the premises).

8.86 Under these circumstances, staff should be made fully aware of any restrictions, and the number of exits not immediately available should be limited. The available exits should still be sufficient for travel distance limitations to be satisfied (see later).

Padlocks, chains, and similar measures.

8.87 In some premises with a high standard of management control, it might be acceptable for normal fastenings, such as panic locks and latches, to be supplemented by additional fastenings, such as padlocks and chains, during periods of non-occupation.

8.88 This practice is sometimes adopted in cinemas and theatres, in which there are very strict and formal opening procedures before the public are admitted to the premises. It is unlikely to be suitable for other premises, such as common places of work.

8.89 The formal arrangements typically comprise, for example, a number marked on each padlock and chain. When a padlock and chain is removed, it is hung on a hook bearing the same number. Before the premises are opened to the public each day, the manager of the premises signs a logbook, confirming that a padlock and chain is hanging from every hook.

Case study

In 2010, in the course of an audit by the fire and rescue authority, it was found that 2 fire exits from a supermarket near Slough had been repeatedly chained and padlocked, using bicycle chains with combination locks, for some months; the

combinations were not readily available. It was claimed by the RP that this was because a junior manager failed to follow company rules.

However, nothing in the Fire Safety Order provides an employer with a defence in any criminal proceedings for a contravention of the Fire Safety Order because of any act or default of an employee.

Although it is said that the court recognised the company's good fire safety record, the company was fined £40,000 for this breach, and other breaches, of the Fire Safety Order and was ordered to pay £15,500 in costs.

Subsequently, the manager of the supermarket at the time of these offences was fined £2,000 for 3 offences.

What is, and is not, acceptable as means of escape?

8.90 Means of escape normally comprise open-plan areas of accommodation, corridors and stairways, any or all of which are the escape routes that people pass through after operation of the fire alarm system. Lowering lines, folding ladders and chutes should never be regarded as suitable means of escape.

Lifts

8.91 Lifts should not be used as means of escape, other than in the case of specially designed "evacuation lifts" (or certain modern lifts designed for use by the fire and rescue service), which are suitable, under management control, to provide escape for people with mobility impairments.

Guidance on the means of escape for disabled people is given in: Fire safety risk assessment: means of escape for disabled people - GOV.UK (www.gov.uk)

Accommodation stairways

8.92 "Accommodation stairways" (see later), which are used for general communication and movement of people in the premises, but are not designated as "protected stairways", are not part of the means of escape. Protected stairways, which are required in all except the smallest of buildings, are discussed later in this section. They are stairways that are suitable for means of escape because, unlike accommodation stairways, they are fully enclosed in fire-resisting construction; commonly, accommodation stairways are open to the accommodation on each floor.

8.93 The open nature of accommodation stairways means that they might permit spread of fire and smoke from one storey to another. Accordingly, they should not pass through "compartment floors" (see Section 9), and their siting should be such that people do not need to pass the entry to an accommodation stairway to reach a means of escape stairway, to avoid exposure to smoke spreading from a floor below.

Escalators and travelators

8.94 Escalators and travelators should not normally form an integral part of the escape routes, unless, in unusual circumstances, based on the fire risk assessment for the premises, it has been advised by a competent person that they may be taken into account.

External stairways

8.95 External stairways should, ideally, not be used as means of escape for members of the public, particularly if large numbers of people are likely to use them. Where an external stairway does form part of the means of escape, it should be protected from the effects of fire throughout its full length.

8.96 This means that any door, window (other than toilet windows) and walls within 1.8m horizontally, and 9m vertically below, any part of the stairway should be fire-resisting. Windows within this “zone of protection” should be fixed shut, and doors should be self-closing (see Figure 11).

8.97 External stairways should, ideally, be protected from the weather, as the treads may become slippery (such as due to algae, moss, ice or bird droppings). If there is no enclosure to protect the stairway, it must be ensured that the stairway is regularly maintained. The stairway should be subject to periodic inspection by a structural engineer or building surveyor at appropriate intervals (such as typically every 3 years) to verify that it remains structurally sound.

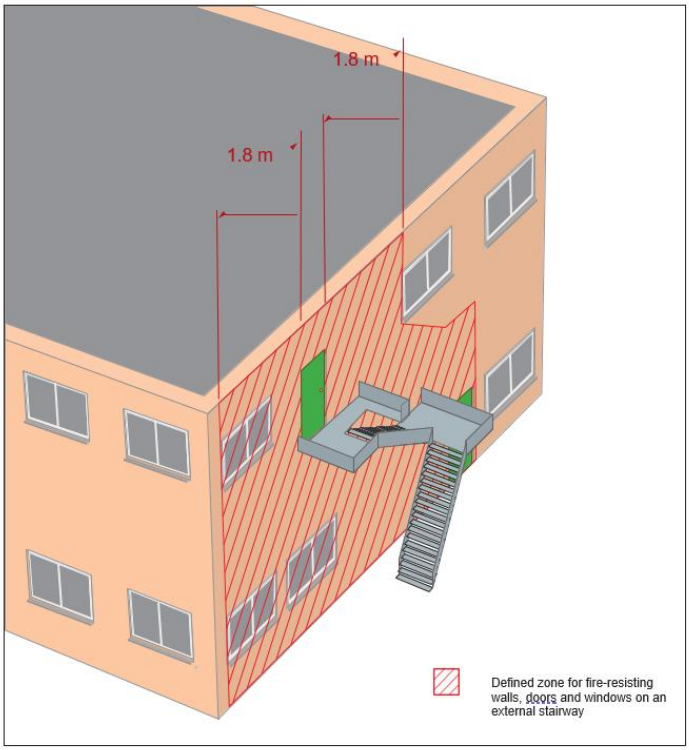

Figure 11: Protection to an external stairway

Spiral and helical stairways

8.98 Spiral and helical stairways are usually acceptable only in very limited situations, (such as for a maximum of 50 people who are not members of the public). The stairway should not be more than 9m in total height and not less than 1.5m in diameter, with adequate headroom. A handrail should be continuous throughout the full length of the stairway.

8.99 However, spiral and helical stairways may be used as means of escape by more than 50 staff and may be used by the public if the stairways have been specially designed for the purpose. Further guidance is given in BS 5395-2. However, they are not usually suitable for young children.

Roof exits

8.100 It may be that means of escape have included an escape route across a flat roof, particularly in the case of older buildings, typically in urban areas. Though this is not ideal, where this escape route is still needed, additional precautions will usually be necessary, as follows:

- The roof should be flat and the route across it should be adequately defined and well-illuminated with normal lighting and emergency escape lighting. The route should be non-slip and guarded with a protective barrier
- The escape route across the roof and its supporting structure should be fire-resisting from the underside to prevent compromise of the escape route from a fire below
- Any doors, windows, rooflights and ducting within 3m of the escape route should be fire-resisting
- The exit from the roof should be located in, or lead to, a place where people can quickly move to a place of ultimate safety
- Where an escape route passes through, or across, another person's property there will need to be a comprehensive legal agreement in place to allow its use at all times when people are on the premises; these agreements can give rise to disputes, and the need for them should be avoided if possible
- Escape routes across a roof should, ideally, not be used by members of the public or young children

8.101 A typical roof escape route is illustrated in Figure 12.

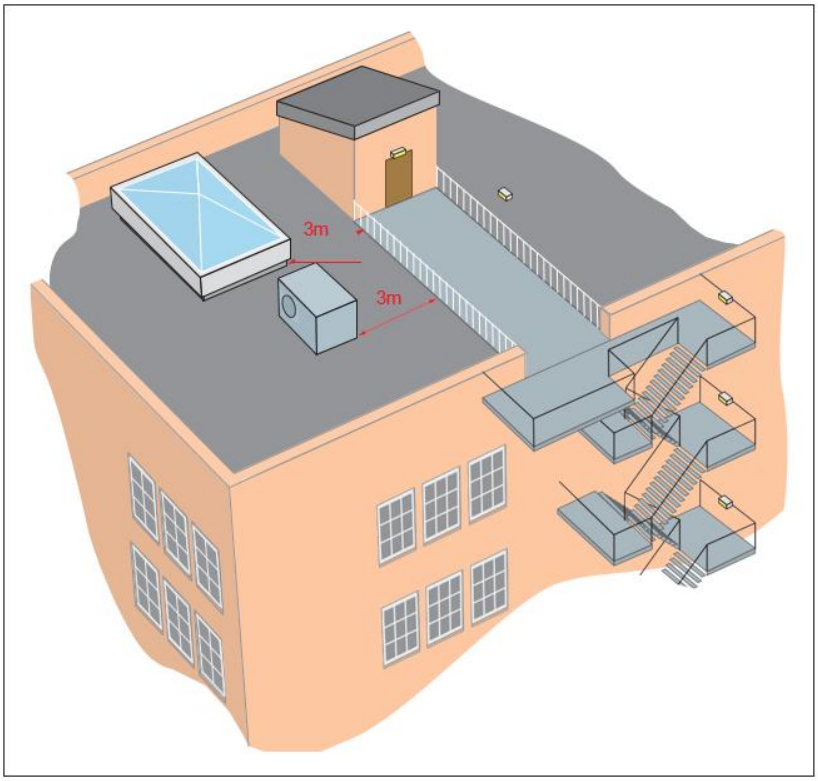

Figure 12: Escape route across a roof

Revolving doors, wicket doors, sliding doors and roller shutters

8.102 The Fire Safety Order requires that where necessary, sliding or revolving doors must not be used for exits specifically intended as emergency exits.

8.103 Revolving doors should not normally be regarded as fire exits unless the leaves fold outward to form a clear opening upon pressure from within, or (more commonly) standard doors of the required exit width are provided next to the revolving door.

8.104 Normally, wicket doors will only be suitable for escape by up to 15 members of staff; however, in areas of a higher fire risk, this maximum should be reduced. Ideally, wicket doors or gates should have a minimum opening height of 1.5m. The bottom of the door should not be more than 250mm above the floor and the width should be preferably more than 500mm but not less than 450mm.

8.105 Loading and goods delivery doors, shutters (roller, folding or sliding), up-and-over doors and similar openings are not normally suitable for use as a fire exit. However, they may be suitable for escape by small numbers of staff, provided they are not likely to be obstructed and can be easily and immediately opened manually, even if normally power operated. These are normally only acceptable for people familiar with the escape routes and operation of the doors.

8.106 Manually operated sliding doors are not normally suitable on escape routes unless they are for the sole use by a small number of members of staff. Where provided, a notice with the words “slide to open” with an arrow pointing in the direction of opening, should be permanently displayed at about eye level on the face of door.

8.107 However, powered sliding doors, which open automatically as people approach them (such as commonly found in retail premises), can be used as fire exits, provided that, when the fire alarm system operates, the doors automatically revert to the open position and remain open until the fire alarm system is reset. Other than when the building is unoccupied, the doors should also revert to the open position in the event of failure of the power supplies that operate the doors.

8.108 A green break glass unit, bearing the words “EMERGENCY DOOR RELEASE” should be located in close proximity to the doors, so that, by operation of the break glass unit, the doors will revert permanently to the open position even if the fire alarm system fails to operate correctly (see Figure 13). Guidance on the interface between fire alarm systems and powered sliding doors is given in BS 7273-4.

Figure 13: Emergency door release

8.109 Other than in premises in which only trained staff are likely to use this control, next to the control there should be a sign bearing the words “In emergency break glass to open door” in white letters of at least 20mm in height on a green background. The sign should incorporate a suitable pictogram (see Figure 14). This sign is unlikely to be necessary in locations where there will be trained staff in close proximity to the doors (such as where doors comprise the main entrance of a shop or hotel).

Figure 14: Suitable pictogram for emergency door release control (Other pictograms may be used, provided the meaning is clear)

Bars on windows

8.110 In non-domestic premises, windows should never form part of the means of escape. Accordingly, it is unlikely that security bars on windows would conflict with the requirements of the Fire Safety Order.

8.111 However, other than in circumstances such as ensuring the security of a building, it is strongly recommended that bars are not fitted to windows. Bars may prevent rescue of trapped occupants if means of escape are, in very unusual circumstances, impossible to use.

Case study

In 1968, a fire occurred at a furniture factory at James Watt Street in Glasgow. The fire resulted in the deaths of 22 employees. They were unable to escape by a stairway, which had been set alight by burning polyurethane foam. The trapped employees could not be rescued by the fire service because of bars on the windows, which were a legacy of previous use of the building as a whisky bond.

The Inquiry into the fire recommended that bars should not be fitted to windows of factories.

Earlier reference was made to a multiple-fatality fire at a large department store in Manchester in 1979. In that fire, bars on windows, again a legacy of previous use of the building as a bonded warehouse, impeded rescue of customers by the fire service, though, ultimately, use of cutting equipment was successful. This fire, again, led to recommendations against the fitting of bars to windows.

Principal factors in design of means of escape

8.112 In assessing the adequacy of means of escape, there are 3 major factors to consider:

- travel distance
- exit capacity
- the number of occupants for whom means of escape must be provided.

8.113 These 3 factors will have a major bearing on the required configuration and number of stairways and exits.

Travel distance

8.114 Travel distance is the maximum distance to be travelled from any point on a storey to the nearest:

- final exit, meaning an exit to a place of ultimate safety, normally the open air); this will be relevant on the ground or entrance level of a building
- door to a place of relative safety, normally a protected stairway; this will apply on floors above, and below, ground or entrance level.

8.115 In effect, these definitions can be further simplified; the travel distance, on any storey, is usually the maximum distance between any point on the storey and the nearest “storey exit”. Storey exits from the ground or entrance storey will lead to open air; storey exits from an upper storey lead into a protected stairway.

8.116 NOTE: A stairway that is not separated from adjacent accommodation by fire-resisting construction is described as an accommodation stairway. As an accommodation stairway is not a place of relative safety, measurement of travel distance does not stop on reaching such a stairway, but continues down the stairway until a place of relative safety or a place of ultimate safety is reached. In contrast, travel distance does not include distance of travel down a protected stairway.

8.117 Thus, travel distance is the maximum distance that a person would have to walk to reach a place of relative safety, or a place of ultimate safety, measured along the actual route they would follow rather than in a straight line.

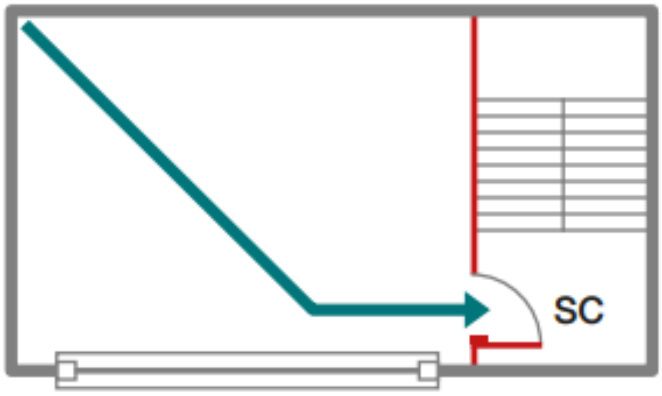

Figure 29: Measurement of travel distance (on upper floors)

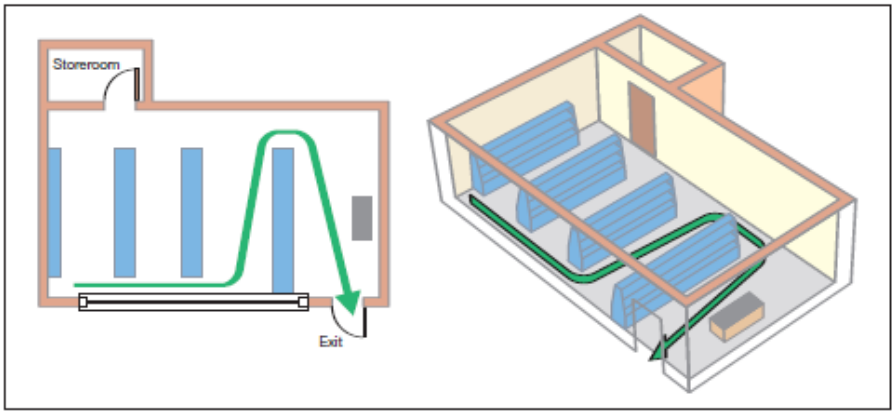

Figure 30: Measurement of travel distance (on ground floor)

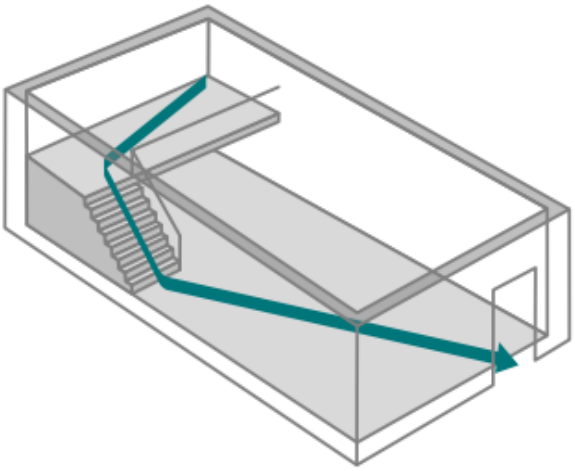

Figure 31: Measurement of travel distance (including travel within an accommodation stairway)

8.118 Where a protected stairway is approached via a protected lobby, into which no other accommodation opens except toilets, measurement of travel distance may stop at the door into the protected lobby (rather than the door from the lobby into the stairway), because people have reached a place of relative safety when they enter the protected lobby. However, creation of an extended lobby, simply to reduce travel distance, should generally be avoided.

Limitation of travel distance

8.119 In all buildings, there is a need to limit travel distance. Limitation of travel distance is just a relatively simple means for minimising the exposure of people to the effects of a fire (smoke, toxic gases and flame) while they are evacuating the building.

8.120 The appropriate travel distance for any type of building depends on 2 factors, namely:

- the use of the building
- whether or not there are alternative means of escape

8.121 The appropriate travel distances for any type of building (such as office, shop, factory, hotel, and similar measures) are given in the sector-specific guides. However, by way of example, the maximum travel distance in an office or shop should be 45m from any point at which there are alternative means of escape, or 18m where escape is possible in only one direction from a dead end.

8.122 Although, as discussed in Section 6, the travel distances recommended in the sector specific guides should not be applied too rigidly, they should not generally be greatly exceeded, at least without compensating measures or justification based on the principles of fire engineering.

Exit capacity

8.123 The Fire Safety Order requires that, where necessary, the number, distribution and dimensions of emergency routes and exits must be adequate having regard to the use, equipment and dimensions of the premises and the maximum number of persons who may be present there at any one time.

8.124 Limitation of travel distance alone does not ensure the adequacy of means of escape. In a crowded shop, for example, a single, narrow exit door might be insufficient to enable all occupants to escape quickly enough to be safe from any fire that develops, even though no occupant is further than the maximum specified travel distance from the exit. The number and width of exits and stairways, therefore, must be sufficient to enable sufficiently rapid evacuation.

Capacity of fire exit doors

8.125 The principles involved in calculating the required number and width of exits are based on a very simple model. It is traditionally assumed that the shoulder width of an average adult male is around 525mm. Therefore, any exit of this width, which is known as a unit of exit width, will only permit people to pass through in single file.

8.126 Based on practical trials, it is further assumed that people passing through an exit in single file do so at the rate of 40 persons a minute. In practice, an exit of only 525mm width would be somewhat tight for occupants to pass through, and, therefore, a factor of safety is added to this figure. So, the minimum width of a fire exit is 750mm.

8.127 As discussed earlier in this section, an exception is made for wicket doors (such as within a roller shutter in a warehouse). The absolute minimum width for these is 450mm, but should preferably be 525mm. However, wicket doors are only suitable for a maximum of 15 members of staff who are familiar with the premises. Moreover, if rapid fire development might be anticipated (such as because of high rack storage of combustible materials in a warehouse), this maximum number of people who will use the exit should be reduced.

8.128 Any exit that is less than 2 units of exit width can still only permit people to discharge in single file so, for example, a door of 950mm in width will not allow people to evacuate at a greater rate than a door of 850mm in width.

8.129 If it is imagined that the width of an exit door is gradually increased, when a width of 2 units (2 x 525mm = 1,050mm) is reached, the rate at which people can pass through the exit effectively doubles, as people can, according to this simple model, pass through 2 at a time. Thus, an exit that is 1,050mm in width is regarded as capable of discharging 80 persons a minute.

8.130 If the required evacuation time is then defined, it is possible to calculate the number of occupants that may be served by any exit. In Section 6 of this guide, it was noted that, by convention, people using any fire exit for their evacuation should be able to pass through the exit in 2.5 minutes.

Accordingly:

- an exit of single unit in width (750mm – 1,049mm) will enable evacuation of 100 people (2.5 x 40)
- an exit of 2 units in width (1,050mm) will enable evacuation of 200 people (2.5 x 80)

8.131 For exits wider than 1,050mm, a capacity of 5mm per person is assumed, so the capacity is determined by measuring the width of the exit and

dividing by 5. So, for example, an exit of 1,100mm in width is suitable for 220 people, an exit of 1,200mm in width is suitable for 240 people, while an exit of 1,300mm in width is suitable for the evacuation of 260 people, and similar measures.

8.132 For the purpose of these calculations, the width of a door is the clear width when the door is open (see Figure 32).

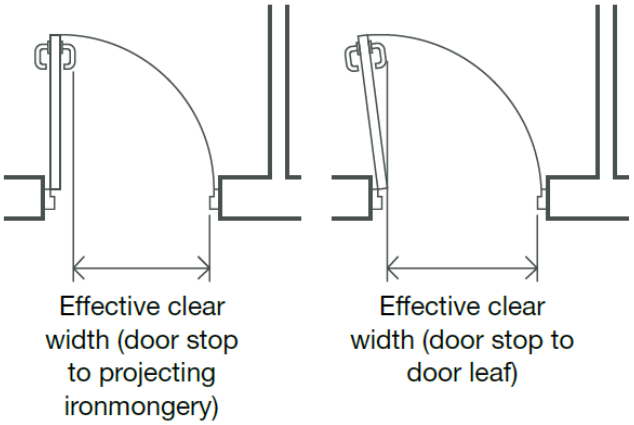

Figure 32: Measurement of exit width

8.133 From the above, the number of people who can safely be accommodated on any storey of a building can be determined from the number and width of the fire exits from that storey. To incorporate a factor of safety, it is assumed that the largest exit from the storey is unavailable because of the location of the fire. So, in calculating the maximum permissible number of people on the storey, the largest storey exit is discounted. (See Figure 33) (Where there in only one exit, the maximum number of people who will use it should be limited to 60.)

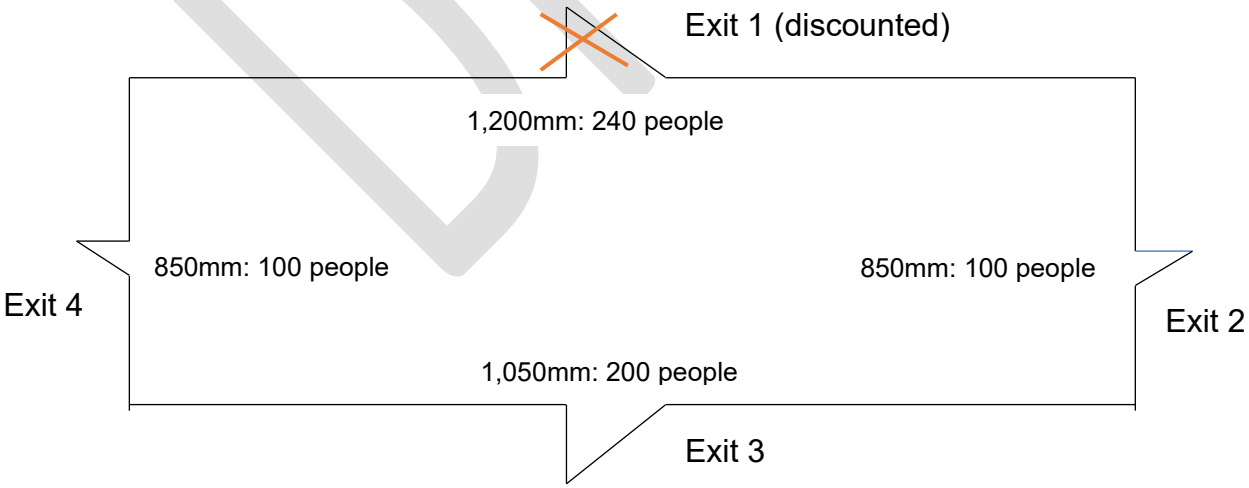

Figure 33: Calculation of exit capacity

8.134 In Figure 33 above, the largest exit is exit 1, which is discounted. The safe capacity for this storey is then 400 people (200 + 100 + 100).

8.135 It then needs to be determined as to whether the number of people present on any storey at any one time is likely to exceed the capacity of the fire exits.

8.136 If this is the case, either:

- the number of exits should be increased; or
- the width(s) of one or more exits should be increased; or
- there should be management arrangements to restrict the number of persons present (such as this is quite common in nightclubs)

8.137 The number of people likely to be present at one time can often be determined by the facilities provided for the people (such as from a knowledge of the number of available desks in an office, the number of seats in a theatre or cinema, the number of covers in a restaurant, and similar measures).

8.138 However, for some premises, particularly places of public assembly (such as bars and nightclubs) and shops, there should be means for determining the number of people that are likely to be present at one time, so that it can be ensured that there is sufficient exit capacity for their evacuation.

Floor space factors

8.139 Prediction of the number of people likely to be present can be determined from floor area available to them (excluding stairways, lifts and sanitary accommodation), using “floor space factors”. These are tabulated figures, expressed as m^2/person. Recommended floor space factors are given in the relevant sector-specific guides.

8.140 Floor space factors vary according to the use of the building. By way of example, in areas close to the serving point in a bar, a floor space factor of 0.3m^2 per person is used, in a supermarket a figure of 2m^2 per person is used, in an art gallery or museum a figure of 5m^2 per person is used, in a furniture store a figure of 7m^2 per person is used.

8.141 Therefore, in a single-storey supermarket of 3,000m^2 in area, there should be sufficient exits for evacuation of 1,500 people. In a museum of the same area, the exit capacity would only need to be sufficient for 600 people.

It should be stressed that floor space factors are not intended, in their own right, as a limitation on the number of occupants of a storey; this is determined solely by exit capacity (or by other factors not related to fire safety).

So, for example, if Figure 33 represented a storey of an art gallery, 1,000m^2 in area, use of floor space factors would predict an occupancy of 200 people. However, it is not intended that the number of occupants be restricted to 200. It is safe for 400 people to occupy the storey, as there is sufficient exit capacity for this number.

Alternatively, if Figure 33 represented a supermarket of the same size, use of floor space factors would predict an occupancy of 500 people. In this instance, this represents a shortfall in exit capacity of 100 people and should be identified in the fire risk assessment.

Restriction of occupants

8.142 Often, the capacity of exits is more than enough for the number of persons likely to be present, particularly in offices, factories and warehouses. While restriction in the number of occupants might be necessary even in an office, it is more likely to occur in places of public assembly, such as nightclubs, entertainment venues, conference centres, and similar measures.

8.143 As in the case of many aspects of means of escape, the number and width of exits on any storey would have been adequate for the anticipated number of persons likely to occupy the storey at the time of construction of the building. However, this number can change, particularly when alterations to layout occur (such as cellular office accommodation may have been converted to open plan accommodation).

8.144 Any obvious shortfall in exit capacity should be identified in the fire risk assessment. However, it is important for the RP to understand any limitation on the number of occupants of a storey, based on the above calculations, so that the adequacy of exit capacity can be monitored, particularly when alterations to layout occur.

8.145 Equally, in some premises, such as nightclubs, it is essential, on a continuous basis, for management arrangements to ensure that the number of occupants at any time does not exceed the exit capacity.

Case study

In 2017, a highly popular celebrity was performing at a nightclub in York. As a result of his popularity, the number of patrons seeking entrance greatly exceeded the safe exit capacity of the nightclub. There was a failure to restrict entrance to the nightclub. At one point in the evening, there were around 1,300 members of the public on the premises, which was more than double the safe occupancy, based on exit capacity, even though a recommended limit on occupancy had been included in the fire risk assessment.

The owners of the nightclub, the manager (in his personal capacity) and the company providing the door supervisors were all successfully prosecuted for breaches of the Fire Safety Order; the owners (a company) were a Responsible Person. The manager was a person with duties by virtue of Article 5(3) of the Fire Safety Order (see Section 1 of this guide). The door supervisors' company was also

a person with duties, either as a Responsible Person (from their employment of the door supervisors) or a person with duties under Article 5(3).

The Court heard evidence regarding the potential results of overcrowding in a nightclub, including the effect on public order; in the case in question, fights and assaults had occurred during the evening. The Court also heard evidence regarding the experience, worldwide, of inadequate exit capacity on serious injury in the event of an evacuation, as a result of some people trampling on others to reach the exits.

In 2011, localised overcrowding at a nightclub in Northampton, led to the deaths of 2 young women, when urgent messages were broadcast to students, warning that their coaches were about to leave. The circumstances are thought to have been aggravated by the operation of the fire alarm system, albeit that there was no fire.

Care to avoid overcrowding is particularly important in premises in which the occupants are predominantly young and in which alcohol is consumed; the combination of inexperience and the effects of alcohol potentially result in impaired judgement and reactions in an emergency.

Stairways

8.146 Whereas the exits from any storey determine the number of persons who can safely be accommodated on that storey, it then needs to be ensured that the capacity of the stairways is sufficient for the maximum number of people who can be present on the upper floors of the building at any one time (assuming that, in the event of fire, all occupants of the building evacuate simultaneously). An unprotected stair maybe acceptable in limited circumstances where fire engineering principles are being applied or in small premises.

8.147 The process for determining the adequacy of protected stairway capacity for the number of people present on the upper floors of the building at any one time is similar to the process of determining the capacity of storey exits, and is assisted by recognised tabulated capacities that are also used, at the time of original design of any building, for compliance with the Building Regulations (see Table 1).

No. of floors served	Maximum number of persons served by a stair of width:								
	1000mm	1100mm	1200mm	1300mm	1400mm	1500mm	1600mm	1700mm	1800mm
1.	150	220	240	260	280	300	320	340	360
2.	190	260	285	310	335	360	385	410	435
3.	230	300	330	360	390	420	450	480	510
4.	270	340	375	410	445	480	515	550	585
5.	310	380	420	460	500	540	580	620	660
6.	350	420	465	510	555	600	645	690	735
7.	390	460	510	560	610	660	710	760	810
8.	430	500	555	610	665	720	775	830	885
9.	470	540	600	660	720	780	840	900	960
10.	510	580	645	710	775	840	905	970	1035

Table 1: Capacity of protected stairways (simultaneous evacuation)

8.148 It will be noted that the capacity of any protected stairway depends on the width of the stairway and the number of floors/storeys served. The width of the stairway influences the rate at which people can flow down (or up) the stairway, albeit that, as people in a protected stairway are in a place of relative safety, there is no specific time limit on evacuation within a stairway.

8.149 It will also be noted that, as the number of storeys served increases, the number of persons who can be served by the stairway also increases. This reflects the number of people who can safely be accommodated on the stairway landings without a feeling of overcrowding. These people can safely queue within the stairway, because, again, a protected stairway is a place of relative safety.

8.150 In the same way that, in calculating the capacity of storey exits, the largest storey exit is discounted because access to it could be prevented by a fire, there is generally a need to discount the widest protected stairway just in case use of the stairway is prevented by smoke within the stairway. This is a conservative assumption, because, by definition, a protected stairway should be separated from any foreseeable fire by fire-resisting construction.

8.151 Moreover, if the protected stairway is approached through a protected lobby or a protected corridor on every floor, there will, by definition, be 2 fire-resisting, self-closing fire doors between any fire and the protected stairway. Under these circumstances, there will be no need to discount the stairway.

8.152 Table 1 is based on the assumption that, when the fire alarm system operates, all occupants of the building are expected to evacuate immediately. This is a procedure known as “simultaneous evacuation”.

<u>Phased evacuation</u>

8.153 Phased evacuation relies on the provision of specific active and passive fire safety measures which are unlikely to found in many buildings. Accordingly, the decision to adopt a phased evacuation is usually made at the design stage of the building to ensure these safeguards are incorporated. Where consideration is given to relying a phased evacuation instead of a simultaneous evacuation, then specialist advice should be sought.

8.154 The safeguards incorporated in a building with phased evacuation include the following:

- A staged fire alarm system should be provided, so that a fire warning signal can be given on any storey, independently of any other storey (see Section 7)

- Every floor is designed as a compartment floor (see Section 9); the intention is to ensure that any fire is limited to the storey on which it breaks out
- All protected stairways are approached via a protected lobby or protected corridor on every storey (except a top storey). Because there will then be 2 fire-resisting doors between every protected stairway and any fire, the availability of the stairways for escape is reliable and maintained for a significant period of time
- All lifts should be approached through a protected lobby at each storey (unless the lift well is contained within a protected stairway)
- If any storey is located at more than 30m above ground level, the building should be protected throughout by an automatic sprinkler system, further limiting fire spread
- Automatic fire detection should be provided in accordance with the recommendations of BS 5839-1 or a Category L3 system (see Section 7). This ensures that when fire breaks out, everyone on the storey of fire origin and, typically, the storey above, is given an early warning of fire, before smoke can spread into escape routes
- There should be reliable two-way speech communication between a control point for the fire alarm system and fire wardens on every storey. The fire wardens can then instigate the evacuation of the next phase. Ideally, this should comprise a two-way speech communication system conforming to BS 5839-9
- Ideally, the building should be equipped with a voice alarm system (see Section 7). While a voice alarm system is normally installed to help achieve a more rapid evacuation, in this case, the primary intention is to provide reassurance to those who are not required to evacuate, so avoiding their unnecessary evacuation, which might cause overcrowding on stairways

8.155 Subject to these safeguards, for the determination of the required protected stairway numbers and widths, Table 2 can be used, rather than Table 1.

Maximum number of people in any storey	Stair width mm
100	1000
120	1100
130	1200
140	1300
150	1400
160	1500
170	1600
180	1700
190	1800

Table 2: Minimum width of stairs designed for phased evacuation (assuming evacuation of 2 storeys at a time)

Phased evacuation is not normally suitable for hotels, halls of residence or public buildings, such as nightclubs or other places of entertainment, museums and art galleries, cinemas, theatres and concert halls, and similar measures. because management of phased evacuation of the public is normally impracticable without a high staff to public ratio. Use of phased evacuation mainly occurs in office buildings.

Progressive horizontal evacuation

8.156 In certain premises, such as hospitals and care homes, each storey is divided into smaller compartments, known as sub-compartments. In the event of fire, only the sub-compartment of fire origin is evacuated in the first instance; occupants are moved horizontally into the adjacent sub-compartment.

8.157 In a large building, there may be numerous sub-compartments within any single storey. This enables occupants to be progressively moved from one sub-compartment into the next sub-compartment if the sub-compartment adjacent to the sub-compartment of fire origin begins to be affected by fire or smoke

8.158 The intention is to avoid moving occupants vertically if possible, though, ultimately, this may become necessary.

8.159 Further guidance on progressive horizontal evacuation is given in the relevant sector-specific guides.

Summary of Points in Section 8

Escape route layout & general design principles:

- Escape routes should be obvious and not tortuous or complicated. There should be no narrowing of escape routes in the direction of escape, nor obstacles that could cause a trip hazard.
- Ideally, occupants of a building should be afforded 2 directions of escape from any point in the building, but, subject to certain safeguards, short “dead ends”, from which there is only a single direction of escape, are acceptable.
- Rooms with capacity for more than approximately 60 people should have 2 fire exits to provide alternative means of escape.
- A building with only a single stairway available for escape is only acceptable up to a limited height and number of storeys. These limitations are given in the sector-specific guides.
- Fire exits should ideally open in the direction of escape. This is essential if more than 60 people will use the door.

Inner rooms:

- Where there is an “inner room”, from which escape is possible only by passing through another (“access room”), there should either be vision between the inner room and the access room or smoke detection within the access room to alert occupants in the inner room.

Protected escape routes (definition & applications):

- The term “protected” (in relation to escape routes, such as corridors and stairways, and lobbies) has a special meaning, namely that the route is separated by fire-resisting construction from adjacent accommodation.
- Corridors linking protected stairways should be sub-divided by cross-corridor doors, located in the middle third of the corridor, if they are greater than 12m in length.
- It should not be necessary to pass through one protected stairway to reach another protected stairway; a bypass route is necessary.
- The only route from one part of any premises to another part should not be through a stairway enclosure, unless it is acceptable for the doors to be held open under normal circumstances, but close automatically on operation of the fire alarm system.
- Protected stairways in buildings over 18m in height should be approached only through a protected corridor or protected lobby. Normally, this also applies to stairways in single-stairway buildings of any height.

- Corridors serving sleeping accommodation, and normally dead-end corridors, should be designed as protected corridors.

- All fire-resisting doors should be self-closing or kept locked shut. However, self-closing fire doors may be held open by suitable devices, which enable the door to close automatically when the fire alarm system operates. This arrangement is not suitable for stairways in sleeping accommodation, entertainment premises and a stairway in a single-stairway building, unless the doors close automatically when any fault occurs on the fire alarm system.

- If a protected stairway does not lead directly to a final exit, there must be a protected route from the foot of the stairway to a final exit; alternatively, there must be 2 alternative escape routes from the foot of the protected stairway.

Securing and managing exits:

- Fire exits must never be locked with a key when people are on the premises. However, suitable hardware can be used to secure fire exits. Where the doors will be used by members of the public or more than 60 people, locks and latches should be overcome by a “panic bar”, which runs across the full width of the door.

- Electronic locking can be used to secure fire exits, subject to certain safeguards, such as an interface with the fire alarm system and a “break glass” emergency door release in close proximity to the doors. Electronic locking may not be suitable for fire exits that will be used by members of the public.

- In some large premises, the number of available fire exits can be restricted when there are only a few staff on the premises (such as during the night or before the premises open for business).

- In some premises, when the premises are unoccupied, additional security measures, including padlocks and chains, can be fitted to fire exits. However, this requires very stringent and formal management control, and is normally only adopted in cinemas and theatres.

What is / is not acceptable as means of escape (specific features):

- Means of escape comprise open-plan areas, corridors and “*protected stairways*”.

- Normally, accommodation stairways, escalators and travelators are not part of the means of escape.

- External stairways and exit routes over flat roofs can only be used as means of escape in limited circumstances.

- Spiral and helical stairways are usually acceptable as means of escape only in exceptional situations, unless they are specially designed for the purpose.

- Lowering lines, folding ladders and chutes do not comprise suitable means of escape.

- Revolving doors are not suitable fire exits unless they collapse flat when pressure is applied to them; normally, standard fire exit doors are provided adjacent to revolving doors.

- Wicket doors, roller shutters and manually operated sliding doors are only suitable means of escape for a very small number of staff.

- Powered sliding doors (as commonly found in retail premises) can be used as fire exits, provided there is an interface with the fire alarm system and a “break glass” emergency door release in close proximity to the doors

- Bars on windows should be avoided, albeit that windows do not form part of the means of escape.

Principal factors & evacuation strategies:

- In all premises, the maximum travel distance that people need to walk on any storey to reach a final exit from the building or reach a protected stairway (or lobby to the stairway) should be limited. Recommended travel distances are given for different types of premises in the relevant sector-specific guides. These should not be regarded as hard and fast limits, but should not be greatly exceeded without compensating measures.

- The number and width of exits on any storey should be sufficient for the number of persons who will occupy that storey at any one time. In calculating the appropriate number and widths of exits, the largest exit from the storey should be discounted.

- The number and width of protected stairways should be sufficient for the number of persons who will occupy the building at any one time. In calculating the appropriate number and widths of stairways, in multi-stairway buildings, the largest stairway should be discounted, unless the stairways are approached by means of protected corridors or protected lobbies.

- In tall buildings, the number and widths of stairways can be reduced by *“phased evacuation”,* in which only 2 storeys are evacuated at any one time. This requires special safeguards and managerial arrangements. Phased evacuation is applicable mainly to high-rise office buildings, but is not normally suitable for hotels, halls of residence or public buildings, such as nightclubs, entertainment premises, museums and art galleries, cinemas, theatres and concert halls, and so on.

9. Structural Fire Safety Measures and Linings

9.1 The hazards of fire that structural fire protection and control over linings are intended to limit are broadly those controlled by the Building Regulations (see Section 1).

9.2 When a building is constructed, the fire safety objectives of the Building Regulations include measures that are intended to ensure that, in the event of fire:

- the structure of the building remains stable, so that early structural collapse of the building is prevented
- spread of fire within the building is limited
- flame spread over the linings of walls and ceilings is limited
- flame spread over external walls is limited
- spread of fire beyond the building is prevented

9.3 The *general fire precautions* required by the Fire Safety Order also include measures to reduce the risk of spread of fire.

Structural stability

9.4 The effect of fire on the structural stability of a building is a very complex subject, involving a sound knowledge of structural engineering principles.

9.5 However, the basic principle is that, during a fire, loadbearing walls, floors, beams and columns can continue to support their load for long enough. This requires that these structural elements have adequate fire resistance, the duration for which will depend on the height of the building and its use.

9.6 The appropriate fire resistance should have been provided at the time of construction of the building, however there may be cases where further consideration of this area is necessary to ensure compliance with the fire safety order.

9.7 However, elements, such as steel beams and columns, may have been afforded protection by measures, such as encasement in fire-resisting boards or spray-applied coatings, to enable them adequately to resist fire. It is important to ensure that these protection measures remain in place and are not subject to mechanical damage (such as damage to steel columns that might cause a fire-resisting coating to fall away).

Compartmentation

9.8 Compartmentation means sub-division of a building by walls and/or floors for the purpose of limiting fire spread within the building (such as stopping a fire from passing from the area of origin to other areas / floors of the

building. The precise nature of any sub-division will be dependent on the type and use of the building – see specific guides.

Case study

Historically, a number of major fires have occurred in large, single-storey DIY retail warehouse buildings, thereby placing the public and firefighters at risk. This is the principal reason that government guidance on compliance with the Building Regulations now specifies that, at the time of construction, such buildings should be sub-divided by compartment walls or should be sprinklered.

9.9 Compartment walls and compartment floors generally do have openings, as they are penetrated by service ducts and risers, stairways, lifts, and similar measures. Vertical service risers would have been enclosed by fire-resisting construction to form "*protected shafts*", or the risers would be sealed by fire-resisting construction at each floor level. Alternatively, cables, pipes, and similar measures, would have the penetration through which they pass sealed with fire-resisting materials; this is known as "*fire stopping*".

9.10 Where a ventilation duct passes through a compartment wall or floor, measures are required to ensure that compartmentation is maintained. Most commonly, this involves the provision of simple fusible link-operated fire dampers, which close at elevated temperature (such as above 72 ºC). In the case of air transfer grilles, an intumescent "honeycomb" barrier can be used, but this will not be suitable for protecting an escape route from smoke spread.

9.11 In the case of escape routes, particularly in sleeping accommodation, dampers need to resist the passage of fire and smoke. These dampers are generally motorised and are operated by smoke detectors.

9.12 Fire-resisting ductwork can be used to maintain the compartmentation, so that dampers are not needed in line with the compartment wall or floor. However, dampers will still be necessary to prevent entry of fire and/or smoke at terminations within accommodation.

However, it is essential to be alert for any loss of integrity of these barriers to fire, particularly during alterations or the installation of new services, such as electrical cables, water pipework, and similar measures.

9.13 A suitable and sufficient fire risk assessment will consider (by non-intrusive and purely visual inspection, with a degree of sampling) the state of any compartmentation that is required to be maintained.

9.14 However, on a more day-to-day basis, the Responsible Person must ensure that compartmentation is not undermined. For this purpose, it is important for the Responsible Person to understand arrangements for compartmentation within the fire strategy for the building.

9.15 It should be stressed that compartmentation is not only undermined by major alterations or building works. Any work involving installation of new services can give rise to undermining of compartmentation. Even the simple installation of a new cable or pipe can result in a hole around the service in question, which must then be "*fire stopped*", meaning sealed with material that will afford the same fire resistance as the barrier that is penetrated.

9.16 "Hidden" areas that should be given special consideration include service risers, within which services penetrate the walls of adjacent accommodation, and areas above false ceilings, where services commonly run. Doors and access panels to risers should be fire-resisting, and doors should either be self-closing or kept locked shut.

9.17 Areas above false ceilings need to be monitored to confirm that service penetrations do not impair the integrity of walls and partitions enclosing protected corridors and stairways.

Sealing and sub-division of concealed spaces

9.18 Hidden fire travel within roof spaces, floor voids, ceiling voids and external walls is a particular hazard. Concealed fire spread may permit fire to develop to an extent that is a threat to occupants before detection of fire and evacuation of the building.

Case study

In Section 5, there was reference to the fire at Summerland Leisure Complex on the Isle of Man in 1973. The fire started externally, but spread into the leisure complex via external walls, which incorporated a very large, undivided, void between the external combustible wall and internal combustible linings.

9.19 At the time of construction, voids in external walls, above false ceilings, and similar measures. should have been sealed or sub-divided with "cavity barriers", which are fire-resisting (though not necessarily to the extent of a compartment wall).

9.20 Again, it is important to ensure that cavity barriers are not disturbed, damaged or removed. Particular care should be taken above false ceilings and in roof voids.

Linings

9.21 The materials used to line walls and ceilings in escape routes should be such that they are not able to spread fire rapidly across their surfaces and do not release any significant amounts of heat if involved in a fire. Less stringent requirements apply to linings within rooms, particularly those of limited size.

9.22 Again, at the time of construction, suitable linings would have been provided for compliance with the Building Regulations. However, care

should be taken to ensure that changes to linings do not undermine the required fire performance, particularly as a change in linings does not require approval under the Building Regulations.

Case summary

In the early hours of 14 February 1981, a fire occurred at the Stardust Nightclub in Dublin. 48 people died and 128 people were seriously injured. The overwhelming majority of the victims were young people.

Deaths and injuries could have been reduced by prompt and efficient evacuation of the building, but, even in those circumstances, serious injuries, and probably deaths, would have occurred because of the rapid fire spread.

Carpet tiles had, inappropriately, been used as wall coverings. The fire performance of the carpet tiles was not suitable for this purpose. This highlights the importance of suitable lining materials on walls of rooms and escape routes.

9.23 Suitable materials include plasterboard, mineral fibre tiles, ceramic tiles, plastered finishes and inorganic, non-combustible materials, such as brickwork, blockwork, concrete, and similar measures. Untreated timber linings are generally unsuitable, but appropriate fire performance can be achieved by treating the timber with fire-retardant or intumescent paints.

9.24 Care should be taken in respect of constant over-painting of surfaces, as multi-layer paint finishes can result in rapid spread of fire.

External fire spread

9.25 This is a further matter that is addressed under the Building Regulations at the time of construction. One requirement is that the external walls of the building must adequately resist the spread of fire over the walls

9.26 The use of combustible cladding materials and extensive cavities with inadequate cavity barriers can present a risk in some buildings. Restrictions are now applied to the use of combustible materials in, for example, hotels and hospitals. However, in the case of existing buildings, external wall construction and cladding will need to be considered in the fire risk assessment, and there may be a need for a fire risk appraisal of the external wall construction and cladding by specialists. In the 2017 Grenfell Tower fire, the fire spread rapidly over all the external wall surfaces, resulting in 72 deaths; the original masonry walls of the building had been over-clad with rainscreen cladding, the fire performance of which did not satisfy the Building Regulations.

9.27 Particular care needs to be taken in any alterations to external wall construction, such as installing new cladding. This is an area that requires specialist advice, including any circumstances in which there is doubt or uncertainty about the fire performance of existing cladding.

9.28 A further requirement is that external wall construction, the area of windows and the space between the building and an adjacent building should, in combination, be such as to prevent fire spread from one building to another. Similarly, roof construction must be such as to prevent spread of fire from one roof to another.

Summary of Points in Section 9

- The Responsible Person must ensure that there are adequate measures to reduce the risk of spread of fire on the premises.
- Compliance with building regulations at the time of construction of a building should ensure the structural stability of the building in the event of fire, and limitation of spread of fire within the building by compartmentation (and/or fire suppression systems), suitable wall and ceiling linings and cavity barriers. Building regulations also require measures to limit external fire spread (over the walls of the building and from one building to another).
- The Responsible Person must ensure that the measures required for compliance with the original building regulations are not compromised.
- Important issues to look out for are damage to structural fire precautions, including compartmentation, the need for fire stopping of service penetrations, combustible wall and ceiling linings, and damage to cavity barriers (such as in false ceiling and roof voids).

10. Emergency Escape Lighting

10.1 The Fire Safety Order requires that the general fire precautions taken by the RP must include measures for "*… securing that, at all material times, the means of escape can be safely and effectively used.*". This simply means that there must be appropriate fire safety measures to assist people safely to use the means of escape.

10.2 One such measure is emergency escape lighting. Emergency escape lighting is often described simply as "*emergency lighting*", which is the term used, for short, in this, and later, sections of this guide, though, strictly, emergency lighting is a generic term that includes other forms of lighting that are not related to fire safety.

10.3 Emergency lighting is lighting that will provide adequate illumination throughout the means of escape if the normal lighting fails (such as as a result of fire damage to normal lighting circuits), so that, under these circumstances, people can still safely use the means of escape. The emergency lighting should also enable people to see relevant safety equipment, such as manual call points and fire extinguishers.

10.4 The Fire Safety Order further, and more specifically, requires that, "*where necessary*", if emergency routes and exits require illumination, they must be provided with emergency lighting of adequate intensity in the case of failure of their normal lighting.

10.5 The size and type of the premises will determine the necessity for, and extent of, any emergency lighting. For some small premises, reliable borrowed lighting (such as from street lamps, if they are dependable) might be suitable to illuminate means of escape in the event of normal lighting failure. Alternatively, in these premises, torches, kept permanently charged, might be sufficient.

10.6 However, in the vast majority of premises to which this guide applies, there will be a need for an emergency lighting system.

Types of emergency lighting

10.7 There are 3 main types of emergency lighting system, namely systems in which the emergency lighting is provided by:

- self-contained luminaires (light fittings)
- a central battery system
- an emergency generator (though this will very rarely be suitable)

<u>Self-contained emergency lighting</u>

10.8 Emergency lighting is most commonly provided by the installation of self-contained luminaires. As the name implies, each luminaire is entirely

independent and incorporates a battery, charger, changeover device and associated electronics, all within a single housing.

10.9 Self-contained luminaires are connected to the normal lighting circuit in the area in which they are provided. The battery therefore remains charged by the normal lighting circuit. Failure of the normal lighting circuit is detected automatically, and illumination is then provided by the emergency lighting unit.

Central battery emergency lighting

10.10 A central battery emergency lighting system comprises a single battery installation with associated charger. This provides a power supply to all "*slave*" emergency lighting luminaires, by means of a dedicated wiring system, running throughout the building, thus forming a complete secondary lighting installation.

10.11 The batteries and control equipment for the system are housed in a metal "*cubicle*", or, in the case of very large sites, a dedicated battery room.

10.12 In a central battery system, care needs to be taken to ensure that there is suitable monitoring of normal lighting circuits that serve the means of escape, so that, for example, if normal lighting fails in the corridor on one floor, the emergency lighting on that floor will illuminate, unless the emergency lighting is a "*maintained system*", in which the emergency lighting is illuminated at all times, rather than just when normal lighting fails.

Emergency generators

10.13 An emergency generator will rarely be a suitable source of supply for the emergency lighting required by the Fire Safety Order. This is because the generator will only start on total power failure to the building, whereas a fire is more likely to affect only a limited number of normal lighting circuits in the building.

10.14 In some very unusual circumstances (occasionally occurring in, for example, hospitals), there are 2 normal lighting circuits in every area. One of these is wired in a fire-resisting cable (so that it cannot be affected by fire) and the normal lights are illuminated at all times. If power to the building fails, the emergency generator supplies these lights. While this arrangement would satisfy the Fire Safety Order for emergency lighting, as noted, such an arrangement is rarely encountered.

Mode of operation of emergency lighting

10.15 There are 3 possible modes of operation of luminaires:

- *non-maintained* - the luminaires operate only when the normal lighting fails

- *maintained* – the luminaires are illuminated at all times
- combined (maintained or non-maintained) one lamp in the luminaire is energised from the emergency supply on failure of the normal supply, and a second lamp is energised only from the normal mains supply. These are now quite rare, as dedicated luminaires are much more common

10.16 Illuminated exit signs are normally part of the emergency lighting, and are of the maintained type in places in which there is a significant number of members of the public (such as licensed premises), so that the exits are constantly highlighted for those who are unfamiliar with the premises.

10.17 Maintained emergency lighting should also be used where the normal lighting might be dimmed or turned off, such as in cinemas, theatres and concert halls. In other premises used for recreation, where there is no dimming, it is necessary only for exit signs to be maintained or combined.

Duration of operation of emergency lighting

10.18 Emergency lighting batteries should have sufficient capacity to operate the emergency lighting for 3 hours if premises are not expected to be evacuated immediately on power supply failure (unassociated with a fire in the building), or if it is intended that the premises will be reoccupied when power supply is restored without waiting for batteries to recharge (which can take 24 hours to restore to full capacity from a fully discharged state).

10.19 This is the case in sleeping accommodation and places of entertainment. If, for example, the power supply to a hotel fails during the night, it will not be practicable to rouse all guests immediately and request that they evacuate the building for 24 hours. The period of 3 hours covers most interruptions to supply of power to a building.

10.20 If premises will be evacuated immediately on supply failure and not reoccupied until full capacity has been restored to the batteries, a minimum duration of one hour for emergency lighting would be satisfactory. While this could apply in the case of, for example, an office building or factory, in practice, to avoid interruption to business, emergency lighting of 3 hours duration is normally installed.

Coverage of emergency lighting

10.21 Emergency lighting should normally cover the following:

- escape routes
- intersections of corridors
- changes in floor level
- stairways so that each flight receives adequate light
- each exit door

- the immediate area outside each final exit and on external escape routes (unless there is borrowed lighting, such as that provided by street lamps)
- windowless toilet accommodation exceeding 8m^2 or any toilet that will be used by disabled persons.
- covered and multi-storey car parks
- emergency escape signs
- firefighting equipment
- fire alarm manual call points
- equipment used to assist in the evacuation of disabled people
- equipment that would need to be shut down in an emergency
- lifts
- halls or other areas greater than 60m^2

10.22 It is not necessary to provide individual luminaires for each item above, but there should be a sufficient overall level of light to allow them to be visible and usable.

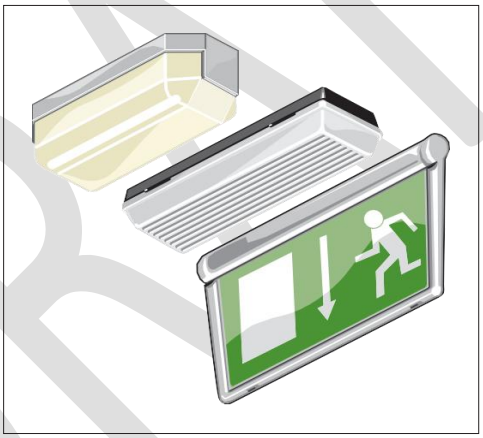

Figure 34: Luminaires

10.23 Design of emergency lighting requires specialist expertise (such as to ensure that the levels of illumination comply with the relevant standards). The emergency lighting installation should comply with BS 5266-1, BS EN 1838, BS EN 50172 and BS 5266-8.

Test facilities for emergency lighting

10.24 All emergency lighting installations should be provided with facilities to enable routine testing. Typically, the test facilities take the form of a “fishtail” key, which is inserted into a special switch, normally located either near to electrical distribution boards or adjacent to relevant light switches. (See Figure 35)

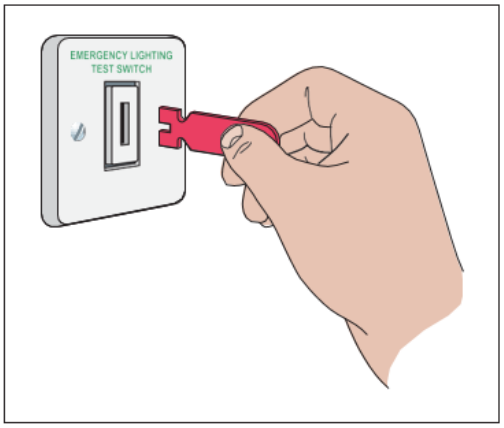

Figure 35: Typical emergency lighting test switch

10.25 Some more complex emergency lighting systems incorporate self-testing facilities. These reduce the work of routine testing by persons on the premises, and they ensure that the required routine testing is carried out.

10.26 Arrangements for testing and maintenance of emergency lighting are discussed in Section 21 of this guide.

Photoluminescent way guidance systems

10.27 To supplement emergency lighting (and escape signage), people can be helped to identify exit routes by the use of way guidance systems.

10.28 These systems usually comprise photoluminescent material forming a continuous marked escape route (see Figure 36). Photoluminescent systems are designed to absorb energy from ambient light so that they emit light in low ambient light conditions (“glow in the dark”), thereby assisting persons with escape.

10.29 While fire safety measures should already be in place to ensure that visibility is not compromised by either smoke or loss of power, these systems can assist people, particularly those who are partially sighted, in evacuation during conditions associated with a fire or lighting failure.

10.30 They can be used to demarcate an escape route in open spaces or identify the physical boundaries of the escape routes in stairways and corridors. Accordingly, they may be particularly beneficial for people who are unfamiliar with the premises or for directing people to alternative, less obvious escape routes.

However, it should be stressed that way guidance systems are not intended to replace emergency lighting or fire escape signage.

10.31 There might be certain (uncommon) situations where emergency lighting is not needed in any case, and way guidance systems might be considered to provide some benefit. Nevertheless, it is generally

recommended that way guidance systems are used only in combination with emergency lighting for illumination of the escape routes, simply to provide possible additional benefits.

10.32 It should be noted that, unlike emergency lighting, photoluminescent way guidance alone would not provide illumination to allow safe movement (such as to negotiate any trip hazards) or illuminate safety equipment. The low-level nature of these systems means they can easily fall out of view or become obstructed Also, the continuity of the strip can be broken when doors are open. When a number of people are using the escape route, use of photoluminescent way guidance only, in the absence of emergency lighting, would tend to slow evacuation.

10.33 Issues can arise in testing and maintenance of photoluminescent way guidance systems. For example, heavy pedestrian traffic might result in scratching and wearing of photoluminescent strips, and it is difficult to check for degradation of the system over a period of time. In large open areas, where it is desirable to define an escape route, the photoluminescent material might suffer particular wear (and could be difficult to see from other parts of the area).

Figure 36: Way guidance system

Summary of Points in Section 10

- For most premises within the scope of the Fire Safety Order, emergency lighting is required.
- The emergency lighting should be adequate for illumination throughout all escape routes (including external escape routes, unless they are covered by borrowed lighting from street lamps). The emergency lighting should also provide illumination of fire safety equipment, such as manual call points and fire extinguishers.
- Emergency lighting can be provided by self-contained luminaires or a central battery system. A standby generator will rarely be suitable for the emergency lighting necessary for compliance with the Fire Safety Order.
- Maintained emergency lighting (in which the light fittings are on at all times) should be used where the normal lighting might be dimmed or turned off (such as cinemas, theatres and concert halls). Maintained fire exit signs should be provided in premises where there is a significant number of members of the public (such as licensed premises).
- Normally, the emergency lighting should be capable of operating for 3 hours, though this may be reduced to one hour if the premises will be evacuated immediately on power supply failure and not re-occupied until emergency lighting batteries are fully charged (which typically takes 24 hours).
- All emergency lighting systems should have suitable test facilities to enable routine testing by unskilled personnel.
- Photoluminescent way guidance systems can be used to supplement emergency lighting, but they are not intended to replace emergency lighting or fire escape signage.

11. Signs and Notices

11.1 Various fire safety signs are used in buildings to provide information, or instructions, to occupants. As discussed below, some of the signs are required for assistance in compliance with the Fire Safety Order, while the provision of other signs is recommended good practice.

11.2 For consistency of understanding, there is a standard protocol for the shape and colour of fire safety signs, according to the meaning of the sign. The appropriate shapes and colours are shown below.

Category of sign	Shape	Colours	Example
Safe condition (Leading people to escape)	Square or oblong	White symbol or text on a green background	
Mandatory	Circular	White symbol or text on a blue background	
Fire equipment	Square or oblong	White symbol or text on a red background	
Hazard	Triangular	Black symbol or text on a yellow background, surrounded by a black triangular band	
Prohibition	Circular with cross band	Black symbol on a white background, inside a red circle with a red cross bar	

Table 3: Format and colour of fire safety signs

Escape signs

11.3 The Fire Safety Order requires that, where necessary, emergency routes and exits must be indicated by signs. This is a further measure for "*… securing that, at all material times, the means of escape can be safely and effectively used.*".

11.4 In simple premises, a few signs indicating the alternative exit(s) might be all that is needed; it is often unnecessary to signpost the normal route by which people entered the premises. In larger and more complex premises, a series of signs directing people along the escape routes towards the final exits might be needed.

11.5 Exit signs should be clearly visible whenever the public, staff and contractors are present.

11.6 The presence of other signs in premises (such as advertising and customer information), can distract attention from, or obscure the visibility, of escape signs. This could affect people's ability to see and understand escape signs, particularly if there is a fire evacuation. It should always be ensured that escape signs are not overwhelmed by other signage.

11.7 Escape signs should meet the following criteria:

- They should provide clear, unambiguous information to enable people safely to leave a building in an emergency
- Every escape route sign should, where necessary, incorporate, or be accompanied by, a directional arrow. Arrows should not be used on their own
- If the escape route to the nearest exit is not obvious then it should be indicated by a sign(s)
- Escape signs should be positioned so that a person escaping will, for much of the escape route, have the next escape route sign in sight
- Signs should be fixed above doors in the direction of escape and not be fixed to doors, as they will not be visible if the door is open
- Signs mounted above doors should be at a height of between 2.0m and 2.5m above the floor
- Signs on walls should be mounted between 1.7m and 2.0m above the floor
- Mounting heights greater than 2.5m may be used for hanging signs, such as in large open spaces or for operational reasons, but care should be taken to ensure that such signs are both conspicuous and legible. In such cases, larger signs may be necessary
- Signs should be sited at the same height throughout the escape route, as far as is reasonably practicable

Escape sign design

11.8 The Health and Safety (Safety Signs and Signals) Regulations 1996 require that signs that direct people along means of escape must include a pictogram, often described as "*the running man*" (see Figures 37 and 38).

11.9 These Regulations do not stipulate where the signs must be provided (as that is a matter for the fire risk assessment). The Regulations simply make requirements about the appearance of the signs that are identified as necessary. Emergency escape signage should comply with the recommendations of BS 5499.

11.10 The pictogram can be supplemented by text if this is considered necessary to make the sign easily understood (as is commonly the case), but it is a breach of the Regulations for an escape sign to incorporate only text in the absence of a pictogram.

11.11 Accordingly, the escape signs may either comprise a pictogram on its own, or a pictogram in combination with text. Either type of sign can be used, but the 2 different types of sign should not both be used within the same building.

11.12 So that the colour green always directs people to safety, the background colour of escape signs should be green, and any words should comprise white lettering.

Figure 37: Pictogram in conjunction with words

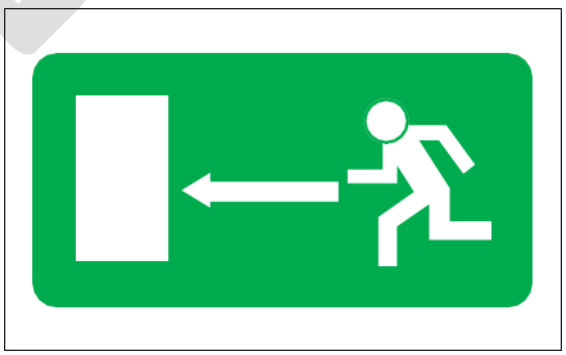

Figure 38: Pictogram without words

11.13 The legibility of escape signs is determined by the size of the sign, its level of illumination and the distance over which it is viewed. The use of signs within the same premises should follow a consistent design pattern or scheme.

11.14 In multi-occupied premises, cooperation between the respective persons with duties including, if necessary, the managing agent or landlord, should be sought to ensure that, as far as possible, all signs in the building conform to a single pattern or scheme.

11.15 The colour green should always be used to direct people to safety, or to assist people in evacuation of premises; the colour green should not be used for other purposes.

11.16 Signs that assist people in evacuation of premises and should incorporate a green background include:

- Slide to open (fixed to a manually operated sliding door on means of escape)
- Push bar to open (for use with panic bars)
- In emergency break glass to open door (such as adjacent to electronically locked doors)

11.17 It is important to ensure that fire escape signs accurately lead occupants of a building along escape routes and to the nearest fire exit. Where changes occur to the layout of a building, it should be considered as to whether changes to fire exit signage are required.

Case study

Following a fire at a retail store in Nottingham in 2006, it was found that fire exit signage on the first floor staff area was potentially confusing.

It transpired that, as a result of a fire risk assessment, an escape route over a flat roof had been disestablished in favour of a new escape route over a different section of flat roof. However, the original fire exit signs, indicating the disestablished escape route, had not been removed, so that, incorrectly, routes over both flat roofs were indicated as fire exits.

As it happens, the small number of employees on the first floor did use the correct escape route, but this indicates that attention to detail in escape route signage needs to be taken into account when escape routes are altered.

Firefighting equipment signs

11.18 The Fire Safety Order requires that, *where necessary*, any "*non-automatic fire-fighting equipment*" is indicated by signs. This applies to, for example, fire extinguishers, hose reels and dry, or wet, rising mains,

by which the fire and rescue service obtain water for fighting fire within a building.

11.19 The colour red must be used as the background colour for firefighting equipment signs, on which pictograms and text must be white. As in the case of fire escape signs, firefighting equipment signs must incorporate a pictogram (such as see Figure 39).

Figure 39: Fire extinguisher pictogram

11.20 However, the colour red is, alone, sufficient to indicate the location of a fire extinguisher that is in direct view. Virtually all modern fire extinguishers are red in colour, so a sign is not essential unless the extinguisher is hidden from view (in which case the sign should be accompanied by a white arrow on a red background) or the extinguisher might blend into the background (such as because of its surroundings).

11.21 Similarly, it is often unnecessary to provide a sign for manual call points, provided these are obvious. Where this is not the case, a pictogram may be used in conjunction with text (see Figure 40).

Figure 40: Manual call point pictogram

Fire procedure notices

11.22 The Fire Safety Order requires that the RP must establish and, where necessary, give effect to, appropriate fire procedures.

11.23 This necessitates provision of fire procedure notices within the premises. A suitable location for these is adjacent to all manual call points. In larger or more complex premises, as well as positioning the notices adjacent to call points, they may be put on staff notice boards and where staff frequently assemble in the premises (such as a canteen, locker rooms, and similar measures) (see Figure 41).

11.24 Ideally, any wording of the notice that tells people what to do should comprise white letters on a blue background, in accordance with the normal protocol for mandatory signs. Any wording that prohibits people from taking specific actions should comprise white letters on a red background in accordance with the normal protocol for prohibition signs.

Figure 41: Typical fire procedure notice

11.25 In the bedrooms of premises in which people sleep, it can be helpful to incorporate a simple drawing that assists those unfamiliar with the premises to orientate themselves in relation to escape routes and fire exits. In hotels, it is good practice to include fire instructions in multiple languages. (See Figure 42)

Figure 42: A typical bedroom fire procedure notice

Other signs and notices

11.26 It is recognised custom and practice to provide other fire safety signs and notices, though these do not fall within the scope of the Health and Safety (Safety Signs and Signals) Regulations. These are outlined below.

Mandatory signs (see Table 3 for format and colour)

11.27 Typical mandatory signs[6] comprise:

- **Fire door keep shut** (fitted on both sides of a self-closing fire door, at about eye level)
- **Fire door keep locked shut** (fitted to a fire door that is not self-closing and must be kept locked when not in use)
- **Automatic fire door keep clear** (fitted to a door that is held open, but closes automatically in the event of fire)
- **Remove security fastenings when premises are occupied**
- **Fire exit keep clear** (This sign is sometimes confused with the safe condition fire exit sign, but should be used on the external face of a fire exit door that might be obstructed by, for example, storage or a parked car)

Hazard signs (see Table 3 for format and colour)

11.28 The only common hazard sign used in fire safety is the general hazard sign comprising an exclamation mark with the supplementary text "*In case of fire do not use lift*". This sign is often fixed adjacent to lift call buttons (see Figure 43).

Figure 43: Hazard sign regarding use of lift

11.29 Other hazard signs are not commonly used in fire safety, but may be appropriate in certain industries to warn of dangerous substances, such as those that are flammable or explosive.

[6] The term "mandatory" refers to the action specified in the sign; it does not necessarily infer that the signs themselves are mandatory.

Summary of Points in Section 11

- In most buildings, there will be a need for signage of escape routes and fire exits.
- The Health and Safety (Safety Signs and Signals) Regulations do not specify where fire safety signs should be used, but, where they are used, the Regulations specify requirements for the shape and colour of fire escape and firefighting equipment signs. Under the Regulations, these signs must incorporate pictograms.
- There must be adequate provision of fire procedure notices throughout the premises.
- Signs should be fixed to all fire doors indicating that they should be kept shut, kept locked shut or (in the case of fire doors that are normally held open but close in the event of fire) should be kept clear, unless a risk assessment determines that these are unnecessary.

12. Fire Fighting Equipment

12.1 The Fire Safety Order requires that, *where necessary*, in order to safeguard the safety of relevant persons, the RP must ensure that the premises are, to the extent that is appropriate, equipped with appropriate firefighting equipment. These can reduce the likelihood of a small fire developing into a large one.

12.2 In determining what is appropriate, consideration needs to be given to the use and size of the premises, the equipment contained on the premises, the materials likely to be present and the maximum number of persons who may be present at any one time.

12.3 The safe use of an appropriate fire extinguisher, to control a fire in its early stages, can also significantly reduce the threat of injury to other people in the premises by allowing people to assist others who are at risk. Safe use requires adequate training; staff training is discussed in Section 19 of this guide.

Case study

A study published by the Fire Industry Association shows that, in 2021, in 93% of fires in which portable fire extinguishers were used, the fires were successfully extinguished by the extinguishers.

Although the fire and rescue service should always be called to any fire, in 27% of the above fires, the fire and rescue service were not called or required.

12.4 Fire extinguishers can contain a range of different extinguishing agents. To assist anyone using a fire extinguisher to understand whether a fire extinguisher is suitable for the materials that are burning, fires are classed according to what is burning (see Table 4).

Class of fire	Description
Class A	Fires involving commonly found solid materials (which normally burn with glowing embers), such as wood, paper or textiles.
Class B	Fires involving flammable liquids, such as petrol, diesel or oils.
Class C	Fires involving gases.
Class D	Fires involving metals.
Class F	Fires involving cooking oils and fats in cooking appliances, such as deep-fat fryers.

Note:
1. If there is a possibility of a fire involving material in the shaded boxes, specialist advice should be sought. Fires involving gases normally involve a leak of gas.

The leak should be turned off, rather than attempting to extinguish the fire, as continued leakage of gas after extinguishment can result in an explosion.

2. It is not safe to fight fires involving aerosols with fire extinguishers.
3. Electrical fires do not constitute a class of fire. A fire involving or started by electrical equipment could involve any of the other classes of fire.

Table 4: Classes of fire

12.5 In the vast majority of buildings, the predominant fire hazard is that of a Class A fire.

12.6 To assist users, fire extinguishers are labelled with numbers and letters to indicate the maximum size and class of fire that can be extinguished by the extinguisher (if used by a trained operator). This makes it possible to specify the appropriate distribution of fire extinguishers according to their extinguishing capability.

12.7 For example, the labelling on a typical 9 L water extinguisher will indicate that the extinguisher has a 13A rating, showing that it is suitable for use on Class A fires (see Figure 44). The number 13, which relates to the maximum size of Class A fire that can be extinguished, can then be used to assist in determining how many of these extinguishers should be provided on any storey.

Figure 44: Fire extinguisher showing 13A rating

12.8 Certain 6 L water or water-based fire extinguishers can also achieve a 13A rating. Equally, some 9 L water or water-based fire extinguishers can achieve a higher rating (such as 21A). The important issue is the extinguishing capability.

Number and siting of fire extinguishers

12.9 Where the fire hazard is not confined to a particular location (as will normally be the case for Class A fires), the fire extinguishers should be positioned on escape routes, close to the exit from the room or storey, and to the final exit from the building. Additional fire extinguishers should be provided, as necessary, ideally to ensure that no one need travel more than approximately 30m to reach a fire extinguisher, for areas with specific fire hazards (class B, F) or involving live electrical equipment, appropriate extinguishers should be sited so that the travel distance does not exceed approximately 10m.

12.10 Having sited fire extinguishers as described above, a rough check should be carried out to confirm that the aggregate extinguisher rating of all fire extinguishers on any storey equates to 0.065 x (floor area in m^2).

12.11 Typically for the Class A fire risk, the provision of one water-based extinguisher for approximately every 200m^2 of floor space, with a minimum of two extinguishers per floor, will normally be adequate. Where it is determined that there are additionally other classes of fire risk, the appropriate type, number and size of extinguisher should be provided. Further information is available in BS 5306-8.

12.12 Where a particular fire hazard is specifically located (as in the case of cooking appliances in a kitchen), the appropriate fire extinguisher should be sited near to the hazard, but located so that it can be safely reached in the event of fire.

12.13 Fire extinguishers should be hung on a wall at a convenient height so that employees can easily lift them off (at about 1m for larger extinguishers, or 1.5m for smaller extinguishers, between floor level and the level of the handle). Alternatively, extinguishers can be placed in a dedicated floor stand. Fire extinguishers should not be free standing on the floor.

Colour coding of fire extinguishers

12.14 Modern fire extinguishers are predominantly red in colour (regardless of their contents). A colour-coded area, sited above, or within, the instructions on the extinguisher body, denote the contents of the extinguisher. (Some proprietary extinguishers have a stainless steel, uncoloured body, but, again, a colour-coded area denotes the contents of the extinguisher).

12.15 Older extinguishers manufactured to previous standards had bodies painted entirely in a single colour which denotes the type of extinguisher. These older extinguishers are now very uncommon, but remain

acceptable until they are no longer serviceable. However, it is good practice to ensure that old and new style extinguishers are not mixed on the same floor of a building.

12.16 The following paragraphs describe the different types of extinguishers. The colour referred to is the colour of the extinguisher or the colour-coded area.

Types of fire extinguishers

Water extinguishers (red)

12.17 This type of extinguisher is intended for use on Class A fires. They allow the user to direct water onto a fire from a considerable distance (typically, up to 6 m).

12.18 A standard water fire extinguisher is not suitable for use on live electrical equipment or Class B fires. However, certain water-based fire extinguishers, which discharge water as a spray or fine mist, are certificated for use on these fires, in which case this information will be shown on the extinguisher body.

Foam extinguishers (cream)

12.19 Foam extinguishers are suitable for use on Class B fires and are particularly effective when the fire is contained. Most types of foam extinguisher are also suitable for use on Class A fires.

12.20 They should not be used on free-flowing liquid fires unless the operator has been specially trained, as these have the potential to rapidly spread the fire to adjacent material. This type of extinguisher is not suitable for deep-fat fryers or chip pans.

Powder extinguishers (blue)

12.21 This type of extinguisher can be used on most classes of fire and achieves a good “knock down” of the fire. They are effective against running fuel fires, so are often provided on garage forecourts. They can be used on fires involving electrical equipment, but will almost certainly render that equipment useless. Because they do not cool the fire appreciably, it can re-ignite.

12.22 The discharge of powder extinguishers within buildings can cause a sudden reduction of visibility and can also impair breathing, which could temporarily jeopardise escape or other emergency action.

Carbon dioxide extinguishers (black)

12.23 This type of extinguisher is particularly suitable for fires involving live electrical equipment, because carbon dioxide is non-conductive, and they will extinguish a fire without causing any further damage to the equipment

(except in the case of some electronic equipment such as computers). As with all fires involving electrical equipment, the power should be disconnected if possible.

Class F extinguishers (yellow)

12.24 This type of extinguisher is particularly suitable for fires involving cooking oils or fats (such as in commercial catering establishments with deep-fat fryers).

12.25 It is important that only extinguishers classified as suitable for use on Class F fires are used on cooking oils or fat fires.

Specialised powder extinguishers (violet)

12.26 This type of specialist extinguisher uses special powders to smother fires involving metals (such as titanium, magnesium, potassium, sodium, and aluminium). These are normally found sited where industrial processes using these types of metals are carried out.

Extinguishers for use on lithium-ion battery fires

12.27 A number of fire extinguishers are marketed as suitable for use on lithium-ion battery fires. These are a recent development, and, at the time of writing, there are no standard fire tests in the UK to verify their exact capability. In general, it is unsafe for members of the public to deal with a lithium-ion battery fire with a portable fire extinguisher in view of the likely rate of fire development and the extent of toxic fire products.

Fire blankets

12.28 Fire blankets should be located in the vicinity of the fire hazard where they are needed, but in a position that can be safely accessed in the event of a fire. Fire blankets are suitable for dealing with small fires in containers of cooking oils or fats and fires involving clothing. Accordingly, they are suitable for use in kitchens.

12.29 Fire blankets may also be found in some laboratories or areas in which people handle highly flammable liquids.

Hose reels

12.30 Hose reels (see Figure 45) provide an effective firefighting facility and are sometimes provided to supplement portable fire extinguishers.

12.31 However, a major drawback of hose reels is that, because there is a continuous supply of water, without restriction of duration, people might stay and fight a fire beyond the stage when escape was essential. There is also potential for hose reels to be taken through self-closing fire doors, which do not then fully close to restrict the spread of fire and smoke.

12.32 For these reasons, it is not uncommon for hose reels to be removed from buildings and replaced with an appropriate number of portable fire extinguishers. However, in some premises, particular those of an industrial nature, hose reels are sometimes provided for use by trained operatives, such as fire teams.

Figure 45: Hose reel

Summary of Points in Section 12

- In virtually all buildings, portable fire extinguishers will be necessary.
- A very large number of small fires are extinguished by portable fire extinguishers, without any need for action by the fire and rescue service.
- Fires are classified, according to the materials that are burning. The most common fires are those denoted as Class A; these involve commonly found materials present in all buildings, such as wood, paper or textiles.
- Marking on every fire extinguisher indicates the class of fire for which the extinguisher is suitable and a metric as to the size of fire that can be extinguished, so enabling the appropriate number of extinguishers to be determined.
- Colour-coding of fire extinguishers indicates the extinguishing medium contained within the extinguisher.
- Fire extinguishers should be sited on escape routes and at all storey exits. No one should need to travel more than approximately 30m to reach the nearest extinguisher.

- The aggregate rating of all extinguishers on a storey should equate to 0.065 x (floor area in m^2). This will equate to one 13A-rated extinguisher for every 200m^2 of floor area.

- It may be necessary to provide additional extinguishers to deal with particular fire hazards. For example, in a kitchen in which there is a deep fat fryer, a Class F extinguisher (and a fire blanket) should be provided.

- Extinguishers should be wall-mounted or placed in dedicated floor stands; they should never be free standing on a floor.

- Fire blankets are particularly suitable for kitchens, but may be found in laboratories or areas in which people handle highly flammable liquids.

- Hose reels may be provided to supplement portable fire extinguishers, but major drawbacks are the possibility that they will encourage people to remain in a building for too long, attempting to fight a fire, and they may prevent fire doors from fully closing. However, they are sometimes provided in factories and warehouses, and similar measures, particularly where they are intended for use by, for example, a trained fire team.

13. Automatic Fire Suppression and Extinguishing Systems

Sprinkler systems

13.1 A sprinkler system is regarded as a fire suppression system, rather than a fire extinguishing system, as its principal objective is to control a fire, limiting its size to a reasonably predictable area. However, in practice, it is common for a sprinkler system to totally extinguish a fire.

13.2 Sprinkler systems are extremely reliable, and over 95% of fires in sprinklered premises are controlled or extinguished by the sprinkler system. In the unusual circumstances where a sprinkler system does not control or extinguish a fire, the most common reasons for this are that the water supply to the system is turned off or the nature of the fire hazard for which the sprinkler system was originally designed has changed.

13.3 The original use of sprinkler systems was for protection of property, and they are much favoured by insurers for this reason. However, in many premises, sprinklers are an important life safety measure, particularly in respect of protecting those beyond the room or compartment of fire origin. Accordingly, they are of great value to life safety for occupants of, residential care homes, sheltered housing and supported housing for vulnerable people.

13.4 . It is a common misconception that no life is ever lost from fire in a sprinklered building, but it is true to say that cases involving loss of life are rare. It is important to understand that a sprinkler system may not, for example, be sufficient to save the life of a person whose bedding and/or clothing is alight. Other, or additional, measures may need to be taken to address the risk of, for example, mobility impaired people who smoke in bed.

Case studies

In Section 6, there was reference to a fatal fire in the bedroom of a resident in a care home in Dundee in 2015. As noted in Section 6, the sprinkler system very successfully achieved its objective of controlling (and, in this case, extinguishing) the fire, with very little damage to furniture in the room. However, the resident, the nightwear and bedclothes of whom were alight, tragically died in hospital.

In 2017, a fire in a flat within a high-rise block of flats in Ayr resulted in the death of the occupant of flat, who died later in hospital. A sprinkler system successfully controlled the fire.

13.5 While a sprinkler system will not necessarily save a vulnerable person in the room of fire origin, particularly if they are directly involved in the fire, the system is likely to limit the fire to the room or compartment of origin, so providing a high standard of protection for those beyond that room or

compartment. The system may also protect other people within the room or compartment of fire origin.

13.6 A sprinkler system is often part of a “package” of fire precautions in a building and so forms an integral part of the fire strategy for the building. Examples are enclosed shopping centres and some buildings that incorporate an atrium, where the sprinkler system is installed in conjunction with a smoke control system (see Section 14) to enable people to safely escape from the building in the event of fire.

13.7 A sprinkler system may also have been required under the Building Regulations, as a measure to permit increased compartment sizes or reduction of the fire resistance of structural elements of the building.

13.8 Guidance on the design and installation of new sprinkler systems is given in BS EN 12845 or, in the case of residential sprinkler systems, BS 9251.

How a sprinkler system works

13.9 All areas of the building to be protected are covered by a grid of pipes with sprinkler heads fitted into them at regular intervals. Water supplied from a tank via pumps, or from the public water mains (if they can give enough flow) fills the pipes.

13.10 Every sprinkler head is, in effect, a form of non-return valve, which is held shut by a glass bulb that fractures when liquid within the bulb expands due to heat, or is held shut by a soldered link, the solder of which melts as a result of elevated temperature.

13.11 Each sprinkler head operates only when it is heated to its predetermined operating temperature by the hot gases from a fire. Only the sprinklers in the immediate area of the fire open. The others remain closed. This ensures that no water is applied to areas where there is no fire and reduces the amount of water needed.

It is a common misconception that all sprinkler heads operate simultaneously, with potential for water damage. It will be obvious from the above explanation of the mechanism of operation of sprinkler heads that each sprinkler head is independent. Fires are commonly controlled or extinguished by operation of just a few heads.

A further misconception is that, like smoke detectors, sprinkler systems are prone to false alarms (and hence unwanted discharge of water) because of cigarette smoke, cooking fumes, and similar measures. This is totally incorrect; false discharge of water from sprinkler heads is very rare and is usually the result of accidental mechanical damage (such as by forklift trucks in industry).

13.12 The sprinkler heads are spaced, generally on the ceiling (though special heads can be wall-mounted), so that, if one or more operate, there is always sufficient flow of water. The flow is calculated so that there is always enough to control a fire, taking into account the size and construction of the building and the goods stored in it or its use.

13.13 At the point where the water enters the sprinkler system there is a valve. This can be used to shut off the system for maintenance. For safety reasons, it is kept locked open and only authorised persons should be able to close it. If a sprinkler head opens and water flows through the valve into the installation pipework, the valve lets water into another pipe that causes an alarm device to sound. In this way, the sprinkler system generates a local external alarm at the same time as controlling or extinguishing the fire.

13.14 By installing a water pressure or flow switch to the system, with a connection to the building's fire alarm system, the system can act as an automatic fire detection system, so that the fire alarm system is operated when a sprinkler head operates. Obviously, if required, a signal can then be sent to an alarm receiving centre, from where the fire and rescue service would be summoned.

Watermist systems

13.15 As with sprinkler systems, watermist systems consist of a water supply, which supplies water, through pipework, to specially designed watermist nozzles. The water supply may comprise simply the local water mains, but, often, the high pressure required cannot be provided by the mains, so, commonly, it is necessary for the water to be pumped from a tank; alternatively, water can sometimes be supplied from pressurised cylinders.

13.16 Watermist systems control or suppress a fire in a different way from sprinkler systems. Sprinkler systems control a fire by wetting combustible material ahead of a fire, so restricting its spread. The water droplets are relatively large and heavy, such that they have the momentum to reach the ground, against the upward flow of smoke and hot gases.

13.17 In contrast, watermist systems discharge a mist of very fine water droplets. The droplets control or suppress a fire by absorption of relatively large amounts of heat from the flames as a result of the high surface area of the water droplets. They also smother the flames by evaporation of the water droplets to steam, and heat transfer to adjacent combustible materials is blocked.

13.18 For protection of life, and hence compliance with the Fire Safety Order, use of watermist systems is normally restricted to residential premises. BS 8458 provides recommendations for the design and installation of watermist systems in residential and domestic premises whilst In England, sprinkler systems should be provided in all new blocks of flats with a storey of greater that 11m in height for compliance with the Building Regulations.

13.19 The individual heads of a watermist system are, as in the case of a sprinkler system, normally operated by the fracture of a glass bulb or fusible link, but discharge can be triggered by automatic fire detectors

(such as flame detectors). As in the case of sprinkler systems, discharge of the system generates an alarm signal.

13.20 Watermist systems are a much newer technology than sprinkler systems, and their performance can be more sensitive than sprinkler systems to small design changes, or changes in the geometry of the protected space. If watermist is considered for the potential objective of compliance with the Fire Safety Order, the advice of specialists should be obtained.

Other forms of fire extinguishing system

13.21 Other forms of fire extinguishing system exist. These include systems that discharge a gaseous extinguishing agent into a compartment, such as a plant room, computer room, and similar measures. Gaseous fire extinguishing systems are normally provided for protection of property, or protection against business interruption, as the result of a fire. They are rarely used for protection of life or compliance with fire safety legislation. These systems may present additional hazards therefore specialist advice should be sought prior to installation.

13.22 “Local application” systems can also be used to extinguish a fire in a piece of equipment or process plant. As discussed in Section 1, process fire precautions are outside the scope of the Fire Safety Order.

13.23 However, as discussed in Section 5, it is common to provide a manual/automatic fire extinguishing system for commercial cooking equipment. This may mitigate the hazard of this equipment, such as to enable siting or location of the equipment, or its enclosure, in circumstances that would, otherwise, potentially undermine compliance with the Fire Safety Order.

Summary of Points in Section 13

- Sprinkler systems are a very long-established and highly reliable means of automatically controlling a fire.
- The systems are valuable in protection of life in many types of premises in which people sleep, such as, residential care homes, sheltered housing and supported housing. In England, sprinkler protection of blocks of flats is required in the case of blocks over 11m in height.
- It is rare (but not unknown) for loss of life to occur as a result of a fire in a sprinklered building.
- Sprinklers are commonly part of the “package” of measures incorporated within a fire strategy, particularly for complex buildings, such as shopping centres and certain buildings containing an atrium.
- It is a total misconception that all sprinkler heads operate simultaneously and that the systems may be prone to false alarms, causing unwanted discharge of water. Each sprinkler head operates independently, and false discharge of water is very rare.
- By connecting a sprinkler system to the building’s fire alarm system, the system can act as a form of automatic fire detection, triggering a fire alarm signal in the building.
- Watermist systems are a much newer technology, but there is growing use of these systems in residential and domestic premises.
- There are many similarities between sprinkler systems and watermist systems, but watermist systems control and suppress fires in a different way from sprinkler systems.
- Specialist advice is required if watermist systems are to be used as part of the measures installed for compliance with the Fire Safety Order to ensure suitability for the application.
- Most other forms of fire extinguishing or suppression system will not be necessary for compliance with the Fire Safety Order.

14. Smoke Control

14.1 Smoke control is provided in some buildings, normally for either, or both, of 2 purposes, namely:

- to support means of escape
- to assist the fire and rescue service

14.2 Smoke control systems are usually provided in, for example, single and multi-storey shopping malls, large warehouses, buildings containing atria, underground and enclosed car parks, firefighting shafts, theatres and any basement more large than 200 sqm or more than 3m.

14.3 A common application for smoke control systems is for protection of means of escape, particularly stairways, in blocks of flats. As such premises are outside of this scope of this guidance, see the Blocks of flats guidance for more information.[7].

14.4 In enclosed or underground car parks, smoke control systems often have a dual function. On a day-to-day basis, they provide ventilation and mixing to keep carbon monoxide from car exhausts at permissible levels, and they provide smoke clearance in the event of fire.

14.5 The principal objectives of a smoke control system have a significant bearing on system design. In fire engineered systems, assumptions will have been made during the design process of, for example, the anticipated fire size, and it is essential that the RP understands this, as it may have an effect on management of the premises (such as the need to ensure that fire loading does not exceed that anticipated in the design of the system).

14.6 The designer of the system may have made assumptions regarding the interaction of other design features, such as the presence of a sprinkler system, the volume of the space to be ventilated (which may relate to, for example, the locations of fire-resisting walls and doors) and arrangements for replacement air (to replace that extracted with smoke). Accordingly, other features of the building may have a significant bearing on system performance, which may not be immediately obvious or apparent to non-specialists.

14.7 It is essential that the RP is aware of the presence of any smoke control system, the type of system installed, its method of operation and its objective. This information should be contained within the fire strategy for the building.

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[7] *Fire Safety in Purpose-Built Blocks of Flats* Fire safety in purpose-built blocks of flats - GOV.UK (www.gov.uk)

14.8 Accordingly, it is important for the type of smoke control system to be recorded within the fire safety arrangements for the building (see Section 16) so that it can be ensured that those who undertake alterations to the building can do so in an informed manner, and the system can be properly maintained.

14.9 The reason that this is stressed within this guide is that it is not unknown for an RP to be unaware of this information and, in consequence, to fail to carry out suitable routine testing and maintenance of the system. Alterations to the building may also be detrimental to the correct operation of a smoke control system, unless the potential effects of the alterations on the smoke control system are taken into account. Further information on smoke control systems can be found here[8].

14.10 Responsible Persons (RPs) should be aware of the presence of a smoke control system and understand its basic operation. This includes not only how the exhaust vents remove smoke from the building or area but also how replacement air is introduced to maintain effective smoke extraction. Without proper replacement air, the system may not function as intended, compromising safety.

14.11 Atria will often be provided with systems for either smoke control or smoke clearance. The objectives of these systems will be dependent on factors relating to the atrium design, particularly in respect of means of escape. If smoke spread via an atrium could present a challenge for escape, smoke control will be provided with the objective of maintaining tenable conditions for escape.

14.12 However, in atria design where escape arrangements can satisfactorily avoid escape through the atrium, a smoke clearance system might be provided instead, for use by firefighters during a fire, and/or to clear smoke following a fire. Smoke control and smoke clearance systems are different, with smoke clearance systems generally having a lower performance standard.

14.13 In certain old premises, standard ventilation systems may have been designed to provide a smoke control or smoke clearance function. This was sometimes provided in rooms that are not naturally ventilated by windows, where the air handling system may have been intended to shut down supply air and continue to run extraction.

14.14 Such arrangements were sometimes provided under historical design codes and legislation, and mechanical engineers carrying out repair or replacement works to the system may not recognise the original design objectives, as they may be far removed in design and construction from current standards. For example, old existing systems may not incorporate

[8] https://www.smokecontrol.org.uk/client/files/Guidance-on-Maintenance-of-Smoke-Control-Equipment-v1_1.pdf

fire-resisting ductwork and fans. It is, however, important that such systems are maintained for compliance with Article 17 of the Fire Safety Order, or that there is a review by competent persons before altering these arrangements.

14.15 Smoke control systems are generally operated by automatic fire detection, often with manual controls to override the automatic operation for use by the fire and rescue service. Manually operated vents, purely for use by the fire and rescue service, may also be found in some circumstances.

14.16 In the case of some basements, means for release of heat and smoke may comprise, for example, pavement lights that can be broken out or opened by the fire and rescue service. It is important that these are suitably marked and kept clear.

14.17 The design of smoke control systems is a complex subject, which is outside the scope of this guide. If there is uncertainty regarding the nature of the smoke control system in a building, the advice of specialists should be sought.

14.18 The principal types of smoke control system are briefly described below.

Natural systems

14.19 Natural smoke control systems rely on the natural buoyancy of hot air and smoke, and may include the use of vertical shafts, which work like chimneys. The systems may be operated automatically, manually or by both means.

14.20 Natural systems may comprise simply an automatically opening vent, louvre or window on an external wall, with replacement air provided by, for example, the stairway door being opened during escape or firefighting, with a further ventilator provided in the stairway for the purposes of providing makeup air. In these cases, there can be the potential for system performance to be affected by ambient wind conditions.

Mechanical smoke ventilation systems

14.21 Mechanical smoke ventilation systems remove the reliance on buoyancy, and mechanically remove the smoke with fans. The smoke is normally extracted via vertical shafts or directly from smoke reservoirs.

14.22 These systems have a greater dependence on replacement air, which, if not designed or maintained properly, can have an effect on escape (such as by drawing smoke into escape routes, introducing pressure onto escape doors, making them difficult to open, or by creating high air

velocities in escape routes which thereby discourage occupants from using the escape route).

Pressure differential ("pressurisation") systems

14.23 In a pressurisation system, fans create a positive pressure in escape routes (typically stairways), so that, rather than smoke flowing from a fire in accommodation into the escape route, fresh air flows from the escape route into the accommodation, through gaps around doors, preventing smoke entry into the escape route. (Therefore, these doors should not be fitted with smoke seals.) There should then be leakage paths within the accommodation for the air.

Summary of Points in Section 14

- Smoke control is used to support means of escape and/or to assist the fire and rescue service.
- There are various different forms of smoke control system. It is important for the RP to understand any smoke control system present in the building, so that it is properly tested and maintained, and that it is not undermined when alterations to the building take place.
- Smoke control will often form part of a package of measures that include other equipment or systems, which can include automatic smoke detection, fire curtains, a sprinkler system and mechanical components, such as dampers. Reliable operation of smoke control may be dependent on an emergency power supply. Consequently, smoke control facilities must often be tested and maintained as an integrated system.
- The design of smoke control systems requires specialists, who should be consulted if there is any lack of clarity as to existing smoke control arrangements and their adequacy.

15. Fire and Rescue Service Facilities

15.1 While all modern buildings are required to have adequate access arrangements to the vicinity of the building for fire appliances, certain buildings have various measures incorporated in them to assist the fire and rescue service in the event of fire. Such buildings are normally over 18m in height, but can include certain public assembly buildings, shops and factories of lower height but relatively large area. (Some buildings might incorporate certain firefighting facilities if they are over 11m in height.)

15.2 Facilities to assist the fire and rescue service primarily comprise:

- access for fire appliances and firefighters
- firefighting shafts (incorporating protected stairways and lobbies for use by firefighters) and lifts (for use by firefighters)
- dry and wet rising mains
- evacuation alert systems in high-rise blocks of flats
- storey identification signs and dwelling indicator signs in blocks of flats
- firefighters' switches (to isolate power supply to high voltage illuminated signs)
- firefighters' isolation switches for photovoltaic (PV) installations
- smoke control (for smoke clearance to assist firefighters) - see previous section
- water supplies (such as location of hydrants)
- secure information boxes

15.3 Some large, complex buildings may have been provided with dedicated control rooms, from where the fire and rescue service can command firefighting operations.

15.4 In modern buildings, the above facilities should have been provided, as required at the time of construction, for compliance with the building regulations. The provision of any additional facilities will be determined through the assessment and management of risk under the FSO (such as making provision for access for firefighting appliances).

15.5 However, the Fire Safety Order requires that where necessary in order to safeguard the safety of firefighters in the event of a fire, the RP must ensure that the premises and any facilities, equipment and devices provided in respect of the premises for the use by or protection of firefighters under legislation, particularly building regulations, are subject to a suitable system of maintenance and are maintained in an efficient

state, in efficient working order and in good repair. Maintenance is discussed in Part 2 of this guide.

15.6 Furthermore, where major refurbishment or alterations to a building are carried out, it may provide an opportunity to provide facilities or equipment for the fire and rescue service that would be required in a new building today, but were not required at the time of construction of the building.

15.7 Similarly, when old equipment that is far removed from current standards is replaced, there will often be an opportunity to upgrade the equipment to current standards. The obvious example is an old lift for use by the fire and rescue service (known as a firemen's lift). If there is to be replacement of the lift this might present an opportunity to upgrade the lift installation to the modern (firefighters lift) standard. However, it would need to be determined whether, taking cost and risk into account, upgrading would be reasonably practicable. For example, in a building without a standby generator, upgrading of an old firemen's lift installation would necessitate the provision of a generator (or an equivalent reliable secondary power supply).

Access for fire appliances and firefighters

15.8 Buildings that have been constructed in accordance with modern building regulations or in accordance with certain, now repealed Local Acts will have been provided with facilities that allow fire appliances to approach and park within a reasonable distance so that firefighters can use their equipment without difficulty.

15.9 These facilities may include hard standing areas for fire appliances and access into the building for firefighters. Hard standing areas for fire appliances should not be used as car parking. It is essential that where such facilities are provided, they are properly maintained, signed and must be available for use at all times.

15.10 Where a building is used by a number of different occupants you will need to ensure cooperation between the various RPs to maintain fire and rescue service access. In exceptional cases, where access is persistently obstructed, additional arrangements may need to made.

Firefighting shafts and lifts

15.11 Firefighting shafts (see Figure 46) are provided in high-rise buildings, or buildings with deep basements, to help firefighters reach floors farther away from the building's access point. They enable firefighting operations to start quickly and in comparative safety by providing a safe route from the point of entry to the floor where the fire has occurred.

15.12 Entry points from a stairway in a firefighting shaft to a floor will be via a firefighting lobby, through 2 sets of fire and smoke-resisting doors and

walls. In high-rise residential buildings, a protected corridor will typically replace the conventional firefighting lobby.

15.13 Many people will use the firefighting stairway for normal movement through the building and it is important that the safety features are not compromised by doors being wedged open.

15.14 Most firefighting shafts will also incorporate a lift for use by the fire and rescue service that opens into the lobby. The primary function of the lift is to transport firefighting personnel and their equipment to the scene of a fire with the minimum amount of time and effort.

15.15 Firefighting shafts include some means of ventilation to prevent smoke entering the firefighting stairway. This may comprise natural openings, such as windows and vents, smoke shafts and mechanical means of extraction.

15.16 Alterations that might affect the firefighting shaft should not be made without first liaising with other RPs, any owners or managing agents and the enforcing authority. Any proposed changes will require Building Regulation approval from a Building Control Body.

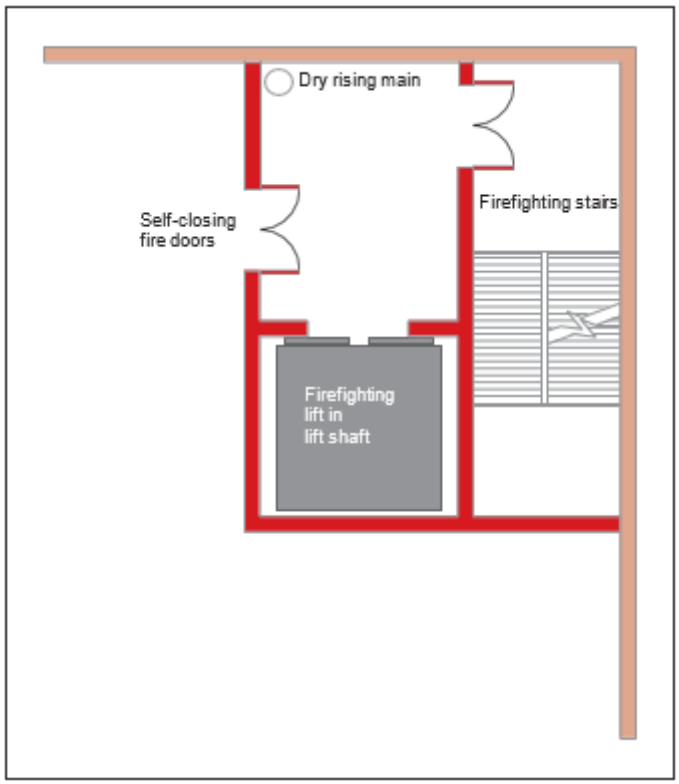

Figure 46: Firefighting shaft

Dry and wet rising fire mains

15.17 The rising fire main (see Figure 47) is an important facility for the fire and rescue service in taller buildings and certain large footprint buildings. (Deep basements may be provided with falling mains.) It consists of an inlet box where firefighters can connect their hoses, a pipe running up or through the building, outlet valves (known as landing valves) on each floor level and an air release valve at the top.

15.18 In buildings where a dry rising main is used, the system remains empty until it is needed during a fire. The fire and rescue service charges it with water by connecting to an inlet located on the building's external wall. This system relies on firefighters to pump water into the pipework during an emergency.

15.19 In very tall buildings, a wet rising main is likely to be used instead. Unlike a dry rising main, this system is permanently charged with water. The water supply is pumped from a storage tank within the building, ensuring immediate availability for firefighting operations without the need for external water supply connections.

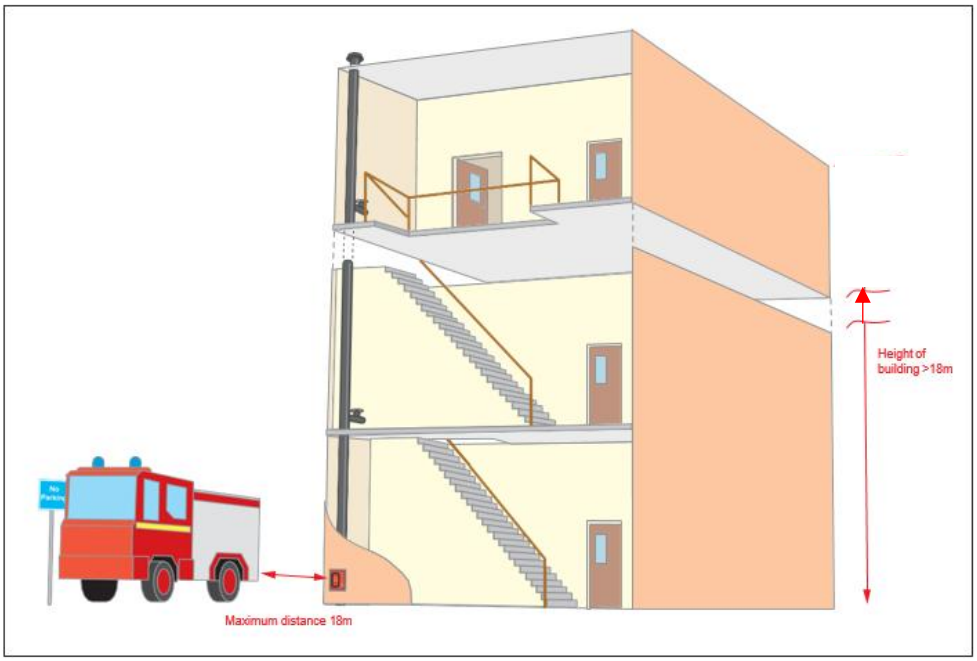

Figure 47: Rising main

15.20 It is important that rising mains are ready for effective operation at all times. So, for example, it is essential that parked cars cannot block access to the external inlet of a dry rising main. All landing valves within the building should be secured shut with a leather strap (which can be cut by the fire and rescue service) and a padlock.

Firefighters' switches

15.21 Luminous discharge lighting, such as neon signs, is occasionally still used in some premises for which this guide is intended. Safety switches are normally provided to isolate high-voltage luminous signs or to cut off electrical power.

15.22 In the case of existing installations, if they have been provided in accordance with previous legislation (such as the local government (Miscellaneous Provisions) Act 1982), then it is likely that they will comply with the Order. If this is not the case, then you may need to consult the enforcing authority regarding the suitability of its location and marking. Testing should be carried out in accordance with the manufacturer's instructions. If you have no such instructions, then an initial test should be carried out by a competent electrician.

PV isolation switches

15.23 Any building with a PV array can present an increased risk to firefighters in the event of a fire.

15.24 Parts of the PV system are always live while light falls on the panels (artificial lighting may generate small currents).

15.25 The emergency isolation switches isolate the electrical power between the PV array and the inverter.

Summary of Points in Section 15

- There needs to be adequate arrangements for access for fire and rescue service appliances to the proximity of a building.
- Certain buildings are provided with special facilities to assist the fire and rescue service with firefighting operations. The measures comprise, at least, stairways and lobbies suitable for use by firefighters, rising mains and lifts for use by firefighters.
- The buildings in question are normally high-rise buildings, but also include low-rise public assembly buildings, shops and factories, though, for these buildings, lifts for use by firefighters are not normally provided.
- All the relevant measures are not necessarily present in older buildings, but it is unlikely that they will need to be installed retrospectively, for compliance with the Fire Safety Order. However, major refurbishments or alterations can provide an opportunity to provide facilities that are now required for new buildings, but were not required at the time of original construction of the building.
- Similarly, equipment and facilities that do not meet current standards (and are not required to do so) might be upgraded when replacement (such as an old-style firemen's lift) takes place.

- Facilities and equipment provided for the assistance, or safety, of firefighters must be subject to suitable maintenance, including, where appropriate, routine testing, as well as periodic servicing.

Fire Safety Duties Part 2: Management of Fire Safety

16. Arrangements for Management of Fire Safety

16.1 Fire safety should be an integral part of the safety management of any organisation throughout every part of its structure.

16.2 Experience shows that inadequate management of fire safety is a major contributory factor in placing people at risk in the event of a fire..

16.3 Inquiries into past fire disasters have determined that management deficiencies played a major role in the outcome of the fire. Factors common to such incidents and other fire disasters include:

- the obvious failure to prevent the fire occurring, sometimes as a result of management failures
- a lack of overall duty in respect of fire safety
- inadequate staff training in fire safety, with consequent misguided actions by staff
- a delay in operating the fire alarm system
- a significant delay in summoning of the fire and rescue service
- a lack of adequately pre-planned and organised evacuation

16.4 In Section 3, the concept of the “fire triangle” was discussed; remove any side of the triangle and there will not be a fire. In a fire disaster, there is what might be described as the “fire disaster polygon”; sometimes, removal of one side (though sometimes more than one side) can prevent multiple fatalities occurring in a fire.

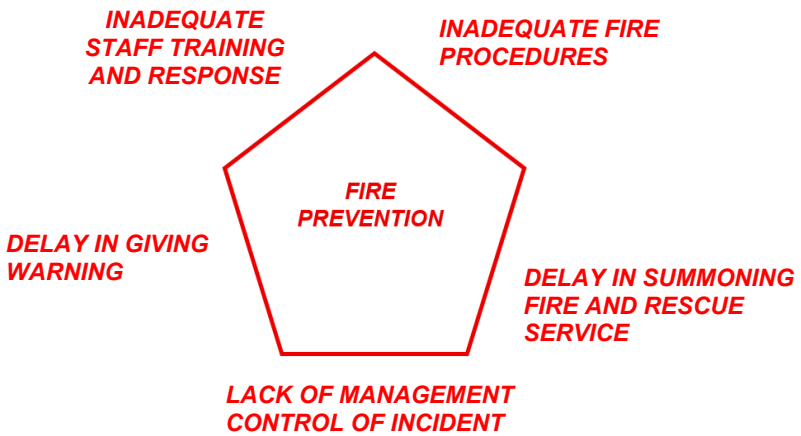

Figure 48: The fire disaster polygon

16.5 Shortcomings in fire safety management can be identified by a suitable and sufficient fire risk assessment, as required by Article 9 of the Fire Safety Order.

16.6 Under Article 11 of the Fire Safety Order, the RP must establish and record arrangements, appropriate for their undertaking, covering the planning, organisation, control, monitoring, and review of fire safety measures. These arrangements directly implement the preventative and protective measures identified in the fire risk assessment, and failure to do so likely constitutes a breach of Article 11. These management systems often integrate other duties, like appointing competent persons and ensuring regular reviews, ultimately aiming for effective control over fire safety arrangements in the premises.

16.7 It should be noted that the need for the arrangements made by the RP must be appropriate, having regard to the size of the organisation and the nature of its activities. This will also include the hazards and risks that are present. However, it should be noted that relatively small premises might have quite complex fire safety arrangements, while those in a large building are sometimes simple.

16.8 The quality and depth of the fire safety arrangements put in place for any given premises will vary with the nature of the premises. The arrangements will range from something very simplistic through to a complex arrangement of maintenance contracts, method statements, a means for employees to report deficiencies in general fire precautions, schedules for periodic reviews and tests of the various fire safety measures in place, and similar measures.

16.9 If management can demonstrate, in a recorded form, that they have a general policy for the day-to-day running of the business, which includes recognition that fire safety is an important consideration, they are going some way to complying with Article 11. Compliance with this article may be shown through programmed maintenance dates, and training and instruction intervals for members of staff.

16.10 Such actions will demonstrate that not only have relevant fire safety measures been put in place by the RP, but that they understand the importance of those measures and the part they play in providing for the safety of relevant persons. This understanding is essential, especially when identifying issues with fire safety management systems or incident response, as it enables the RP to assess both the impact of the failure and the necessary actions to address it to reduce the likelihood of recurrence.

16.11 The important aspect of this article is that fire safety is “managed” and that the elements of the arrangements are being addressed. Responsible persons may choose to address these arrangements within the pages of a “fire safety policy”, but the overriding consideration must be that the management of fire safety has been addressed in some way. Such arrangements will also include the requirement (where necessary) to cooperate and co-ordinate with other responsible persons, as required by Article 22 (see Section 23 of this guide).

16.12 The way preventative and protective measures can be planned, organised, controlled, monitored and reviewed will vary depending on the risk. By way of example, consider fire-resisting doorsets.

The responsible person might, for example:

- Plan – have a numbered door schedule to assist in the identification of relevant doors; and ensure that relevant information and training relating to the importance of doors is given to employees
- Organise – work out how the doors should be routinely inspected and nominate somebody to oversee this function
- Control – have in place a system that enables employees to report defects to the person in charge of door maintenance
- Monitor – ensure that the doorsets are routinely checked over a given period
- Review – make sure that the systems in place are operating as intended

16.13 . Whatever the system put in place by the RP, it should remain under review and should be flexible in its approach to enable prompt handling of matters when they go wrong or are no longer suitable.

16.14 It should be noted that a record of the fire safety arrangements must be kept. This can take the form of a fire safety manual for the premises which holds the fire procedures and fire safety measures incorporated in the premises for example describing the measures in place for the prevention of fire, protection of occupants from fire and the arrangements for management of fire safety.

There is sometimes confusion between the documentation of the "*fire safety arrangements*" and documentation of the significant findings of the fire risk assessment. However, carrying out a fire risk assessment does not involve formulation of the fire safety arrangements; they should already be in place.

16.15 Nevertheless, there is an interface between the fire safety arrangements and the fire risk assessment. Recorded arrangements will assist in carrying out the fire risk assessment. If the record of the arrangements is lacking in some respects, some of the information recorded in the fire risk assessment might fill the 'gaps', for example emerging risks like lithium ion batteries. In carrying out the fire risk assessment, the adequacy of the fire safety arrangements, and of their documentation, should be considered.

16.16 A summary of arrangements for management of fire safety are set out below.

- In every organisation, a defined structure for managing fire safety from top management (board of directors) downwards *(Article 11)*
- In every building a defined responsibility for fire safety

- A properly documented, and periodically reviewed, fire risk assessment that is suitable and sufficient for the premises (*Article 9*)
- A documented fire safety manual
- Arrangements for competent assistance with compliance with the Fire Safety Order (*Article 18*)
- Proper arrangements for fire prevention, including good standards of housekeeping (*Article 8*)
- Proper arrangements to address the hazards of dangerous substances (*Article 12 and Article 16*)
- Suitable and well-documented fire procedures, including arrangements for evacuation of disabled people (*Article 15*)
- Training of staff in fire safety matters with additional training for those with special responsibilities, such as fire wardens and those with responsibility for summoning the fire and rescue service (*Article 21*)
- Appointment of fire wardens if appropriate (*Article 15*)
- Properly conducted fire drills (*Article 15*)
- In-house inspections to monitor fire precautions (*Article 11*)
- Arrangements for inspection, testing and maintenance of fire protection equipment (*Article 17*) and measures for use by, or protection of, firefighters (*Article 38*)
- Inspection, testing and maintenance of plant and equipment to reduce the risk of fire (*Article 8*)
- Control over activities of outside contractors to reduce the risk of fire (*Article 8*)
- Arrangements for liaison with the fire and rescue service at the time of a fire and, to the extent appropriate, in pre-planning for a fire (*Article 13*)
- Provision of information regarding fire precautions to employers of third parties who are working in the premises, whether long term (such as a staff catering franchise) or short term (for example, contractors carrying out work). The RP must ensure that the employees of the third party are provided with sufficient information regarding evacuation procedures, and similar measures. (*Article 20*)
- In premises where 2 or more RPs share, or have duties in respect of, the premises, cooperation and coordination between the RPs to coordinate the measures they take to satisfy the Fire Safety Order (*Article 22*)

16.17 Guidance on the principal measures to which specific Articles of the Fire Safety Order apply is given in subsequent sections of this guide.

Summary of Points in Section 16

- Management of fire safety is extremely important. Failure to manage fire safety is often the cause of major fire disasters.
- The article of the Fire Safety Order in relation to management of fire safety is Article 11. This article requires arrangements for the planning, organisation, control, monitoring and review (POCMAR) of the measures identified as necessary for compliance with the Fire Safety Order by a fire risk assessment.
- For compliance with Article 11, there should be a proper structure and strategy for managing safety from top management downwards, including a high-level fire safety policy endorsed by top management.
- The management strategy should include matters that are more specifically required by other articles of the Fire Safety Order, including arrangements for maintenance of fire safety measures, fire and evacuation procedures, training of staff, liaison, cooperation and coordination with other RPs within the premises, and similar measures.
- The fire safety arrangements, formulated for compliance with Article 11, must be documented.
- In multiple occupancy buildings, there must be mutual cooperation between persons with duties to coordinate their fire safety measures.
- A competent person is someone who has sufficient training and experience, or knowledge and other qualities, properly to assist the RP in undertaking the required fire safety measures.

17. Competent Persons to Assist the Responsible Person

17.1 Article 18 of the Fire Safety Order requires that the RP must appoint one or more competent persons to assist the RP in compliance with the Fire Safety Order.

This requirement is commonly misunderstood. It is often thought that any party who assists the RP with relatively routine matters, such as maintenance of fire protection equipment, is a competent person to which Article 18 refers.

This is incorrect. In fact, as discussed in Section 1 of this guide, the intention is that the competent person in question provides the RP with “high-level” strategic policy and guidance on compliance with the Fire Safety Order.

17.2 Typically, the competent person will prepare, or input to, an organisation’s fire safety policy, fire safety arrangements (see Section 16 of this guide), arrangements for carrying out fire risk assessments, and similar measures.

17.3 For compliance with Article 18, the competent person(s) who provides this assistance must, in the case of a workplace, be someone in the employment of the employer, unless no such person exists, in which case an external consultant can be appointed for the purpose. This consultant is not necessarily the person appointed to carry out a fire risk assessment, unless they are specifically appointed for this task.

17.4 The competent person(s) in the employment of the RP will typically be an in-house fire safety manager, the director, or manager, of health and safety, or even a complete department devoted to health and safety and/or fire safety.

17.5 The requirement for competence is important. Competence is defined in the Fire Safety Order as someone who has sufficient training and experience, or knowledge and other qualities, to enable them to properly to assist the RP in undertaking the preventive and protective measures, meaning the measures identified as necessary in the fire risk assessment.

17.6 The Fire Safety Order requires that the number of persons appointed for compliance with Article 18, the time available for them to carry out their duties as the competent person, and the means at their disposal, are adequate, taking into account the size of the premises, the risks to which relevant persons are exposed and the distribution of the risks throughout the premises.

17.7 While fire and rescue services can assist persons with duties with advice of a very general nature on compliance with the Fire Safety Order, they can neither act as the fire risk assessor nor the competent person to

which Article 18 refers. The fundamental principle on which the Fire Safety Order is based is one of self-compliance on the part of RPs, where fire and rescue services (or other relevant enforcing authorities) can audit the RPs' compliance.

Case study

In the prosecution of property managing agents, the court heard that the managing agents had acknowledged, in writing, that they were "out of their depth" and expected the fire and rescue service to explain to them what was necessary for management of fire safety in particular premises for which they were responsible.

This is, in effect, evidence of a failure to meet the requirements of Article 18, in that, as the relevant person with duties, they were required to appoint one or more competent persons to ensure adequacy in satisfying the Fire Safety Order.

Summary of Points in Section 17

- Every RP must appoint one or more competent persons to assist their organisation to comply with the Fire Safety Order. The assistance comprises "high-level" advice on policies and structure for managing fire safety, not day-to-day management or maintenance of premises.

- The competent person(s) must be employees of the RP, unless no such competent employees exist, in which case outside consultants can be used.

18. Fire Procedures

18.1 The Fire Safety Order requires that the RP must establish suitable and sufficient fire procedures. The Order also requires that the RP nominate a sufficient number of persons to implement procedures for evacuation of relevant persons (for example, fire wardens).

18.2 In many cases, the fire procedures required will be simple but will vary depending on the risks present in any given premises. The services of a specialist will not normally be required to write the fire procedures for the building. Fire procedures for certain specific premises types are discussed in the relevant sector specific guides

18.3 It should also be noted that the fire procedures must address arrangements for the evacuation of those who require assistance to evacuate the premises, with appropriate assistance rendered by other occupants of the building. In the case of disabled staff who normally work in the building, this will involve preparation of personal emergency evacuation plans (“PEEPs”). Guidance on arrangements for means of escape for those who require assistance to evacuate the premises is given in separate guidance from this guide.

18.4 Most fire procedures are written for 3 groups of occupants:

- the person(s) who discovers the fire
- persons who hear the fire alarm, but have no special duties in the event of fire
- persons with special duties to perform when a warning of fire is given.

The simplest fire procedures may include the following:

18.5 In fire procedure notices, these 3 actions are normally set out in a theoretical chronological order, as though there were only one occupant of the building. This is also the manner in which they are considered below.

18.6 However, in practice, all 3 measures need to be implemented simultaneously or as quickly as possible. If there are several occupants in the area of the fire, one person should deal with the fire immediately if it is safe to do so, while a colleague raises the alarm and ensures that the fire and rescue service are summoned.

18.7 The fire procedures should set out tasks to be carried out in the event of fire by those with special responsibilities, for example, fire wardens, persons to assist with evacuation of disabled people, and similar measures. However, it should be noted that, under the Fire Safety (Employees’ Capabilities) (England) Regulations 2010, every employer

must, in entrusting tasks to employees, take into account their capabilities as regards health and safety, so far as those capabilities relate to fire.

Raising the alarm

18.8 In the event of fire, the first action should be to immediately warn all occupants of the danger, to avoid any delay in evacuating the building. It should be the recognised right of any person to operate the fire alarm system if they suspect, or know, that there is a fire in the building. Procedures to raise the fire alarm that first rely on informing a manager, telephoning a switchboard operator, security officer, fire warden, and similar measures. are inherently dangerous and divorced from the reality of both fire and human behaviour. There should be no difference in the procedures for a “small” fire and those for a “large” fire.

18.9 In some buildings, there may be a need for important staff to be made aware of the circumstances of the fire. Additional procedures can be established whereby after operating a manual call point, further information is given, by telephone or in person, to a person at a continuously staffed location, such as a reception desk or switchboard.

18.10 In some buildings, it may be unnecessary to evacuate the entire building when a fire is discovered, and the alarm system is operated. However, the fire alarm system should normally be configured in such a manner that any person who operates a manual call point receives confirmation (normally by operation of the alarm sounders in the area) that the signal has been received at the fire alarm control equipment. Even in buildings with 2 stage alarms, in which an “alert” signal, rather than an evacuation signal, is given in some areas, an immediate evacuation signal should normally be given in the area in which the manual call point is operated.

18.11 In a building with automatic fire detection, it may be acceptable for a fire alarm signal from a smoke detector to begin a “*staff alarm*”. In this arrangement, important staff are alerted, but no general evacuation signal is given. This is to avoid unnecessary evacuation in the event of a false alarm. However, a signal from a manual call point, heat detector or sprinkler system should result in immediate evacuation.

18.12 A staff alarm should be long enough to enable an investigation to be made but should not be so long as to place occupants in danger in the event of a real fire. No hard and fast time limit can be given, but a period of around 3 minutes is commonly adopted, and a period of 6 minutes should not generally be exceeded. On expiry of this delay period, an evacuation signal should be given unless the fire alarm system has been reset following identification of a false alarm.

Action on hearing the fire alarm

18.13 The correct action on hearing the fire alarm sound depends on whether an alert signal or an evacuation signal is being given. In buildings with single stage evacuation arrangements, only the evacuation signal will

ever occur. In buildings with phased evacuation arrangements, an evacuation signal will be given in the area of the fire, and an alert signal will be given in other areas.

18.14 On hearing an alert signal, occupants should prepare for a possible evacuation. The form of preparation will vary from one building to another. In some buildings, equipment might be shut down during the alert stage. In most buildings (other than hospitals and care homes), it is normally appropriate to begin evacuation of disabled people at the alert stage.

18.15 The evacuation signal should be regarded as an instruction to occupants to evacuate immediately. There should be no delays while belongings are collected, an item on the agenda of a meeting is finished, telephone calls are finished, or meals in a restaurant are paid for or eaten.

18.16 Procedures for dealing with occupants, including members of the public, who are reluctant to evacuate, must be considered. Any equipment that might itself create a fire hazard if left unattended should be switched off. As occupants make their escape, all doors should be closed, particularly those designated as fire doors. If it is possible to close windows quickly, this may also be appropriate, but is less essential.

18.17 All occupants, on evacuation, should report to a pre-determined assembly point. Re-entry of the building should be strictly prohibited until the fire and rescue service officer in charge declares that it is safe to do so (or, in the case of a false alarm, staff are instructed to do so by someone nominated in the fire procedures to take charge of evacuation and re-entry). In particular, the silencing of the fire alarm system should never be regarded as an indication that it is safe to re-enter the building; the signal may have been silenced deliberately because it is known that the building is evacuated, or the fire may have damaged the alarm system, causing it to stop sounding.

Informing the fire and rescue service

18.18 It is vital to ensure that the fire and rescue service are summoned immediately to every outbreak of fire, however small it may be. Fire grown can be very rapid in its early stages, and even a short delay in summoning the fire and rescue service may put lives at risk (and result in additional loss of property).

18.19 In premises with a staff alarm arrangement, other than in the case of care homes, it is commonly acceptable for investigation of a fire signal from a smoke detector before summoning the fire and rescue service to avoid summoning them to a false alarm. At the end of the delay period discussed above, the fire and rescue service should be summoned if the signal has not been identified as a false alarm.

18.20 Responsibility for summoning the fire and rescue service in the event of fire should be pre-planned. It is desirable that the responsibility is placed on a person other than the person(s) who actually discovers the fire. For example, the procedure may be that, on hearing the fire alarm, the switchboard operator will summon the fire and rescue service, or a decision will be taken to do so by someone tasked with investigating a signal from a smoke detector.

18.21 The alarm signal may be relayed to an alarm company alarm receiving centre (ARC), from where the fire and rescue service will be summoned. Although this should ensure that the fire and rescue service will be summoned quickly when the alarm system is operated, a connection to an ARC never removes the need for an emergency call (via 999 or 112) to the fire and rescue service from the premises, if occupied.

18.22 In buildings that have no suitable and continuously staffed location at which the fire alarm control panel is monitored, the responsibility for summoning the fire and rescue service should still be pre-planned. For example, it may be the duty of a manager or supervisor, but it should be ensured that the duty is not delegated to a named individual (who may not always be present).

18.23 In smaller premises (see: Fire Safety in Small Non-domestic Premises), or those in which it is not practicable to delegate the duty for summoning the fire and rescue service, it may be necessary to place the responsibility for summoning the fire and rescue service on the person who discovers the fire. In this case, the duty should be made clear in the written fire procedures.

18.24 Although immediate summoning of the fire and rescue service has been stressed, occupants should not place themselves at risk to make the call. It may be necessary to retreat to a safe area of the building or to another building. However, procedures should never require the use of a telephone on a higher floor level than the fire, from which escape might prove difficult (except in the case of basements).

Extinguishing the fire

18.25 The Fire Safety Order requires that the RP must, where necessary, take measures for firefighting in the premises, by nominating competent persons to use the fire extinguishing equipment provided in the premises. This means that there are a sufficient number of trained staff, based on the size and the specific risk in the premises, to safely and effectively deal with a small fire.

18.26 Procedures should not actually require persons to attempt to extinguish a fire, but should, in most premises, advise that extinguishing action may be taken if it is safe, and they are trained, to do so. Extinguishing action should, however, generally be implemented only in tandem with raising the alarm and summoning the fire and rescue service, and should be

implemented only by persons who have received appropriate instruction in the use of the extinguishing appliances.

Fire wardens

18.27 In larger buildings, or those in which a roll call after evacuation is ineffective due to a varying occupancy or the presence of members of the public, designated fire wardens (also known as fire marshals) and nominated deputies should be appointed for each area of the building. In the event of fire, the fire wardens should be responsible for ensuring that their areas are evacuated. They should then evacuate and report that their area (including any toilets) is clear to the person in charge at the assembly point.

18.28 It should be stressed that no one in a building should delay their evacuation pending instructions from a fire warden. The absence of fire wardens should have no effect on the evacuation, but could affect the reliability and value of information that is available to the fire and rescue service. A well conducted evacuation should enable the fire and rescue service to turn their attention to firefighting, rather than searching for non-existent occupants, potentially placing firefighters at risk.

18.29 If a fire warden scheme is operated, provisions must be made for fire wardens to be present at all times. Normally, fire wardens are named persons, but there must be sufficient wardens and deputies to cater for absences. The problem of absences can be avoided by incorporating the duties of fire warden with a designated post, for example, shift supervisor, which it is known must always be filled.

18.30 Where there is not a fire warden scheme in place, it is important to ensure that all staff are fully aware of their roles and responsibilities in relation to evacuation. It will also be necessary to adopt a search and confirm evacuation procedure, where staff report areas being clear, in the event that the Responsible Person has determined that a roll call protocol is not suitable for the premises use.

Accounting for occupants

18.31 An appropriate member of staff should be designated to account for occupants at the evacuation assembly point(s). If a roll call is considered to be a feasible (for example, in small premises or premises with a small number of occupants), pre-planned procedure, this person should obviously have available a list of occupants who should be present at the time of the evacuation.

18.32 Otherwise, there should be arrangements for fire wardens to report to the person in charge of the assembly point(s) that their areas have been evacuated. Information regarding the status of the evacuation, and any person for whom it is impossible to account, should be given to the fire and rescue service on their arrival.

Reception of the fire and rescue service

18.33 An appropriate person, easily identifiable (such as by a tabard), should be made responsible for meeting the fire and rescue service on arrival and liaising with the officer in charge. A critical early action is to inform the officer in charge regarding the status of the evacuation and any known circumstances around the activation of the fire alarm/the fire.

18.34 This person should also be familiar with the building and be in a position to advise regarding the location of any information packs for the fire and rescue service, the layout and access to the building, fire protection measures, building services and their controls, any hazards to firefighters, and similar measures. This may require the availability of other persons, such as the building services engineer, who can provide specialist information if it is needed by the fire and rescue service. This may require the availability of other persons, such as the building services engineer, who can provide specialist information if it is needed by the fire and rescue service. Information packs may be stored in a secure information box, as a recognised focal point for attending fire and rescue crews (such as located within the main entrance foyer or external to the building).

Security staff

18.35 Security staff may be given special duties to perform in the event of fire. In a building with particular security risks, these duties may relate to their primary duty of maintaining security. However, security personnel may be required to perform other duties, such as:

- grounding lifts to ensure that they are not used to evacuate (except in the case of disabled people who may use special evacuation lifts), unless the lifts ground automatically on operation of the fire alarm system
- acting as lift operators for any evacuation lifts designated for use by disabled people
- preventing persons from entering the building, until a general re-occupation is permitted
- co-ordinating salvage work
- providing advice to the fire and rescue service concerning the building.

Senior management

18.36 A single nominated person should be in overall charge until the fire and rescue service arrives. It should be understood that, on arrival, the fire and rescue service will take charge. However, the manager should be in a position to make decisions regarding alternative accommodation for building occupants, notification or call out of other managers or specialist, implementation of contingency plans, assist the FRS post incident and similar measures.

Summary of Points in Section 18

- The Fire Safety Order requires that the RP must formulate and disseminate suitable and sufficient fire procedures.
- The RP must also nominate people, such as fire wardens, to assist with evacuation.
- Fire procedures should address actions to be taken by anyone who discovers a fire, everyone who hears the fire alarm signal, and those with special duties in the event of fire.
- The procedures should set out arrangements for raising the alarm, informing the fire and rescue service and, where appropriate, extinguishing the fire.
- There should also be pre-planned arrangements for liaison with the fire and rescue service on arrival and confirming the status of the evacuation to the officer in charge.

19. Information to Employees and Staff Training

19.1 As discussed in Section 18, it is essential that staff respond properly when a fire occurs, so, to ensure this, they must be given fire safety training appropriate to the actions required of them in the event of fire.

Legal requirements

19.2 The Fire Safety Order requires that employees must be provided with comprehensible and relevant information on:

- the risks to them identified in the fire risk assessment
- the preventive and protective measures, meaning the fire safety measures in the building)
- the fire procedures
- the persons who are expected to use fire extinguishers (which could be simply anyone who discovers a fire or could be a specific group of employees)
- the persons who are expected to assist with evacuation, that is, fire wardens
- any risks notified to the RP by other persons with duties in the premises

19.3 Before the RP employs a child who is not over the compulsory school age, information about the risks to the child, the fire safety measures in the building and any risks notified to the RP by other persons with duties must be provided to a parent.

19.4 Where a dangerous substance is present on the premises, the RP must provide information about the substance to employees. This includes access to any relevant safety data sheet and information regarding any relevant legislation applicable to the dangerous substance.

19.5 The Fire Safety Order also requires that RPs provide employees with adequate fire safety training, in an easily understandable format, and it is by this means, in conjunction with written information where appropriate, that the RP will impart the information in paragraph 19.2 to employees.

19.6 Training must be given when employees are first employed; this is normally part of their induction training. Training must also be given if employees are given new responsibilities in relation to fire safety, there is a change of equipment or introduction of new technology, or when there are new, or changed, work systems.

19.7 The training must include suitable and sufficient instruction and training on the appropriate precautions and actions to be taken by the employee,

to enable employees to safeguard themselves and other relevant persons on the premises and be appropriate to the risk identified in the fire risk assessment. The training must take place during normal working hours.

19.8 The Fire Safety Order requires that the training be repeated periodically "*where appropriate*". In practice, rarely, if ever, will it not be appropriate for regular "refresher" training to be given, as employees cannot be expected to remember everything they are told about fire safety at the time of their induction.

Approach to training

19.9 Refresher training should be repeated periodically based upon the risk associated with the premises eg. permanent nightshift staff (such as in hotels and care homes) may need to receive refresher training every 3 months. In many premises it may be approptiate for anual refresher training. Training should also be given when staff are exposed to new or increased risks.

19.10 It should be noted that it is not sufficient for employees to be trained only in the appropriate procedures to follow in the event of fire. They must be given suitable instruction on relevant measures to prevent fire and on the fire safety measures that are provided within the building.

19.11 An understanding of the fire safety measures in the building is likely to minimise the extent to which employees might inadvertently compromise these measures (such as by wedging open fire doors, obstructing escape routes or fire protection equipment, manual call points).

19.12 Where there is an expectation for a small fire to be tackled with a fire extinguishing appliance, it is essential that those employees nominated for this task are instructed on the correct operation of the appliances provided and the circumstances in which they should not deal with, or continue to deal with, a fire.

19.13 It is important that training is appropriate for the employees in question. For those who are not fully familiar with English, at least the written instructions should be prepared in their native language. For those with severe cognitive problems, pictorial instruction, in conjunction with suitable face-to-face instruction might be appropriate.

19.14 With regard to induction training, if this is not given within a very short time of an employee joining the company, new employees should, at least, be given basic instruction concerning escape routes, fire procedures and the fire alarm signals in the building on the day that they begin work in the building. It is important that employees are made aware, at an early stage in their employment, of any alternative escape routes that do not form part of the normal access or circulation routes.

19.15 Fire safety instruction should be based on written emergency plan and given to employees in an appropriate understandable method and would

normally include verbal instruction. A possible alternative to this might comprise computer-based learning packages, which can incorporate tests to evaluate learning outcomes. Standard “off the shelf” fire instruction leaflets are unlikely to be adequate, except for very small buildings; the instructions should be tailor-made for the building in question.

19.16 Periodic refresher training should not be unduly time consuming. These training sessions should not merely reiterate the standard fire instructions for the building. The objective should be to raise the awareness of employees by attracting their attention and providing material that is of interest. Videos can be of assistance, and numerous useful videos dealing with different aspects of fire safety can be purchased or hired.

19.17 Refresher training also offers the opportunity to discuss any fire problems that have arisen in the company or causes of false alarms that might have occurred. Interest can also be generated by providing guidance on domestic fire safety for the employees’ own benefit.

Content of training sessions

Means of escape

19.18 All employees must be made familiar with all means of escape from the building in which they work. It is particularly important that they are made aware of escape routes that are different from the normal entrances and exits. Employees should also be shown how to operate any exit devices, such as panic bars and override devices fitted to doors with electronic locking.

Action in the event of fire

19.19 All employees should be instructed in the actions to take in the event of fire. This should include any special duties, such as those allocated to fire wardens. Procedures for the evacuation of persons who need assistance should be outlined..

Means of raising the alarm

19.20 All employees must be familiar with the means of raising the alarm, which normally involves the operation of a manual call point. There is some variation between one type of call point and another - particularly older types, in which the glass breaks into fragments, and modern types in which it does not.

19.21 The exact method of operating the type of call point that is present in the building should, therefore, be demonstrated. A member of staff should be given the opportunity to operate a call point on each occasion that a fire drill is held (see Section 20). Employees should also be reminded of the locations of manual call points.

Means of summoning the fire and rescue service

19.22 The need for the fire and rescue service to be summoned to all fires should be stressed in training sessions. The 999 (or 112) emergency call procedure should be explained (for example, ask for the FRS, provide full postal address and any other pertinent details about the incident). Many people do not realise that the first person they will speak to is the public telecommunications organisation's operator, who will only wish to know which emergency service is required. 'Ensure members of staff with disabilities also have the ability to contact 999 if required'.

19.23 People commonly forget that they are not talking to the fire and rescue service at this stage and begin to describe the circumstances of the fire. If the duty of summoning the fire and rescue service is associated with a specific post, for example a receptionist, consideration might occasionally be given to simulating a 999 call.

Action on hearing the fire alarm

19.24 One of the most important points to stress during training sessions is that occupants must evacuate as soon as the evacuation signal is given. People are always reluctant to do so; they tend to assume that the signal is the result of a false alarm and do not wish to appear foolish by evacuating when, perhaps, others are not doing so.

19.25 This reluctance can be helped by making it clear that management will support an evacuation even if a false alarm has occurred, and by using visual aids that demonstrate the speed with which fire can develop. It is necessary to create an appreciation of the risk that fire presents to life.

19.26 If evacuation times are to be minimised, it must be stressed to employees that all means of escape should be used, including those that are not part of the normal access routes and which require the use of exit devices. It should also be emphasised that lifts must not be used, except in the case of lifts specifically designed and designated for evacuation. Location and use of fire extinguishing appliances

19.27 All employees must know the location of the nearest fire extinguishing appliances to their normal working location and the general layout of appliances in the building. This can prevent undue delay in tackling a small fire that might otherwise grow to untenable proportions, while people search for a fire extinguisher.

19.28 Employees must understand the colour coding of portable extinguishers, and the types of fire for which the extinguishers provided in the building are suitable. The method of operation of extinguishers and hose reels (if present) should also be demonstrated. Ideally, selected members of staff should be permitted to discharge extinguishers as part of practical fire extinguishing training. Video material can also be used to show the use of extinguishers. Virtual reality training aids are also available.

General fire precautions

19.29 Occupants of a building often negate the fire precautions in the building simply because they do not understand the function of fire resisting doors, which they wedge open, or the need to keep escape routes clear of combustible materials. It is important that they are not only instructed on these mandatory measures but also on the reasons for them. In some buildings, there may be special precautions to take because of hazardous activities or dangerous substances and, again, it is vital that staff are aware of the appropriate precautions.

Case studies

As previously discussed, the importance of staff training cannot be over-emphasised, as has been demonstrated in many of the fatal fires (ranging from those involving a single death to those involving multiple deaths) to which there has been reference in this Guide.

By way of examples:

- *In the Summerland Leisure Complex fire in 1973, the Public Inquiry identified "delayed, unorganised and difficult" evacuation as being one of the 2 most important causes of the high number of deaths. Staff were not trained in evacuation procedures and were unsure of their responsibilities.*

  The first calls to the fire and rescue service were made as a result of reports by a passing taxi driver and a ferry at sea. Fire alarm sounders were not operated; they would have been operated from the control room in the complex, which was described by the Chairman of the Public Inquiry as "a high-sounding name for a place which was occupied by a 19-year old girl who did not even know what most of the switches on the alarm boxes were for".

- *At the time of the Woolworths, Manchester fire in 1979, staff training at the store was poor. The first call to the fire service was from the control of a taxi driver, who could see smoke billowing from a window, but, even at that stage, no call had been made by staff at the store.*

- *After the King's Cross underground station fire in 1987, it was discovered that staff had not been adequately trained in evacuation and that staff could go for some years without refresher training.*

- *The Fatal Accident Inquiry into the fire at Rosepark Care Home in 2004, determined that, of the staff who were on duty on the night of the fire, each had been shown a video only once and had not received any feedback on their completion of questionnaires they were required to complete after watching the video.*

  Apart from that, none of the staff on duty, had received any fire training. The nurse in charge on the night had been given no training in her role; she had not been told the fire procedures; she had no understanding of her role as nurse in charge.

  The Fatal Accident Inquiry determined that, had the staff been effectively and properly trained, the likely course of events when fire occurred would have been such that some, or even all, of the 14 deaths might have been avoided.

- *When fire occurred at supported living premises in 2018, resulting in the death of a resident, the Inquest determined that an audit of compliance with the Fire Safety Order by London Fire Brigade, which found that staff training was suitable and sufficient, was "flawed".*

  The Inquest determined that, in fact, staff actions at the time of the fire contravened the policies of the persons with duties and national guidance, in that they did not evacuate the building or summon the fire and rescue service on operation of the fire alarm system; there was a delay of up to 45 minutes before the fire and rescue service were summoned.

  A "Prevention of Future Deaths" report by the Coroner expressed concern that the operator of the premises had failed to ensure that staff on duty were competent to carry out a fire evacuation.

Summary of Points in Section 19

- Provision of fire safety information and fire safety training for staff are legal requirements.
- The importance of fire safety training cannot be over-stressed. Failure to train staff properly has been a important factor in many fatal fires.
- Training must be given on induction of new employees, and should be repeated at regular intervals (typically, annually, but typically every 3 months for permanent nightshift staff in premises in which people sleep).
- It is not sufficient to train staff in the action to follow in the event of fire. Staff should be aware of measures to prevent fire and must be made aware of the fire safety measures in the building, including all relevant means of escape, operation of the fire alarm system, the importance of fire doors, and similar measures.

20. Fire Drills

20.1 The Fire Safety Order requires that the RP must, *where necessary*, carry out fire drills, in which the fire alarm is operated and the premises are evacuated. Drills will be necessary in all but the very smallest premises. In care homes and hospitals, evacuation of residents is often impracticable, but a simulated evacuation, with role play of staff acting as residents or patients, is appropriate.

20.2 Fire drills are a useful means of reinforcing evacuation procedures, monitoring their effectiveness and ensuring competency of staff with designated duties. A properly conducted drill can highlight problems, such as the failure of occupants to use all fire exits, resulting in an inordinately long evacuation time.

20.3 The evacuation time, defined as the time between the operation of the fire alarm system and the evacuation of the last person from the building, should always be measured and recorded. In large and complex premises, with several final exits, it may be necessary to use several observers to determine when the last person leaves the building (or in, for example, care homes, the sub-compartment from which residents are to be evacuated).

20.4 In premises with more than one staircase or fire exit, it can be useful to prevent the use of one staircase or exit during the drill, so that occupants are forced to use alternative routes. The design of buildings is such that acceptable evacuation times should still be physically possible.

20.5 Unannounced fire drills provide the most realistic simulation of what is likely to happen in a real fire. On the other hand, false alarms should not generally be counted as a fire drill, as there will be no observers in place to monitor evacuation. However, if a fire drill is planned shortly after a false alarm, it might be appropriate to re-schedule the drill, to avoid complacency of occupants when the fire alarm is operated.

20.6 The drill should begin by permitting an employee to operate a manual call point. All occupants, including senior management and disabled people, should participate in the drill. Exemptions should be rare and should only be given in very exceptional circumstances to persons on whose presence a critical continuous operation absolutely depends. A record of such exemptions should be kept, so that, if possible, the same persons are not exempted from 2 consecutive drills.

20.7 A de-brief should always be held soon after each drill. This provides an opportunity for management to review the outcomes, fire wardens to report problems, such as any unwillingness to evacuate by specific groups, difficulties in hearing the alarm system, and similar measures. Fire drill outcomes should be documented at company health and safety meetings.

20.8 In very small premises, and premises with very few employees (that do not run into double figures), formal fire drills may not be unnecessary; all that may be necessary is a reminder to employees (for example on an annual basis) of the fire procedures, including means for raising the alarm, means for summoning the fire and rescue service, use of fire extinguishers, the assembly point, and similar measures. In such premises, there will, commonly, be no fire alarm system.

20.9 In non-domestic buildings in multiple occupation, it is important that fire drills involve all occupants and that each tenant cooperates with the building owner or managing agents who arrange the fire drills. This is part of each tenant's compliance with Article 22 of the Fire Safety Order, which requires cooperation between persons with duties.

Summary of Points in Section 20

- Regular fire drills are necessary in most premises.
- Fire drills reinforce staff training and provide feedback on its effectiveness in practice.
- The evacuation time should be measured and recorded.
- Following the drill, a debrief should be carried out with relevant staff (for example, fire wardens).

21. Inspection, Testing and Maintenance of Fire Safety Measures

21.1 The Fire Safety Order requires that, where necessary, fire safety measures provided for compliance with the Order, or with other legislation (such as building regulations), are subject to a suitable system of maintenance, and that they are maintained in an efficient state, in efficient working order and in good repair.

21.2 The same requirement applies to facilities, equipment and devices provided for use by, or protection of, firefighters if these measures were provided for compliance with the Fire Safety Order or building regulations. Accordingly, this requirement will apply to measures such as fire mains and lifts designed for use by the fire and rescue service.

21.3 This means that active fire protection systems and equipment (such as fire alarm systems, emergency lighting, fire extinguishers, sprinkler systems, and similar measures) must be routinely tested and periodically serviced, while passive systems (such as fire doors, compartment walls, and similar measures) should be routinely inspected. Defects should be repaired as soon as practicable.

21.4 Routine testing and inspection can generally be carried out by competent employees. Servicing and repair are most commonly carried out by specialist contractors. Good practice is for contracts to be placed for routine servicing and emergency call out. Where contractors are used, third party certification, under a UKAS accredited certification scheme, is one method of reasonably ensuring the competence of the contractors.

21.5 Putting all of the above arrangements in place forms part of the RP's compliance with Article 11 of the Fire Safety Order (see Section 16 of this guide). Inspections of the building, which may also form part of the arrangements, frequently lead to identification of requirements for maintenance of passive fire protection measures.

21.6 Common examples are new service penetrations in fire-resisting construction that have not been properly fire stopped, self-closing devices that require adjustment in order to close fire-resisting doors firmly shut in their frames, and gaps around fire-resisting doors, through which smoke could spread.

21.7 More generally, a general awareness on the part of all employees, particularly supervisors, engineers and managers, can ensure that, as building occupants go about their day-to-day activities, new fire hazards are identified and addressed, while deficiencies in fire safety measures are recognised, reported and rectified.

21.8 The Fire Safety Order requires that every employee must inform their employer, or any other employee with specific responsibility for the safety of their fellow employees, of any work situation which they could be

reasonably expected to consider represents a serious and immediate danger to safety, and of shortcomings in the employer's fire protection arrangements for safety.

21.9 RPs should prepare a schedule of the frequencies with which checks, tests and servicing should be carried out. For many fire protection systems and equipment, appropriate frequencies are recommended in relevant British Standards and manufacturers' guidance in line with specific industry regulations.

21.10 A typical schedule would be as set out below however this not definitive and additional checks and testing may be required. Detailed guidance on the checks and tests that should be carried out is generally available in relevant British Standards and manufacturers' guidance.

Daily

- check fire alarm control and indicating equipment for any fault indications
- check the control panels of any emergency escape lighting central batteries or generators for any fault indications
- ensure that, if applicable, any fastenings are removed from fire exits (prior to general occupation of the building), and that escape routes are unobstructed
- if the master station of an emergency voice communication system is sited in a location where an audible fault warning signal could go unnoticed for longer than 24 hours, confirm that the master station is indicating correct operation

Weekly

- Check of escape routes (including external stairs and routes), final exit doors and general housekeeping test fire alarm systems
- check correct operation of all door release mechanisms
- test automatic water suppression systems
- test smoke control systems provided to support means of escape
- test switches for evacuation and firefighting lifts
- test at least one outstation of any emergency voice communication system for clear communication

Monthly

- test emergency escape lighting
- check that fire safety signs are in place and visible
- check that all fire extinguishers are in position, undamaged, accessible, and similar measures
- check of any hose reels

- test of emergency generators, and inspect vented batteries, which provide standby power for fire safety measures (such as firefighting lifts), by simulating a failure of the primary power supply and confirming that the standby supply operates correctly

Quarterly

- maintenance of automatic water suppression systems
- test of all smoke control systems (including those provided to enable smoke clearance by the fire and rescue service)

6-monthly

- maintenance of fire alarm systems
- check of all fire-resisting doors
- maintenance of all door release arrangements
- maintenance of any gaseous extinguishing installations
- inspection of fire mains
- maintenance of any emergency voice communication system

Annually

- maintenance of fire extinguishing appliances
- inspection and test of lightning protection systems
- maintenance and full discharge test of emergency escape lighting installations
- test spring-operated fire dampers (other fire dampers should be tested at least every 2 years)
- maintenance of private fire hydrants
- carry out a “wet test” of dry rising mains
- maintenance of all lifts provided for use by the fire and rescue service or evacuation of disabled people

Periodically

- Arrange for inspection of external metal escape stairways and walkways for corrosion and structural integrity (typically, every 3 years)
- Arrange for inspection and test of the fixed electrical installation, portable electrical appliances, gas installations, boiler plant, and similar measures. by a suitably qualified person.

Summary of Points in Section 21

- The Fire Safety Order requires that the legislatively required fire safety measures (including measures for use by, or protection of, firefighters) are subject to suitable maintenance, and that they are kept in an efficient state, efficient working order and good repair.

- RPs should prepare a plan for routine checking, testing and periodic servicing, as appropriate, of all fire safety measures. Where contractors are used, use of contractors that are third party certificated provides assurance of their competence.

- Employees also have a duty to report any serious fire hazards and deficiencies in fire safety measures that they are capable of identifying and that come to their attention.

22. Record Keeping

22.1 The Fire Safety Order explicitly requires certain records to be kept, namely:

- the findings of the fire risk assessment
- the identity of the individual (their name), and/or, if applicable, their organisation (name) engaged by them, to undertake/review any or all of the fire risk assessments
- the fire safety arrangements (demonstrating how fire safety is managed in their premises)
- RP's contact information, including a UK-based address, and share this with other RPs and residents of multi-occupied residential premises, where applicable

22.2 As a matter of best practice (albeit not a legal requirement under the Fire Safety Order), the further records outlined below should be kept:

- inspection, testing and maintenance of fire safety measures
- general fire safety training of staff
- training of staff with special responsibilities (for example, fire wardens)
- fire drills
- certificates of inspection and test of electrical installations, portable appliances, and similar measures.
- removal of fastenings on fire exits before occupation (like in theatres)
- formal checks of means of escape, fire exit doors, and similar measures.

22.3 Proper records can assist in demonstration of due diligence in compliance with the Fire Safety Order. The records should be either kept in a suitable logbook or should be kept electronically.

22.4 The existence of such records may provide evidence for defence against prosecution or civil action, in the event of allegations that an RP has neglected to maintain fire protection measures in proper working order.

22.5 The Fire Safety (England) Regulations require that certain records are kept in residential premises to which the Regulations apply. Guidance on the records in question is given in Check your fire safety responsibilities under the Fire Safety (England) Regulations 2022 - GOV.UK (www.gov.uk).

Summary of Points in Section 22

- The Fire Safety Order requires that records of the findings of the fire risk assessment, and of the fire safety arrangements, for the premises must be kept.
- It is good practice to keep further records of, for example, inspection, testing and maintenance, staff training and fire drills as a means of demonstrating due diligence in compliance with the Fire Safety Order.
- Keeping of certain further records is required by the Fire Safety (England) Regulations in the case of premises to which these Regulations apply.

23. Cooperation and Coordination Between Persons with Duties

23.1 Article 22 of the Fire Safety Order requires that, where 2 or more responsible persons share, or have duties in respect, of any premises (whether on a temporary or permanent basis), they must cooperate with each other, so far as is necessary, to enable them to comply with the Fire Safety Order. They must also take all reasonable steps to inform each other of any risks to relevant persons that arise from the use of, and processes within, their premises.

23.2 This requirement has a particular bearing on commercial premises in multiple occupation. There is a need for cooperation between each employer or other person(s) having control in a multi-occupancy workplace, and between these persons and any other person or employer with control over any part of the workplace or the fire precautions provided (for example a landlord). In many situations, the exchange of information between the parties may be sufficient cooperation.

23.3 A common situation in which Article 22 is significant comprises multi-storey office buildings, with multiple tenants. In this case, persons with duties in relation to Article 22 often comprise the building owner, managing agents and the commercial tenants.

23.4 Typical examples of failures to comply with Article 22 include:

- refusal by a tenant company to participate in fire drills organised by the building owner or managing agents
- storage of combustible materials within the common parts of the building by a tenant of one area of the building, contrary to the instructions of the building owner or managing agents
- a tenant constantly wedging open fire doors between their demise and the common parts, contrary to the instructions of the building owner or managing agents
- failure of a tenant to permit access to their premises for inspection, testing or maintenance of fire protection systems or equipment that are the responsibility of another persons with duties, including the building owner or managing agents

23.5 Where such issues cannot be resolved by cooperation between, for example, a tenant and the managing agents for the building, enforcement action might need to be taken by an enforcing authority against the party that is failing to comply with Article 22.

23.6 This cooperation and coordination is extremely important in premises with a large number of RPs, such as shopping centres, in which it is vital that, for example, fire procedures are coordinated. This can also necessitate exchange of findings from the respective fire risk assessments.

23.7 Article 22(2) deals with the issue of explosive atmospheres. The responsible person with overall responsibility for the premises must coordinate the implementation of all measures required by Part 2 of the Order to be taken to protect relevant persons from any risk from the explosive atmosphere.

Summary of Points in Section 23

- The Fire Safety Order requires that, where there is more than one persons with duties in a building, each persons with duties cooperates with every other persons with duties, as far as is necessary to enable them to comply with the Fire Safety Order.
- Common examples of situations in which this applies include, for example, office buildings with multiple tenants, and shopping centres, in which the large number of RPs makes mutual cooperation and coordination of fire safety measures essential.
- Failure on the part of a persons with duties to comply with Article 22 can result in enforcement action by the relevant enforcing authority, such as the fire and rescue authority.

Glossary

Access room	Room that forms the only escape route from an **inner room**
Alternative escape routes	Escape routes sufficiently separated either by direction and space, or by fire-resisting construction, intended to ensure that if one is affected by fire the other will still be available
Automatically opening vent (AOV)	A vent provided for smoke control in common parts, which opens automatically when smoke is detected by smoke detectors
Available safe escape time (ASET)	Calculated time available between ignition of a fire and the estimated time at which tenability criteria are exceeded in a specified space in a building
Building Control Body	A term that includes both local authority building control and registered building control approver
Building Safety Regulator (BSR)	The building control body for defined higher-risk buildings
Cavity barrier	Construction provided to close a cavity against penetration of smoke or flame, or provided to restrict the movement of smoke or flame within such a space
Combustible material	Material that can be burned
Compartmentation	Sub-division of a building by fire-resisting walls and/or floors for the purpose of limiting fire spread within the building
Compartment wall or floor	A fire-resisting wall or floor that separates one fire compartment from another
Dead end	Area from which escape is possible in one direction only.
Emergency escape lighting	That part of emergency lighting that provides illumination for the safety of people leaving a location or attempting to terminate a potentially dangerous process before doing so
Escape route	Route forming part of the means of escape from any point in a building to the final exit
Evacuation lift	Lift designed to be used for the evacuation of persons with disabilities, in automatic mode or under the direction of building management, trained evacuation assistance or the fire and rescue service
Exit capacity	The maximum allowable number of people for a defined area of the building (for example, a storey)
Final exit	End of an escape route from a building giving direct access to a street, passageway, walkway or open space, and sited to enable the rapid dispersal of persons from the

	vicinity of a building so that they are no longer in danger from fire and/or smoke
Fire detection and alarm system	System (other than a single self-contained smoke alarm device or fire alarm device) in which a fire alarm can be initiated automatically
Fire damper	Device affording fire resistance in respect of integrity, intended to seal automatically a penetration in fire-resisting construction in the event of fire *NOTE These are typically used within heating, ventilation and air-conditioning (HVAC) systems to maintain the compartmentation afforded by a compartment wall or floor*
Firefighters lift	Lift, conforming to BS EN 81-72, which has protection, controls and signals which enable it to be used under the exclusive control of firefighters
Firefighters' switch	A switch provided solely for use by the fire and rescue service (and not readily accessible or operable by others) that enables the fire and rescue service to change the state of equipment (such as causing electronic locks to release), or to take control of equipment (for example, a firefighters lift) *NOTE This was previously known as a fireman's switch*
Firefighting lift	A lift which has protection, controls and signals which enable it to be used under the exclusive control of firefighters, but that are less stringent than those of a firefighters lift *NOTE The term "fire-fighting lift" refers to a lift installed in accordance with BS 5588-5, which was first published in 1986. "Fire-fighting lifts" were superseded by "firefighters lifts" with the publication of BS EN 81-72*
Firefighting shaft	protected enclosure containing a firefighting stairway, firefighting lobbies, a fire main and, if provided, a firefighters lift together with any machinery space
Fire load	quantity of heat that would be released by the complete combustion of all the combustible materials in a volume, including the facings of all bounding surfaces
Fire main	system of pipes and valves provided to carry water for firefighting purposes
Firemen's lift	Lift installed before fire-fighting lift standards were made available, incorporating only simple means to recall the lift to a designated floor, with no complex lift controls or protection measures for fire and rescue service use
Fire resistance	The ability of a component or construction of a building to satisfy, for a stated period of time, some or all of the appropriate criteria of relevant fire test standards

Fire-resisting door	Door which, together with its frame and hardware as installed in a building, is intended (when closed) to restrict the passage of fire and/or smoke, and is capable of meeting specified performance criteria to those ends
Fire-resisting door – Notional FD30 door	A door assembly that satisfied the current specification, or fire resistance test, for 30 minutes at the time of construction or manufacture of the door
Fire-resisting door – Upgraded FD30S door	A notional FD30 door that, in order to improve the fire resistance to approximate to 30 minutes, and control the passage of smoke at ambient temperature, has been upgraded by fitting intumescent strips and smoke seals
Fire risk appraisal (of external wall construction and cladding) (FRAEW)	Appraisal of external wall construction (and any cladding), to determine the materials used, sample compliance with building regulations and determine the risk of external fire spread over the walls. The findings of the FRAEW must be considered in the overall fire risk assessment.
Fire risk assessment	Process of identifying fire hazards and evaluating the risks to people arising from them, taking into account the adequacy of existing fire precautions, and deciding whether or not the fire risk is acceptable without further fire precautions
Fire stopping	A seal provided to close an imperfection of fit or design tolerance between elements or components, to restrict the passage of fire and smoke
Flashover	Sudden transition from a localised fire to the ignition of all exposed flammable surfaces within an enclosure
Heat alarm	Device containing within one housing all the components necessary for detecting heat and for giving an audible alarm in a dwelling
Intumescent	Possessing the property of swelling under the influence of heat to form a protective, usually carbonaceous mass with insulating and/or sealing properties
Inner room	A room from which escape is possible only by passing through another room, known as an access room
Intrusive fire risk assessment	A fire risk assessment in which, by means of destructive exposure, access is obtained to view concealed construction
Manual call point	Component of a fire detection and fire alarm system that is used for the manual initiation of a fire alarm signal
Material alteration	An alteration to the building that significantly affects (usually lowering or with the potential to lower) the level of risk to people from fire

Means of escape	Means whereby a safe route or routes in the event of fire is or are provided for persons to travel from any point in a building to a place of ultimate safety
Non-intrusive fire risk assessment	A fire risk assessment that does not involve destructive exposure (but normally will still involve opening a sample of accessible service riser doors and, for example, sample inspections, where feasible, above accessible demountable ceilings, and similar measures, without use of tools)
Openable vent (OV)	A vent provided for smoke control which is opened by the fire and rescue service by means of hardware or a control (which may be located remotely) provided for the purpose
Persons with duties	Person or organisation with specific legally prescribed responsibilities (under the Regulatory Reform (Fire Safety) Order 2005 (as amended))
Phased evacuation	System of evacuation in which different parts of premises are evacuated in a controlled sequence of phases, those parts of the premises expected to be at greatest risk being evacuated first
Place of relative safety	Place in which there is no immediate danger, but in which there could be future danger, from fire or the effects of fire
Place of ultimate safety	Place in which there is no immediate or future danger from fire or the effects of fire
Progressive horizontal evacuation	Initial evacuation from a fire into a place of relative safety on the same level
Protected corridor or lobby	A corridor or lobby that is adequately protected from fire in adjoining accommodation by fire-resisting construction
Protected route	An escape route that is adequately protected from the rest of the building by fire-resisting construction
Protected stairway	Stair discharging through a final exit to a place of ultimate safety (including any exit passageway between the foot of the stair and the final exit) that is protected from fire elsewhere in the building by fire-resisting construction
Reasonably practicable measures	Measures that reduce fire risk to an extent where the cost, time and effort to reduce the risk further would be grossly disproportionate to the remaining risk
Required Safe Escape Time RSET	Calculated time available between ignition of a fire and the estimated time at which occupants in a specified space in a building are able to reach a place of relative safety
Relevant person	Any person lawfully on the premises and any person in the immediate vicinity of the premises (but not firefighters carrying out operational duties)

Responsible Person	The person, group, company or other entity on whom duties are imposed by the Regulatory Reform (Fire Safety) Order 2005 (as amended) to ensure the safety of occupants of a building from fire
Self-closing device	Device which fully closes a door from any angle, overriding the resistance of any latch and/or seal but not including rising butt hinges
Simultaneous evacuation	Procedure in which all parts of a building are evacuated following the giving of a common alarm of fire
Smoke alarm	Device containing within one housing all the components necessary for detecting smoke and for giving an audible alarm in a dwelling
Travel distance	Distance a person needs to travel between 2 points within a building, having regard to the layout of walls, partitions and fittings

Further References

Legislation

Building Act 1984

The Health and Safety (Safety Signs and Signals) Regulations 1996

The Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002

Housing Act 2004

The Regulatory Reform (Fire Safety) Order 2005 (as amended)

Building Regulations 2010 (as amended)

The Construction (Design and Management) Regulations 2015

Fire Safety Act 2021

The Fire Safety (England) Regulations 2022

The Building Safety Act 2022 (and subordinate regulations)

Guidance on Legislation

Fire safety risk assessment: 5-step checklist

Making your small block of flats safe from fire

Making your small paying-guest-accommodation safe from fire

Making you small non-domestic premises safe from fire

Regulatory Reform (Fire Safety) Order 2005. Guidance for Persons with duties in premises used for:

- Sleeping Accommodation
- Residential Care Premises
- Offices and Shops
- Factories and Warehouses
- Public Buildings
- Educational Premises
- Healthcare Premises
- Cinemas, Theatres, and Similar Premises

- Open Air Events and Venues
- Transport premises and facilities
- Animal Premises and Stables

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BS 8899: 2016. Improvement of fire-fighting and evacuation provisions in existing lifts– Code of practice.

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BS EN 81-72:2020. Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts - Firefighters lifts.

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