Practical Fire Safety Guidance for Existing Non-Residential Premises

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PRACTICAL FIRE SAFETY GUIDANCE FOR EXISTING NON-RESIDENTIAL PREMISES

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Chapter 1: PREFACE

Introduction

1. In 2006, the Fire (Scotland) Act 2005 ("the 2005 Act") introduced changes to fire safety law in Scotland and repealed previous fire safety legislation. This guide has been produced to assist those who have responsibility under this Act for ensuring fire safety in premises in Scotland. In addition, the guide has a statutory basis for the Scottish Fire and Rescue Service ("SFRS") and local authorities, as enforcers.

2. This guide, prepared by the Scottish Government, offers fire safety advice in respect of existing non-residential premises. It consolidates and supersedes a number of individual Scottish Government guides, and introduces a substantial number of editorial changes in the revision aimed at improving dutyholders' understanding. The guides superseded are:

- Practical Fire Safety Guidance for Educational and Day Care for Children Premises: February 2008
- Practical Fire Safety Guidance for Places of Entertainment and Assembly: December 2007
- Practical Fire Safety Guidance for Factories and Storage Premises: February 2008
- Practical Fire Safety Guidance for Offices, Shops and Similar Premises: February 2008
- Practical Fire Safety Guidance for Transport Premises: February 2008

Scope

3. The guidance in this document is applicable to general fire safety in existing non-residential commercial, industrial, transport, assembly, educational, day care or entertainment premises. The guide does not apply to premises used for overnight sleeping accommodation and does not apply to premises used for child-minding, for which other guidance has been produced[1].

4. Much of the guidance in this document relates to buildings, however, the requirements of fire safety law also apply to other structures, external areas and open air sites.

5. This guide extends to fire safety measures intended to protect life. Fire protection for the protection of property is not within the scope of this guide.

6. This guide applies to existing premises and is not a design guide for new build. New buildings must be designed to the mandatory functional standards under the Building (Scotland) Regulations 2004. Similarly, buildings which undergo extension, structural alteration or change of use should also meet the standards (and be subject to building warrant approval, where required). Design guidance in

[1] "*Fire Precautions in Domestic Childminding Premises: A Guide to Childminders"* produced by the Chief Fire Officers Association (Scotland).

respect of building regulations is contained in the *Scottish Building Standards Technical Handbook for Non-Domestic Buildings.*

7. There are types of premises which, due to their complexity and use, require or will have involved specialist consideration for fire safety. There are also buildings where fire safety engineering has produced bespoke fire safety measures. In these cases, specific sector information and advice may be applied and this guide used for general principles. Examples are large transport hubs, enclosed shopping centres, and certain industrial premises which contain special processes or hazards such as high bay warehouse, automated retrieval system, explosives, petrochemical plant; and power generation.

8. In major sports grounds, fire safety is closely related to other aspects of spectator safety and reference should also be made to the document commonly known as the Green Guide - 'Guide to Safety at Sports Grounds'.

Fire Safety Law

9. Part 3 of the 2005 Act, along with the Fire Safety (Scotland) Regulations 2006, sets out the fire safety duties in respect of the majority of non-domestic premises in Scotland.

10. The legislation requires the provision of fire safety measures; this includes risk reduction measures, means of fire warning, fire-fighting, escape, staff training and instruction, as well as emergency procedures. It sets out fire safety responsibilities and seeks to ensure the safety of persons from harm caused by fire.

11. The list below is a summary of the general requirements imposed and is not intended to be comprehensive; anyone in doubt about their legal obligations may wish to seek further advice. Guidance on complying with these general requirements is considered in the remaining chapters:

- assessing the risk from fire in respect of the premises;
- identifying the fire safety measures necessary as a result of the assessment of risk;
- implementing these fire safety measures, using risk reduction principles;
- putting in place fire safety arrangements for the ongoing control and review of the fire safety measures;
- complying additionally with the specific requirements of the fire safety regulations;
- keeping the fire safety risk assessment and outcome under review; and
- record keeping.

12. Underground railway stations and certain mainline stations[2] in Scotland are additionally subject to the general fire safety provisions in the Fire Precautions (Sub-surface Railway Stations) Regulations 1989.

[2] This applies to mainline stations with an underground platform

13. The general fire safety provisions in Part 3 of the 2005 Act take precedence over the terms and conditions imposed in relation to licences issued under other legislation. Section 71 of the 2005 Act provides that terms, conditions or restrictions in such licences – including statutory certification or registration schemes – have no effect if they relate to fire safety requirements or prohibitions which are, or could be, imposed under Part 3. For example, fire safety in sports grounds is governed through Part 3 of the 2005 Act and not through sports grounds certification.

Who Must Comply with these Duties?

14. The responsibility for complying with the fire safety duties in premises sits with the employer and other persons who operate or have control of the premises to any extent. This may include managing agents, landlords and tenants, factors, owners, and managers and staff. Contractors and volunteers working on site may also have some responsibilities through their degree of control or responsibility for safety systems. In this guide, persons with fire safety responsibilities are referred to generally as ‘dutyholders’.

15. Under fire safety law, all dutyholders are required to take all reasonable measures regarding the safety of persons. Employers additionally have a specific obligation to ensure the safety of employees in the event of fire, so far as is reasonably practicable. This means that fire safety measures need to be taken to address risk, but not to the extent that the cost, effort and other disadvantages associated with the provision of fire safety measures would be disproportionate to the risk to life. In this respect, a judgement is made about the cost of measures being proportionate to the resulting risk reduction, not the capacity of a dutyholder to pay.

16. Where premises or responsibilities are shared, each employer, or other dutyholder who has control over any part of the premises is required to co-operate and co-ordinate in respect of complying with fire safety law and to inform each other of risks.

17. If the requirements of fire safety law are not complied with, the omission may constitute a criminal offence with a penalty of a fine or imprisonment.

Obtaining Advice on Fire Safety

18. The responsibility for carrying out an assessment of fire risk, reviewing such an assessment and taking fire safety measures rests with dutyholders. General guidance is available on the **Scottish Government Firelaw webpages**.

19. Dutyholders should consider their own capabilities and circumstances in respect of assessing and managing risk, and factors such as the size and use of premises and the number and type of persons involved.

20. Whilst dutyholders are usually best placed to know their premises, they will need to decide whether they, or their employees, have the capability to assess fire risk. If dutyholders do not have sufficient resources, skills or experience to undertake a fire safety risk assessment themselves they can arrange for a suitably qualified person or company to carry out an assessment on their behalf.

21. When looking to contract a specialist, it can be difficult to judge the competence of companies and persons who advertise their services. The fact that a person or company is operating in the fire sector or that someone has previous fire service experience, does not mean that they are a fire safety specialist.

22. Both the Scottish Government and the SFRS recommend that dutyholders who wish to contract the services of an external fire safety risk assessor, select an assessor from a list of competent fire risk assessors maintained by a professional body or a UKAS accredited third party certification body. Alternatively they could use the services of companies, including sole traders, that are third party certificated under appropriate schemes operated by certification bodies that have, themselves, been UKAS accredited as competent to certificate against such schemes. (The benefit of company certification is that the certification body monitors the quality of the certificated company's work and confirms that there is a system for management of quality within the certificated company).

23. The SFRS maintains a list of UKAS accredited certification bodies and professional registration schemes, which can be accessed on its website http://www.firescotland.gov.uk/media/1173445/sfrs_advice_on_fire_safety.pdf. The SFRS has not assessed and does not endorse any individuals or companies participating in these schemes. However, participation in such schemes can offer a degree of assurance that a risk assessor (individual or company) has met the professional requirements of the scheme.

24. Generally, reviews of a risk assessment should be carried out regularly by the dutyholder to ensure it remains valid. This will reinforce ownership of fire safety management and assist in the development of relevant knowledge, and of a fire safety culture. However, where significant changes to premises have occurred or if the dutyholder continues to feel that they lack the time, knowledge or skills required to undertake a thorough review, it may be advisable to seek specialist advice to review and revise the initial assessment.

Who Enforces the Fire Safety Law?

25. While the responsibility for compliance with the legislation sits principally with the persons who operate and employ persons to work in the premises, there is provision in the legislation for an enforcing authority with enforcement powers.

26. The SFRS enforces Part 3 of the 2005 Act and relevant regulations in respect of the majority of non-domestic premises. Though there are certain premises where enforcement is by other bodies:

- in premises occupied by the armed forces or visiting forces - the Defence Fire and Rescue Service;
- in ships under repair or construction and in some construction sites - the Health and Safety Executive;
- in nuclear installations - the Office for Nuclear Regulation; and
- in major sports grounds - the local authority.

27. The SFRS policy towards enforcement is proactive and it adopts an enabling approach to assist dutyholders in complying with their obligations.

28. Enforcement officers' powers are listed in section 62 of the 2005 Act: they may do anything necessary to allow them to enforce the provisions of the legislation. This includes entering premises, inspecting, requesting information, records or assistance, copying or removing documents; carrying out measurements or tests; taking samples, dismantling articles, and taking possession of an article for examination or evidence.

29. If the SFRS is not satisfied with the outcome of a dutyholder's assessment of fire risk in the premises, or the action taken by a dutyholder, or the fire safety measures in place, it may send out a letter which requests or specifies that certain action or measures be taken and may request that a dutyholder draws up an action plan for implementation of the measures.

30. The SFRS has the power to take more formal action in certain situations. This could involve:

- the issuing of an 'Enforcement Notice' that requires specified action to be taken;
- the issuing of a 'Prohibition Notice' in cases of serious risk so that the use of all or part of the premises is prohibited or restricted until specified matters are remedied; or
- reporting the matter for prosecution.

31. Additionally, the SFRS has power to issue an 'Alterations Notice' that requires the recipient to inform the enforcing authority before making specified changes to the premises.

32. Failure to comply with a notice issued by the enforcing authority or placing persons at risk of death or serious injury by failing to carry out any duty imposed by fire safety law is an offence.

33. Where there is disagreement between a dutyholder and the enforcing authority on compliance issues, the dispute may be suitable for referral for a determination. Dispute determination is a third party independent resolution arrangement. Information on this provision is available on the web pages of the Fire Service Inspectorate at www.gov.scot/fireinspectorate.

34. There is also a right of appeal to the court against a Prohibition Notice, Enforcement Notice or Alterations Notice, within 21 days from the date the notice is issued.

35. While the general fire safety measures required by the 2005 Act are enforced by SFRS (or other enforcing authority), there are some matters that are enforced by the Health and Safety Executive or the local authority, under various pieces of health and safety legislation. Some examples are precautions relating to:

- use and storage of flammable liquids;
- ventilation systems to dilute or remove flammable gas or vapour;
- selecting equipment that will not be a source of ignition; and
- maintenance of electrical equipment.

36. Certain premises which pose a risk of major accident are also subject to the Control of Major Accident Hazard Regulations 2015 ("COMAH"). Where COMAH applies, general fire safety is controlled through both the 2005 Act, by the appropriate enforcing authority, and also through COMAH by the Health and Safety Executive.

How to Use this Guide

37. The remaining chapters in this guide provide information on the assessment of fire risk, the reduction of risk and identification and implementation of fire safety measures. It is not necessary to follow the risk assessment method in this guide or the guidance on fire safety measures; other suitable methods and measures may be appropriate.

38. The fire safety measures described in this guide are principally benchmarks. When deciding what fire safety measures are appropriate for premises, the benchmarks can be used as a comparison against what exists in the premises. The benchmarks should not be applied prescriptively to premises, they are not minimum standards nor are they provisions that are deemed to satisfy the legislation. In each case, the measures adopted should be risk appropriate for the particular circumstances in which they are applied. A standard lower than the benchmark may be adequate, in other cases a standard above the benchmark may be necessary. The assessment of risk needs to be specific to the individual premises.

39. If persons feel unable to interpret this guidance, they should seek assistance from someone with technical knowledge. The SFRS as an enforcer of the legislation, cannot undertake a dutyholder's risk assessment obligation. But it has a statutory requirement to provide general advice on request about issues relating to fire safety and should be able to provide information and advice which will assist dutyholders to understand their obligations under the law.

40. While the principal purpose of this guide is to provide guidance to assist dutyholders in complying with their legal obligations, the guide and its contents constitute guidance given by the Scottish Ministers to the SFRS and local authorities in terms of section 61(2) of the 2005 Act and the SFRS and local authorities are therefore required to take it into account in determining whether enforcement action may be necessary. In their enforcement function, these enforcing authorities are also required to have regard to the Scottish Regulators' Strategic Code of Practice.

41. Where an enforcement officer considers that additional fire safety measures are necessary in premises, this decision should be based on risk, taking likely cost benefit into account. It will assist the awareness of dutyholders if enforcement officers explain why the existing fire safety measures are not acceptable, and how additional fire safety measures will deliver improvement.

42. Nothing in this guide should be interpreted as permitting a reduction in the standard of fire safety measures where the measures have been incorporated to comply with Building Regulations. But it is possible for a standard higher than that required by Building Regulations to be necessary as a consequence of assessment of risk.

43. From October 2013, a Fire Safety Design Summary is recorded as part of the building regulation process. This may be a useful source of information to assist dutyholders with the safe operation of the premises and to inform the assessment of fire risk.

Chapter 2: ASSESSMENT OF FIRE RISK IN PREMISES

44. Where fire safety law applies, it is a legal requirement to assess the premises to identify risk to persons from fire and to take fire safety measures. The assessment of risk should be specific to fire safety and to the specific premises concerned. A generic risk assessment will not be sufficient.

45. Fire safety risk assessment is a practical exercise aimed at evaluating the risk from fire and how to ensure the safety of persons in the event of fire. It involves an organised and methodical look at the premises, the activities within the premises, the type of occupants, the potential for a fire to occur and the harm it could cause to people. The existing fire safety measures are evaluated to establish whether they are adequate or if more requires to be done. In this respect, fire safety measures include not just physical measures, such as fire alarm systems and escape routes, but also standards of management.

46. The risk assessment process described in this chapter is shown in Figure 1.

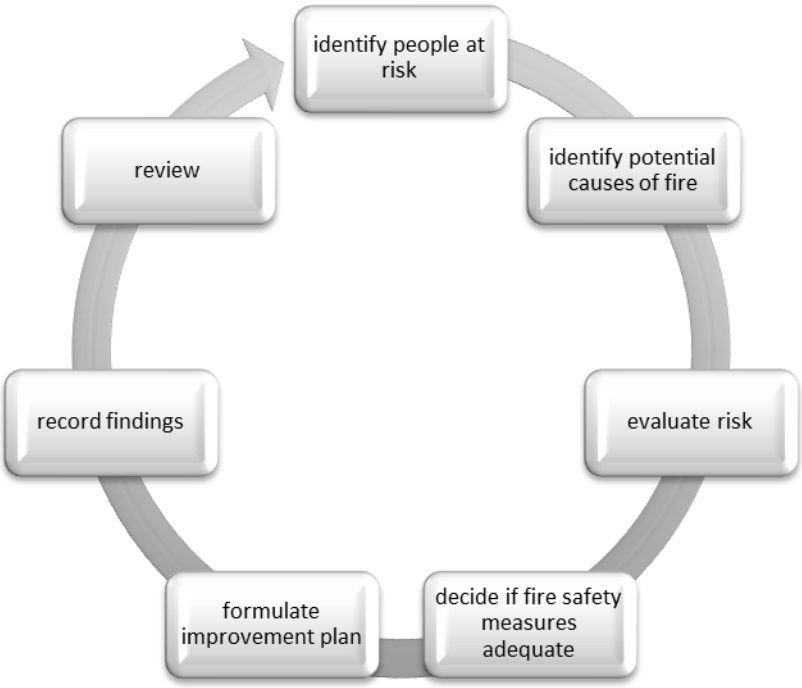


Figure 1 Fire safety risk assessment process

Identify People at Risk

47. An assessment should be made of those persons at risk if a fire occurs within, or in the immediate vicinity of the premises. The number, characteristics and location of occupants, staff and other persons who frequent the premises should be identified. Disabilities should be taken into account along with people's familiarity with the premises. The inexperience, lack of awareness and immaturity of any young persons (under 18 years) employed, should also be considered.

Identify Potential Causes of Fire

48. For a fire to start, three components are needed: a source of ignition; fuel; and oxygen. These components can be represented as the sides in a simple 'triangle of fire' model shown in Figure 2. If any one of these components is missing, a fire cannot start. Taking steps to avoid the three coming together will reduce the chance of a fire occurring, while reducing the quantity of oxygen (smothering) or fuel (starvation) may restrict the development of a fire.

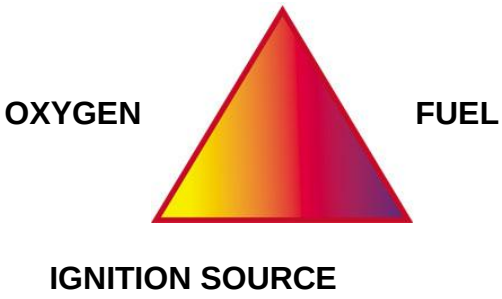


Figure 2 Triangle of Fire

49. The premises should be critically examined to identify potential ignition sources and materials that might fuel a fire and the circumstances which might allow a fire to start. Any previous fires should also be considered, as should indications of 'near misses', such as scorch marks on furniture or fittings, discoloured or charred electrical plugs and sockets or cigarette burns. Some general information and examples are given in Tables 1 to 3 at the end of this chapter and recommendations on controlling ignition sources are contained in **Chapter 5**.

Evaluate the Risk

50. The risk in the premises should be evaluated so that a judgement can be made on the adequacy of fire safety measures. Risk has two components: the likelihood that a fire may occur; and the potential for a fire to cause death or injury i.e. consequence. Both likelihood and consequence should be considered when assessing risk.

51. The likelihood of a fire starting will be low if there are few ignition sources, and if combustible materials are kept away from them.

52. Having considered the people likely to be at risk and the chances of a fire occurring, the consequences and extent of the risk to those people if a fire starts and spreads should be considered. In evaluating the risk to people, it is necessary to consider different situations and possible scenarios such as:

- fire starting on a lower floor affecting the escape of people on upper floors;
- the potential for fire to affect escape routes, particularly where there is a single escape route;
- fire developing in a space that people have to pass to escape from the building;
- fire or smoke spread through a building via routes such as vertical shafts, service ducts, service penetrations, ventilation systems, cavities, roof voids and open doors;
- fire and smoke spread through open areas such as atria and concourses;
- fire and smoke affecting the behaviour of occupants;

- the contribution to fire spread and development if dangerous substances are involved or if there is failure of work processes;
- fire and smoke spread into the premises from exterior fires;
- underground or tunnel fires where escape may involve upward travel above a fire;
- the potential for fire originating in the premises to pose a threat to persons in the surrounding area.

53. Additionally, where the building is in multi-occupancy, consider;

- the risk from a fire which may occur in communal parts or in another part of the building occupied by a different person; and
- the risk which a fire in the premises may pose to other occupiers of the building and any adjoining premises.

54. If there have been any previous fires in the premises, considering the circumstances and lessons learned may assist with evaluating risk.

Decide if Existing Fire Safety Measures are Adequate

55. A judgement needs to be made to determine whether the fire safety measures and fire safety arrangements are adequate or if more needs to be done to safeguard persons. The level of fire safety measures provided in premises should be proportionate to the level of risk posed to the safety of people and will therefore vary between different premises.

Formulate an Improvement Plan

56. Carrying out an assessment of the premises is not an end in itself. The outcome of the risk assessment needs to be acted upon; risks need to be controlled in a practical way and fire safety measures and arrangements need to be put in place.

57. Potential causes of fire identified should be avoided or removed, if reasonably practicable to do so. If they cannot be removed, measures should be taken to control the risks.

58. Where improvements to fire safety measures in premises are considered necessary as a result of assessment of risk, a plan for implementation of the improvements should be drawn up. The plan should have priorities and timescales for the completion of the action required.

59. Where improvements involve building work, the work should be carried out in accordance with Building Regulation procedures. In a listed building (a building of special architectural or historic interest included in a list compiled by the Scottish Ministers), alternatives to conventional fire safety measures may be appropriate. Guidance is available in *Guide for Practitioners 7 Fire Safety Management in Traditional Buildings* issued by Historic Scotland.

Record the Findings

60. Having carried out a fire safety risk assessment of the premises, fire safety law requires that certain information be recorded where five or more employees are employed by an employer (whether they are on the premises or not), or the premises is subject to licensing or registration, or an Alterations Notice has been issued requiring this. **Chapter 4** contains recommendations in respect of record keeping.

Review the Assessment

61. The fire safety risk assessment should be reviewed regularly and also before any significant or relevant changes are made or if relevant safety issues arise. This will involve setting time aside to consider whether change has affected the risk and whether fire safety measures remain appropriate.

62. Where changes are proposed, the consequence to fire safety in the premises should be considered before the change is introduced. Changes that might prompt a review of the risk assessment include:

- a change in the number of people present or the characteristics of the occupants;
- changes to work procedures, including the introduction of new equipment;
- alterations to the building, including the internal layout; and
- the introduction or increase in the storage of dangerous substances.

63. A review should occur on becoming aware of shortcomings in fire safety measures; potential improvements; or if a fire or ‘near miss’ occurs which may indicate that the existing fire safety measures are inadequate. If the Fire and Rescue Service has attended a fire in the premises, its fire investigation findings may help inform a review.

64. Generally, reviews of a risk assessment should be carried out in-house by the premises management. This will reinforce ownership of fire safety management and assist in the development of relevant knowledge and of a fire safety culture. However where significant changes to premises have occurred, it may be advisable to seek specialist advice.

65. In respect of entertainment events, there may be a need for frequent reviews in cases such as where there are regular changes to premises or contents.

Table 1 - Ignition Sources

Potential ignition sources are those where sources of heat could get hot enough to ignite material. This could include:

- smokers' material - such as cigarettes, matches and lighters;
- naked flames - such as candles or open-flame equipment;
- heaters - fixed or portable;
- hot processes - such as cutting and welding or repair work;
- cooking equipment and lighting equipment;
- deliberate fire raising;
- electrical equipment or fixed installations;
- interaction of reactive chemicals;
- spontaneous ignition; and
- pyrotechnics and special effects.

There are various ways to reduce potential sources of ignition, for example:

- replace naked flame and radiant heaters with a central heating system restrict the movement of, and provide guards for portable heaters;
- install, use and maintain electrical and mechanical equipment in accordance with the manufacturer's instructions;
- inspect and test electrical installations and equipment;
- ensure that the prohibition of smoking is enforced;
- take precautions to avoid deliberate fire-raising; and
- control the storage and use of pyrotechnics.

Table 2 - Fuel

Material which will burn and is in enough quantity may provide fuel for a fire. This includes contents, fixtures, fittings, structure, wall and ceiling linings and surfaces. Some examples of ‘fuels’ are:

- textiles, soft furnishings and clothing;
- flammable liquids and solvents, such as white spirit, methylated spirit, and adhesives;
- wood, paper, cardboard, plastics, cellular foam, rubber and upholstered furniture;
- waste and litter such as paper, packaging, wood shavings, off-cuts and dust;
- flammable gases such as liquefied petroleum gas (LPG) and aerosol contents;
- hydrogen produced during battery charging;
- powdered materials or dusts (including materials not normally considered combustible but where, as a dust, they may be prone to dust explosions (examples are flour, animal feed and some metals); and
- dry vegetation.

There are various ways to reduce the materials and substances which burn, and to separate them from ignition sources, for example:

- store flammable materials properly;
- remove combustible wall and ceiling linings, such as timber, polystyrene or carpeting (to reduce the surface rate of flame spread and smoke production);
- keep flammable or combustible materials in public areas to a minimum with stock in storage areas secure against fire raising; and
- control the build-up of combustible waste with proper disposal.

Table 3 - Oxygen

The main source of oxygen for a fire is in the air around us. Air supply can be by natural air flow through doors, windows and other openings; or mechanical air conditioning systems and air handling systems. Buildings may have a combination of sources capable of introducing or extracting air.

Potential sources of oxygen supplied to a fire can be reduced by:

- closing doors and other openings;
- ensuring that doors are close fitting and, where appropriate, fitted with seals; and
- closing down ventilation equipment.

The action may be a precaution taken in case a fire starts, such as keeping certain doors closed. In other cases, the action may take place once a fire is detected, such as when ventilation equipment is shut down (either manually or automatically), or when doors are closed, either manually or by the automatic release of hold-open devices. (This subject can be complex where an automatic smoke-control system is installed).

Chapter 3: THE PERSONS IN THE PREMISES

66. The number, nature and location of the occupants needs to be considered. This will influence the fire safety measures necessary. In some cases, the risk to persons will be influenced by their particular circumstances and by their location in, and familiarity with, the premises. Premises-based employees and other persons who regularly frequent premises may be expected to have some familiarity with layouts and procedures, while visitors and members of the public may be unfamiliar. In public access buildings many of the public may only know building entrances and be unfamiliar with alternative escape routes.

67. Numbers of persons can be anticipated from the size of the premises and knowledge of occupancy levels. A guide to potential capacity of a room or space is to divide the area by an occupancy load factor. For example a room of 50 m^2 with a load factor of 5 gives an occupancy of 10 persons.

Table 4 - Occupancy load factor of a room or space by use

Description of room or space	**Load factor**
standing spectator area	0.3
assembly area, bar, open air standing spectator area	0.5
queuing area, concourse	0.7
conference room, lounge, staff room, waiting room, dining room, meeting room, restaurant	1
shop sales area - high occupancy e.g. supermarket	2
factory production area, museum	5
office	6
shop sales area - low density e.g. furniture shop library, kitchen	7
storage, warehouse, enclosed car park	30

68. In a shopping centre, a load factor of 0.7 may be used for mall areas up to a width of 6 m and a load factor of 2 for areas beyond the 6 m. Footfall data may provide a more accurate measure of actual occupancy.

69. Occupancy capacity is not used for determining capacity limits because it takes no account of means of escape or other fire safety measures. For example, exit capacity needs to be compared to occupancy capacity. The number of persons who can safely use rooms, areas or storeys may be more or be less than calculated because of the means of escape provided, or other fire safety measures in place.

70. Some persons who have a disability may have difficulty in perceiving or responding to a fire or in leaving the premises if there is a fire. In considering staff and frequent visitors, any disability and associated difficulty should be identified. The personal evacuation needs of staff should be considered and be discussed with each individual along with the assistance required. An individual personal emergency egress plan (PEEP) for each of these persons should be established. Information and guidance on the evacuation of disabled persons in the event of fire is available in Practical Fire Safety Guidance: The Evacuation of Disabled Persons from Buildings.

71. In some premises, such as a crèche, multiscreen cinema or summer play scheme, where children are separated from adults, following activation of the fire alarm system, adults may attempt to contact the children inside the building rather than evacuate the premises separately. Account needs to be taken of this.

72. The age and ability of children, pupils and students should be considered. Account should be taken of the vulnerability and supervision needs of children and of the lack of awareness and immaturity of young persons including any young persons employed.

73. Consideration should be given to employees and others who may work alone such as cleaners and security staff and anyone who may be in isolated areas, such as maintenance staff and staff who have control of critical processes which cannot be left unattended.

74. In entertainment premises, the age range and behaviour profile of different types of audience should be taken into account. Events attended by children or young persons may require a greater degree of control and stewarding than other events which, despite similar audience numbers, may have a different behaviour profile.

Transport Premises

75. Passengers using transport terminals on an occasional basis may have less familiarity than people who are using the same facility daily, but in any case persons may be familiar only with routes they normally use.

76. Delays and special events may greatly increase passenger numbers and more generally, passenger disembarkation during a fire is a factor to consider. For some premises, an elevated risk to life safety may occur at peak times when a high volume of people are passing through the premises and account should also be taken of the psychological stress and behaviour of passengers that may be associated with congestion or perceived evacuation delay.

77. The behaviour of passengers in the event of fire may offer difficulty and they may be reluctant to obey instructions or evacuate. Examples are:

- people may be reluctant to evacuate without their luggage;
- people may be in a state of undress such as in changing rooms;
- people may decide their first priority is to try and re-join children and/or friends; and
- people in queues may be concerned at losing their place in the queue.

78. Where large numbers of people use transport premises, there may be a need to monitor the number of people entering the premises to prevent capacity being exceeded and avoid overcrowding.

Chapter 4: MANAGING FIRE SAFETY

79. A management commitment to fire safety is important to assist with achieving suitable fire safety standards in premises and in maintaining a staff culture of fire safety.

Fire Safety Policy

80. There should be a clearly defined fire safety policy which includes arrangements for planning, organisation, control, monitoring and review of fire safety measures.

81. There should be one named individual with responsibility for the coordination of fire safety management within each premises. In multi-site organisations additionally there is a need to establish responsibility for fire safety within the organisation as a whole and the arrangements for monitoring the management of fire safety.

82. In multi-occupied premises there is a need for co-ordination between occupiers to account for the overall fire safety arrangements.

Emergency Fire Action Plan

83. An emergency fire action plan sets out the action that staff and other people in the premises should take in the event of a fire. It is a management responsibility to have in place an emergency fire action plan specific to the premises and to have in place arrangements to implement the plan.

84. In multi-occupied premises the emergency fire action plan will need to be coordinated between all occupiers.

85. For locations where the Fire and Rescue Service has a specific emergency response plan, then there should be compatibility between the premises' emergency fire action plan and the response plan.

86. The emergency fire action plan for a major open air event such as a music festival will normally be prepared after consultation with all dutyholders and agencies involved.

Table 5 - Emergency Fire Action Plan Checklist

- how people will be warned if there is a fire;
- what staff should do if they discover a fire;
- what staff should do in the event of a fire or the fire alarm activating;
- the arrangements for calling the Fire and Rescue Service;
- the action to be taken by the person in charge when the fire alarm activates or a fire is discovered;
- any arrangements for fighting fire by staff trained to use fire extinguishers;
- any processes, machines or power supplies that need to be stopped or isolated;
- the procedure to evacuate the premises, taking into account the personal evacuation needs of individuals;
- procedures for checking whether the premises have been evacuated and where persons should assemble or be taken after they have left the premises;
- procedures for meeting the Fire and Rescue Service and passing on details of the incident, whether all persons have evacuated and the presence of any dangers; and
- contingency arrangements for the relocation or welfare of evacuees.

87. There should be an adequate number of trained persons responsible for supervising and implementing the emergency fire action plan. Emergency evacuation is a management responsibility and the plan should not rely on the attendance of the Fire and Rescue Service to work.

88. Stewarding and crowd control are vital components in the safe evacuation of the public from large places of assembly and entertainment.

89. The use of lifts needs to be considered. In general, lifts should not be used for evacuation, though some lifts may be designed for evacuation of disabled persons. And in some situations, particularly in large complexes, the fire safety measures provided may allow for the use of specific lifts for fire evacuation purposes. If fire-fighting lifts are to be used for evacuation, this should be agreed and co-ordinated with the Fire and Rescue Service who may, on arrival, need to take control of the lift for fire-fighting.

90. Where escalators are used for evacuation, there is the potential that persons could inadvertently be conveyed up (or down) into a fire situation. There needs to be consideration whether in event of fire alarm activation, an escalator can continue to operate along with staff supervision and control; or whether the escalator should stop on activation of the fire alarm. The use of escalators to facilitate evacuation is an established protocol in some transport premises.

91. Similarly, if travelators continue to run during a fire incident they could inadvertently convey passengers towards the fire. Therefore they should normally come to a halt on activation of a fire alarm.

92. In larger buildings or complexes, phased evacuation may be appropriate. This describes a situation where those people most at risk from a fire, usually those closest to where the alarm has originated, will be immediately evacuated, while others in the building are given an alert signal and will then evacuate when it becomes necessary or after a pre-determined timescale. The initial movement, depending on the layout and configuration of the premises, can be either horizontal or vertical. Where a phased evacuation strategy is in place, it may be appropriate for those disabled people who have an extended evacuation time to be alerted at the first stage to give them the maximum time to escape. Phased evacuation requires a fire-warning system capable of giving staged alarms, including an ‘alert’ and a different ‘evacuate’ signal.

93. With a staged alarm system, an initial staff alarm may be given to staff before the general alarm is given. This gives time for investigation purposes or to carry out pre-arranged actions. Normally staff alarms are restricted to signals from smoke detectors, an evacuation signal is given if a manual call point, heat detector or sprinkler head activates.

94. In enclosed shopping centres, the emergency fire action plan may involve immediate evacuation of the shop concerned where an alarm originates and allow for the activation to be investigated without full centre evacuation. After a pre-determined time delay, commonly up to four minutes, the evacuation of the whole centre would commence. If during the investigation period there is further alarm activation then the system would go to full evacuation. In the case of fire alarm activation anywhere other than in an individual shop, or on activation of sprinklers anywhere within the shopping centre, evacuation would commence immediately.

95. Staff should be aware of the emergency fire action plan through their training and instruction. Staff notices containing extracts of the emergency fire action plan should be permanently displayed in appropriate positions in the building. These notices should contain sufficient instructions for staff on their actions in the event of fire. There may also be a need for notices designed specifically for other occupants.

Transport Premises

96. Due to the significant disruption and associated risks that may be caused by a false alarm or a minor incident, the provision of a staff alarm may be appropriate for some transport premises.

97. Fire safety law does not specifically apply to means of transport but traffic issues need to be taken into account, such as their potential to be the origin of a fire, be involved in fire or for the consequences of their movement and passenger disembarkation in a fire or emergency situation.

98. In respect of rail management there are specific issues which need to be considered and pre-planned for, such as:

- the procedure, should a fire occur while a train is in a sub-surface station, and whether a train should leave with passengers to reduce the number of persons using the station means of escape;
- whether to prevent trains stopping at a sub-surface station in which there is a fire;
- the need to consider that the movement of a train may cause undesirable air flows within tunnels, station and communicating areas;
- in other stations, whether trains should be stopped to prevent arrival and discharge of passengers;
- in a tunnel. the need to consider planning for de-training and whether passengers need to alight from the train and walk along at track level, whether passengers can use cross-passages to an adjacent tunnel, and whether passengers have to travel along the tunnel to a final exit or station; and
- where relevant, arranging disconnection and earthing of the traction current.

99. Where major airport terminals have large compartments or smoke control zones, the evacuation of persons into adjacent zones may be appropriate for the following reasons:

- to prevent people having to enter a hostile environment such as the airport apron;
- to avoid disruption to the operation of the building;
- to avoid the airside/landside barriers being breached;
- to maintain the segregation of arriving and departing passengers; and
- to assist in the evacuation of people with disabilities.

100. In all cases, communication with passengers is important. The plan should include the arrangements for informing passengers and travellers of what action they should take.

Fire Safety Information and Training

101. It is important that staff know what they have to do to safeguard themselves and others on the premises and to have an awareness of the importance of their actions including risk reduction, maintenance of fire safety measures and action if there is a fire.

102. All staff (including shift workers, stewards, cleaners, volunteers, temporary and agency staff) should be given information, instruction and training on the action to be taken in case of fire and the measures to be taken or observed on the premises.

103. Staff training should take place at a frequency which will ensure that staff remain familiar with procedures. The specific fire safety training needs of any young persons employed should be considered.

104. Fire safety training should be specific to the premises. Table 6 shows a staff training checklist. What is important is not simply the fact that staff training has taken place, but that staff have the knowledge and understanding of what they should do in the event of fire and also actions to prevent fire. Assurance to confirm staff understanding could be achieved by incorporating a post-training check.

Table 6 - Fire safety training checklist

- instruction on the fire alarm control panel (if applicable);
- the action to take on discovering a fire;
- how to raise the alarm of fire;
- the action to take upon hearing the fire alarm;
- the arrangements for calling the Fire and Rescue Service;
- information on risks;
- the identity of people nominated with responsibilities for fire safety;
- any special arrangements for serious and imminent danger to persons from fire;
- the procedures for evacuating visitors and the public;
- the measures in place to ensure a safe escape from the building and how they will operate;
- the personal emergency egress plans for disabled persons;
- the fire prevention and fire safety measures and procedures in the premises;
- the location and, where appropriate, use of fire-fighting equipment;
- the risks from flammable materials used or stored on the premises;
- the precautions to be taken to minimise and control the risks, with particular attention to their role in reducing and controlling fuel and ignition sources;
- the identity of persons nominated to use fire extinguishers; and
- the need for staff to report defects in fire safety measures.

105. The knowledge and understanding that employees require will be guided by the role and function the member of staff is expected to fulfil. Staff who have a supervisory role should receive additional training which will enable them to discharge their specific responsibility.

106. Those staff who may require to physically move persons during an evacuation, should receive manual handling training and should be familiar with the use of any evacuation aids or equipment provided.

107. A record should be kept of individual staff member training and should include the date and time, content, duration and trainer.

108. Where work is undertaken in the premises by outside contractors, then fire safety law specifically requires that information on risks and fire safety measures be notified to these workers and their employers. If any child (not over school age) is employed to work on the premises, information on risks and fire safety measures must be given to their parents.

109. Information may need to be issued to staff whenever there is a change in the risk from fire, where changes have been made to the emergency fire action plan or other fire safety measures, or where working practices or people's responsibilities have changed. This includes temporary changes such as when contractors' work is in progress.

Fire Drills

110. Staff may not follow appropriate action in an emergency if they have never experienced that action. Fire drills should be carried out to check that staff understand and are familiar with the operation of the emergency fire action plan, to evaluate its effectiveness and identify any weaknesses.

111. During fire drills, scenarios should be introduced to reflect what could occur in a fire and problems that staff may be faced with, such as an escape route unusable due to fire. During drills, a member of staff who is told of the supposed outbreak should operate the fire alarm and the staff should then rehearse the routine as fully as possible.

112. The frequency of drills for each building should reflect the level of risk and may therefore be different for different premises. Within each building the fire drill evacuation should be tailored to the needs of the premises and take into account what is achievable and what is realistic. When planning the timing of drills, the existence of occasional and shift workers should be considered.

113. The minimum frequency for an evacuation drill is once a year, but 6-monthly may be more appropriate for many premises. In schools there is a need for familiarity and discipline by children or pupils and fire drills should take place preferably once a term.

114. If the fire warning system is connected to a remote alarm receiving centre, the receiving centre should be informed or the link should be taken off-line (to prevent the Fire and Rescue Service being called) and then reinstated when the drill is terminated.

115. When carrying out a fire drill it may prove helpful to nominate observers to assess the appropriateness of actions and identify problems such as communication difficulties caused by sounders, the use of a frequently used route instead of the most appropriate escape route, or difficulties experienced by people with disabilities.

116. Where the drill involves evacuation, the drill should include the means of establishing and reporting that all persons have evacuated.

117. The results of the fire drill should be recorded, discussed with staff, and action should be taken to address any issues which have arisen.

118. Where there are infrequent or one-off major events such as a music festival, a fire drill should be rehearsed prior to the commencement of the event to ensure that all persons with responsibilities during any fire emergency, such as stewards, know what is expected of them.

119. In premises where the public have access, fire drills should involve a rehearsal for evacuation and may be scheduled when there are few members of the public in the premises.

120. In entertainment premises, whilst it may be impractical to expect fire drills to involve full audience evacuation, in some cases there may be an opportunity to practise all, or specific, aspects of a fire drill at the end of an event or performance when members of the public are leaving the premises. It may be appropriate to give advance notice to attendees that a fire drill will be undertaken at the end of the event or performance.

Maintenance of Fire Safety Measures

121. There should be regular checks, periodic servicing and maintenance of the physical fire safety measures. Any defects which occur should be put right as quickly as possible, though there may be a need for contingency plans when life safety systems such as fire-warning systems or sprinklers are defective.

122. The maintenance and testing of some systems and equipment will fall within the recommendations of a British Standard. Examples of testing and maintenance are given below. Some six monthly and annual tests may normally be carried out by a person with specialist knowledge, usually via a service contract. Experience in individual premises may show a need to vary the suggested frequencies, such as for premises which are unstaffed or used on an infrequent basis. The fault occurrence frequency in premises may suggest more frequent checks. In the case of periodic sporting events or open air concerts, it may be appropriate to carry out tests and checks prior to public access.

<u>Escape routes and doors</u>

- Daily walk through to check escape routes are clear of obstructions and combustible materials, and that self-closing doors are not wedged open, and that out of hours security devices have been removed or disabled;
- Weekly check of escape routes, safety signs and notices, exit securing mechanism; and door self-closing devices; and
- Six monthly check that fire doors are in good working order: inspect doors for warping or distortion, fire-resisting glazed panels are in good condition and secure in their frame, and that intumescent strips and smoke seals are in good condition.

<u>Portable fire fighting equipment</u>

- Monthly visual check of fire extinguishers and hose reels to ensure no obvious faults; and
- Annual maintenance.

Fire warning system

- Daily check of the control and indicating equipment to ensure the system is operational;
- Weekly test by activating a manual call point (usually by inserting a test key). This checks that the control equipment is capable of receiving a signal and in turn, activating the sounders. A different call point is used for each successive weekly test. Call points can be numbered to assist with sequential testing. It is good practice to test the alarm at the same time each week, but also to ensure that shift workers are given the opportunity to hear the alarm. During the test, the alarm should not operate for too long so there is a distinction between a test and an unplanned activation. Check that the test causes the operation or disabling of other features such as electrically powered locks, the release of doors on hold-open devices, the operation of doors on swing free arms and automatic opening doors reverting to manual operation. Where the system is connected to an alarm receiving centre (ARC), the ARC should be warned before carrying out the test, then confirmation requested after the test that the signal was received correctly; and
- Six monthly servicing and preventive maintenance.

Emergency lighting

- Monthly functional test of all emergency light fittings at a time when, following the test, the lighting will not be immediately required. Test methods vary; some systems have self-testing facilities that reduce routine checks to a minimum; and
- Annual maintenance and full discharge test.

Suppression system

- Six-monthly and annual check and routine.

Smoke control system supporting escape

- Weekly test; and
- Annual service.

Third Party Certification

123. Other than where work is exempt, any work to a building must comply with the building regulations irrespective of whether or not a building warrant is required. Building regulations require that materials, fittings and components used should be suitable for their purpose, correctly used or applied, and sufficiently durable.

124. Fire protection products should be fit for purpose and properly installed and maintained, while installation and maintenance contractors should be competent. Third-party certification, where a reputable certification body independently checks competencies and processes and that standards are being met, is one method of providing a reasonable assurance of quality of products and services, provided that the certification body itself is a competent evaluator. Accreditation by UKAS is an indication that a third-party certification body is a competent evaluator. Products and

services that are not third-party approved by an accredited body are not necessarily less reliable, but accredited third-party certification can offer assurance. Information on schemes is available from trade associations.

Recording Information and Keeping Records

125. Paragraph 60 indicates those premises where there is a requirement to keep records in respect of fire safety. The records that should be kept are:

- the significant findings from the fire safety risk assessment;
- the resulting fire safety measures and action to be taken;
- persons who are especially at risk; and
- fire safety arrangements for the effective planning, organisation, control, monitoring and review of the fire safety measures.

126. In low risk premises and most small premises, it will be proportionate to keep no more than details of the significant findings from the risk assessment, any action taken as a result of the fire safety risk assessment, and a copy of the emergency fire action plan.

127. In other premises a full record should be kept. As part of the requirement to record fire safety arrangements, this should include a record of the results of maintenance and testing, This could be either electronic or paper based and retained for at least three years for possible audit by the enforcing authority.

128. Where premises have a complex layout or bespoke fire safety measures, a fire safety manual should be kept in addition to other records. This type of fire safety manual should contain technical specifications, detail of any fire safety engineered design, an explanation of the operation of different systems and specific information on testing and maintenance.

Chapter 5: REDUCING THE LIKELIHOOD OF FIRE

129. An effective strategy should be in place to reduce the likelihood of a fire starting. At its simplest, this means separating flammable and combustible materials from ignition sources and ensuring that equipment and installations are maintained.

Housekeeping and Storage

130. Control of combustible materials should be achieved by attention to good housekeeping principles. By carefully considering the type of material, the quantities kept and the storage arrangements, risks can be significantly reduced. Appropriate practices are:

- not storing combustible materials in plant rooms, boiler rooms, attics, service voids and shafts, electrical main or sub-switch rooms;
- control and frequent disposal of packaging, waste and other combustible rubbish;
- loose storage, bins and waste external to the building, sited well away from the building so that any fire cannot affect external walls or overhanging eaves;
- external bins and storage containers secured to prevent movement;
- regular building checks to ensure that storage arrangements are appropriate; and
- combustible material in external storage areas should be divided into separate stacks or piles with sufficient space separation between them to restrict the spread of fire.

131. In temporary classrooms buildings, boarding or ‘skirts’ should be fitted around the base to prevent combustible material being placed under the structure.

132. A feature in older sports stands may be the existence of voids under seating decks which can be a resting place for litter. Voids below seating decks should be separated from the deck to prevent litter falling through and accumulating below the seating deck**.**

Storage and Use of Dangerous Substances

133. Certain substances and materials are by their nature flammable, oxidising or potentially explosive. These substances are controlled by legislation, in particular the Dangerous Substances and Explosive Atmospheres Regulations 2002. The principles of safe handling and storage are:

- avoid the use of flammable materials and liquids wherever possible or substitute flammable substances and materials with those that are preferably non-flammable or with those that are less flammable;
- reduce the quantity of dangerous substances to the smallest reasonable amount necessary for use;
- correctly store dangerous substances, for example in a fire-resisting metal enclosure: all flammable liquids and gases should ideally be locked away, and segregated if necessary, to reduce the chance of them being involved in a fire or used in deliberate ignition;
- ensure good ventilation is provided by way of high and low level vents to allow any flammable vapours to be dispersed; and

- ensure that all staff are aware of the fire risk of dangerous substances present and the precautions necessary.

134. The presence of flammable liquids increases the chance of a fire starting and its rate of development. For example, a leak from a container of flammable liquid may produce flammable vapours which can travel some distance away from the source of the leak, increasing the likelihood of reaching a source of ignition. The risk can be reduced by ensuring the storage and use of flammable liquids is carefully managed and materials contaminated with flammable liquids are properly disposed of. Further guidance is available on the HSE website at www.hse.gov.uk/fireandexplosion/.

135. Where gases are stored in cylinders these should ideally be stored and used in the open air outside the building and be located where they cannot be interfered with, and where they will not affect the means of escape. They should not be beside heat, a source of ignition or readily ignitable material and care should be taken to minimise the possibility of involvement in a fire.

136. Acetylene cylinders are found in many workshops and pose particular problems if subjected to fire. If heated in a fire an acetylene cylinder can fail violently due to progressive decomposition of the acetylene, even after the fire has been extinguished. Due to this potential for explosion, the Fire and Rescue Service generally adopts the strategy of cooling a heated cylinder for 24 hours and establishing a 200 m hazard zone. A small fire can therefore result in major disruption to the affected area, adjoining premises and transport networks.

137. Under normal circumstances, Liquefied Petroleum Gas (LPG) is flammable and is heavier than air. Where LPG cylinders or cartridges are used, these should be stored and used in the open air outside the building. Care should be taken to minimise the possibility of involvement in a fire.

138. The total stock of LPG for display or demonstration in retail areas should be kept to the minimum necessary to meet business needs. The maximum stock should be in accordance with HSE guidance.

139. Some premises use bulk LPG fixed installations for cooking or heating, comprising an external tank and supply piping. In these installations there is a need to ensure that there are no fires in the vicinity of the LPG tank, and to consider the maintenance of the installation and piping.

140. Guidance on the safe storage and use of LPG is available from the supplier, and the trade association for the LPG industry UKLPG (www.uklpga.org), and on the gas safety pages of the HSE website at www.hse.gov.uk.

141. Flammable propellants are often used in aerosol cans. Aerosols are liable to explode if involved in a fire, causing spread and intensification of fire and possibly damaging doors so that they fail to function in restricting the spread of fire and smoke. These potential consequences should be taken into account and appropriate use, storage and disposal arrangements put into place for aerosols, taking into account the quantities involved. Manufacturers' instructions should be followed. Storage should be away from escape routes and no storage should be allowed in boiler houses or other areas containing fixed sources of ignition. They should not be stored or placed in damp areas where the container might corrode. Aerosol cans can overheat and rupture in direct sunlight therefore avoid placing aerosol cans containing LPG/flammable liquid propellant on window ledges.

142. The ignition of combustible dusts can result in fires which range from a slow smoulder to very rapid combustion or, where the dust is dispersed in the atmosphere, a dust explosion. Dust flammability is affected by factors such as particle size and moisture content. Where dust is present, deposits should not be allowed to accumulate, since dust deposits can be disturbed and give rise to a dust explosion.

143. Sources of oxygen can sometimes be found in some chemicals (oxidising materials), which can provide a fire with additional oxygen and so assist it to burn, or oxygen supplies from cylinder storage. High concentrations of oxygen can cause materials to burn extremely rapidly and some materials, which are not normally considered combustible, can burn in an enriched oxygen atmosphere. Oxygen is dangerous when in contact with grease or oil.

Furniture and Textiles

144. The choice of furniture, fittings and textiles, can influence the ease of ignition and growth of a fire. There is a need to consider the combustibility and flammability, particularly in premises where large numbers of people assemble. In entertainment premises this consideration includes theatrical curtains, drapes and scenery. Items used in theatrical productions or other events such as concerts, should be durably flame-retardant.

145. It is difficult to assess dried or artificial foliage in terms of flame retardance. These and similar items could be subject to ignition tests using a suitable ignition source such as the match equivalent flame, prior to introduction. Consideration may also be given to the location, ease of access by the public and the overall amounts of artificial foliage/decorative materials present.

146. In places of assembly and entertainment, upholstered furniture (and composites of cover material and infill) should meet the standards in the Furniture and Furnishings (Fire) (Safety) Regulations 1988[3] and in addition, pass the flammability standard in BS 5852 with ignition sources 0 and 5. BS EN 1021: Part 1 offers an acceptable direct equivalent standard to ignition source 0 of BS 5852. Upholstered furniture should be maintained so that there are no tears which have caused the filling material to be exposed.

[3] At time of writing these Regulations are under review.

147. Where the fire performance of curtains needs to be controlled, textile fabrics for curtains (including nets, linings and blackout curtains) should meet the standards of BS 5867: Part 2 Type B.

148. Textile floor coverings bonded to the floor present a lower fire risk than those loosely laid. BS 5287 contains an assessment system for textile floor coverings.

149. Polypropylene chairs should have flame retardant polypropylene shells.

Cellular Foam Fillings

150. Gymnasium mats and crash pads with cellular foam fillings may burn fiercely and generate dense toxic smoke. Cellular foam in places such as sports halls or gymnasia may affect the safety of persons using parts of the premises if the cellular foam is involved in fire. Gymnastic mats and similar equipment should contain combustion modified high resilience foam. Mats and other such equipment should also comply with the provisions of BS 1892: Part 3. When not in use they should be kept in a locked store which has a minimum of 60 minutes fire-resistance.

151. Soft play environments can contain a large volume of foam in various shapes. The covered foam should meet BS 5852 with ignition sources 0 and 5.

Safe Use of Equipment

152. Lack of preventive maintenance increases the likelihood of fire starting in equipment. A competent person should regularly maintain (and where necessary clean) machinery, equipment and plant, including cooking, heating and office equipment. Appropriate signs and instructions on the safe use of equipment may be necessary.

153. Generally, equipment ventilation points should be kept clear to avoid becoming clogged or blocked. A build-up of grease or fat deposits should be removed from equipment in kitchens, including extraction equipment.

154. There should be a procedure for reporting faults. Faulty equipment should be taken out of use when it is identified or suspected of being defective, and thereafter repaired or replaced.

Electrical

155. Electrical installations[4] and electrical equipment can be a significant cause of fire. Possible causes include:

- equipment faults;
- overheating cables and equipment due to overloading or loose connections;
- incorrect installation, use or maintenance;
- damaged or inadequate insulation;
- combustible materials placed close to heat-producing electrical equipment;
- arcing or sparking; and
- modifications to an installation by unskilled/incompetent persons.

156. Some precautions are:

- maintenance of installations and equipment should be done only by persons competent to do so;
- electrical equipment should only be used for its designed purpose;
- correctly wired and fused extension leads and plugs should be used; and
- sockets and extension leads should not be overloaded.

157. To reduce the potential for a fire occurring, there should be an effective programme of planned preventive maintenance for electrical installations and equipment.

158. Where there is the potential for flammable or combustible atmospheres, then hazardous area classification is a methodology imposed by the Dangerous Substances and Explosive Atmospheres Regulations 2002 for protecting against potentially explosive atmospheres. This is then used in the selection of appropriate certified installed and portable equipment and vehicles etc, including electrical equipment. Where only certified equipment should be installed, this also applies to electrical fire safety systems such as a fire warning system.

159. Guidance on electrical safety, including FAQs on maintaining portable appliances, is available on the HSE website at www.hse.gov.uk/electricity/index.

Smoking

160. Careless use of cigarettes and other smoking materials is a common cause of fire. A cigarette can smoulder for some time, especially when surrounded by combustible material, however, smoking is banned in all wholly or substantially enclosed public places. Staff should be aware of the potential for fires associated with illicit smoking. Where smoking takes place in external areas, consideration should be given to minimising the risk of combustible materials being ignited.

[4] An ‘electrical installation’ is the electrical system from the premises’ supply meter point to the socket outlets etc.

Managing Building Works and Alterations

161. Fires often occur when buildings are undergoing refurbishment or alteration. Before any major building work or decoration, the fire safety risk assessment should be reviewed and additional risks considered and evaluated. There are three aspects of building work that should be considered:

- the introduction of new ignition sources and combustibles and the associated risk of fire occurring during the work;
- the potential interference with the existing fire safety measures while the building work is underway; and
- whether the building work will result in adverse changes to existing fire safety measures.

162. To ensure that fire safety measures are not compromised and that adequate controls are in place, it is important to ensure co-operation between the building contractor and management. It may be appropriate to specify site-specific fire precautions in contract conditions.

163. Examples of issues that may arise with building work and that need to be considered and controlled are:

- the potential for fires to be caused by hot work such as soldering, welding, flame-cutting, roof repair, paint stripping;
- increased quantities of combustible materials and accumulated waste;
- obstruction of internal and external escape routes;
- loss of normal storage facilities;
- fire safety equipment, such as automatic fire detectors being out of use; and
- Fire-resisting construction being breached or fire-resisting doors being wedged open.

164. Hot work should only be undertaken when suitable precautions and equipment are in place. This may be the use of an industrial quality fire blanket to mask areas adjacent to the work being carried on, an appropriate fire extinguisher provided immediately to hand, or where the activity presents a high fire risk, an observer standing-by to identify any fire propagation from sparks or other source. Areas where hot work is undertaken should be frequently inspected during the first 30 minutes after the work is completed, and then 30 minutes later to ensure that no materials are smouldering. A ‘permit to work’ system is a useful procedure and management tool which allows a degree of control over contractors or staff who may be carrying out hot work.

165. Modern buildings of timber frame construction contain combustible material in the structure. Care needs to be taken with tools or heat sources where any construction work or alteration involves drilling or cutting openings in the outer cladding or the inner plasterboard skin.

166. The content of skips, waste containers or combustible material may be subject to deliberate ignition. Storage, preferably in lockfast non-combustible containers, should be away from the building so that any fire cannot affect external walls or overhanging eaves.

167. Only the minimum materials necessary for the work in hand should be allowed within the building or close to the exterior of the building.

Keeping Escape Routes Clear

168. There needs to be control over the provision of combustible materials in escape routes. If a fire were to occur in an escape route or spread to material in the escape route, this could be a particularly difficult and threatening situation, preventing occupants from escaping.

169. Stairways that form part of escape routes should be kept clear of combustible items and items that could be a source of ignition. Items kept in corridors should be controlled, consistent with the need for the normal functioning of the premises.

170. The maintenance of adequate escape route width and prevention of obstruction is also relevant. Escape route width is covered in **Chapter 7**.

171. Examples of some items which are normally unacceptable in stair and protected escape routes are:

- gas cylinders, gas pipes, meters and similar fittings;
- cooking appliances;
- upholstered furniture;
- coat racks;
- electrical equipment such as photocopiers and battery chargers; and
- storage of combustibles.

Fire-Raising

172. The possibility of deliberate fire-raising should be considered. This may be particularly relevant in areas with a history of vandalism or fire-setting.

173. Appropriate precautions should be taken. This may involve ensuring the outside of the premises is well lit and secure against unauthorised access, and that waste stored external to the building is kept in lockfast bins or stores. Security measures should not compromise the means of escape and the ability to evacuate including those working late or alone.

174. In schools some fires are started deliberately and there has been a trend for deliberately started fires to occur during school time.

Tented Structures

175. The ignitability and flame-spread characteristic of tents, marquees and air supported or pneumatic structures should be considered. In addition, certain plastics used in the construction of such structures can produce highly toxic fumes when subjected to heat.

176. Tent membranes and fabrics, including wall hangings and other decorative display materials, should be of inherently flame retardant fabric or durably flame retardant fabric when tested to BS 5438 or BS 7157. Materials should be free of flaming molten droplet characteristics and should not support combustion.

177. A test certificate to show compliance with the appropriate standard should be obtained from the manufacturer or supplier.

Pyrotechnics and Special Effects

178. Pyrotechnics and special effects may produce light, colour, heat, sound or smoke, or a combination of these. They are used in outdoor and indoor places of entertainment or assembly for a variety of purposes such as outdoor firework displays and in theatres and other venues to enhance performance.

179. Operators of pyrotechnics and special effects should be suitably qualified to manage such equipment. Pyrotechnics/special effects should be obtained from a reputable supplier who can demonstrate suitability of products. The manufacturer's and supplier's instructions regarding use and storage should be followed as should the Event Safety guidance issued by the HSE.

180. The use of pyrotechnics needs to be carefully controlled. Fireworks and pyrotechnics intended for outdoor use should not be used within buildings or structures. The indoor use of outdoor pyrotechnics has been a cause of fire in entertainment venues worldwide which have included multiple fatalities (see case studies annex).

181. Factors to consider prior to the use of pyrotechnics and special effects include:

- positioning pyrotechnics in an area upstage of the safety curtain where installed;
- the height that will be reached by any flaming effect;
- safe positioning away from audience, performers and flammable materials;
- escape routes for firers of fireworks;
- the potential for heat, flame or sparks starting fires in adjacent materials;
- burning residue from pyrotechnics setting off non-fired pyrotechnics;
- potential for smoke effects to obscure signage and escape routes or actuate smoke detectors;
- gaps in flooring might allow sparks or material to fall through to ignite combustible materials below;
- hot surfaces on special effects machinery;
- noise levels affecting fire warning or verbal evacuation signals; and
- the co-ordination and co-operation between occupiers and participants at events to ensure their awareness of the use of pyrotechnics.

Chapter 6: RESTRICTING THE SPREAD OF FIRE AND SMOKE

182. To reduce the risk to persons from fire, it is necessary to consider how to restrict the spread of fire and smoke. The majority of people who die in fires are overcome by smoke. To evaluate the risk requires a basic appreciation of the way fires grow and how smoke can spread through a building. A fire in a building can generate smoke that is thick and black, obscures vision, causes difficulty in breathing, and can prevent persons from using escape routes. Smoke is a serious threat to life which should not be underestimated.

183. Fire is spread by convection, conduction and radiation. Convection causes the major proportion of injuries and deaths. When fire starts in a building, the smoke rising from the fire becomes trapped by the ceiling and then spreads in all directions to form an ever-deepening layer over the entire room space. The smoke will pass through any holes or gaps in the walls, ceiling and floor into other parts of the building. The heat from the fire gets trapped in the building and the temperature rises. Some materials, such as metal beams can absorb heat and transmit it to other rooms by conduction, where it can set fire to combustible items that are in contact with the heated material. Radiation transfers heat in the air in the same way that an electric bar heater heats a room. Combustible material close to a fire will absorb the heat until the item starts to smoulder and then burn.

Layout of Transport Premises

184. In some transport premises, the open design gives the potential for rapid heat, smoke or fire spread and exposure to occupants. Also openings in floors may allow smoke and hot gases to move from the fire source to areas occupied by people who may not be aware of the fire. Lack of containment potentially increases the number of people at risk from a fire.

185. Consideration of materials' fire properties and smoke production is important for tunnels, stations and transport premises that are underground. The use of combustible materials should be minimised. Some materials can be replaced by materials that are more difficult to ignite, less capable of spreading flame or do not emit toxic fumes or smoke when subject to high temperatures.

Auditoria Design

186. In some traditional theatres, the stage area may be equipped with a high level outlet over the stage to allow the escape of smoke and hot gases in the event of a fire on the stage, and a fire-resisting wall and a safety curtain in the proscenium opening to provide separation between the fire and the audience.

187. In the event of fire, the direction of air movement by the ventilation system is from the auditorium towards the stage.

188. Escape from the stage area behind the curtain is independent of that from the auditorium and escape provision from elevated areas such as grids and fly galleries is direct to open air, or to another part of the premises (other than to the auditorium) via a door providing at least 60 minutes fire-resistance leading to a separate fire compartment or protected area.

189. An under stage area used in conjunction with a stage presentation may require two exits, one of which is independent of the stage. An under stage area used for storage should be separated from the remainder of the building by at least 60 minutes fire-resistance.

Stadia Design

190. The fire safety design of sports stadia may include:

- viewing accommodation separated from other parts of the building by fire-resisting construction - as far as possible no storage areas form part of the stand building; where this is unavoidable, storerooms are provided with fire suppression system appropriate to the risk and are not accessible from public areas;
- low flammability and fire risk potential in fixture and fittings, and contents; and surface finishes which have low surface spread of flame characteristics;
- contents which are not capable of being easily dismantled or moved to block exit routes;
- voids sealed so that litter cannot collect;
- a fire warning system including, where appropriate, automatic fire detection;
- a roof geometry to restrict smoke and flame travel along the underside of stand roofs;
- in some cases, the provision of smoke ventilation within structures; and
- escape routes which allow free flow of people.

191. For sports stadia, reference should be made to the guidance and benchmarks in the Green Guide. (See paragraph 8).

Fire Separation and Compartmentation

192. The purpose of fire separation is to provide a physical fire-resisting barrier to restrict fire spread between different occupancies and between single occupancy parts and communal areas. Where premises adjoin or are part of a larger building, the potential for an outbreak of fire to spread to or from the neighbouring building or another occupancy should be considered.

193. A fire compartment is part of a building constructed to provide a physical fire-resisting barrier to prevent the spread of fire and smoke to or from another part of the building. The life safety objectives of fire compartmentation may be to:

- reduce the number of occupants who may be immediately at risk;
- reduce the travel distance for persons;
- restrict the size and growth of fire; and/or
- protect occupants where there may be delayed evacuation of premises.

194. For the purposes of smoke control, corridors which are not protected corridors, and which have at least two directions of escape, and with more than 12 m in length between the exits, may be divided in the middle third of the corridor with a wall or screen with at least 30 minutes fire-resistance (for integrity) and the door in the wall or screen at least an FD30S self-closing fire door.

195. A lift well can be a route for vertical fire spread. A lift well which is enclosed by walls with fire-resistance will be a barrier to fire spread. A lift well which is totally within a protected area such as an enclosed stair, is already within a fire-resisting enclosure. Where a lift well is not the full height of the building, the fire-resistance of the floor and/or ceiling needs also to be considered.

196. Where services pass through any fire-resisting structure, gaps should be sealed or fire stopped to maintain the fire-resistance of the structure and prevent the passage of fire or smoke. Pipes should be fitted with a proprietary sealing system capable of maintaining the fire-resistance. A similar consideration exists for penetration by ventilation ducts.

197. Boiler rooms and plant rooms are a possible source of fire. To contain a fire, at least in its early stages, a room may be enclosed by walls with fire-resistance where it contains an appliance (solid fuel, oil or gas fired, or fuel oil tanks). Where the appliance or equipment uses liquid fuel, the room should be able to contain all the liquid plus 10%.

Smoke Control

198. In some premises such as atrium buildings and enclosed shopping complexes, fire safety measures may include an automatic smoke and heat exhaust ventilation system (SHEVS). SHEVS are often used in conjunction with automatic fire suppression systems; suppression limits the size of a fire therefore controlling the amount of smoke produced. Smoke control in this context is a specialist subject.

199. In the malls and some large units of shopping centres, smoke reservoirs at roof level allow heat and smoke to vent to the outside. The design should maintain the smoke layer above head height to allow persons to use the mall as an escape route.

200. The fans or ventilators in a reservoir operate:

- on activation of any automatic fire suppression system; or
- on activation of smoke detection within the reservoir; or
- on activation of more than one smoke detector anywhere in the shopping centre; or
- following a delay (of perhaps 4 minutes) from the first fire alarm activation.

201. A smoke control system needs replacement air to function. This is provided automatically on the operation of the system with the air entering below the smoke layer level.

202. A manual override may be provided at access points and in the centre control room.

Doors

Fire doors

203. A 'fire door' is a fire-resisting door which is rated by performance to fire under test conditions. Fire doors are used to prevent fire spread and for the protection of means of escape. A self-closing device is a normal feature of a fire door, though there are some exceptions, such as doors to small cupboards which are kept locked shut.

204. A fire door rated to 30 minutes is described as FD30 [5] or E30 [6]. A suffix is added to denote that the door has a smoke control function giving FD30S and E30Sa respectively. A 60 minutes fire door with smoke control is designated FD60S or E60Sa. The door rating is an indication of test performance and is not necessarily how a door will perform in a real fire.

205. The level of protection provided by a fire door is determined by the time taken for a fire to breach the integrity of the door assembly, together with its resistance to the passage of smoke, hot gases and flame. The gap between the door leaf and the frame is normally fitted with intumescent strips, in either the door or the frame (but not at the bottom of the door). The strips expand in response to heat from a fire, to seal the gap between the door leaf and the frame.

206. Smoke seals fitted to the door leaf gap prevent the spread of smoke at ambient temperatures, before an intumescent strip expands.

207. In determining the performance of a door in fire, it is necessary to consider the whole door assembly including the frame, glazing, side-panels, transoms and ironmongery. In the case of a new door assembly, the manufacturer's installation instructions should be followed.

[5] tested to BS 476: Part 22
[6] tested to BS EN 1634: Part 1

208. Some existing non-fire-resisting doors may have the potential to be upgraded to nominal 30 minutes standard, but replacement of existing doors and frames is often preferable.

Self-closing function

209. A fire door will only fulfil its function to provide a barrier to fire and smoke if it is closed at the time a fire occurs. A controlled self-closing device, complying with BS EN 1154, will be fitted to each fire door (other than to certain cupboard doors). The closing pressure of the self-closing device needs to be sufficient to overcome any latch mechanism. It is inappropriate to rely on a procedure whereby staff will attend and close doors as an alternative to fitting self-closers.

Hold-open and door release devices

210. There are devices which hold self-closing fire doors in the open position until a fire detection system operates. It follows that these are only appropriate in premises provided with an automatic smoke detection system. They should not be used for a door to a room in which the type of automatic fire detector is solely a heat detector.

211. A self-closing fire door can be held open by an electromagnetic hold-open device (which complies, where appropriate, to BS EN 1155 or BS 5839: Part 3) or with electromagnetic hold-open door closers (to BS EN 1155). Electrically operated hold-open devices should deactivate and release the door on operation of the fire warning system or any loss of power to the hold-open device. Doors to a stairway that forms the only means of escape from an upper floor should close automatically in the event of fault in the fire warning system.

212. An alternative release is an acoustically-activated door release mechanism complying with BS EN 1155. Acoustic devices should not be used on fire doors to a protected stair that is the only stairway serving the building or part of the building. Acoustic devices actuate in response to the sound from the fire alarm sounders so will not be appropriate where the initial fire alarm activation does not activate the fire alarm sounders (such as a staff alarm).

213. A further type of self-closing device comprises a 'swing free' arm [7], allowing the door leaf to work normally and independently of the closing device in normal conditions. On the operation of the fire warning system or on power failure, the self-closer operates and closes the door.

214. Radio-linked devices are available; these reduce the need for wiring. Some acoustic systems are battery powered.

215. BS 7273: Part 4 contains detailed guidance on conditions for use of door release devices.

[7] The mutual terms 'swing-free' and 'free-swing' are both in common use.

216. The automatic closing of doors may take persons by surprise and the force of the closing mechanism could knock someone over and be a source of injury. Consequently precautions should be taken to avoid injury, including during a scheduled test or action which will result in release of the doors.

Fire Spread through Cavities

217. Many buildings have cavities and voids, sometimes hidden from view, which may allow smoke and fire to spread. Examples are:

- vertical shafts, lifts and dumb waiters;
- false ceilings, especially if walls do not continue above the ceiling;
- voids behind wall panelling;
- unsealed holes in walls and ceilings for pipe work, cables or other services;
- a roof space or attic; and
- a duct or any other space used to run services.

218. Potential fire spread through cavities and voids should be assessed and, where practical, examined to see if there are voids that fire and smoke could spread through.

219. Cavity barriers may be necessary to restrict the spread of fire in cavities, particularly for those cavities that could allow fire spread between compartments.

220. Certain modular construction buildings have hidden voids through which fire may spread. Modern timber frame buildings have cavities within the frame and these should have been installed with fire-resisting cavity barriers between the external cladding and the timber wall panel at the time of construction.

221. Poor work standards during building work can result in cavity barriers (or the enclosure of escape routes) being breached and/or not being reinstated. This potential needs to be considered. The control of building work is considered in **Chapter 5**.

222. Insulated core panels (sandwich panels) normally consist of an insulated core sandwiched between an inner and outer metal skin. They are used in buildings as exterior cladding or for internal structures and partitions. The retail sector in particular uses insulated core panels because they are easily constructed and suitable for internal alterations. Various materials have been used as a core, some of which are combustible. The existence of panels with a combustible core needs to be carefully considered since fire may spread through the combustible core. Some relevant precautions are:

- avoid siting ignition sources adjacent to panels;
- do not store highly combustible materials against the panels;
- repair damaged panels or sealed joints;
- make sure that jointing compounds or gaskets around the edges of the panels are in good order; and
- openings made for doors, windows, cables and ducts should be effectively sealed so that the inner core is not exposed.

Ventilation Systems

223. The potential for ventilation systems to allow the spread of fire and smoke should be assessed. A powered ventilation system may assist the spread of smoke unless it is designed to shut down automatically if fire is detected.

224. Ventilation ducts may provide a pathway for the spread of fire and smoke between compartments or into stairs. Where ventilation ducts penetrate the walls or floors of these enclosures, automatic dampers provided inside the ducts hold back fire and smoke. Dampers may need to be activated by smoke detection. Specialist guidance on the use of dampers is contained in BS 9999.

Fire Spread on Internal Surfaces

225. Fire can rapidly spread on certain surfaces of walls and ceilings, significantly affecting the rate of fire growth and smoke production. The potential for fire spread on surfaces in escape routes is important as this could prevent occupants from escaping. The internal surfaces may predominantly be:

- category 0 for protected stairs and escape routes, and other corridors of shops, assembly and entertainment buildings; or

- category 1 for corridors in other buildings, and for large rooms.

226. The grading system for surface spread of fire relates to performance against tests set out in certain British Standards. Examples of materials are:

- category 0 - brickwork, blockwork, concrete, ceramic tiles, plaster finishes (including rendering on wood or metal lathes), wood-wool cement slabs and mineral fibre tiles or sheets with cement or resin binding;

- category 1 - timber, hardboard, blockboard and particle board, which have been treated to achieve this category; and

- category 2 - timber, hardboard, blockboard, particle board and certain dense timber or plywood.

227. Additional finishes may be detrimental to the fire performance of the surface. Multiple layers of wallpaper or certain paints applied to the face of a wall or ceiling surface can increase surface flame spread.

228. The use of plastics for surface finishes is a complex issue and outwith the scope of this guidance document. Information on the suitability of plastic materials can be found in the Scottish Building Standards Technical Handbook for Non-Domestic Premises.

Fire Spread on External Walls

229. If there is combustible external wall cladding or construction, it will be necessary to consider the potential for an outbreak of fire within the building, or from an external source, to spread on the external walls of the building and pose a risk to occupants. Recommendations on the fire performance of external walls can be found in the Scottish Building Standards Technical Handbooks.

Chapter 7: PROVISION AND USE OF MEANS OF ESCAPE

230. Once a fire has been detected and a warning given, everyone in the premises should, if necessary, be able to move or be assisted away from the fire to a place of reasonable safety such as an enclosed protected stair or another fire compartment from where they should be able to continue to escape to an unenclosed safe area beyond the premises. Means of escape is the provision of safe escape routes for people to travel from any point in a building to an unenclosed safe area, and includes the measures to maintain those routes. The number and capability of people present will influence the assessment of the escape routes. The escape routes must be sufficient to enable the maximum number of people likely to use the premises at any time to safely escape.

231. Escape must also be considered from external areas like enclosed yards and from within perimeter fences provided for security purposes at outdoor events.

232. Means of escape should be provided both in terms of the number and capacity of escape routes and in terms of their protection from fire and smoke. When determining whether premises have adequate escape routes, a number of interdependent factors should be considered, including:

- the characteristic, number and location of people in the premises;
- the construction of the premises and the potential for fire and smoke spread;
- the fire compartmentation of the premises; and
- the time it will take people to escape.

233. The provision of means of escape and the fire protection given to an escape route will vary depending on the level of risk within the premises and the occupants. In some premises a single escape route will be acceptable, in other cases there should be at least two exits and independent escape routes from each storey of the premises.

234. In public access premises, persons will generally use routes with which they are familiar therefore there is advantage if escape routes are aligned with the general access and circulation routes.

Escape Routes

235. A room containing more than 60 persons should have at least two exits, a room with more than 600 should have at least three exits. But a greater number of exits may be necessary, this will depend on the actual numbers resorting and travel distance to the nearest room exit.

236. Even where the number of persons is low, at least two escape routes may be necessary from:

- a storey over 7.5 m in height;
- a basement used by the public (other than only toilets); or
- a basement more than 4.5 m deep.

237. In an auditorium that has more than one exit, at least one exit should be provided not less than two thirds of the distance from the stage or screen to the back of the room.

238. The direction of travel of alternative escape routes from any point within a room should:

- diverge at an angle of at least 45 ^{o}; or
- after a single direction of escape (limit as shown in table 7) then diverge at an angle of at least 45 ^{o} plus 2½ ^{o} for every metre travelled in the single direction.

239. Escape routes should be via a direct and unobstructed route. Once occupants have left a room they should ideally not have to pass through another room to reach a protected escape route or a place of safety. In existing low risk situations, escape may be from an inner room through an outer room. (See paragraph 258).

240. Where travel distance is to a compartment that does not itself contain either a final exit or direct access to a protected stair, then the next adjoining compartments should contain either a final exit or direct access to a protected stair.

241. An escape route should not be by way of:

- a lift (unless specifically designed for evacuation);
- an escalator;
- turnstiles, other than those with breakout facility opening in the direction of escape;
- a fire shutter which closes automatically in the event of fire;
- a manual sliding door, other than one to which the general public does not have access;
- revolving or automatic doors unless arranged to fail safely in the outward opening position in accordance with BS 7036; or
- a window.

242. Where children are at a different location in a building from adults, then the adults may desire to go to the child facility if the fire alarm sounds. This could involve adults travelling against the normal direction of escape and this needs to be considered. Where practicable, relocating the child facility may avoid this.

243. A clear headroom for escape routes and circulation areas is at least 2 m, and not less than 1.9 m in a doorway.

244. The width and geometry of escape routes should be sufficient to facilitate the evacuation method used and for the number of occupants to escape. From a room or storey with not more than 100 persons, an escape route width not less than 1000 mm. Where in excess of 100 persons, 1100 mm may be adequate. At least 1200 mm may be necessary where the room or storey is accessible to wheelchair users.

245. An escape route will not normally narrow in the direction of escape but at doorways the width can generally be 150 mm less than the escape route. Where the number of people using the escape route is not more than 225, the door width may be at least 850 mm, and may be 800 mm where the number of people is not more than 100.

246. To assist with evacuation, a door across an escape route should open in the direction of escape where there are 60 persons or more (or in factories 10 persons), or where occupants may need to exit quickly, or the door is a final exit. In other situations it is good practice for a door to be outward opening if practicable.

247. The area outside final exit doors should have suitable underfoot conditions for persons evacuating and pathways so that persons can move away from the building. Where escape is across grass or open ground, including from tented structures and open air locations, the surface should be capable of withstanding the traffic volumes, taking account of weather conditions and avoiding the potential for trips and falls.

248. In multi-occupied buildings, escape routes from individual occupancies should normally be independent of parts in separate occupancy; people should not have to go through another occupier's premises to escape as the route may be secured or otherwise unavailable.

249. In storage areas, the width of gangways between fixed obstructions such as racking or shelving may not be less than 530 mm. In bulk storage of spirituous liquor, gangways may not be less than 400 mm.

250. In part of a building with fixed seating consideration should be given to seating arrangements. Gangway widths and seatway lengths should allow ease of escape for the numbers present. A gangway (or exit door) should be provided at each end of a row of more than 12 fixed seats.

Shopping Centres

251. There will normally be at least 2 directions of travel from every part of a mall and from every mall-level shop without passing through a space in single occupation. Each shop with a frontage to the mall, other than small units, will normally have an alternative escape route that is not through the mall.

252. The aggregate unobstructed width, in mm, of all escape routes from a mall should be at least 2.65 multiplied by the occupancy capacity of the entire centre.

253. Each exit from a mall should be at least 1.8 m wide. Where occupancy levels will be higher than in other parts of the shopping centre, a wider exit would be appropriate in those parts. The entrances used by the public should have the greatest escape route width as evacuees will tend to use the egress routes with which they are familiar.

254. Where a service corridor is used for means of escape from a shop, the width would be based on the total number of persons that evacuate into the corridor from the largest shop plus an additional width of 1 m to allow for goods in transit.

Travel Distance

255. There should be a limit on the distance that persons have to travel to reach a place of reasonable safety. Travel distance is the distance measured along the actual route of escape (having regard to the layout) from any point within a storey to the nearest door giving direct access to either another compartment; a protected stair; or to a final exit. From a mall-level storey of a shop in an enclosed shopping centre, travel distance may be measured to the mall. Travel distance benchmarks are given in Table 7.

Table 7 **-** Travel distance benchmarks

Use	**Single direction distance (m)**	**Maximum distance* (m)**
Primarily for persons who need more time to evacuate, such as disabled people, or people with learning difficulties Boiler room	9	18
Public-access buildings Education and day care High hazard storage	15	32
Non public-access buildings Enclosed car park	18	45
Within a protected escape route	100	unlimited

* this includes the single direction distance

256. Travel distance benchmarks for occupants of buildings will not be appropriate for some large or underground travel facilities. Greater distances may be acceptable in railway stations with a large dispersal volume for smoke and heat from a fire, and in underground facilities where combustible materials have been reduced to a point where there is little to burn.

257. A single direction of escape is travel before there is the choice of escape routes. See **Figures 3, 4** and **5**. A single direction of escape may involve persons moving towards or past a fire, if the fire occurs between the occupant and the choice of escape routes.

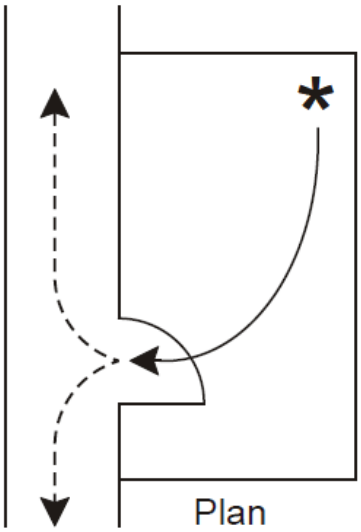


Figure 3 Single direction of escape within a room before a choice of escape routes becomes available

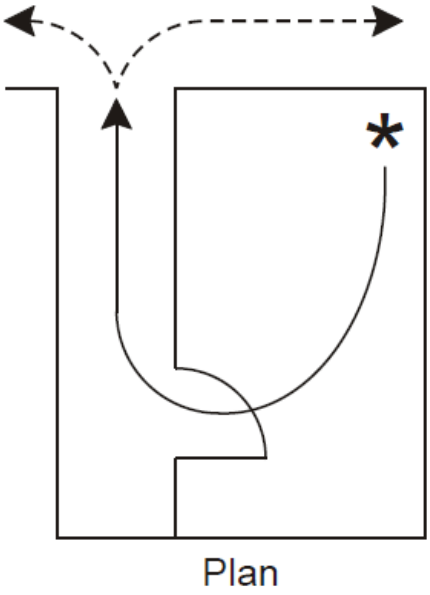


Figure 4 Single direction of escape out of room and along a corridor before a choice of escape routes becomes available

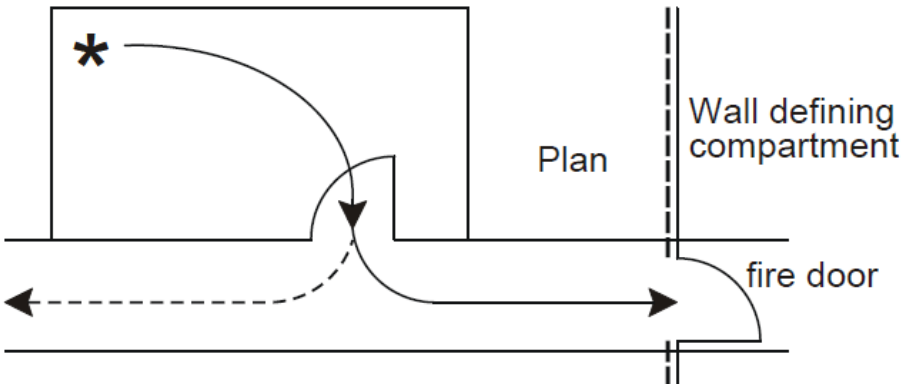
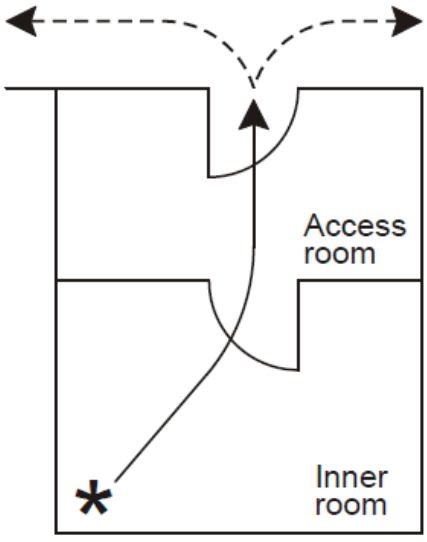


Figure 5 Single direction of escape within a room before a choice of escape routes, one of which goes through a fire door into another compartment

Inner Rooms

258. An inner room is a room where access to a circulation area can only be achieved by passing through an access room (see Figure 6). A fire could develop unnoticed in the access room preventing the occupants of the inner room escaping. The risk to persons in the inner room will be less if the access room contains limited combustibles and ignition sources; and travel distance from any point in the inner room to the exit from the outer room are short. A smoke alarm or automatic smoke detector in the access room may give an early warning and may be appropriate where the risk of fire occurring in the access room is high and cannot be reduced.



Plan

Figure 6 Single direction of escape out of an inner room and through an access room before a choice of escape routes becomes available

Stairs

Escape stairs

259. To protect escape routes from fire, the normal standard for escape stairs is for stairs to be enclosed within a fire-resisting enclosure (creating a protected zone) such that the enclosing structure between the stair and the rest of the building has fire-resistance and any door in the enclosing structure is a self-closing fire door. Each escape stair should have its own independent final exit.

260. However, an enclosure is not normally necessary for:

- an escape stair within a single storey where the difference in level is not more than 1.8 m;
- an external escape stair with a total rise of not more than 1.6 m; or
- an escape stair from a gallery where the gallery has:
  - an occupancy capacity of not more than 60 or;
  - an occupancy capacity of 61 to 100 and at least one route of escape is by way of a protected zone, an external escape stair, or another compartment.

261. If the enclosure has an external wall that projects beyond the face of a building or is set. back in a recess, the route may be vulnerable should fire break through an adjacent window, door, or other opening. Radiated heat or flames from the fire may impede escaping occupants. Therefore an external wall of a building which makes an angle less than 135 ^{o} with the external wall of the enclosure might need to have fire-resistance.

262. The width of an escape stair should be at least the width of any escape route giving access to it. A check should be made that the width of an existing escape stair is suitable for the persons who would use it and the method of evacuation. Where there is simultaneous evacuation, the number and capacity of stairs serving a building needs to be sufficient for the number of persons to allow the occupants of all storeys to evacuate at the same time.

263. Where part of a building has only one escape route by way of an escape stair, if access to the escape stair is by way of a protected lobby, this will provide an additional barrier to fire and may afford people additional time to escape. A protected lobby is where there are two self-closing fire doors between the adjoining accommodation and the stair.

264. Access by way of a protected lobby is also relevant to a storey at a height of more than 18 m.

265. Where an escape stair also serves a basement storey, a self-closing fire door at ground floor level separating the basement stair enclosure from the stair enclosure serving the rest of the building will provide improved protection to the means of escape from any fire that may start in the basement.

266. Ideally, an escape stair (including landings) and the floor of a protected lobby will be non-combustible. Where an existing escape stair is combustible, consider the potential for the stair to be directly affected by fire, such as a fire occurring in an under-stair cupboard, and the possibility of lining the underside of the stair with non-combustible material.

267. A small room, reception, cupboard or toilet may be sited within the enclosure of an escape stair if the fire risk is considered low and all other parts of the building served by the escape stair have at least one other escape route.

268. The evacuation speed of people with a mobility disability can be slow and there may be a space within the protected stair so that they can wait temporarily until it is safe to use the stair - a space capable of accommodating a wheelchair and measuring not less than 700 mm x 1200 mm. These spaces should not be used for storage. Modern buildings may have an emergency voice communication system in the temporary waiting space to assist the escape process and reduce the anxiety of occupants making use of the space.

External stairs

269. An external escape stair may present problems for persons evacuating a building because people can feel less confident using an unenclosed stair at a height. For this reason, an external escape stair may only be suitable where the topmost storey height is not more than 7.5 m; and the stair is used only by those who can safely use it. Appropriate weather protection may be necessary to enable the stair to be used in all weather conditions.

270. An external escape stair should lead directly to a safe area beyond the premises and should be non-combustible.

271. An external escape stair may be unusable if fire occurs in the building. External stairs with a rise of more than 1.6 m may need to be protected against fire from within the building with at least 30 minutes fire-resistance.

Escape across Flat Roofs

272. Where the occupants of premises can safely use it, an escape route may be across a flat roof, and be an alternative additional provision to another escape route in the premises.

273. The following criteria apply to an escape route across a flat roof:

- be clearly defined, illuminated and guarded with barriers not less than 1.1 m in height;
- have a slip free surface;
- have fire-resistance for a distance of 3 m on either side of the route; and/or
- have no unprotected openings from adjacent structures, within 2 m.

Door Fastening

274. It is important that doors necessary for escape be easily openable while the premises are occupied. Where a door across an escape route has to be secured against entry, it should be fitted with a fastening which is readily operated without a key, from the side approached by people making their escape. Where a door is operated by a code, combination, card, biometric data or similar means, it should be capable of being manually overridden from the side approached by people making their escape. The potential for persons having to retrace their route during an evacuation to use an alternative escape route, should also be considered.

275. Push pad devices (to BS EN 179) are suitable securing devices for outward opening final exit doors where occupants can be expected to be familiar with the devices. In other cases, panic exit devices operated by a horizontal bar (to BS EN 1125) are suitable.

276. When premises are being used out of normal hours, including use by community or outside groups, or by security or cleaning staff, in addition to arranging and controlling access, sufficient escape routes and exits require to be kept available for the duration of the occupation.

<u>Electrically powered locks</u>

277. Electrically powered locks can be operated by electromagnetic or electromechanical means.

278. Electrically powered locks should not be installed on a door which provides the only route of escape for persons, or which serves a room or storey with more than 60 persons, or a door on a fire-fighting shaft.

279. Electrically powered locks should return to the unlocked position:

- On operation of the fire warning system;
- On loss of power; and
- On actuation of a manual door release unit positioned at the door on the side approached by people making their escape (where the door provides escape in either direction, a unit should be installed on both sides).

280. Access control systems may be in the form of revolving doors, sliding doors, ticket barriers, or entrance gates. Where there is no alternative adjacent means of escape, access control systems across the escape route should in the event of a fire, power failure, or malfunction, continue to provide a means of escape without reducing the width by automatically opening and remaining open; or being readily pushed to the outward open position by occupants in an emergency.

281. In railway stations, fences and automatic barriers are often used for revenue protection purposes. The potential impact of these on escape needs to be assessed and the consequences considered in respect of congestion, reduction in escape width and emergency opening arrangements.

282. BS 7273: Part 4 provides detailed guidance on the electrical control arrangements for the fail-safe release of powered locks.

Automatic opening doors

283. An internal door may be linked to a motion sensor or other device so that the door opens automatically to facilitate movement of occupants. Some devices can be triggered by smoke movement which may cause a door to open precisely at the time when it should be closed as a barrier to fire and smoke. These doors should be linked to the fire warning system so that the automatic opening function is disabled if the fire warning system is triggered (but still permitting the door to be manually opened). If the door is a fire door, the opening mechanism should not reduce the fire-resistance of the door. When the automatic opening function is disabled following activation of the fire warning system, the fire door's normal self-closing function should continue to operate.

284. Automatic opening doors should not be placed across escape routes unless they are designed in accordance with BS 7036 and are either:

- arranged to fail safely to outward opening from any position of opening; or
- are provided with a monitored fail-safe system for opening the door from any position in the event of mains supply failure and also in the event of failure of the opening sensing device; and open automatically from any position in the event of operation of the fire alarm in the fire alarm zone within which the door is situated.

Powered sliding doors

285. Powered sliding doors often open in response to a motion sensor. Such a door across an escape route, should be fail-safe and should open:

- on operation of the fire warning system; where installed;
- on loss of power; and
- on activation of a manual door release unit positioned at the door on the side approached by people making their escape (where the door provides escape in either direction, a unit should be installed on both sides).

286. BS 7273: Part 4 contains detailed guidance on the electrical control arrangements for fail-safe operation of powered sliding doors.

Lighting

287. Escape routes should be provided with lighting to allow persons to safely use these routes in the event of a fire occurring or in the event of failure of the normal lighting power supply.

Escape route lighting

288. Premises should be provided with lighting in the escape routes to the extent necessary to ensure that in the event of an outbreak of fire, illumination is provided to assist in escape and to aid staff in implementing the emergency fire action plan.

289. If there are escape routes that are not permanently illuminated, such as external stairs, then a marked switch or some other means of switching on the lighting, such as a motion sensor, should be provided.

Emergency escape lighting

290. Emergency lighting is lighting designed to operate or remain in operation automatically in the event of a local or general power failure. The size and type of the premises and the risk to the occupants will determine whether there is a need for emergency escape lighting.

291. Emergency lighting can be stand-alone dedicated units or incorporated into normal light fittings. Power supplies can be rechargeable batteries integral to each unit or a central battery bank. Single ‘stand-alone’ emergency lighting units may be sufficient in some premises and these can sometimes be combined with exit or directional exit signs, though the level of general illumination should not be significantly reduced by the sign.

292. Emergency lighting is described as ‘maintained’ if it is permanently illuminated, and ‘non-maintained’ when it only operates if the normal lighting fails.

293. In small premises, in which the escape routes are simple and straightforward, borrowed light may be relied upon to illuminate escape routes.

294. A system of automatic emergency lighting is likely to be needed in large complex premises, particularly in those with extensive occupied basements, sub-surface railway stations or where there are significant numbers of people. If some escape routes are internal and without windows, then some form of emergency lighting may be required. Emergency lighting may be necessary in a room with more than 60 occupants and escape routes serving such a room and escape routes in public access buildings which have two storey exits.

295. A maintained system should be installed in premises such as cinemas, theatres or nightclubs where the normal lighting can be dimmed or reduced below the levels required for escape route identification and illumination while the premises are occupied.

296. An emergency lighting system provided for escape purposes may be used to illuminate the following:

- internal and external escape routes, exit doors and escape route signs;
- intersections of corridors;
- staircases so that each flight receives adequate light;
- changes in floor level;
- fire-fighting equipment;
- fire alarm call points;
- signs; and
- equipment that needs to be shut down in an emergency.

297. In the case of a building with smoke control, the units should be below the smoke reservoir so that it is not rendered ineffective by smoke filled reservoirs.

298. British standards relevant to emergency lighting systems are BS 5266: Part 1 and BS EN 1838.

Signs and Notices

299. In small simple premises where the locations of escape routes and fire-fighting equipment are readily apparent then fire signs may not be necessary.

300. Escape route signs are used to indicate escape routes not in normal use and are only necessary where there might otherwise be confusion regarding the route to follow in the event of fire. The following criteria apply to escape route signs:

- they should provide enough information to enable people to identify escape routes;
- where the location of an exit is not obvious, signs with directional arrows may be provided along the route;
- escape route and exit signs should not be fixed to doors as they may not be visible if the door is open;
- signs mounted above doors should be at a height of between 2 m and 2.5 m above the floor; and
- signs on walls should be mounted between 1.7 m and 2 m above the floor.

301. The legibility of an escape sign is determined by the size of the sign, the level of illumination and the distance over which it is viewed. Signs should be in pictogram form. The pictogram can be supplemented by text if necessary to make the sign easily understood. Guidance on the use of escape route signs is available in BS 5499: Part 10.

302. In public access buildings, persons may be unfamiliar with the location of alternative exits and signs identifying exit location are important. In shops, the presence of advertising and customer information or shop dressing needs to be arranged so that it does not distract from, or obscure escape signs. In storage premises, escape signs should not be obscured by stored goods. In places of entertainment and assembly, advertising, information or other display material should be arranged so that it does not distract attention from, or obscure escape signs.

303. Signs to indicate the location of non-automatic fire safety equipment may be necessary if there is any doubt about its location, such as fire extinguishers that are kept in cabinets or in recesses. Other signs may also be necessary such as:

- ‘Fire door keep shut’ or ‘Fire door keep locked shut’ on fire doors;
- ‘Automatic fire door – keep clear’;
- how to operate the securing devices on doors; and
- location of sprinkler stop valve.

304. New safety signs should comply with BS EN ISO 7010.

305. Notices are used to provide instructions on how to use any fire safety equipment and the actions to be taken in the event of fire. Notices containing details of the emergency fire action plan specific to the premises should be permanently displayed in appropriate positions throughout the building. A distinction may be required between notices that are designed for visitors as opposed to those for staff.

306. In small premises where there is a limited number of people and there is no fire warning system, notices may not be necessary.

307. As well as positioning fire instruction notices on escape routes adjacent to fire alarm call points, they should be located where staff frequently assemble in the premises.

Chapter 8: FIRE DETECTION AND WARNING

308. A fire warning system allows occupants to be alerted and the emergency fire action plan to be implemented. In some small premises, a fire may be obvious soon after it starts. In such cases and where travel distances are short, a shouted warning of ‘fire’ or a simple manually operated device that can be heard throughout when operated from any single point within the building, may be all that is needed.

309. In larger premises, particularly those with more than one floor or that are multi occupied, where a shout or warning sounded from a single point will not be heard throughout, an electrical fire alarm system incorporating sounders and manually operated call points is likely to be required. In large or complex premises, particularly those accommodating large numbers of people, a more sophisticated fire alarm system may be required.

310. Information on maintenance and testing of fire warning systems is in **Chapter 4**. Guidance on the design, installation and maintenance of fire detection and warning systems is contained in BS 5839: Part 1.

System Type

311. Where an electrical fire alarm system is considered necessary, a fire warning system in accordance with the guidance in BS 5839: Part 1 for a category M system is likely to be appropriate for many premises. A category M system is operated by manual call points only.

312. Where automatic detection of fire is necessary for life safety, the system will be designated as a category L system, within which there are subdivisions L1 to L5.

- L5 is a system designed to achieve a specific fire safety objective;
- L4 is a system which provides warning of smoke within escape routes;
- L3 is a system designed to give a warning before escape routes are impassable;
- L2 is a system designed to give warning before escape routes are impassable but with enhanced coverage in specified areas; and
- L1 is a system installed throughout all areas of the building.

313. In areas where an explosive atmosphere could result from the presence of flammable gases, vapours, mists, or dusts, an electrical fire alarm system will require the same consideration as would other electrical equipment in respect of protection to prevent the potential for ignition.

314. An enclosed shopping centre will have a category L1 automatic fire detection and alarm system with a staff alarm capability. The system should activate upon the operation of the sprinkler system, a manual call point or automatic fire detection. The alert is by voice alarm system, however individual shops may have conventional sounders.

Call Points

315. Manual call points, often known as ‘break-glass’ call points, enable a person who discovers a fire to operate the fire warning system and immediately raise the alarm to warn other people in the premises. Manual call points are normally positioned at exit doors. They should be conspicuous and positioned no higher than 1.4 m from the floor, but may be reduced to make accessible to wheelchair users. Building occupants should not have to travel more than 45 m to reach the nearest call point. Where there is particularly high hazard equipment or activity, it may be desirable to have a call point located close by to allow early warning to be given.

316. A hinged cover on the call point can be a deterrent where there is the potential for malicious operation or accidental damage. Hinged covers are particularly recommended for the public access parts of buildings.

317. In some premises, such as assembly or entertainment premises where there is high potential for malicious operation, call points may be sited in positions readily accessible only to staff, such as behind bar counters or in box offices, if these positions are staffed at all material times.

318. Conventionally sited call points that operate a general alarm are not desirable in supervised transport premises due to the potential for malicious or accidental operation which may promote unnecessary evacuation. Alternative arrangements will be appropriate.

Automatic Fire Detection

319. Existing fire warning systems may have automatic fire detection incorporated for the purpose of property protection, or speculatively because the end use of the building was unknown, or just to have a very high specification. However, the inclusion of automatic fire detection in a fire warning system is only required under fire safety law when it is needed to safeguard life on the basis of risk. Examples of the use of automatic fire detection for life safety in non-residential premises are:

- to ensure an early warning of fire in situations where a fire could develop and affect escape routes before a building could be evacuated;
- to operate smoke control systems or door release devices; and
- to ensure early warning of fire where this is necessary to allow the use of phased evacuation.

320. Where the layout of the premises is such that a fire could develop to the extent that escape routes could be affected before the fire is discovered, it may be necessary for the fire alarm system to incorporate automatic fire detectors to ensure an early warning. This may be the case where there are unoccupied areas or circulation areas in multi-occupied buildings or where people work alone and might not see a fire; but the need for the provision of automatic fire detection will be influenced by the means of escape available.

321. Automatic fire detection may be necessary in the rooms and napping areas which accommodate young children in childcare premises, to ensure an early warning of fire. This will be influenced by the level of adult supervision and the layout of the premises.

322. The choice of automatic fire detector type depends on the nature of the hazard and the balance between the speed of system response and the need to avoid false alarms. The common types of automatic fire detector are:

- Heat detectors which operate when a fixed temperature is reached (and may also respond to abnormal rate of rise of temperature). Heat detectors have a good performance in respect of false alarms but are not appropriate where the detection of smoke is required (such as in escape routes);
- Smoke detectors which detect the presence of smoke (either ionisation or optical type). They give a speedier response to most fires than heat detectors but have greater potential to generate false alarms. (Smoke detectors within corridors and stairs should be the optical type);
- Combustion gas detectors which respond to the gases produced in a fire such as carbon monoxide. They can be sensitive to smouldering fires, respond to many fires faster than heat detectors and have a good false alarm performance in the presence of dust, steam and cigarette smoke; and
- Multi-sensor detectors contain a combination of heat, smoke or combustion gas detection. These sensors enhance system performance and some types have a low potential for false alarm actuations.

Warning

323. Sounders are provided to alert building occupants. The type of warning signal and sound level should be appropriate for the premises, the characteristic of the occupants, the fire action plan, and staffing arrangements. A coded staff alert may be desirable in some circumstances to initially warn only staff.

324. It may be necessary to provide tactile and/or visual alarms for staff in high noise level areas or where there are occupants or staff with hearing impairment to the extent that the sounders cannot be perceived.

325. As an alternative to conventional sounders, a voice-alarm facility that provides an automatically broadcast verbal warning of fire, may be suitable for some premises. Voice alarm systems can provide benefits in terms of reduced response time and improved information dissemination. A new voice alarm system should comply with the guidance in BS 5839: Part 8. In considering the areas to be provided with a voice alarm system, the desirability of providing occupants with information regarding the fire and factors such as background noise levels need to be taken into account. The wording of the message on a voice alarm system needs to be clear and precise.

326. In certain types of premises, for example sports grounds/stadia, theatres, cinemas or nightclubs, a conventional audible warning via a fire alarm sounder may provide insufficient information for the patrons to take appropriate action. A fire warning that initially alerts staff members only, by means of lights, a pager or another form of audible or coded alarm at permanently staffed points in the premises may be appropriate. In the case of major sports grounds and stadia, the indication of the fire warning and its location should be given to a central control point.

327. Areas of buildings to which only staff have access could have a conventional audible warning of fire provided, if such an alarm cannot be heard within public areas.

328. The provision of a combined public address/voice alarm system is appropriate for some transport premises, and can allow the use of coded messages for staff investigation where this is part of the pre-planned response to activation of the fire alarm.

System Information

329. A control and indicating panel provides facility for indication of fire or fault signals and manual controls such as silencing and resetting. Where a control and indicating panel is installed, it should be sited at a location which is appropriate both for staff and for the arriving Fire and Rescue Service.

330. The provision of a suitable fire detection and warning system should be accompanied by suitable staff training so that staff know how to operate the system and how to respond to system operation. A schematic plan should be displayed adjacent to the control panel to allow staff to quickly identify and locate the source of an activation. If the fire warning system has detection zones, these zones should be shown on a zone plan in a simple and unambiguous way.

331. The evacuation strategy for premises may require the source of activation to be quickly identifiable. The building should be divided into detection zones so that the activation can be located quickly. The allocation of detection zones needs to take into account the layout of the building and should facilitate the emergency fire action plan. Detection zoning should comply with the recommendation in BS 5839-1, and should not be determined purely for the convenience of the system installer.

332. An addressable fire warning system is one where individual detectors and call points can be identified at the control and indicating equipment. Addressable systems are of great advantage in some premises as they reduce the time taken to identify the location of a fire. Where an addressable system is installed, zone indication is also necessary.

333. Certain fire safety measures are designed so that they operate when the fire warning system operates; examples are:

- automatic release of door hold-open devices;
- automatic closure of self-closing doors which are fitted with swing free arms;
- automatic opening facility disabled on swing doors with automatic opening;
- electronically powered locks on doors returning to the unlocked position; and
- automatic opening of some exit doors.

334. In entertainment and assembly premises, where the sound pressure level of amplified music exceeds 80 dB(A) then the music should be muted automatically when the fire alarm signal is given.

335. If an automatic life safety fire suppression system is installed, the fire warning should activate if the suppression system operates.

336. In the case of enclosed shopping centres, on the operation of the fire alarm:

- unless a different strategy in a fire applies, escalators would come to a controlled halt and lifts would return to the exit level;
- amplified music systems within the mall or shops are silenced; and
- subject to the pre-determined delay, shutdown of air-moving and other systems in the relevant smoke reservoir.

Remote Monitoring

337. With remote monitoring, the activation of the fire warning system causes a signal to be transmitted automatically to a remote alarm receiving centre (ARC). On receipt of a signal, the ARC then calls the Fire and Rescue Service.

338. There are standards and third party certification schemes for ARCs. Dutyholders with a system connected to an ARC may wish to assure themselves about the quality of their own arrangement.

Reducing False Alarms

339. False alarms from automatic fire detectors or manual call point activation are a major problem causing disruption to the running of premises and many unwanted calls to the Fire and Rescue Service. If frequent false alarms occur in the premises, members of staff may become complacent and may not respond correctly to a warning in the event of a real fire.

340. A record log of system activations should be kept. Each false alarm should be investigated to try to establish the cause. Remedial action may be needed, such as re-positioning a detector head or changing a detector to a different type. A fire warning system should not be disabled: if it is posing a problem, specialist advice should be sought from a competent contractor.

341. Steps can be taken to discourage inappropriate or accidental call point use such as the provision of a protective hinged cover on the call point, with or without a tamper alarm. In cases where there is the potential for objects to collide with a call point, then side impact protection should be provided.

342. Where a call point is sited close to a green box or button for door control, the door control feature should be clearly signed, to avoid unintentional activation of the fire alarm.

343. Where a fire warning system is connected to an alarm receiving centre, robust arrangements need to be in place to take the system off-line during tests or for notification of the ARC.

Chapter 9: MEANS FOR FIGHTING FIRE

344. A small fire tackled with fire-fighting equipment in the early stages may be prevented from developing into a fire of life-threatening proportions. Fire-fighting equipment can fall into one of two categories; either (a) it is designed for use by persons, such as portable fire extinguishers or (b) it is a fixed installation, such as a sprinkler system, which comes into operation automatically in the event of fire.

Automatic Life Safety Fire Suppression

345. An automatic life safety fire suppression system operates automatically on detection of an outbreak of fire within the building. In the case of a conventional sprinkler system, water is discharged from the individual head which has detected heat from the fire; all other discharge heads remain closed unless similarly affected by heat. An automatic life safety fire suppression system can be effective in controlling a fire and limiting fire growth.

346. Part 3 of the 2005 Act covers life safety. Some suppression systems will have been provided to protect property. Some schools have sprinkler systems installed for the protection of property and assets as opposed to life safety.

347. Where buildings are fitted with a smoke and heat exhaust ventilation system, sprinklers are usually installed to restrict fire size. Sprinklers may also have been fitted where there is a large compartment size.

348. Fire suppression should be appropriate to the occupancy and should be determined on the basis of risk. Design and installation rules for automatic life safety sprinkler system are contained in BS EN 12845 or LPC Rules. Water mist systems are bespoke systems designed on the basis of established test performance. Many suppression systems are third party certificated which helps to assure their quality.

349. Other suppression systems may be used for high hazard industrial situations such as foam installations and gas flooding systems (total flooding or local application). Information on the systems available is contained in BS 5306: Part 0.

350. In storage areas, there should be appropriate clearance between the storage and sprinkler heads so that there is no interference with sprinkler water distribution.

Fire-Fighting Equipment for Use by Persons

351. Portable fire-fighting equipment may be provided for use by persons. There are third party certification schemes for fire-fighting equipment; this can give some assurance of quality.

352. The number of fire extinguishers provided will depend on the circumstances within and the size of individual premises. Portable extinguishers should be simple to operate, readily accessible, within the handling capabilities of staff and be suitable for the classes of fire anticipated (see Table 8). Extinguishers are described by extinguishing capacity. They are marked with a letter and a number: the letter denotes the class of fire, the number denotes the fire size extinguishing capability. An extinguisher could for example have a rating such as ‘13A’ or ‘55B’.

353. Information on the selection and installation of fire extinguishers is contained in BS 5306: Part 8. A guide to the level of provision of class A extinguishers is obtained by multiplying the floor area of a storey by 0.065. For example, a floor area of 400 m^2 would have a rating of 26A (400 x 0.065 = 26) which is the total value of class A extinguishers and can be achieved by combinations of extinguishers with different ratings to achieve the total value. Where there are other classes of fire, appropriate extinguishers for these may be necessary. In small premises, having one or two portable fire extinguishers of an appropriate type and readily available for use may be all that is necessary.

354. Fire extinguishers are positioned on escape routes, close to room or storey exits, final exits from the building or, if necessary, adjacent to hazards. They may be placed on a stand or hung on a wall at a convenient height so that they can be easily lifted off. Generally no one should have to travel more than 30 m to reach a fire extinguisher. It is good practice to group extinguishers together in fire points at a similar position on each floor.

355. Where there is high potential for malicious operation, consideration may be given to siting extinguishers in areas under staff control.

356. While permanent hose reels can provide an effective fire-fighting facility when used by trained personnel, there are disadvantages. When deployed, a hose reel may prevent doors from fully closing causing the spread of smoke, and the hose may pose an obstacle to the escape of occupants.

357. A fire blanket may be appropriate. It may be used to smother a small fire involving cooking oil or fat. Where a kitchen provides meals on a scale larger than a normal domestic household, a heavy duty fire blanket may be appropriate.

Table 8 - Extinguisher types

Water Extinguisher · Suitable for Class A fires (fires involving solid materials such as wood, paper or textiles) but not suitable for use on live electrical equipment because water is a conductor of electricity.	*Red body*
Water Extinguisher with Additives · Suitable for Class A fires. Some also suitable for Class B fires (fires involving flammable liquids such as petrol, diesel or oils) if so indicated on the extinguisher.	*Red body*
Foam Extinguisher · Suitable for Class A or B fires and particularly suited to extinguishing liquid fires; · Should not be used on free-flowing liquid fires unless the operator has been specially trained; and · Not suitable for deep-fat fryers or chip pans.	*Red body with cream label/band*
Powder Extinguisher · Suitable for most classes of fire; · Can be used on fires involving electrical equipment but may damage the equipment; and · Since powder does not cool a fire appreciably, the fire may re-ignite.	*Red body with blue label/band*
Carbon Dioxide (CO2) Extinguisher · Suitable for Class B fires and particularly suitable for fires involving electrical equipment as it is a non-conductor; and · Since CO2 does not cool a fire appreciably, the fire may re-ignite.	*Red body with black label/band*
Wet Chemical Extinguisher · Suitable for Class F Fires (fires involving cooking oils such as in deep-fat fryers).	*Red with canary yellow label/band*

Chapter 10: FIRE AND RESCUE SERVICE FACILITIES

358. To comply with building regulations or other legislation, premises may have been provided with facilities, equipment and devices for use by, or protection of, fire-fighters. Fire safety law includes a duty requiring maintenance of such features. Some general information is included below. Current standards for some can be obtained from the Building Regulation Technical Handbook.

359. The Fire and Rescue Service should be notified of any changes affecting existing facilities for fire-fighters.

Fire and Rescue Service Access

360. Buildings may have been provided with facilities such as access roads and hard standing areas that allow Fire and Rescue Service vehicles to approach and park within a reasonable distance. Vehicle access to the building exterior may enable high reach appliances to be used, and enable pumping appliances to supply water and equipment for fire-fighting and rescue. **Table 9** shows access dimensions.

Table 9 Access route for Fire and Rescue Service vehicles

	High reach appliance	**Pumping appliance**
Minimum width of road between kerbs	3.7 m	3.7 m
Minimum width of gateways etc	3.5 m	3.5 m
Minimum clearance height	4 m	3.7 m
Minimum turning circle between kerbs	26 m	16.8 m
Minimum turning circle between walls	29 m	19.2 m
Minimum axle loading	14 tonnes	14 tonnes

Water Supply for Fire and Rescue Service Use

361. Fire-fighting operations often depend on a sufficient supply of water. External water hydrants provide a water supply for use by the Fire and Rescue Service. Where no adequate piped water supply is available, an alternative supply may have been provided such as a fixed water tank, or access to a spring, river, canal, loch or pond, with access for a Fire and Rescue Service pumping appliance.

Smoke Ventilation

362. Smoke ventilators or outlets may be provided for assisting Fire and Rescue Service personnel with smoke control and clearance. These may be located in basement storeys and stairs, and may be openable windows.

Fire-Fighting Shafts and Lifts

363. Fire-fighting shafts are provided in tall buildings to provide fire-fighters with a protected route from the point of building entry to the floor where the fire has occurred and to enable fire-fighting operations to commence. The stairway within the shaft is likely also to be used for normal movement through the building. Entry points from a stairway in a fire-fighting shaft to a floor will be via a protected lobby. Most fire-fighting shafts incorporate a fire-fighting lift which has a back-up electrical supply and car control override.

Dry and Wet Rising Fire Mains

364. The rising fire main is a facility mostly in medium and high rise buildings, for the Fire and Rescue Service. It consists of a pipe running up or through the building, an inlet box where fire-fighters can connect their hose; and outlet valves for the connection of a hose. A dry riser is empty and is charged with water by the Fire and Rescue Service; a wet riser is kept full of water from the mains water supply. Wet rising mains have a facility to allow the Fire and Rescue Service to supplement the water supply.

365. Issues to consider include:

- the approach to allow a Fire and Rescue Service vehicle close to the inlet box;
- prohibition of car parking in front of the inlet box;
- the inlet box door secured in a way that fire-fighters can readily open the door;
- the outlet valves secured in the closed position, usually with a leather strap and padlock, to prevent tampering; and
- the outlet valves being easily openable.

Information Arrangements for Fire-Fighters

366. In some buildings, there may be layout plans available for fire-fighters or information on the presence of particular hazards.

367. For certain premises where 25 tonnes or more of dangerous substances are used or stored, there is a requirement to give written notification to the Fire and Rescue Service and the Health and Safety Executive and to provide signs to give warning to fire-fighters. This is to comply with the Dangerous Substances (Notification and Marking of Sites) Regulations 1990. Even where dangerous substances are below the threshold, notifying the Fire and Rescue Service is good practice.

ANNEX

Pyrotechnics in Entertainment Premises

In January 2009, there was a fire in an Edinburgh nightclub which was caused when pyrotechnics used during a Hogmanay celebration ignited a suspended plastic net. There were no fatalities though some patrons were injured. This involved inappropriate selection of pyrotechnics. The events manager of the premises was prosecuted for non-compliance with the Fire (Scotland) Act 2005.

The use of outdoor pyrotechnics has been associated with major loss of life in fires in entertainment premises throughout the world. The following list shows premises where pyrotechnics have been reported as a cause of fire. Sometimes other factors have been contributory such as combustible sound-insulation and means of escape issues.

- Nightclub, Rhode Island, USA - February 2003 – 100 deaths
- Club, Buenos Aires, Argentina – December 2004 – 194 deaths
- Nightclub, Quito, Ecuador – April 2008 – 15 deaths
- Club, Bangkok, Thailand – January 2009 – 66 deaths
- Nightclub, Perm, Russia – December 2009 – 154 deaths
- Nightclub Brazil January 2013 – 242 deaths
- Nightclub Bucharest October 2015 – 64 deaths

British Standards British Standards Institution (www.bsi-global.com).

EN 179 Building hardware. Emergency exit devices operated by a lever handle or push pad. Requirements and test methods

EN 1125: Building hardware. Panic exit devices operated by a horizontal bar. Requirements and test methods

EN 1154: Building hardware. Controlled door closing devices. Requirements and test methods

EN 1155: Building hardware. Electrically powered hold open devices for swing doors. Requirements and test methods

EN 1634: Part 1: Fire-resistance tests for door, shutters and openable windows

EN 12845 Fixed firefighting systems: automatic sprinkler systems: design, installation and maintenance

EN ISO 7010 graphical symbols – safety colours and safety signs - registered safety signs

476: Part 22: Fire tests on building materials and structures. Methods for determination of the fire-resistance of non-loadbearing elements of construction

5266: Part 1: Emergency lighting. Code of practice for the emergency lighting of premises

5306: Part 0: Fire protection installations and equipment on premises. Guide for selection

5306: Part 8: Fire extinguishing installations and equipment on premises. Selection and installation of portable fire extinguishers. Code of practice

5499: Part 10: Guidance for the selection and use of safety signs and fire safety notices

5839: Part 1: Fire detection and fire alarm systems for buildings. Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises

5839: Part 3: Fire detection and alarm systems for buildings. Specification for automatic release mechanisms for certain fire protection equipment

5839: Part 8: Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning, and maintenance of voice alarm systems

5852: Methods of test for assessment of ignitability of upholstered seating by smouldering and flaming ignition sources

5867: Part 2: Fabrics for curtains drapes and window blinds. Flammability requirements. Specification

7036: Code of practice for safety at powered doors for pedestrian use

7273: Part 4: Code of practice for the operation of fire protection measures. Actuation of release mechanisms for doors

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

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