

The Building Regulations 2010

Fire safety

APPROVED DOCUMENT

B

Volume 2: Buildings other than dwellings

Requirement B1: Means of warning and escape

Requirement B2: Internal fire spreading (linings)

Requirement B3: Internal fire spread (structure)

Requirement B4: External fire spread

Requirement B5: Access and facilities for the fire service

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* This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No.2) Order 2009.

The approved documents

What is an approved document?

The Secretary of State has approved a series of documents that give practical guidance about how to meet the requirements of the Building Regulations 2010 for England. Approved documents give guidance on each of the technical parts of the regulations and on regulation 7 (see the back of this document).

Approved documents set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirements of the Building Regulations to which they refer. If you follow the guidance in an approved document, there will be a presumption of compliance with the requirements covered by the guidance. However, compliance is not guaranteed; for example, 'normal' guidance may not apply if the particular case is unusual in some way.

Note that there may be other ways to comply with the requirements – *there is no obligation to adopt any particular solution contained in an approved document*. If you prefer to meet a relevant requirement in some other way than described in an approved document, you should discuss this with the relevant building control body.

In addition to guidance, some approved documents include provisions that must be followed exactly, as required by regulations or where methods of test or calculation have been prescribed by the Secretary of State.

Each approved document relates only to the particular requirements of the Building Regulations that the document addresses. However, building work must also comply with any other applicable requirements of the Building Regulations.

How to use this approved document

This document uses the following conventions.

- a. **Text against a green background** is an extract from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations.
- b. **Key terms, printed in green**, are defined in Appendix A.
- c. References are made to appropriate standards or other documents, which can provide further useful guidance. When this approved document refers to a named standard or other reference document they have been clearly identified in the document. Standards are highlighted in bold throughout. The full name and version of the document referred to is listed in Appendix E (standards) or Appendix F (other documents). However, if the issuing body has revised or updated the listed version of the standard or document, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations.

NOTE: Standards and technical approvals may also address aspects of performance or matters that are not covered by the Building Regulations, or they may recommend higher standards than required by the Building Regulations.

Where you can get further help

If you do not understand the technical guidance or other information in this approved document or the additional detailed technical references to which it directs you, you can seek further help through a number of routes, some of which are listed below.

- a. *If you are the person undertaking the building work:* either from your local authority building control service or from an approved inspector.
- b. *If you are registered with a competent person scheme:* from the scheme operator.
- c. *If your query is highly technical:* from a specialist or an industry technical body for the relevant subject.

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The Building Regulations

The following is a high level summary of the Building Regulations relevant to most types of building work. Where there is any doubt you should consult the full text of the regulations, available at www.legislation.gov.uk.

Building work

Regulation 3 of the Building Regulations defines ‘building work’. Building work includes:

- a. the erection or extension of a building
- b. the provision or extension of a controlled service or fitting
- c. the material alteration of a building or a controlled service or fitting.

Regulation 4 states that building work should be carried out in such a way that, when work is complete:

- a. *For new buildings or work on a building that complied with the applicable requirements of the Building Regulations:* the building complies with the applicable requirements of the Building Regulations.
- b. *For work on an existing building that did not comply with the applicable requirements of the Building Regulations:*
 - i. the work itself must comply with the applicable requirements of the Building Regulations
 - ii. the building must be no more unsatisfactory in relation to the requirements than before the work was carried out.

Material change of use

Regulation 5 defines a ‘material change of use’ in which a building or part of a building that was previously used for one purpose will be used for another.

The Building Regulations set out requirements that must be met before a building can be used for a new purpose. To meet the requirements, the building may need to be upgraded in some way.

Materials and workmanship

In accordance with regulation 7, building work must be carried out in a workmanlike manner using adequate and proper materials. Guidance on materials and workmanship is given in Approved Document 7.

Energy efficiency requirements

Part 6 of the Building Regulations imposes additional specific requirements for energy efficiency.

If a building is extended or renovated, the energy efficiency of the existing building or part of it may need to be upgraded.

Notification of work

Most building work and material changes of use must be notified to a building control body unless one of the following applies.

- a. It is work that will be self-certified by a registered competent person or certified by a registered third party.
- b. It is work exempted from the need to notify by regulation 12(6A) of, or Schedule 4 to, the Building Regulations.

Responsibility for compliance

People who are responsible for building work (e.g. agent, designer, builder or installer) must ensure that the work complies with all applicable requirements of the Building Regulations. The building owner may also be responsible for ensuring that work complies with the Building Regulations. If building work does not comply with the Building Regulations, the building owner may be served with an enforcement notice.

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Section 0: Approved Document B: Fire safety – buildings other than dwellings

Summary

- 0.1** This approved document has been published in two volumes. Volume 1 deals solely with dwellings, including blocks of flats, while Volume 2 deals with all other types of building covered by the Building Regulations.

Arrangement of sections

- 0.2** Requirements B1–B5 of Schedule 1 to the Building Regulations are dealt with separately in one or more sections. Each requirement is shown at the start of the relevant sections.

- 0.3** The provisions in this document have the following aims:

Requirement B1: When there is a fire, ensure satisfactory means of:

- a. sounding an alarm
- b. escape for people.

Requirement B2: Inhibit the spread of fire over internal linings of buildings.

Requirement B3: The building must be built such that in the event of a fire:

- a. the premature collapse of the building is avoided
- b. sufficient fire separation is provided within buildings and between adjoining buildings
- c. automatic fire suppression is provided where necessary
- d. the restriction of unseen spread of fire and smoke in concealed spaces.

Requirement B4: Restrict:

- a. the potential for fire to spread over external walls and roofs
- b. the spread of fire from one building to another.

Requirement B5: Ensure both:

- a. satisfactory access for the fire service and its appliances
- b. facilities in buildings to help firefighters save the lives of people in and around buildings.

Regulation 38: Provide fire safety information to building owners.

- 0.4** Guidance is given on each aspect separately, though many are closely interlinked. The document should be considered as a whole package aimed at achieving fire safety. The relationship between different requirements should be recognised; a higher standard under one requirement may benefit one or more other requirements.

Appendices: Information common to more than one requirement of Part B

0.5 Guidance on matters that refer to more than one section of this document can be found in the following appendices.

Appendix A: Key terms

Appendix B: Performance of materials, products and structures

Appendix C: Fire doorsets

Appendix D: Methods of measurement

Appendix E: Standards referred to

Appendix F: Other documents referred to

Management of premises

0.6 The Building Regulations do not impose any requirements on the management of a **building**, but do assume that it will be properly managed.

Appropriate fire safety design considers the way in which a **building** will be managed. Any reliance on an unrealistic or unsustainable management regime cannot be considered to have met the requirements of the regulations.

Once the **building** is in use, the management regime should be maintained and a suitable risk assessment undertaken for any variation in that regime. Failure to take proper management responsibility may result in the prosecution of an employer, **building** owner or occupier under legislation such as the Regulatory Reform (Fire Safety) Order 2005.

Property protection

0.7 The Building Regulations are intended to ensure a reasonable standard of life safety in a fire. The protection of property, including the **building** itself, often requires additional measures. Insurers usually set higher standards before accepting the insurance risk.

Many insurers use the Fire Protection Association's (FPA) *Design Guide for the Fire Protection of Buildings* as a basis for providing guidance to the **building** designer on what they require.

Further information on the protection of property can be obtained from the FPA website: www.thefpa.co.uk

Guidance on property protection issues for **schools** is given in *Building Bulletin 100: Design for fire safety in schools* published by the Department for Education. This gives advice on assessing the financial and social risk of **school** fires. Where the risk is justified, *Building Bulletin 100* promotes the use of fire suppression or additional compartmentation.

Inclusive design

0.8 The fire safety aspects of the Building Regulations aim to achieve reasonable standards of health and safety for people in and around **buildings**.

People, regardless of disability, age or gender, should be able to access **buildings** and use their facilities. The fire safety measures incorporated into a **building** should take account of the needs of everyone who may access the **building**, both as visitors and as people who live or work in it. It is not appropriate, except in exceptional circumstances, to assume that certain groups of people will be excluded from a **building** because of its use.

The provisions in this approved document are considered to be of a reasonable standard for most **buildings**. However, some people's specific needs might not be addressed. In some situations, additional measures may be needed to accommodate these needs. This should be done on a case-by-case basis.

Alternative approaches

- 0.9** The fire safety requirements of the Building Regulations will probably be satisfied by following the relevant guidance in this approved document. However, approved documents provide guidance for some common **building** situations, and there may be alternative ways of complying with the requirements.

If other codes or guides are adopted, the relevant fire safety recommendations in that publication should be followed, rather than a mix of recommendations in the publication and provisions in the relevant sections of this approved document. However, in some circumstances it may be necessary to use one publication to supplement another.

Guidance documents intended specifically for assessing fire safety in existing **buildings** often include less onerous provisions than those set out in this approved document or in other standards for new **buildings**. As such, documents for assessing fire safety in existing **buildings** are unlikely to be appropriate for building work that is controlled by the regulations.

Buildings for industrial and commercial activities that present a special fire hazard, e.g. those that sell fuels, may require additional fire precautions to those in this approved document.

Health care premises

- 0.10** Health care premises and the patients who use them are diverse. Patients using the premises require different types of care to suit their specific needs. The choice of fire safety strategy depends on both of the following.

- a. How a **building** is designed, furnished, staffed and managed.
- b. The needs of the patients.

The Department of Health (DoH) guidance documents on fire precautions in health care **buildings**, *Firecode*, take account of the particular characteristics of these **buildings**. These documents may also be used for non-NHS health care premises. Part B of the Building Regulations is typically satisfied if the guidance in DoH Health Technical Memorandum (HTM) 05-02 is followed. For work to existing health care premises, the guidance in the appropriate section of the relevant *Firecode* should be followed.

Firecode contains managerial and other fire safety provisions that are outside the scope of the Building Regulations.

Unsupervised group homes

- 0.11** An unsupervised group home for not more than six mental health service users should be regarded as having a **purpose group** of either of the following.
- a. An existing house of one or two **storeys** for which the **means of escape** are provided in accordance with DoH HTM 88 should be regarded as a **purpose group 1(c) building**.
 - b. A new **building** may be more appropriately regarded as being in **purpose group 2(b)**.

Shopping complexes

0.12 Although the guidance in this document may be readily applied to individual shops, shopping complexes present different escape problems. The design of units within a shopping complex should be compatible with the fire strategy for the complex as a whole. A suitable approach is given in **BS 9999**.

Assembly buildings

0.13 When fixed seating limits the ability of people to escape, particular problems arise. This may occur at sports events and in theatres, lecture halls, conference centres, etc.

Guidance on fixed seating and other aspects of **means of escape** in assembly buildings is given in **BS 9999**. The relevant recommendations of that standard for **means of escape** in case of fire should be followed.

For buildings to which the Safety of Sports Grounds Act 1975 applies, the Sports Grounds Safety Authority's *Guide to Safety at Sports Grounds* should also be followed.

Schools

0.14 The design of fire safety in schools is covered by *Building Bulletin 100*. If the life safety guidance in *Building Bulletin 100* is followed, Part B of the Building Regulations will usually be satisfied.

Buildings containing one or more atria

0.15 A building with an atrium that passes through compartment floors may need special fire safety measures. Guidance is given in **BS 9999**. For shopping complexes, see also paragraph 0.12.

Fire safety engineering

0.16 Fire safety engineering might provide an alternative approach to fire safety. Fire safety engineering may be the only practical way to achieve a satisfactory standard of fire safety in both of the following:

- a. some large and complex buildings
- b. buildings that contain different uses, e.g. airport terminals.

Fire safety engineering may also be suitable for solving a problem with an aspect of the building design that otherwise follows the provisions in this document.

0.17 **BS 7974** and supporting published documents (PDs) provide a framework for and guidance on the design and assessment of fire safety measures in buildings.

0.18 Factors that should be taken into account include:

- a. the anticipated probability of a fire occurring
- b. the anticipated severity of a fire
- c. the ability of a structure to resist the spread of fire and smoke
- d. the danger of fire to people in and around the building.

0.19 A wide variety of measures might be considered and incorporated to a greater or lesser extent, as appropriate in the circumstances. These include:

- a. the adequacy of means to prevent fire
- b. early fire warning by an automatic detection and warning system

- c. the standard of **means of escape**
- d. the provision of smoke control
- e. control of the rate of growth of a fire
- f. structural robustness and the adequacy of the structure to resist the effects of a fire
- g. the degree of containment of fire
- h. fire separation between **buildings** or parts of **buildings**
- i. the standard of active measures for extinguishing or controlling fire
- j. facilities to assist the fire and rescue service
- k. the availability of powers to require staff training in fire safety and fire routines
- l. any continuing control under other legislation that could ensure continued maintenance of such systems
- m. management of the **building**.

0.20 It is possible to use quantitative techniques to evaluate risk and hazard. Some factors in the list of measures above can be given numerical values in some circumstances. The assumptions made when quantitative methods are used need to be assessed carefully.

Buildings of special architectural or historic interest

0.21 Where Part B applies to existing **buildings**, particularly **buildings** of special architectural or historic interest for which the guidance in this document might prove too restrictive, some variation of the provisions in this document may be appropriate. In such cases, it is appropriate to assess the hazard and risk in the particular case and consider a range of fire safety features in that context, some of which are dealt with in this document and some of which are not addressed in detail.

Purpose groups

0.22 **Building** uses are classified within different **purpose groups**, which represent different levels of hazard (see Table 0.1). A **purpose group** can apply to a whole **building** or to a **compartment** within the **building**, and should relate to the main use of the **building** or **compartment**.

0.23 Where a **building** or **compartment** has more than one use, it is appropriate to assign each different use to its own **purpose group** in the following situations.

- a. If the ancillary use is a **flat**.
- b. If both of the following apply.
 - i. The **building** or **compartment** has an area of more than 280m².
 - ii. The ancillary use relates to an area that is more than one-fifth of the total floor area of the **building** or **compartment**.
- c. In **buildings** or **compartments** in **purpose group** 4, if the ancillary use is storage and both of the following apply.
 - i. The **building** or **compartment** has an area of more than 280m².
 - ii. The storage area comprises more than one-third of the total floor area of the **building** or **compartment**.

0.24 Where there are multiple main uses that are not ancillary to one another (for example, shops with independent offices above), each use should be assigned to a **purpose group** in its own right.

0.25 Where a complex mix of uses exists, the risk that one use may have on another should be considered. Special measures to reduce the risk may be necessary.

Table 0.1 Classification of purpose groups

Title	Group	Purpose for which the building or compartment of a building is intended to be used
Residential (dwellings)	1(a)*	Flat.
	1(b)†	Dwellinghouse that contains a habitable storey with a floor level a minimum of 4.5m above ground level.
	1(c)†+	Dwellinghouse that does not contain a habitable storey with a floor level a minimum 4.5m above ground level.
Residential (institutional)	2(a)	<p>Hospital, home, school or other similar establishment, where people sleep on the premises. The building may be either of the following.</p> <ul style="list-style-type: none"> • Living accommodation for, or accommodation for the treatment, care or maintenance of, either: <ul style="list-style-type: none"> – people suffering from disabilities due to illness or old age or other physical or mental incapacity – people under the age of 5 years. • A place of lawful detention.
Residential (other)	2(b)	Hotel, boarding house, residential college, hall of residence, hostel or any other residential purpose not described above.
Office	3	<p>Offices or premises used for any of the following and their control:</p> <ul style="list-style-type: none"> • administration • clerical work (including writing, bookkeeping, sorting papers, filing, typing, duplicating, machine calculating, drawing and the editorial preparation of matter for publication, police and fire and rescue service work) • handling money (including banking and building society work) • communications (including postal, telegraph and radio communications) • radio, television, film, audio or video recording • performance (premises not open to the public).
Shop and commercial	4	<p>Shops or premises used for either of the following.</p> <ul style="list-style-type: none"> • A retail trade or business (including selling food or drink to the public for immediate consumption, retail by auction, self-selection and over-the-counter wholesale trading, the business of lending books or periodicals for gain, the business of a barber or hairdresser, and the rental of storage space to the public). • Premises to which the public are invited either: <ul style="list-style-type: none"> – to deliver or collect goods in connection with their hire, repair or other treatment – (except in the case of repair of motor vehicles) where the public themselves may carry out such repairs or other treatments.

Table 0.1 Continued

Title	Group	Purpose for which the building or compartment of a building is intended to be used
Assembly and recreation	5	<p>Place of assembly, entertainment or recreation, including any of the following:</p> <ul style="list-style-type: none"> • bingo halls, broadcasting, recording and film studios open to the public, casinos, dance halls • entertainment, conference, exhibition and leisure centres • funfairs and amusement arcades • museums and art galleries, non-residential clubs, theatres, cinemas, concert halls • educational establishments, dancing schools, gymnasia, swimming pool buildings, riding schools, skating rinks, sports pavilions, sports stadia • law courts • churches and other buildings of worship, crematoria • libraries open to the public, non-residential day centres, clinics, health centres and surgeries • passenger stations and termini for air, rail, road or sea travel • public toilets • zoos and menageries.
Industrial	6	<p>Factories and other premises used for any of the following:</p> <ul style="list-style-type: none"> • manufacturing, altering, repairing, cleaning, washing, breaking up, adapting or processing any article • generating power • slaughtering livestock.
Storage and other non-residential [†]	7(a)	<p>Either of the following:</p> <ul style="list-style-type: none"> • place (other than described under 7(b)) for the storage or deposit of goods or materials • any building not within purpose groups 1 to 6.
	7(b)	<p>Car parks designed to admit and accommodate only cars, motorcycles and passenger or light goods vehicles that weigh a maximum of 2500kg gross.</p>

NOTE:

This table only applies to Part B.

* Includes live/work units that meet the provisions of AD B Volume 1, paragraph 3.21.

† Includes any surgeries, consulting rooms, offices or other accommodation that meets all of the following conditions.

a. A maximum of 50m² in total.

b. Part of a dwellinghouse.

c. Used by an occupant of the dwellinghouse in a professional or business capacity.

+ All of the following are included in purpose group 1(c).

a. A detached garage not more than 40m² in area.

b. A detached open carport of not more than 40m² in area.

c. A detached building that consists of a garage and open carport, each a maximum of 40m² in area.

Requirement B1: Means of warning and escape

These sections deal with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
Means of warning and escape	
B1. The building shall be designed and constructed so that there are appropriate provisions for the early warning of fire, and appropriate means of escape in case of fire from the building to a place of safety outside the building capable of being safely and effectively used at all material times. (a) 1952 c.52; section 33 was amended by Section 100 of the Criminal Justice and Public Order Act 1994 (c.33) and by S.I. 1963/597.	Requirement B1 does not apply to any prison provided under section 33 of the Prison Act 1952 ^(a) (power to provide prisons, etc.).

Intention

In the Secretary of State's view, requirement B1 is met by achieving all of the following.

- All people in the **building** are given early warning of fire.
- All people can escape to a safe place without external assistance.
- Escape routes** are well located and of sufficient capacity.
- Where necessary, **escape routes** are protected from the effects of fire.

Building work and material changes of use subject to requirement B1 include both new and existing **buildings**.

Section 1: Fire alarm and fire detection systems

General

- 1.1 All buildings should have arrangements for detecting fire and raising the alarm. In most buildings, fires are detected by people, either by sight or smell, and therefore often nothing more is needed. In this document, the term 'fire detection system' describes any type of automatic sensor network and associated control and indicating equipment. Sensors may be sensitive to smoke, heat, gaseous combustion products or radiation. Normally the control and indicating equipment operates a fire alarm system, and it may perform other signalling or control functions as well. Automatic sprinkler systems can also be used to operate a fire alarm system.
- 1.2 Where the escape strategy is based on simultaneous evacuation, operation of a manual call point or fire detector should give immediate warning from all fire alarm sounders. Where phased evacuation is planned, a staged alarm system is appropriate.
- 1.3 Every building design should be assessed individually. General guidance on the standard of automatic fire detection that may need to be provided within a building can be found in table A1 of BS 5839-1.

Fire alarm systems

- 1.4 In some small buildings/premises, the means of raising the alarm may be simple (for example, a shouted warning). In assessing appropriate solutions, warnings need to be heard and understood throughout the premises. Manually operated sounders, or a manual call point with a bell, battery and charger, could also be used.
- 1.5 In all other cases, an electrically operated fire warning system, with manual call points beside exit doors and sufficient sounders to be clearly audible throughout the building, should be provided.
- 1.6 An electrically operated fire alarm system should comply with BS 5839-1, which specifies three categories of system.
- a. Category L – for the protection of life.
 - b. Category M – manual alarm systems.
 - c. Category P – for property protection.

Category L systems are divided into the following.

L1 – systems installed throughout the protected building.

L2 – systems installed only in defined parts of the protected building (a category L2 system will normally include the coverage required of a category L3 system).

L3 – systems designed to warn of fire at an early enough stage to enable all occupants, other than possibly those in the **room** where the fire started, to escape safely before the **escape routes** become impassable because of fire, smoke or toxic gases.

L4 – systems installed within those parts of the **escape routes** that comprise circulation areas and **circulation spaces**, such as corridors and stairways.

L5 – systems in which the protected area(s) and/or the location of detectors are designed to satisfy a specific fire safety objective (other than that of a category L1, L2, L3 or L4 system).

Type P systems are divided into the following.

P1 – systems installed throughout the protected **building**.

P2 – systems installed only in defined parts of the protected **building**.

- 1.7** Electrical alarm system call points should comply with **BS 5839-2** or Type A (direct operation) of **BS EN 54-11**. Call points should be installed in accordance with **BS 5839-1**.

Type B (indirect operation) call points of **BS EN 54-11** should only be used with the approval of the **building control body**.

- 1.8** A voice alarm system complying with **BS 5839-8**, and giving a fire warning different from other signals in general use, may be considered if either of the following apply.
- People might not respond quickly to a fire warning.
 - People are unfamiliar with the fire warning arrangements.
- 1.9** In premises where lots of members of the public are present, an initial general alarm may be undesirable. Any **fire alarm system** that first alerts staff should comply with **BS 5839-1**.

Warnings for people with impaired hearing

- 1.10** Clause 18 of **BS 5839-1** gives detailed guidance on the design and selection of fire alarm warnings for people with impaired hearing. In **buildings** where people may be in relative isolation, a visual and audible fire alarm may be the most appropriate solution. In **buildings** where the population is controlled, a vibrating personal paging system may be more appropriate.

Design and installation of systems

- 1.11** Fire detection and warning systems must be properly designed, installed and maintained. An installation and commissioning certificate should be provided for detection and alarm systems. Third party certification schemes for fire protection products and related services are an effective means of providing assurances of quality, reliability and safety.

Interface between fire detection and fire alarm systems and other systems

- 1.12** Fire detection and alarm systems sometimes trigger other systems. The interface between systems must be reliable. Particular care should be taken if the interface is facilitated via another system. Where any part of **BS 7273** applies to the triggering of other systems, the recommendations of that part of **BS 7273** should be followed.

Section 2: Design for horizontal escape

Introduction

- 2.1** Means of escape should be provided from any point on a storey to the storey exit, for all types of building. The general principle is that any person confronted by a fire within a building can turn away from it and escape safely.
- 2.2** For small shop, office, industrial, storage and other similar premises, the guidance for small premises may be followed instead of the other provisions in this section, if they meet both of the following.
- No storey with an area more than 280m².
 - A maximum of two storeys plus a basement storey.

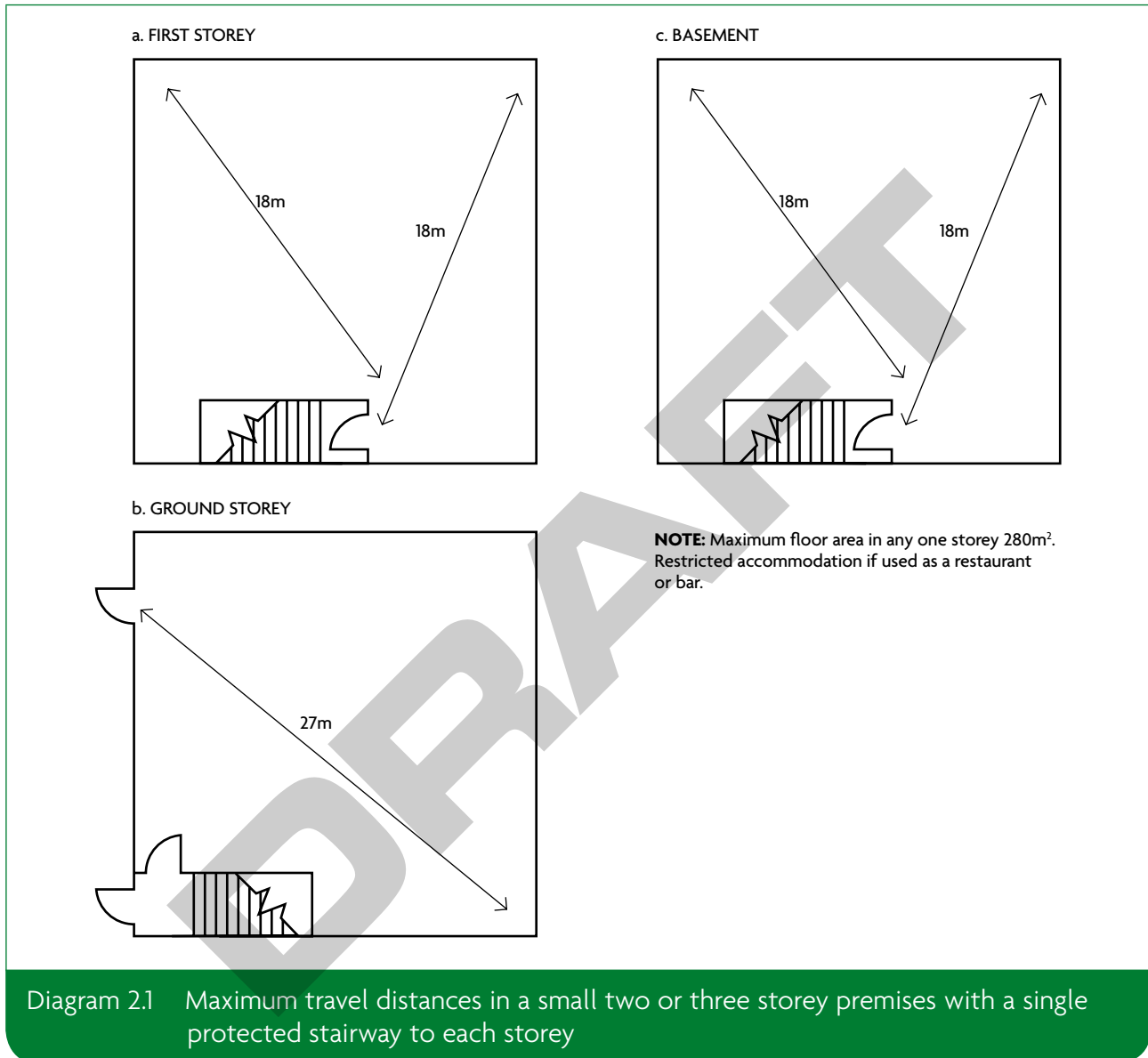
Small premises

- 2.3** The following paragraphs *only* apply in place of those provisions relating to the following.
- The number and position of exits and protected stairways.
 - Measuring distances of travel.
- In covered shopping complexes, the size of small units that may be served by a single exit is further restricted. This is dealt with in **BS 9999**.
- 2.4** A 'small premises' is described by all of the following.
- The premises should meet all of the following general conditions.
 - It should be single occupancy.
 - It should not comprise more than a basement storey, ground storey and first storey.
 - No storey should have a floor area more than 280m² (see diagram 2.1).
 - Any kitchen or other open cooking arrangements should be at the extremity of any dead end remote from the exits.
 - For a bar or restaurant, the seating or standing accommodation (table D1) should be planned for a maximum of 30 people per storey. The seating or standing accommodation for the ground storey may be planned for 100 people if it has a final exit independent of the stair.
- 2.5** The definition of a small premises does not apply where highly flammable materials are sold, stored or used.

Construction

- 2.6** Except in kitchens, ancillary offices and stores, floor areas should be undivided so exits are clearly visible from all parts.
- 2.7** Store rooms should be enclosed with fire resisting construction (minimum REI 30).

- 2.8** Anybody using a kitchen or office **inner room** should receive early warning of a fire. Either of the following is an acceptable method.
- Any partitions separating the kitchen or office from the open floor area should include vision panels (which may also be required for other reasons).
 - Provide the **access room** with an automatic fire detection and alarm system.



Travel distance and number of escape routes

2.9 Escape routes should be sited so the travel distance from any point of a storey to the nearest storey exit does not exceed the distance given in table 2.1. The siting of two or more exits or stairs should give effective alternative directions of travel from any point in a storey.

The travel distance in small premises with an open stairway is measured as follows.

- a. In a basement: to the foot of the stair.
- b. On a first storey: to the head of the stair.

Table 2.1 Maximum travel distances in small premises with a protected stairway

Storey	Maximum travel distance (m)
Ground storey with a single exit	27
Basement or first storey with a single stair	18
Storey with more than one exit/stair	45

NOTES:

If the internal layout of partitions, fittings, etc. is not known, direct distances, rather than travel distances, may be assessed. The direct distance should be assumed to be two-thirds of the travel distance.

Escape route design

Number of escape routes and exits

2.10 The number of escape routes and exits that should be provided depends on both of the following.

- a. The number of occupants in the room, tier or storey.
- b. The limits on travel distance to the nearest exit given in table 2.2 (which apply only to the nearest exit; other exits may be further away).

2.11 In multi-storey buildings, if more than one stair is needed for vertical escape, every part of each storey should have access to more than one stair. An area may be in a dead end provided the alternative stair is accessible.

2.12 In mixed use buildings, separate means of escape should be provided from any storeys or parts of storeys used for the 'residential' or 'assembly and recreation' purpose groups.

Single escape routes and exits

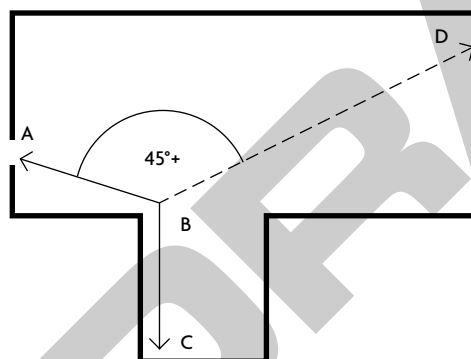
2.13 A single escape route is acceptable for either of the following.

- a. Parts of a floor from which a **storey exit** can be reached within the limit for **travel distance** in one direction shown in table 2.2 (see also paragraphs 4.7 to 4.11), provided the following apply.
 - i. For places of assembly and bars, no one **room** in this situation has a capacity of more than 60 people.
 - ii. For **buildings** in the 'institutional' **purpose group**, no one **room** in this situation has a capacity of more than 30 people. Occupant capacity calculations are described in Appendix D.
- b. A **storey** with a capacity of no more than 60 people, where the limits on travel in one direction only are satisfied (see table 2.2).

2.14 In many cases, the beginning of a route will not have an **alternative escape route** (for example, a single exit from a **room** into a corridor where escape is possible in two directions). This is acceptable if both of the following apply.

- a. The **travel distance** to the nearest **storey exit** is within the limits for routes where escape is possible in more than one direction (table 2.2).
- b. The **travel distance** for the 'one direction only' section of the route does not exceed the limit for **travel distance** where there is no **alternative escape route** (table 2.2).

Diagram 2.2 shows how to measure **travel distances** from a **dead end** in an open **storey** layout.



Angle ABD should be at least 45 degrees.
Distance CBA or CBD (whichever is less) should be no more than the maximum travel distance given for alternative escape routes and CB should be no more than the maximum distance for travel where there are no alternative escape routes.

Diagram 2.2 Travel distance in dead-end condition

Table 2.2 Limitations on travel distance

Purpose group	Use of the premises or part of the premises	Maximum travel distance ⁽¹⁾ where travel is possible in:	
		One direction only (m)	More than one direction (m)
2(a)	Institutional	9	18
2(b)	Other residential:		
	a. in bedrooms ⁽²⁾	9	18
	b. in bedroom corridors	9	35
	c. elsewhere	18	35
3	Office	18	45
4	Shop and commercial ⁽³⁾	18 ⁽⁴⁾	45
5	Assembly and recreation:		
	a. buildings primarily for disabled people	9	18
	b. areas with seating in rows	15	32
	c. elsewhere	18	45
6	Industrial ⁽⁵⁾		
	Normal hazard	25	45
	Higher hazard	12	25
7	Storage and other non-residential ⁽⁵⁾		
	Normal hazard	25	45
	Higher hazard	12	25
2-7	Place of special fire hazard ⁽⁶⁾	9 ⁽⁷⁾	18 ⁽⁷⁾
2-7	Plant room or rooftop plant:		
	a. distance within the room	9	35
	b. escape route not in open air (overall travel distance)	18	45
	c. escape route in open air (overall travel distance)	60	100

NOTES:

1. If the internal layout of partitions, fittings, etc. is not known, direct distances, rather than travel distances, may be assessed. The direct distance should be assumed to be two-thirds of the actual travel distance.
2. Maximum part of travel distance within the room. This limit applies within the bedroom and any associated dressing room, bathroom or sitting room, etc. The distance is measured to the door to the protected corridor that serves the room or suite. Sub-item (b) applies from that point along the bedroom corridor to a storey exit.
3. Maximum travel distances within shopping malls are given in **BS 9999**. Guidance on associated smoke control measures is given in BRE report BR 368.
4. **BS 9999** applies more restrictive provisions to units with only one exit in covered shopping complexes.
5. In industrial and storage buildings, the appropriate travel distance depends on the level of fire hazard associated with the processes and materials being used.

Higher hazard includes manufacturing, processing or storage of significant amounts of hazardous goods or materials, including any of the following.

- Any compressed, liquefied or dissolved gas.
- Any substance that becomes dangerous by interaction with either air or water.
- Any liquid substance with a flash point below 65°C, including whisky or other alcoholic liquor.
- Any corrosive substance.
- Any oxidising agent.
- Any substance liable to spontaneous combustion.
- Any substance that changes or decomposes readily, giving out heat when doing so.
- Any combustible solid substance with a flash point less than 120°C.
- Any substance that is likely to spread fire by flowing from one part of a building to another.

6. Places of special fire hazard are listed in the definitions in Appendix A.
7. Maximum part of travel distance within the room/area. Travel distance outside the room/area should comply with the limits for the purpose group of the building or part.

Access control measures

2.15 Measures to restrict access to the **building** (or parts of it) should not adversely affect fire safety provisions. It may be reasonable to close some **escape routes** outside normal business hours, but measures should remain to safely evacuate people left inside the **building** (see paragraph 4.7).

Number of occupants and exits

2.16 The **building** design should be based on a number of occupants. If the number is not known, use the appropriate floor space factors (Appendix D).

Table 2.3 gives the minimum number of **escape routes** and exits from a **room** or **storey** for different numbers of occupants. This number is likely to be increased by the need to observe **travel distances** and other practical considerations.

The width of **escape routes** and exits is given in paragraph 2.25.

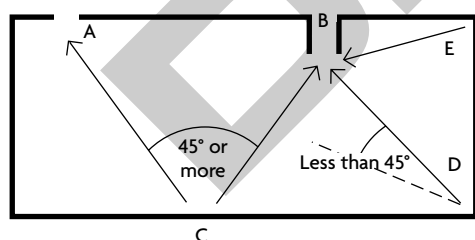
Table 2.3 Minimum number of escape routes and exits from a room, tier or storey

Maximum number of people	Minimum number of escape routes/exits
60	1
600	2
More than 600	3

Alternative escape routes

2.17 **Alternative escape routes** should satisfy one of the following criteria.

- They are in directions 45 degrees or more apart (diagram 2.3).
- They are in directions less than 45 degrees apart, but separated from each other by **fire resisting** construction.



Alternative escape routes are available from C because angle ACB is 45 degrees or more and therefore CA or CB (whichever is the less) should be no more than the maximum travel distance given for alternative escape routes.

Alternative escape routes are not available from D because angle ADB is less than 45 degrees (therefore see diagram 2.2). There is also no alternative escape route from E.

Diagram 2.3 Alternative escape routes

Inner rooms

2.18 An **inner room** is at risk if a fire starts in the **access room** (diagram 2.4). Such an arrangement should only be accepted if all of the following conditions are satisfied.

- a. The capacity of the **inner room** *does not* exceed:
 - i. 30 people for **purpose group 2(a)** (institutional)
 - ii. 60 people for other **purpose groups**.
- b. The **inner room** is not a bedroom.
- c. The **inner room** is entered directly from the **access room** (but not via a corridor).
- d. The **escape route** from the **inner room** does not pass through more than one **access room**.
- e. The **travel distance** from any point in the **inner room** to the exits from the **access room** does not exceed the distances in table 2.2.
- f. The **access room** meets both of the following conditions.
 - i. It is not a **place of special fire hazard**.
 - ii. It is in the control of the same occupier.
- g. One of the following arrangements is made.
 - i. The enclosures (walls or partitions) of the **inner room** stop a minimum of 500mm below the **ceiling**.
 - ii. The door or walls of the **inner room** contain a vision panel (minimum 0.1m²), so people can see if a fire starts in the **access room**.
 - iii. The **access room** is fitted with an automatic fire detection and alarm system to warn occupants of the **inner room** if a fire starts in the **access room**.

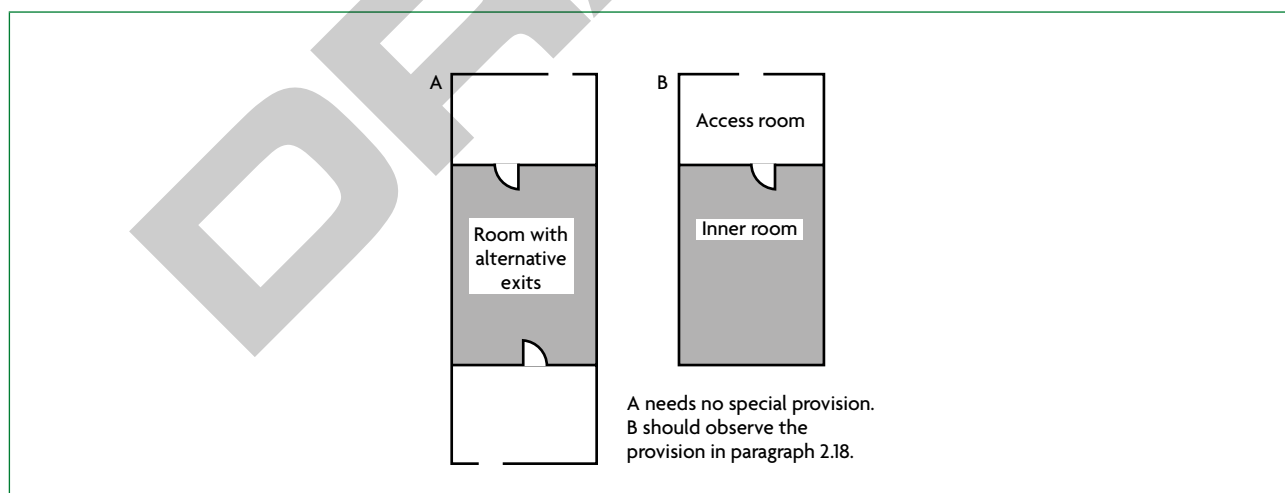


Diagram 2.4 Inner room and access room

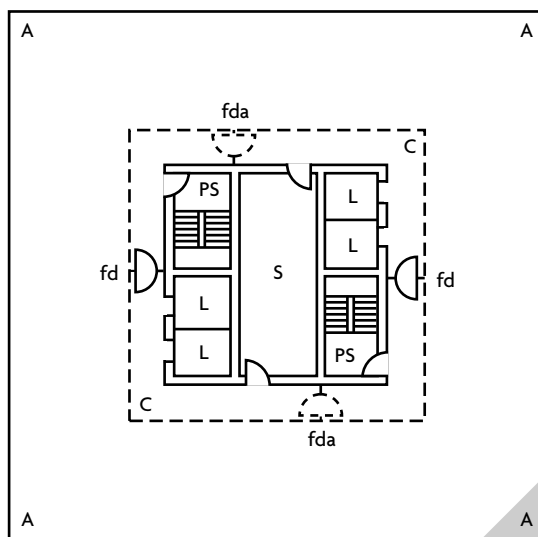
Planning of exits in a central core

2.19 Where a central core has more than one exit, **storey exits** should be remote from one another and no two exits should be approached from the same lift hall, common lobby or undivided corridor (diagram 2.5).

Open spatial planning

2.20 Escape routes should not be within 4.5m of openings between floors, such as for an escalator, unless either of the following applies.

- The direction of travel is away from the opening.
- An alternative escape route does not pass within 4.5m of the open connection (diagram 2.6).

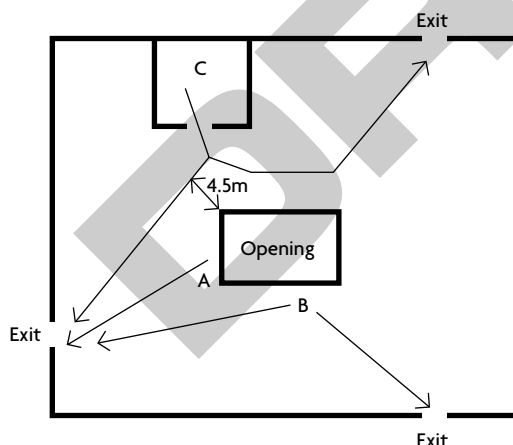


NOTE: The doors at both ends of the area marked 'S' should be self-closing fire doorsets unless the area is sub-divided such that any fire in that area will not be able to prejudice both sections of corridor at the same time. If that area is a lift lobby, doors should be provided as shown in Figure 9 in **BS 9999**.

Key

- L Lift
- S Services, toilets, etc.
- fd Self-closing FD20S fire doorsets
- fda Possible alternative position for fire doorset
- C Corridor off which accommodation opens
- PS Protected stairway
- A Accommodation (e.g. office space)

Diagram 2.5 Exits in a central core



From A and B at least one direction of travel is away from the opening. From C where the initial direction of travel is towards the opening, one of the escape routes is not less than 4.5m from the opening.

Diagram 2.6 Open connections

Access to storey exits

2.21 Where a **storey** has more than one escape stair, people should not need to pass through one to reach another. It is acceptable to need to pass through the **protected lobby** of one stair to reach another stair.

Separation of circulation routes from stairways

2.22 Where they serve **protected stairways** that are part of primary circulation routes, **self-closing fire doorsets** should be fitted with an **automatic release mechanism**, to avoid them being rendered ineffective by misuse. Otherwise, the stair (and any associated **exit passageway**) *should not* form part of the primary circulation route between different parts of the **building** at the same level.

Storeys divided into different uses

- 2.23** If a **storey** contains areas for consuming food and/or drink, and where that is not the main use of the **building**, then both of the following apply.
- A minimum of two **escape routes** should be provided from each area, except from **inner rooms** that meet the conditions in paragraph 2.18.
 - Those **escape routes** should lead directly to a **storey exit** without entering a kitchen or similar area of high fire hazard.

Storeys divided into different occupancies

- 2.24** Where a **storey** is divided into areas of occupancy under separate ownership or tenancy, then both of the following apply.
- The **means of escape** from each occupancy should not pass through any other occupancy.
 - If a common corridor or **circulation space** is on the escape route, either:
 - it should be a **protected corridor**
 - a suitable automatic fire detection and alarm system should be installed throughout the **storey**.

Width of escape routes and exits

- 2.25** The width of **escape routes** and exits should meet the provisions in table 2.4, as well as the guidance in Approved Document M.
- 2.26** If the maximum number of people likely to use the **escape route** and exit is not known, it should be calculated using the occupant capacity guidance in Appendix D.
- 2.27** Guidance on spacing fixed seating for auditoria is given in **BS 9999**.

Table 2.4 Widths of escape routes and exits

Maximum number of people	Minimum width (mm) ⁽¹⁾⁽²⁾⁽³⁾
60	750 ⁽⁴⁾
110	850
220	1050
More than 220	5 per person ⁽⁵⁾

NOTES:

1. See Appendix D for methods of measurement.
2. Widths may need to be increased to meet guidance in Approved Document M.
3. Widths less than 1050mm should not be interpolated.
4. May be reduced to 530mm for gangways between fixed storage racking, other than in public areas of the 'shops and commercial' purpose group.
5. 5mm/person does not apply to an opening serving fewer than 220 people.

Calculating exit capacity

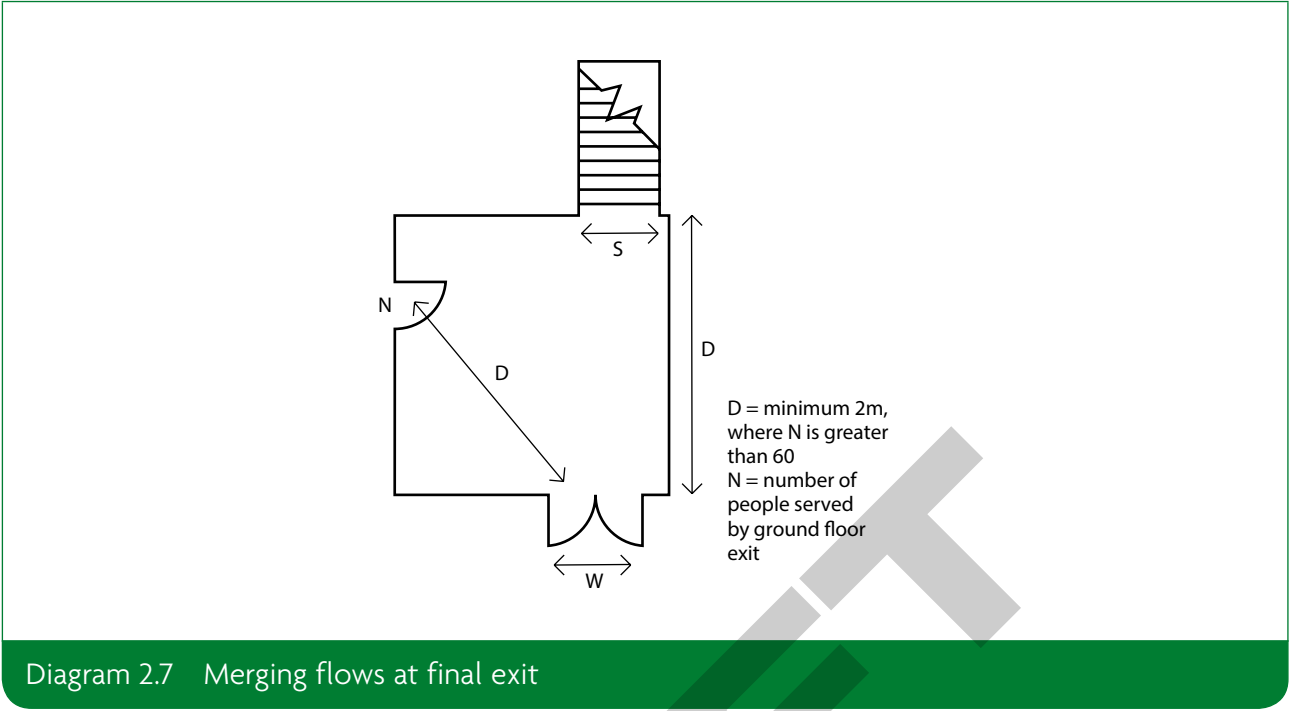
2.28 Where multiple **storey exits** are available, fire might prevent one from being used. Remaining exits need to be wide enough for all occupants, so when using table 2.4, the largest exit should be discounted.

Stairs should be at least as wide as any **storey exit** leading onto them. While some stairs are not subject to discounting (paragraphs 3.15 and 3.16), because the stairs will be available for other floors, the **storey exits** onto them are.

2.29 To calculate how many people two or more available exits (after discounting) can accommodate, add together the maximum numbers of people that each exit width can accommodate.

For example, three exits each 850mm wide accommodate $3 \times 110 = 330$ people.

2.30 If a ground floor **storey exit** and a stair share a **final exit** (via a ground floor lobby), then the **final exit** should be wide enough to evacuate people at a maximum flow rate equal to or greater than from the **storey exit** and stair combined (diagram 2.7).



If that minimum distance cannot be achieved, the width of the **final exit** (W) should be at least the width of the stair plus the width of the **storey exit**.

Required final exit width = $((250/2.5) + (1.2 \times 60))/80 = 2.150\text{m}$

- Every corridor that serves bedrooms.
- Every **dead-end** corridor (excluding recesses and extensions a maximum of 2m deep, as shown in **BS 9999**, figures 11 and 12).
- Any corridor shared by two or more occupancies (paragraph 2.24).

Enclosure of corridors that are not protected corridors

2.32 If a corridor used for **means of escape** is not a **protected corridor**, any partitions enclosing it should provide some defence against smoke spread by meeting the following.

- a. Partitions should continue to the soffit of the structural floor above, or to a **suspended ceiling**.
- b. Openings into **rooms** from the corridor should be fitted with doors, which need not be **fire doorsets**.

Open planning will not stop smoke spread, but occupants can become aware of a fire quickly.

Division of corridors

2.33 A corridor providing access to **alternative escape routes** *should be divided by **fire doorsets** fitted with a **self-closing device*** (and associated screens) where it meets both of the following.

- a. It is more than 12m long.
- b. It connects two or more **storey exits**.

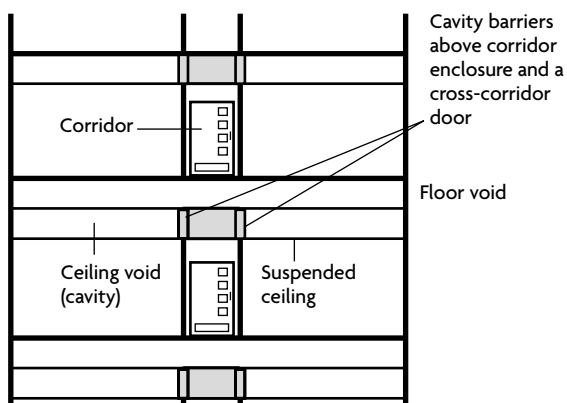
The **fire doorsets** (including any screens) should be approximately mid-way between the two **storey exits**. They should safeguard the route from smoke, while considering the layout of the corridor and any adjacent fire risks.

2.34 For **buildings** in **purpose groups** 2 to 7: if a cavity exists above the enclosures to a corridor as described above (because the enclosures are not carried to full **storey** height or the underside of the roof covering at the top **storey**), the potential for smoke to bypass the enclosure should be restricted by one of the following methods.

- a. Fitting **cavity barriers** on the line of the enclosure(s) to and across the corridor (diagram 2.8a).
- b. Dividing the **storey** using **fire resisting** construction that passes through the line of the division of the corridor (diagram 2.8b). Any void above this division should be fitted with **cavity barriers** on the line of division of the **storey** and the corridor.
- c. Enclosing the cavity on the lower side by a **fire resisting ceiling** that extends throughout the **building, compartment** or **separated part**.

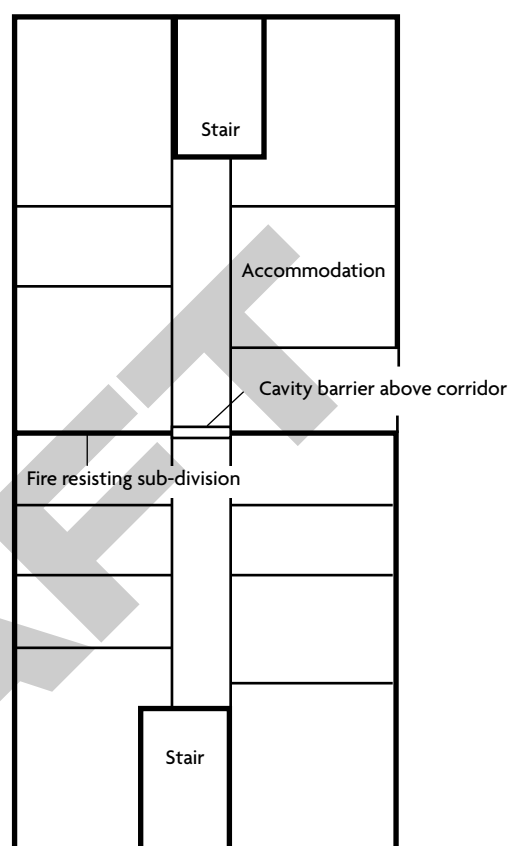
Any door that could provide a path for smoke to bypass the division should be fitted with a **self-closing device** (but need not necessarily be **fire resisting**).

a. SECTION TO SHOW USE OF
CAVITY BARRIERS ABOVE THE CORRIDOR
ENCLOSURE
See paragraph 2.34a.



Where the corridor is a protected escape route, cavity barriers may also be required in any floor void beneath the corridor enclosure (see paragraph 8.4)

b. PLAN SHOWING SUB-DIVISION
OF THE STOREY BY FIRE RESISTING
CONSTRUCTION
See paragraph 2.34b.



The sub-division should be carried full storey height and includes sub-division of the corridor. A cavity barrier may be used in any ceiling void over the sub-division.

Diagram 2.8 Division of corridors

2.35 Where **dead ends** of corridors provide access to a point from which **alternative escape routes** are available, the escape stairs and corridors may be protected by a pressurisation system complying with **BS EN 12101-6**.

Alternatively, every **dead-end** corridor exceeding 4.5m long should be separated by **self-closing fire doorsets** (together with any associated screens) from any part of the corridor that either:

- provides two directions of escape (diagram 2.9a)
- continues past one **storey exit** to another (diagram 2.9b).

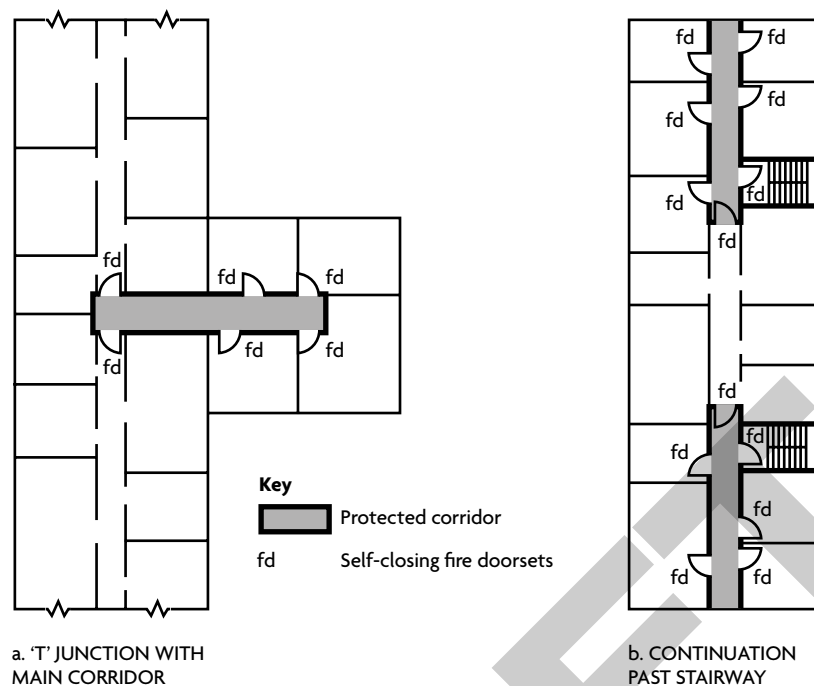


Diagram 2.9 Dead-end corridors

Cavity barriers

2.36 Additional measures to safeguard means of escape from smoke are given in section 8.

External escape routes

2.37 Where an external escape route is beside an external wall of the building, the external wall should be of fire resisting construction in both of the following zones.

- Within 1800mm of the escape route.
- Up to 1100mm above the paving level of the route.

This *does not* apply to external escape stairs (see paragraph 3.32).

Escape over flat roofs

2.38 Where a storey or part of a building has multiple escape routes available, one may be over a flat roof if it does not serve an 'institutional' building (or part of a building) intended for use by members of the public.

2.39 Where an escape route over a flat roof is provided, the roof should meet all of the following.

- It should be part of the same building from which escape is being made.
- The route across the roof should lead to a storey exit or external escape route.
- the part of the roof forming the escape route and its supporting structure, together with any opening within 3m of the escape route, should be fire resisting (minimum REI 30).

- d. The route should be clearly defined and guarded by walls and/or protective barriers to protect from falling.

Residential care homes

General

- 2.40** The choice of fire safety strategy depends on the way a **building** is designed, furnished, staffed and managed, and on the level of dependency of the residents.
- 2.41** In care homes for the elderly, some or all residents are likely to need help to evacuate. **Buildings** should generally be designed for progressive horizontal evacuation (PHE) in accordance with paragraphs 2.42 to 2.53.

For other care home types, the most appropriate of either a PHE or simultaneous evacuation strategy should be identified. The approach adopted in the design of a **building** must be recorded and communicated to the **building** management team, who can adopt procedures compatible with the **building** design.

Planning for progressive horizontal evacuation

- 2.42** The guidance below on PHE is for care homes where the provisions of the *Firecode* documents *do not* apply (see paragraph 0.10).

PHE requires areas used for the care of residents to be divided into protected areas by **compartment walls** and **compartment floors**. Protected areas provide a place of relative safety, from which further evacuation can be made if necessary.

- 2.43** Each **storey** used for the care of residents should be divided by **compartment walls** into at least three protected areas. All floors should be **compartment floors**.
- 2.44** Every protected area should have a minimum of two exits to adjoining protected areas. Maximum **travel distances** within a protected area should be both of the following.
 - a. To the exit to the adjoining protected area: as table 2.2.
 - b. From any point to a **storey exit** or a **final exit**: 64m.
- 2.45** A fire in one protected area should not prevent occupants of other areas from reaching a **final exit** (diagram 2.10). **Escape routes** *should not* pass through ancillary accommodation listed in paragraph 2.51.
- 2.46** The number of residents' beds in protected areas should be based on an assessment of both of the following.
 - a. The number of staff likely to be available.
 - b. The level of assistance that residents may require.

The maximum number of residents' beds in one protected area *should not* exceed 10, but may need to be lower depending on the assessment.
- 2.47** A protected area used for horizontal evacuation from an adjoining protected area should have a floor area able to accommodate its own occupants plus those from the largest adjoining protected area.

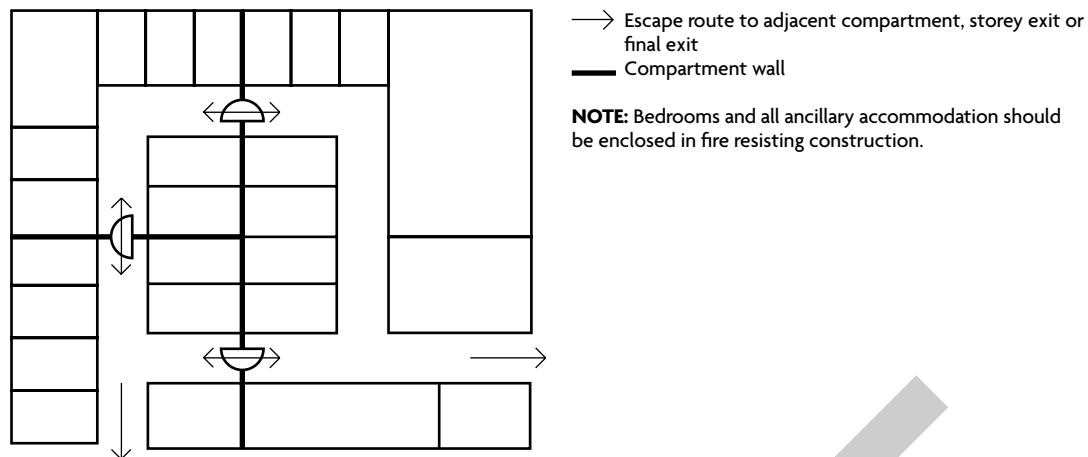


Diagram 2.10 Progressive horizontal evacuation in care homes

Fire detection

2.48 A fire detection and alarm system should be provided to L1 standard in accordance with **BS 5839-1**.

Bedrooms

2.49 Each bedroom in a care home should be enclosed in **fire resisting** construction (minimum REI 30) with **fire resisting** doors (minimum E30). Every corridor serving bedrooms should be a **protected corridor** (see paragraph 2.31).

2.50 Bedrooms should not contain more than one single or double bed.

Ancillary accommodation

2.51 Ancillary accommodation such as all of the following should be enclosed by **fire resisting** construction (minimum REI 30).

- a. Chemical stores.
- b. Cleaners' rooms.
- c. Clothes storage.
- d. Day rooms.
- e. Smoking rooms.
- f. Disposal rooms.
- g. Plant rooms.
- h. Linen stores.
- i. Kitchens.
- j. Laundry rooms.
- k. Staff changing and locker rooms.
- l. Store rooms.

Door closing devices

2.52 If doors fitted with a **self-closing device** could present an obstacle to residents, the following hardware in accordance with **BS EN 1155** is appropriate.

- a. Bedrooms: free-swing door closers.
- b. **Circulation spaces**: hold-open devices.

Sprinkler systems

2.53 When a sprinkler system is provided in accordance with section 10, the following variations to the guidance given in paragraphs 2.42 to 2.52 are acceptable.

- a. **Fire doorsets** to bedrooms need not be fitted with **self-closing devices**.
- b. Protected areas may contain more than 10 beds.
- c. Bedrooms may contain more than one bed.

If any of the variations are made, the management procedures should take account of the larger number of residents that may need assistance, and the need to manually close bedroom doors during sleeping hours.

Section 3: Design for vertical escape

Introduction

- 3.1** The limits on horizontal travel escape distances mean most people should be able to independently reach a protected **escape route** or **final exit**. The following guidance also includes measures for people unable to use stairs without help.

In larger **buildings**, some escape stairs may need to serve as **firefighting stairs**, and section 17 will also apply.

Number of escape stairs

Mixed use buildings

- 3.2** If a **building** contains **storeys**, or parts of **storeys**, in different **purpose groups**, it is necessary to consider providing either of the following.
- Separate routes of escape from the different uses.
 - Other effective means to protect common **escape routes**.

Single escape stairs

- 3.3** A single escape stair may serve a **building** (or part of a **building**) in the following situations.
- When independent **escape routes** from areas in different **purpose groups** are not necessary (paragraph 3.2).
 - From a basement that is allowed to have a single escape route in accordance with paragraph 2.13b and table 2.2.
 - In small premises, provided paragraph 3.4 is followed.
 - From a **building** (other than small premises) that meets both of the following conditions.
 - It has no **storey** with a floor level more than 11m above ground level.
 - It is allowed to have only a single escape route in every **storey** in accordance with paragraph 2.13b and table 2.2.

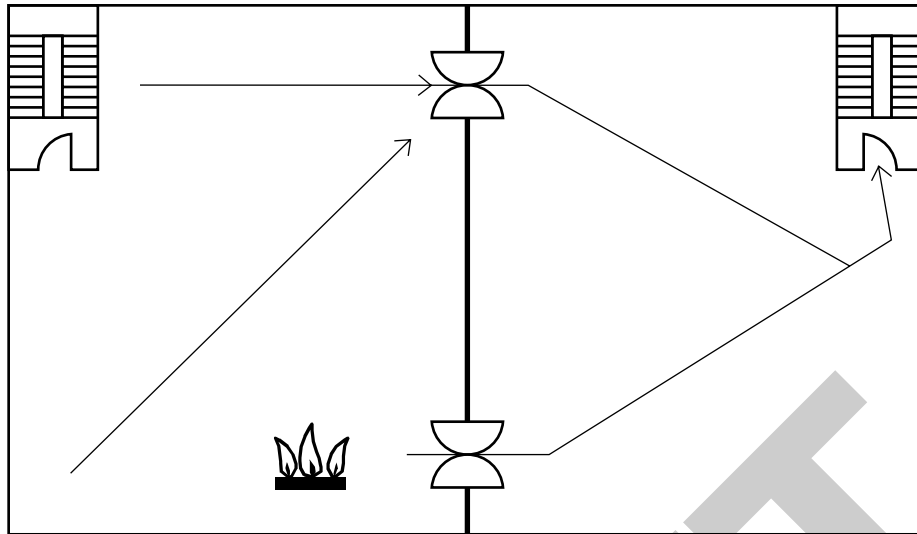
Single escape stairs in small premises

- 3.4** A single escape stair may be used in the following situations.
- A small premises as described in paragraph 2.4.
 - An office **building** with a maximum of five **storeys** above the ground **storey** where both the following apply.
 - The **travel distance** from every point in each **storey** does not exceed table 2.2 for escape in one direction only.
 - Every **storey** with a floor level more than 11m above ground level has an alternative **means of escape**.

- c. A factory comprising no more than either of the following.
 - i. For low risk buildings, two storeys above the ground storey.
 - ii. For normal risk buildings, one storey above the ground storey, provided the travel distance from every point on each storey does not exceed table 2.2 for escape in one direction only.
- d. Process plant buildings with a maximum capacity of 10 people.

Provision of refuges

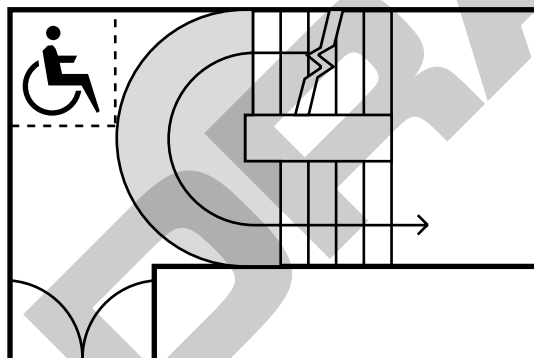
- 3.5** Refuges form part of the management plan and offer relatively safe areas for people to wait for a short period only. Refuges should meet the following conditions.
- a. Refuges should be provided on every storey (except ones consisting only of plant rooms) of each protected stairway providing an exit from that storey.
 - b. Refuges need not be located within the stair enclosure, but should enable direct access to the stair.
 - c. The number of refuge spaces need not equal the number of wheelchair users who may be in the building. A single refuge may be occupied by more than one person during the evacuation procedure.
- 3.6** The following are both examples of satisfactory refuges.
- a. An enclosure such as a compartment (diagram 3.1), protected lobby, protected corridor or protected stairway (diagram 3.2).
 - b. An area in the open air, such as a flat roof, balcony, podium or similar place, that meets both of the following.
 - i. It is protected (or remote) from any fire risk.
 - ii. It has its own means of escape.
- 3.7** Refuges should be a minimum of 900mm × 1400mm in size and accessible by someone in a wheelchair. Where sited in a protected stairway, protected lobby or protected corridor, they should not reduce the width of the escape route or obstruct the flow of people escaping.
- 3.8** Refuges should be provided with an emergency voice communication (EVC) system complying with BS 5839-9. It should consist of Type B outstations communicating with a master station in the building control room (if one exists) or next to the fire alarm panel. In some buildings, wireless technology may be more appropriate.
- 3.9** Refuges and evacuation lifts should be clearly identified. In lobbies and stairways there should be a blue mandatory sign worded 'Refuge – keep clear' in addition to fire safety signs.
- 3.10** Paragraph 4.33 gives guidance on using lifts, including evacuation lifts, during a fire.



Storey divided into two refuges by compartment wall (stairways not provided with wheelchair space).

NOTE: People occupying the left-hand compartment would not reach a refuge until they had entered the right-hand compartment. Two fire doorsets in the partition are necessary in case access to one of the doorsets is blocked by fire.

Diagram 3.1 Refuge formed by compartmentation



Wheelchair space



Occupied by escape flow

Provision where access to the refuge is counter to the access flow within the stairway

Diagram 3.2 Refuge formed in a protected stairway

Width of escape stairs

- 3.11** The width of escape stairs should meet all of the following conditions.
- It should be at least as wide as any exits giving access to the stairs.
 - It should be no less than the minimum widths given in table 3.1.
 - It should not reduce at any point on the way to a **final exit**.
 - It should not exceed 1400mm in stairs taller than 30m, unless a central handrail is provided. When a central handrail is provided, the stair width on each side of it should be considered separately when assessing stair capacity.
- 3.12** Approved Document K requires stairs more than 2000mm wide in public **buildings** to have a central handrail.
- 3.13** If an exit route from a stair is also the **escape route** from the ground **storey** and/or **basement storey** – the width of the exit route may need to be increased (see paragraph 2.30).

Table 3.1 Minimum widths of escape stairs

Situation of stair	Maximum number of people served ⁽¹⁾	Minimum stair width (mm)
1a. In an institutional building (unless the stair will only be used by staff)	150	1000 ⁽²⁾
1b. In an assembly building and serving an area used for assembly purposes (unless the area is less than 100m ²)	220	1100
1c. In any other building and serving an area with an occupancy of more than 50	Over 220	See Note ⁽³⁾
2. Any stair not described above	50	800 ⁽⁴⁾

NOTES:

- Assessed as likely to use the stair in a fire emergency.
- BS 9999** recommends that firefighting stairs should be at least 1100mm wide.
- See table 3.2 for the size of stairs for simultaneous evacuation, and table 3.3 for phased evacuation.
- To comply with the guidance in Approved Document M on minimum widths for areas accessible to disabled people, this may need to be increased to 1000mm.

Calculation of minimum stair width

- 3.14** The width depends on the number of stairs provided and the escape strategy (simultaneous or phased evacuation). If the maximum number of people needing to use escape stairs is unknown, calculate it using the floor space factors in Appendix D.

Discounting of stairs

- 3.15** Regardless of escape strategy, where two or more stairs are provided, it should be assumed that one might not be available during a fire. Each stair should be discounted in turn to ensure the capacity of the remaining stairs is adequate. This applies to **buildings** with or without a sprinkler system.

3.16 Paragraph 3.15 does not apply if either of the following applies.

- a. Escape stairs are protected by a smoke control system designed in accordance with **BS EN 12101-6**.
- b. Escape stairs are approached on each **storey** (except the top **storey**) through a **protected lobby**.

Despite these exceptions, at least one **storey exit** still needs to be discounted (paragraph 2.28). Paragraph 3.34 identifies cases where stairs need lobby protection.

Simultaneous evacuation

3.17 The width of escape stairs should take account of the number of people using them while evacuating all **storeys** at the same time. The following stairs should be designed to allow simultaneous evacuation.

- a. All stairs serving basements.
- b. All stairs serving **buildings** with **open spatial planning**.
- c. All stairs serving 'other residential' or 'assembly and recreation' **buildings**.

BS 9999 includes designs based on simultaneous evacuation.

3.18 The capacity of stairs of widths from 1000mm to 1800mm is given in table 3.2.

Table 3.2 Capacity of stairs for basements and for simultaneous evacuation of the building

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

NOTES:

1. The capacity of stairs that serve more than 10 storeys may be obtained by using linear extrapolation.
2. The capacity of stairs not less than 1100mm wide may also be obtained by using the formulas in paragraph 3.19.
3. Unless a central handrail is provided, stairs with a rise of more than 30m should be a maximum width of 1400mm (see paragraph 3.11).
4. Stairs wider than 2000mm should have a central handrail (see paragraph 3.12).

3.19 As an alternative to table 3.2, the capacity of stairs 1100mm or wider can be found using either of the following formulas:

a. $P = 200W + 50 (W - 0.3)(N - 1)$

b. $W = P + 15N - 15 \div 150 + 50N$

where:

P is the number of people that can be served

W is the width of the stair, in metres

N is the number of storeys served.

Separate calculations should be made for stairs serving basement storeys and stairs serving upper storeys.

The population, P, should be divided by the number of available stairs.

The formula is useful to determine the width of stairs where people are not distributed evenly – either within a storey or between storeys.

In the formula, $200W$ represents the number of people estimated to have left the stair after 2.5 minutes of evacuation, and $50 (W - 0.3)(N - 1)$ represents the number of people estimated to be on the stair after 2.5 minutes of evacuation.

Worked examples

A 14 storey building contains 12 storeys of offices (ground + 11). The top two storeys contain flats that are served by separate stairs. What is the minimum width needed for the stairs that serve the office floors, for simultaneous evacuation? In the 11 above-ground-floor offices, 1200 people use the stairs. (People in the ground floor offices do not use the stairs.) In this example, two stairs are shown to satisfy the travel distance limitations.

a. The population is distributed evenly

The top office storey is at a height greater than 18m, therefore both stairs need lobby protection (see paragraph 3.34). Because both stairs are entered at each level via a protected lobby, both stairs can be assumed to be available (see paragraph 3.16).

$$P = 1200 / 2 = 600, N = 11$$

From the formula:

$$600 = 200W + 50 (W - 0.3)(11 - 1)$$

$$600 = 200W + (50W - 15)(10)$$

$$600 = 200W + 500W - 150$$

$$750 = 700W$$

$$W = 1070\text{mm}$$

Therefore both stairs should be at least 1070mm wide. But this needs to be increased to 1100mm, because the formula applies to stairs 1100mm or wider (see paragraph 3.19).

This width will also be adequate when one storey exit is discounted as described in paragraph 2.28. It also complies with paragraph 3.11a (i.e. the stair widths are not less than the minimum widths needed for 110 people in table 2.4).

b. The population is not distributed evenly

(e.g. 1000 people occupy floors 1 to 9, and 200 occupy floors 10 and 11).

The top office storey is at a height greater than 18m, therefore both stairs need lobby protection (see paragraph 3.34). Because both stairs are entered at each level via a protected lobby, both stairs can be assumed to be available (see paragraph 3.16).

To find the width of:

- the stairs serving floors 10 and 11:

$$P = 200/2 = 100, N = 2$$

From the formula:

$$100 = 200W + 50 (W - 0.3)(2 - 1)$$

$$100 = 200W + (50W - 15)(1)$$

$$100 = 200W + 50W - 15$$

$$115 = 250W$$

$$W = 460\text{mm}$$

Therefore both stairs between the 9th floor landing and the top floor should be at least 460mm wide. But this needs to be increased to 1100mm, because the formula applies to stairs 1100mm or wider (see paragraph 3.19).

This width will also be adequate when one storey exit is discounted as described in paragraph 2.28. It also complies with paragraph 3.11a (i.e. the stair widths are not less than the minimum widths needed for 100 people in table 2.4).

- the stairs serving floors 1 to 9:

$$P = 1200/2 = 600, N = 9$$

From the formula:

$$600 = 200W + 50 (W - 0.3)(9 - 1)$$

$$600 = 200W + (50W - 15)(8)$$

$$600 = 200W + 400W - 120$$

$$720 = 600W$$

$$W = 1200\text{mm}$$

Therefore both stairs between the ninth floor landing and the ground floor should be at least 1200mm wide.

This width will also be adequate when one storey exit is discounted as described in paragraph 2.28. It also complies with paragraph 3.11a (i.e. the stair widths are not less than the minimum widths needed for 134 people in table 2.4).

Phased evacuation

3.20 Phased evacuation cannot be used in every type of **building**, but can be advantageous for escape stairs in high **buildings**. It requires supporting facilities, such as fire alarms, to be provided and maintained.

In a phased evacuation, the first people to be evacuated are those of reduced mobility and those on the **storey** most immediately affected by the fire. If needed, subsequent evacuation is done two floors at a time, reducing disruption in large **buildings**.

Phased evacuation enables stairs to be narrower than with simultaneous evacuation, and may be used for any **building** provided it is not identified in paragraph 3.17.

3.21 Phased evacuation in **buildings** over 30m in **height** introduces the potential for escaping people to impede firefighters entering and operating within the **building**. This can be addressed by consulting with the fire and rescue service about special management procedures.

In very tall **buildings**, typically over 45m in **height**, physical measures may need to be incorporated, such as by discounting a stair.

3.22 A **building** (or part of a **building**) designed for phased evacuation should satisfy all of the following criteria.

- a. At each **storey** except a top **storey**, stairs should be approached through a **protected lobby** or **protected corridor**.
- b. At each **storey**, the lifts should be approached through a **protected lobby** (see paragraph 4.38).
- c. Every floor should be a **compartment floor** (REI depending on **height** and use of the **building**).
- d. If there is a **storey** with a floor over 30m above ground level, the **building** should be protected throughout by an automatic sprinkler system in accordance with section 10.
- e. The **building** should be fitted with an appropriate fire warning system conforming to at least the L3 standard given in **BS 5839-1**.
- f. An internal speech communication system should provide communication between a control point at fire and rescue service access level and a fire warden on every **storey**. The recommendations for phased evacuation provided in **BS 5839-1** should be followed. Where it is deemed appropriate to install a voice alarm, this should be in accordance with **BS 5839-8**.

3.23 The minimum width of stair needed for phased evacuation is given in table 3.3.

Table 3.3 Minimum width of stairs designed for phased evacuation

Maximum number of people in any storey	Stair width mm ²
100	1000
120	1100
130	1200
140	1300
150	1400
160	1500
170	1600
180	1700
190	1800

NOTES:

1. This table assumes a phased evacuation of the fire floor first followed by evacuation of not more than two floors at a time.
2. Unless a central handrail is provided, stairs with a rise of more than 30m should be a maximum width of 1400mm (see paragraph 3.11).
3. As an alternative to using this table, the minimum width (in mm) may be calculated from:
 $(P \times 10) - 100$
 where P = the number of people on the most heavily occupied storey.
 However, the minimum width of a stair should be 1000mm.

Worked example using table 8

What is the minimum width needed for the stairs serving a 15 storey office building (ground + 14 office floors), assuming a total population of 2500 people (excluding the ground floor population, which does not use the stairs)? To satisfy the travel distance limitations, three stairs are required.

The building is over 45 metres in height and designed for phased evacuation. It has been decided to discount one stair to take account of fire and rescue service operations as described in paragraph 3.21. Therefore:

- Number of people per storey = $2500/14 = 179$.

Each remaining stair must be able to accommodate half the population of one storey (i.e. 90 people).

Thus each stair should be 1000mm wide (maximum capacity 100 people).

This width will also be adequate when one storey exit is discounted as described in paragraph 2.28. It also complies with paragraph 3.11a (i.e. the stair widths are not less than the minimum width needed for 90 people in table 2.4).

- At least one of those stairs needs to be a firefighting stair, therefore a minimum width of 1100mm is needed (see note 2 to table 3.1).

Additional worked example using table 3.3

What is the minimum width needed for the stairs serving a 9 storey office building (ground + 8 office floors), assuming a total population of 1920 people (excluding the ground floor population, which does not use the stairs)? To satisfy the travel distance limitations, two stairs are required.

As both stairs need to be entered at each level through a protected lobby (see paragraph 3.22), both stairs can be assumed to be available (see paragraph 3.16). Therefore:

- Number of people per storey = $1920/8 = 240$.
- Each stair must be able to accommodate half the population of one storey (i.e. $240/2 = 120$ people).
- Thus both stairs would require a width of 1100mm (maximum capacity 120 people) according to table 3.3, but:
- Each storey exit needs to be able to serve 240 people, because of discounting as described in paragraph 2.28. The minimum exit width needed for 240 people in table 2.4 is 1200mm. As described in paragraph 3.11a, the stair should be at least as wide as the storey exit serving it.
- The required stair width is therefore 1200mm.

Protection of escape stairs

Enclosure of escape stairs

3.24 Every internal escape stair should be a **protected stairway** (within a **fire resisting** enclosure). If it is also a **protected shaft** or **firefighting shaft**, additional guidance in sections 7 and 17 applies.

There is one exception, where an unprotected stair may form part of an internal escape route to a **storey exit** or **final exit**. The **travel distance** and the number of people involved must be very limited. For example, an unprotected stair may be acceptable in small premises (paragraphs 3.4 and 3.33) and raised storage areas (paragraphs 6.6 and 6.7).

Construction of escape stairs

3.25 The flights and landings of escape stairs should be constructed of materials achieving class A2-s3, d2 or better in all of the following situations.

- Unless the **building** has two or three **storeys** and is in **purpose groups** 1(a) or 3: if the escape stair is the only stair serving the **building** or part of the **building**.*
- If the escape stair is within a **basement storey**.
- If the escape stair serves any **storey** that has a floor level more than 18m above ground or access level.
- Except for a stair connecting the ground floor or paving level with a floor or flat roof a maximum of 6m above or below ground level: if the escape stair is external.*
- If the escape stair is a **firefighting stair**.

Combustible materials may be added to the top horizontal surface, except on **firefighting stairs**.

3.26 Further guidance on the construction of **firefighting stairs** is given in section 17. Dimensional constraints on the design of stairs are given in Approved Document K.

Single steps

3.27 Single steps on **escape routes** should be prominently marked. A single step on the line of a doorway is acceptable, subject to paragraph 4.23.

Helical stairs, spiral stairs and fixed ladders

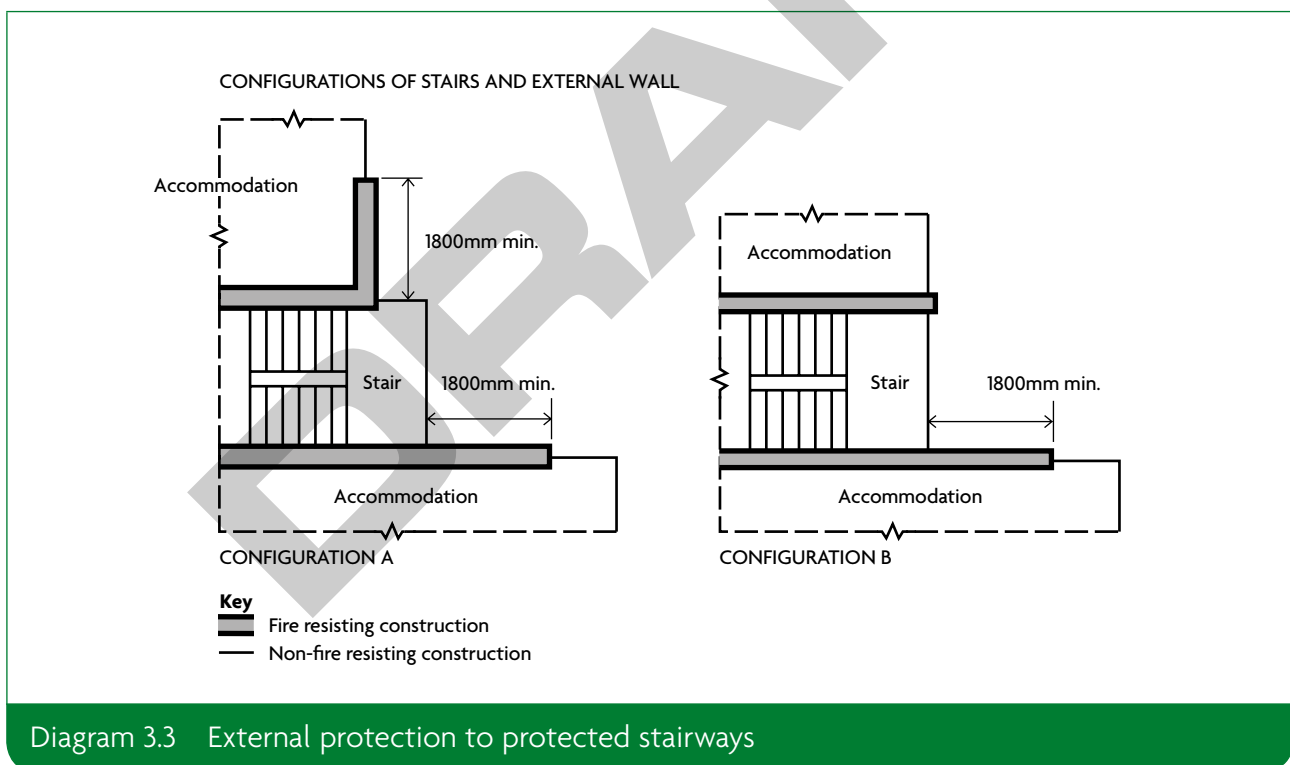
3.28 Helical stairs, spiral stairs and fixed ladders may form part of an escape route provided they comply with all of the following.

- Helical and spiral stairs should be designed in accordance with **BS 5395-2**. Stairs for the public should be type E (public) stairs.
- Fixed ladders should not be provided as a **means of escape** for members of the public. They should only be provided where a conventional stair is impractical, such as for access to plant **rooms** not normally occupied.

3.29 Guidance on the design of safe helical and spiral stairs and fixed ladders is given in Approved Document K.

External walls of protected stairways

3.30 As shown in diagram 3.3, the minimum distance between an **unprotected area** of the **building enclosure** and an **unprotected area** of the stair enclosure should be 1800mm.



External escape stairs

- 3.31** Where a **storey** or part of the **building** has more than one escape route available, some of the **escape routes** may be via an external escape stair, provided the following conditions are met.
- There is at least one internal escape stair from every part of each **storey** (excluding plant areas).
 - In the case of an 'assembly and recreation' **building**, the route is not intended for use by the public.
 - In the case of an 'institutional' **building**, the route serves only office or residential staff accommodation.
- 3.32** Any external escape stair should meet all of the following (diagram 3.4).
- Access doors to the stair should be **fire resisting** (minimum E 30) and be fitted with a **self-closing device**, except for a single exit door from the **building** to the top landing of a downward-leading external stair.
 - Flights and landings of an external escape stair should be of **fire resisting** construction (minimum RE 30). **Fire resisting** construction is also required for the **building** envelope within the following zones from the stair.
 - 1800mm above and horizontally.
 - 9m vertically below.
 - 1100mm above the top landing of the stair (except where the stair leads from basement to ground level).
 - Fire resisting** construction (minimum RE 30) should protect any part of the **building** or adjoining **building** (including doors) within 1800mm of the escape stair to a place of safety. This does not apply if there is a choice of routes from the foot of the external escape stair.
 - Stairs more than 6m in **height** should be protected from adverse weather. Protection should prevent the build-up of snow or ice but does not require full enclosure. Some level of protection may be provided by the **building** itself.
 - In areas of **fire resisting** construction, glazing should be fixed shut and **fire resisting** (in terms of integrity but not insulation).

Small premises

- 3.33** A stair in a small premises that is not a bar or restaurant may be open when it complies with all of the following.
- It connects a maximum of two **storeys**.
 - It enters the ground **storey** a maximum of 3m from the **final exit** (see diagrams 3.5 and 3.6).
 - The **storey** is also served by a **protected stairway**, or all of the following apply.
 - The stair is a single stair.
 - The floor area in any **storey** is a maximum of 90m².
 - If the premises contains three **storeys**, the stair serving either the top or bottom **storey** is enclosed with **fire resisting** construction at the ground **storey** level and discharges to a **final exit** independent of the ground **storey** (see diagram 3.6).

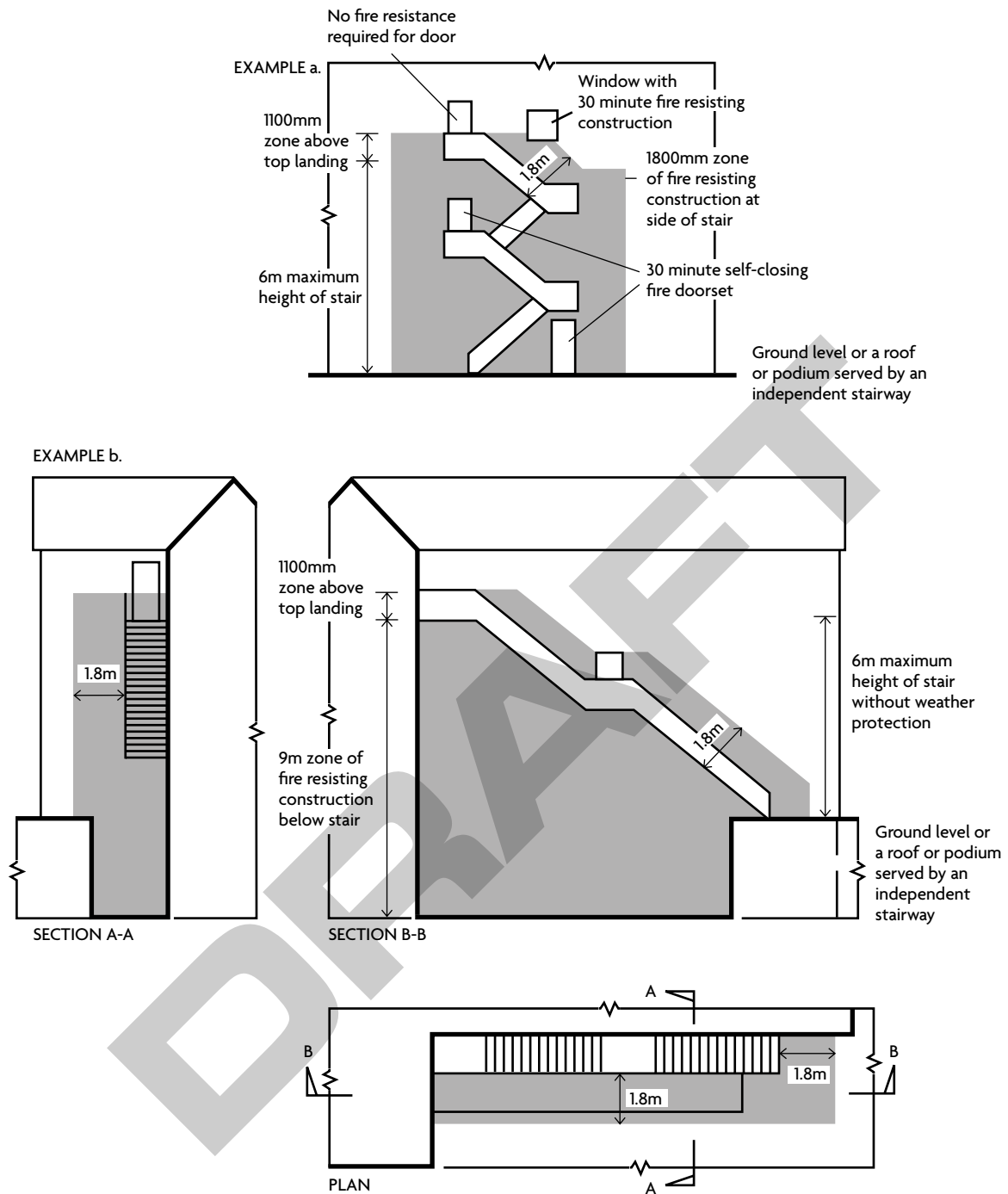
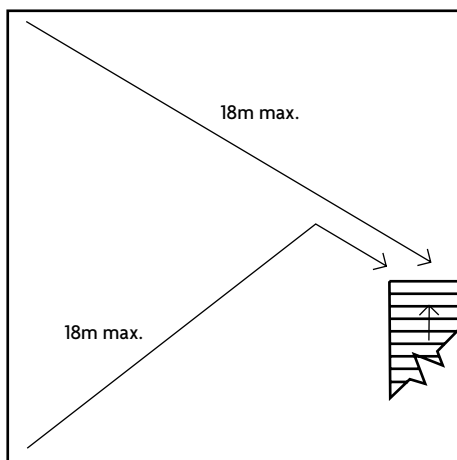
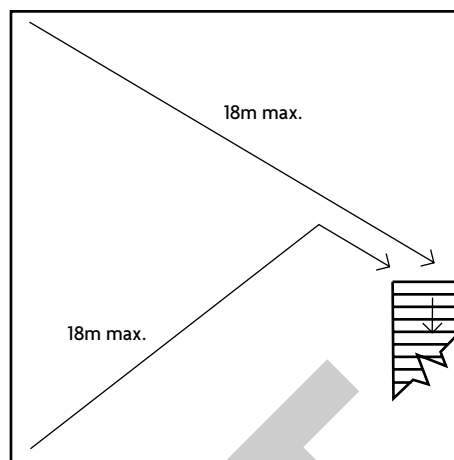


Diagram 3.4 Fire resistance of areas near to external stairs

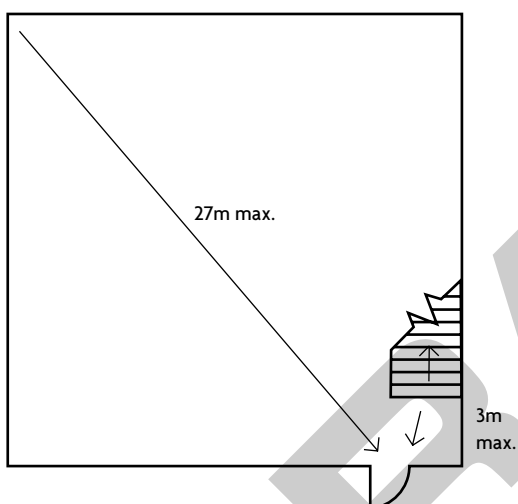
a. FIRST STOREY



c. BASEMENT



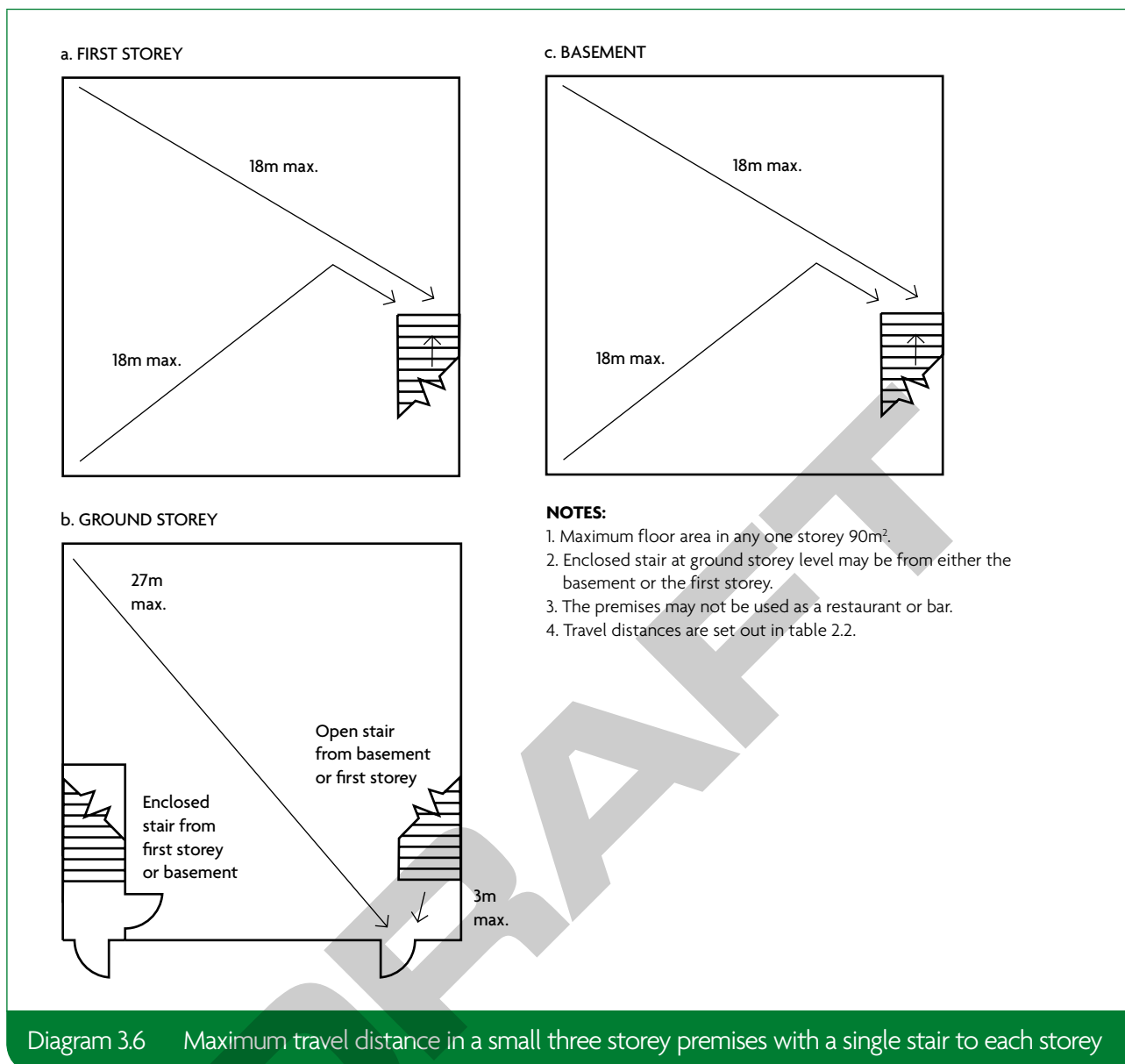
b. GROUND STOREY



NOTES:

1. Maximum floor area in any one storey 90m².
2. The premises may not be used as a restaurant or bar.
3. Only acceptable in two storey premises (a+b or b+c).
4. Travel distances are set out in table 2.2.

Diagram 3.5 Maximum travel distance in a small three storey premises with a single open stair



Access lobbies and corridors

3.34 In the following situations, **protected lobbies** or **protected corridors** should be provided at all **storeys** above ground, except the top **storey**.

- Except in small premises covered in paragraph 2.4:* if the stair is the only one serving a **building** or part of a **building** that has more than one **storey** above or below the ground **storey**.
- If the stair serves any **storey** at a **height** of 18m or more above ground level.
- If the **building** is designed for phased evacuation.
- If the stair is a **firefighting stair**.
- If the option in paragraph 3.16b has been used so as not to discount one stairway when calculating stair widths.

As an alternative to (a) to (c), a smoke control system as described in paragraph 3.16a may be used.

3.35 A **protected lobby** should be provided between an escape stairway and a **place of special fire hazard**. The lobby should have a minimum 0.4m² permanent ventilation.

Exits from protected stairways

3.36 Every **protected stairway** should lead to a **final exit**, either directly or via an **exit passageway**. Any protected exit corridor or stair should have the same standard of fire resistance and lobby protection as the stair it serves. The exit from a **protected stairway** should comply with paragraphs 4.21 to 4.25.

Separation of adjoining protected stairways

3.37 Two adjacent **protected stairways** (or **exit passageways** leading to different **final exits**) should be separated by an imperforate enclosure.

Use of space within protected stairways

- 3.38** A **protected stairway** may only include any of the following.
- Sanitary accommodation or washrooms, as long as the accommodation is not used as a cloakroom. A gas water heater or sanitary towel incinerator may be installed in the accommodation, but no other gas appliance.
 - If the **protected stairway** is not a **firefighting stair**:* a lift well.
 - If the **protected stairway** is not the only stair serving the **building** or part of the **building**:* a reception desk or enquiry office area at ground or access level. The reception or enquiry office area should have a maximum area of 10m².
 - If the **protected stairway** is not the only stair serving the **building** or part of the **building**:* cupboards enclosed with **fire resisting** construction.

Gas service pipes in protected stairways

3.39 Gas service and installation **pipes** and meters should not be within a **protected stairway**, unless installed in accordance with the Pipelines Safety Regulations 1996 and the Gas Safety (Installation and Use) Regulations 1998.

Basement stairs

- 3.40** An escape stair forming part of the only escape route from an upper **storey** should *not* continue down to serve a **basement storey**. The basement should be served by a separate escape stair.
- 3.41** Where multiple escape stairs serve the upper **storeys**, only one needs to end at ground level. Other stairs may connect with the basement **storeys** if there is a **protected lobby** or a **protected corridor** between the stairs and accommodation at each basement level.

Section 4: General provisions

Introduction

- 4.1 This section applies to all **buildings** and deals with the design, construction and protection of **escape routes** and service installations.

Protection of escape routes

Fire resistance of enclosures

- 4.2 Fire resistance test criteria are set out in Appendix B. Standards of performance are summarised in tables B2 and B3. Apart from specific situations described in sections 1 and 2, and requirements B3 and B5, a minimum performance of REI 30 is sufficient to protect **means of escape**.

Fire resistance of doors

- 4.3 Fire resistance test criteria are set out in Appendix C. Standards of performance are summarised in table C1.

Fire resistance of glazed elements

- 4.4 If glazed elements in **fire resisting** enclosures and doors can only meet the required integrity performance, their use is limited. If both integrity and insulation performance can be met there is no restriction in this document on the use or amount of glass.
- 4.5 Glazed elements should also comply with the following where necessary.
- If the enclosure forms part of a **protected shaft**: section 7.
 - Appendix B, table B4.
 - Guidance on the safety of glazing: Approved Document K.

Doors on escape routes

- 4.6 Doors on **escape routes** (both within and from the **building**) should comply with paragraphs 4.7 to 4.16. Doors should be readily opened to avoid undue delay to people escaping.

Door fastenings

- 4.7 All doors on **escape routes** should be either of the following.
- Not fitted with locks, latches or bolts.
 - Fitted only with simple fastenings that are all of the following.
 - Easy to operate; it should be apparent how to undo the fastening.
 - Operable from the side approached by people escaping.
 - Operable without a key.
 - Operable without requiring people to manipulate more than one mechanism.

Doors may be fitted with hardware to allow them to be locked when **rooms** are empty.

In places such as hotel bedrooms, locks may be fitted that are key operated from the outside and manually opened from the inside.

4.8 If a door on an **escape route** has to be locked when the **building** is occupied, it should only be fitted with a lock or fastening that meets the following conditions.

- a. Is easy to operate.
- b. Is operated without a key.
- c. Is operated from the side approached by people escaping.

If a secure door is operated by code or combination keypad, swipe or proximity card, biometric data, etc., a security mechanism override should be possible from the side approached by people escaping.

4.9 Electrically powered locks should return to the unlocked position in all of the following situations.

- a. If the **fire alarm system** operates.
- b. If there is loss of power or system error.
- c. If a Type A manual door release unit to **BS EN 54-11** positioned on the side approached by people escaping is activated. If the door provides escape in either direction, a unit should be installed on both sides of the door.

4.10 In places of assembly, shop and commercial **buildings**, doors on **escape routes** from **rooms** with a capacity of more than 60 people should be either of the following.

- a. *Not* fitted with locks, latches or bolts.
- b. Fitted with panic fastenings in accordance with **BS EN 1125**.

In non-residential **buildings**, some **final exit** doors feature security locks that are used only when the **building** is empty. Such locks may be appropriate, but management procedures must emphasise their safe use.

4.11 Guidance on door closing and 'hold open' devices for **fire doorsets** is set out in Appendix C.

Direction of opening

4.12 The door of any doorway or exit should be hung to open in the direction of escape whenever possible. It should always be hung to open in the direction of escape if either of the following conditions applies.

- a. More than 60 people might be expected to use it during a fire.
- b. There is a very high risk of fire with potential for rapid fire growth, such as with some industrial activities.

Amount of opening and effect on associated escape routes

4.13 All doors on **escape routes** should be hung to meet the following conditions.

- a. Open by a minimum of 90 degrees.
- b. Open with a swing that complies with all of the following.
 - i. Is clear of any change of floor level, other than a threshold or single step on the line of the doorway.
 - ii. Does not reduce the effective width of any escape route across a landing.

4.14 Any door opening towards a corridor or a stair should be recessed to prevent its swing encroaching on the effective width.

Vision panels in doors

4.15 Doors should contain vision panels in both of the following situations.

- a. Where doors on **escape routes** divide corridors.
- b. Where doors are hung to swing both ways.

Approved Document M contains guidance about vision panels in doors across accessible corridors, and Approved Document K contains guidance about the safety of glazing.

Revolving and automatic doors

4.16 Where revolving doors, automatic doors and turnstiles are placed across **escape routes** they should comply with one of the following.

- a. They are automatic doors of the required width, and comply with the following conditions.
 - i. Their failsafe system provides outward opening from any open position.
 - ii. They have a monitored failsafe system to open the doors if the mains electricity supply fails.
 - iii. They failsafe to the open position if the power fails.
- b. Non-automatic swing doors of the required width are provided immediately adjacent to the revolving or automatic door or turnstile.

General

Headroom in escape routes

4.17 **Escape routes** should have a minimum clear headroom of 2m. The only projections allowed below this height are door frames.

Flooring of escape routes

4.18 **Escape route** floor finishes should minimise their slipperiness when wet. Finishes include the treads of steps and surfaces of ramps and landings.

Ramps and sloping floors

4.19 A ramp forming part of an **escape route** should meet the provisions in Approved Document M. Any sloping floor or tier should have a pitch of not more than 35 degrees to the horizontal.

4.20 Guidance for where there is fixed seating is given in both of the following.

- a. Approved Documents K and M give guidance on the design of ramps and associated landings, and on aisles and gangways where there is fixed seating.
- b. Section 2 of this document refers to **BS 9999**, which gives guidance on the design of **means of escape** in places with fixed seating.

Final exits

4.21 The width of a **final exit** should be at least the same as the minimum width of the **escape route** it serves.

4.22 People should be able to rapidly leave the area around the **building**. Direct access to a street, passageway, walkway or open space should be available. The route away from the **building** should comply with the following.

- a. Be well defined.
- b. If necessary, have suitable guarding.

4.23 **Final exits** should not present a barrier for disabled people. Where the route to a **final exit** does not include stairs, a level threshold and, where necessary, a ramp should be provided.

4.24 **Final exit** locations should be clearly visible and recognisable.

4.25 **Final exits** should avoid outlets of basement smoke vents and openings to transformer chambers, refuse chambers, boiler rooms and similar risks.

Lighting of escape routes

4.26 All **escape routes** should have adequate artificial lighting. If the mains electricity power supply fails, **escape lighting** should illuminate the routes listed in table 4.1.

4.27 Escape stair lighting should be on a separate circuit from the electricity supply to any other part of the **escape route**.

4.28 Standards for a system of **escape lighting** are given in **BS 5266-1**.

Table 4.1 Provisions for escape lighting

Purpose group of the building or part of the building	Areas requiring escape lighting
1. Residential	All common escape routes ⁽¹⁾
2. Office, industrial, storage and other non-residential	a. Underground or windowless accommodation b. Stairways either: <ul style="list-style-type: none"> • in a central core • that serve storey(s) more than 18m above ground level c. Internal corridors more than 30m long d. Open-plan areas of more than 60m
3. Shop and commercial, and car parks	a. Underground or windowless accommodation b. Stairways either: <ul style="list-style-type: none"> • in a central core • that serve storey(s) more than 18m above ground level c. Internal corridors more than 30m long d. Open-plan areas of more than 60m ² e. All escape routes (other than in the following exception) to which the public are admitted. ⁽¹⁾ The exception is shops that: <ul style="list-style-type: none"> • have a maximum of three storeys • have no sales floor of more than 280m² • are <i>not</i> a restaurant or bar
4. Assembly and recreation	a. All escape routes ⁽¹⁾ b. Accommodation except for that which is open on one side to view sport or entertainment during normal daylight hours
5. Any purpose group	a. All toilet accommodation with a minimum floor area of 8m ² b. Electricity and generator rooms c. Switch room/battery room for emergency lighting system d. Emergency control rooms
NOTES: 1. Including external escape routes.	

Exit signs

4.29 **Escape routes** should be marked by emergency exit signs of adequate size that comply with the Health and Safety (Safety Signs and Signals) Regulations 1996. Suitable signs should also be provided for refuges (see paragraph 3.9).

Signs containing symbols or pictograms that conform to **BS 5499-1** satisfy these regulations. Some **buildings** may require additional signs to meet other legislation.

Advice on fire safety signs, including emergency escape signs, is given in the HSE publication *Safety Signs and Signals: Guidance on Regulations*.

Protected power circuits

- 4.30** To limit potential damage to cables in **protected circuits**, all of the following should apply.
- Cables should be sufficiently robust.
 - Cable routes should be carefully selected and/or physically protected in areas where cables may be exposed to damage.
 - Methods of cable support should be class A1 rated and offer at least the same integrity as the cable.
- 4.31** A **protected circuit** to operate equipment during a fire should achieve all of the following.
- Cables should achieve PH 30 classification when tested in accordance with **BS EN 50200** (incorporating Annex E), or an equivalent standard.
 - It should only pass through parts of the **building** in which the fire risk is negligible.
 - It should be separate from any circuit provided for another purpose.
- 4.32** Guidance on cables for large and complex **buildings** is given in **BS 5839-1**, **BS 5266-1** and **BS 8519**.

Lifts

Evacuation lifts

- 4.33** Generally, lifts should not be used when there is a fire in the **building**, unless their use forms part of a management plan for evacuating people and following conditions are met.
- Lifts are appropriately sited and protected.
 - Lifts contain safety features to ensure they remain usable during a fire.
- Guidance on the design and use of **evacuation lifts** is given in **BS 9999**.
- 4.34** Where a **firefighting lift** is provided, it can be used to evacuate disabled people. Management plans should describe how this would be managed, and what will happen when the fire and rescue service arrive.

Fire protection of lift installations

- 4.35** Lift wells should comply with one of the following conditions.
- Be sited within the enclosures of a **protected stairway**.
 - Be enclosed with **fire resisting** construction (minimum REI 30) when in a position that might prejudice the **means of escape**.
- 4.36** A lift well connecting different **compartments** should form a **protected shaft** (see section 7).
- 4.37** Lifts that rise within a large volume such as a mall or **atrium** and do not have a conventional well, such as wall-climber or feature lifts, may be at risk if they run through a smoke reservoir. Care should be taken to maintain the integrity of the smoke reservoir and protect people in the lift.
- 4.38** In **buildings** designed for phased horizontal evacuation, if the lift well is not within the enclosures of a **protected stairway**, its entrance should be separated at every **storey** by a **protected lobby** (minimum REI 30).
- 4.39** In basements and enclosed car parks, the lift should be within the enclosure of a **protected stairway**. Otherwise, the lift should be approached only via a **protected lobby** or **protected corridor** (minimum REI 30).

- 4.40** The lift should be approached via a **protected lobby** or **protected corridor** (minimum REI 30) where both of the following apply.
- Where the lift serves any **storey** containing high fire risk areas (kitchens, communal lounges, stores).
 - Where the lift delivers directly into corridors serving sleeping accommodation.
- 4.41** A lift shaft should not serve any basement where either of the following applies.
- There is only one escape stair, and smoke from a basement fire would adversely affect **escape routes** in the upper **storeys**.
 - The lift shaft is within the enclosure to an escape stair that terminates at ground level.
- 4.42** Lift machine **rooms** should be sited over the lift well where practical. Where **buildings** with one stair make this arrangement impractical, the lift should be sited outside the **protected stairway**.

Refuse chutes and storage

- 4.43** Site and construct refuse storage chambers, refuse chutes and refuse hoppers in accordance with **BS 5906**.
- 4.44** Refuse chutes and **rooms** for storing refuse should meet both of the following conditions.
- Be separated from other parts of the **building** by **fire resisting** construction (minimum REI 30 in **buildings** with a top **storey** up to 5m above ground level; otherwise REI 60).
 - Not be situated within a **protected stairway** or **protected lobby**.
- 4.45** The approach to **rooms** containing refuse chutes or for storing refuse should comply with one of the following conditions.
- Be directly from the open air.
 - Be through a **protected lobby** with a minimum 0.2m² of permanent ventilation.
- 4.46** Access openings to refuse storage chambers should *not* be sited next to **escape routes** or **final exits**.

Shop store rooms

- 4.47** Fully enclosed walk-in store **rooms** should be separated from retail areas with **fire resisting** construction (minimum REI 30) if they negatively affect the **means of escape**. The **fire resisting** construction is not necessary if the walk-in store **room** complies with either of the following.
- Has an automatic fire detection and alarm system.
 - Is fitted with sprinklers.

Requirement B2: Internal fire spread (linings)

This section deals with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
Internal fire spread (linings)	
B2. (1) To inhibit the spread of fire within the building, the internal linings shall: <ul style="list-style-type: none"> (a) adequately resist the spread of flame over their surfaces; and (b) have, if ignited, either a rate of heat release or a rate of fire growth, which is reasonable in the circumstances. 	
(2) In this paragraph 'internal linings' means the materials or products used in lining any partition, wall, ceiling or other internal structure.	

Intention

In the Secretary of State's view, requirement B2 is met by achieving a restricted spread of flame over internal linings. The building fabric should make a limited contribution to fire growth, including a low rate of heat release.

Requirement B2 *does not* include guidance on the following.

- a. Generation of smoke and fumes.
- b. The upper surfaces of floors and stairs.
- c. Furniture and fittings.

Section 5: Wall and ceiling linings

Classification of linings

5.1 The surface linings of walls and ceilings should meet the classifications in table 5.1.

Table 5.1 Classification of linings

Location	European class
Small rooms of maximum area:	D-s3, d2
a. 4m ² in residential accommodation	
b. 30m ² in non-residential accommodation	
Other rooms (including garages)	C-s3, d2
Other circulation spaces	B-s3, d2 ⁽¹⁾
NOTES:	
1. Wallcoverings which conform to BS EN 15102 achieving at least class C-s3, d2 and bonded to a class A2-s3, d2 substrate, will also be applicable.	

Walls

- 5.2 For the purposes of this requirement, a wall includes both of the following.
- The surface of internal and external glazing (except glazing in doors).
 - Any part of a ceiling which slopes at an angle greater than 70 degrees to the horizontal.
- 5.3 For the purposes of this requirement, a wall *does not* include any of the following.
- Doors and door frames.
 - Window frames and frames in which glazing is fitted.
 - Architraves, cover moulds, picture rails, skirtings and similar narrow members.
 - Fireplace surrounds, mantle shelves and fitted furniture.
- 5.4 Parts of walls in rooms may be of lower performance than stated in table 5.1, but not lower than class D-s3, d2. In any one room, the total area of lower performance should be less than half of the room's floor area, up to a maximum of:
- 20m² in residential accommodation
 - 60m² in non-residential accommodation.

Ceilings

- 5.5 For the purposes of this requirement, a ceiling includes all of the following.
- Glazed surfaces.
 - Any part of a wall at 70 degrees or less to the horizontal.
 - The underside of a mezzanine or gallery.

d. The underside of a roof exposed to the **room** below.

5.6 For the purposes of this requirement, a **ceiling** *does not* include any of the following.

- a. Trap doors and their frames.
- b. The frames of windows or **rooflights** and frames in which glazing is fitted.
- c. Architraves, cover moulds, picture rails, exposed beams and similar narrow members.

Fire resisting ceilings

5.7 The need for **cavity barriers** in concealed floor or roof spaces can be reduced by installing a **fire resisting ceiling** (minimum EI 30) below the cavity, complying with diagram 8.3.

Rooflights

5.8 **Rooflights** should meet the following classifications, according to material. No guidance for European fire test performance is currently available, because there is no generally accepted test and classification procedure.

- a. Non-plastic **rooflights** should meet the relevant classification in table 5.1.
- b. Plastic **rooflights**, if the limitations in table 5.2 and table 14.3 are observed, should be a minimum class D-s3, d2 rating. Otherwise they should meet the relevant classification in table 5.1.

Special applications

- 5.9** Any flexible membrane covering a structure, other than an air-supported structure, should comply with Appendix A of **BS 7157**.
- 5.10** Guidance on the use of PTFE-based materials for tension-membrane roofs and structures is given in BRE report BR 274.

Fire behaviour of insulating core panels used for internal structures

5.11 Insulating core panels consist of an inner core of insulation sandwiched between, and bonded to, a membrane such as galvanised steel or aluminium. When exposed to a fire, the bond can fail, causing the panel to lose its stiffness and exposing the insulation to the fire.

Insulating core panel systems are used for external cladding as well as for internal structures. Where they are used for external cladding, they should be used in accordance with the guidance on **external wall** construction in section 13.

Where they are used for internal structures they can present particular problems with regard to fire spread, and should meet all of the following.

- a. Panels with a core which is not class A1-s3, d2 should be sealed to prevent exposure of the core to a fire. This includes at joints and where services penetrate the panel.
- b. In high fire risk areas, such as kitchens, **places of special fire hazard** or in proximity to where hot works occur, only class A1-s3, d2 cored panels should be used.
- c. Fixing systems for all panels should be designed to take account of the potential for the panel to delaminate. For instance, where panels are used to form a **suspended ceiling**, the fixing should pass through the panel and support it from the lower face.

Further advice can be found in *Design, construction, specification and fire management of insulated envelopes for temperature controlled environments* published by the International Association of Cold Storage Contractors (European Division).

Other controls on internal surface properties

5.12 Guidance on the control of flame spread is given in the following sections.

- Stairs and landings: section 3 (escape stairs) and section 17 (firefighting shafts).
- Section 8: exposed surfaces above fire-protecting suspended ceilings.
- Section 9: enclosures to above-ground drainage system pipes.

Thermoplastic materials

General

5.13 Thermoplastic materials that do not meet the classifications in table 5.1 can be used as described in paragraphs 5.14 to 5.19. No guidance is currently possible on performance requirements in European fire tests, because there is no generally accepted test and classification procedure.

Thermoplastic materials are defined in Appendix B, paragraph B19. Classifications used here are explained in paragraph B20.

Windows

5.14 Thermoplastic material classified as a TP(a) rigid product may be used to glaze external windows to rooms, but not external windows to circulation spaces. Approved Document K includes guidance on the safety of glazing.

Rooflights

5.15 In rooms and circulation spaces other than protected stairways, rooflights may be constructed of thermoplastic material if they comply with both of the following.

- The lower surface is classified as TP(a) rigid or TP(b).
- The size and location of the rooflights follow the limits in table 5.2 and the guidance in tables 14.2 and 14.3.

Lighting diffusers

5.16 The following paragraphs apply to lighting diffusers forming part of a ceiling. Diffusers may be part of a luminaire, or used below sources of light. The following paragraphs *do not* apply to diffusers of light fittings attached to the soffit of a ceiling or suspended beneath a ceiling (diagram 5.1).

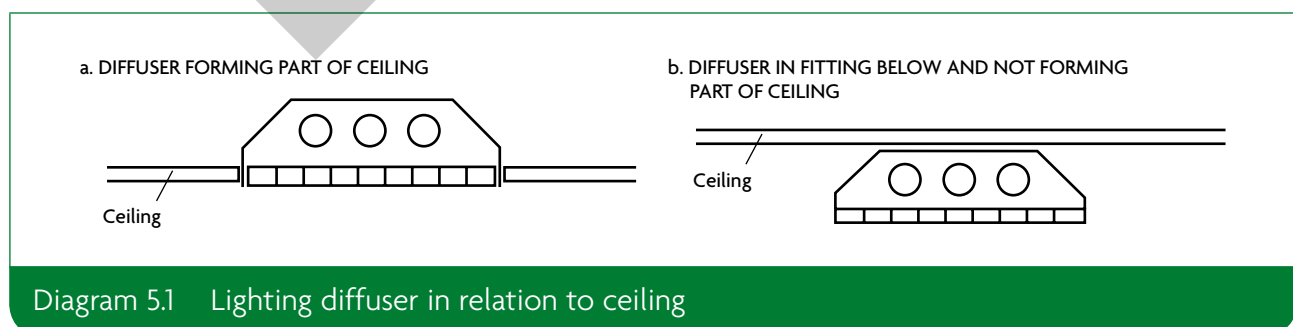


Diagram 5.1 Lighting diffuser in relation to ceiling

5.17 To be used in fire-protecting or fire resisting ceilings, thermoplastic lighting diffusers should be part of a tested ceiling system.

- 5.18** Ceilings to rooms and circulation spaces, but not to protected stairways, may incorporate lighting diffusers constructed of thermoplastic material if both of the following conditions are met.
- Except for the upper surfaces of the thermoplastic panels, wall and ceiling surfaces exposed in the space above the suspended ceiling should comply with paragraph 5.1.
 - Diffusers should be classified as one of the following.
 - TP(a) rigid – no restrictions on their extent.
 - TP(b) – limited in their extent (see table 5.2 and diagram 5.2).

Suspended or stretched-skin ceilings

- 5.19** Where not required to be fire resisting, the ceiling may be constructed from TP(a) flexible panels. Each panel should meet the following conditions.
- Have a maximum area of 5m².
 - Be supported on all sides.

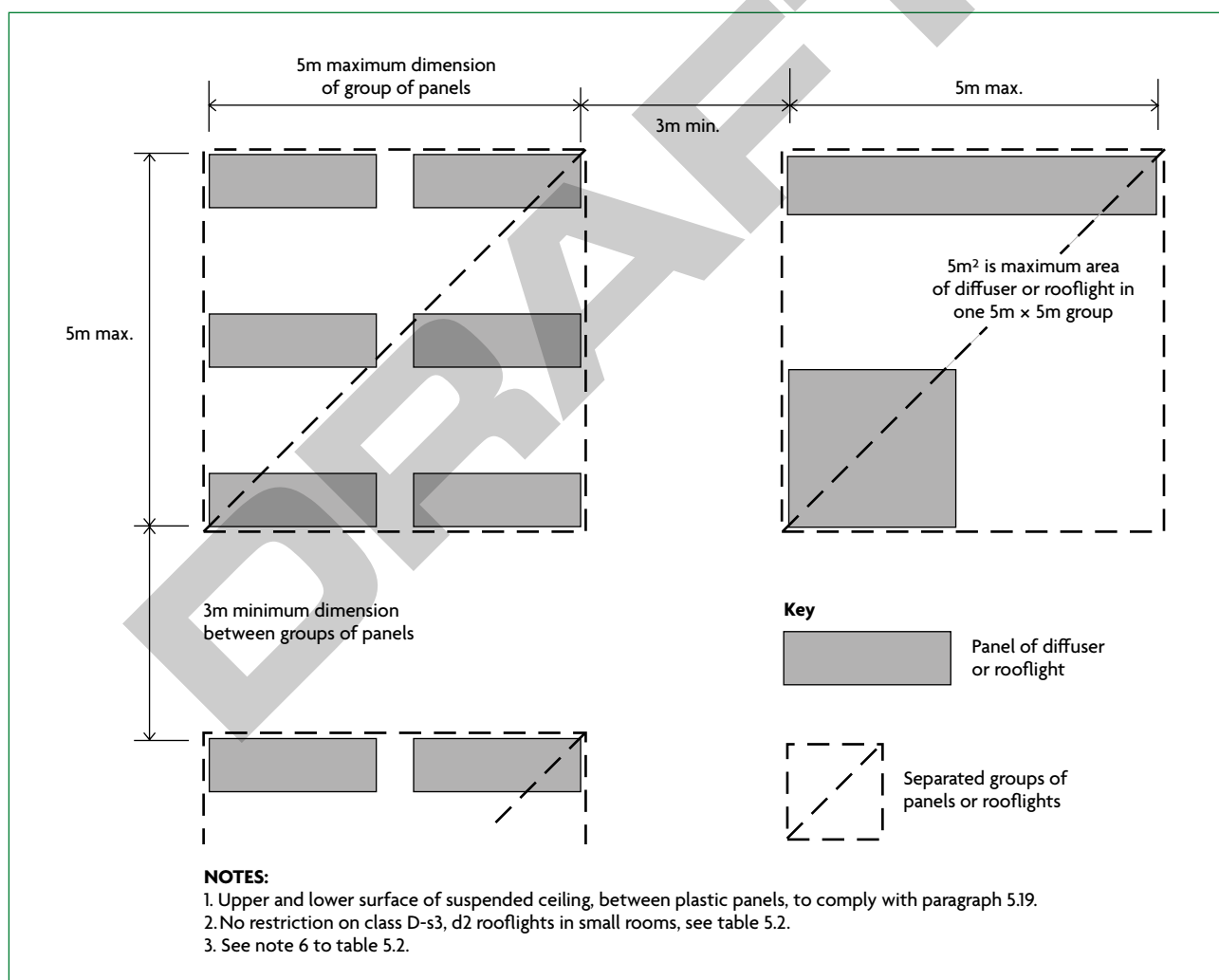


Diagram 5.2 Layout restrictions on class D-s3, d2 plastic rooflights, TP(b) rooflights and TP(b) lighting diffusers

Table 5.2 Limitations applied to thermoplastic rooflights and lighting diffusers in suspended ceilings and class D-s3, d2 plastic rooflights⁽¹⁾

Minimum classification of lower surface	Use of space below the diffusers or rooflight	Maximum area of each diffuser panel or rooflight ⁽²⁾ (m ²)	Maximum total area of diffuser panels and rooflights as percentage of floor area of the space in which the ceiling is located (%)	Minimum separation distance between diffuser panels or rooflights ⁽¹⁾ (m)
TP(a)	Any except protected stairway	No limit ⁽³⁾	No limit	No limit
D-s3, d2 ⁽⁴⁾ or TP(b)	Rooms	1	50 ⁽⁵⁾⁽⁶⁾	A distance equal to the largest plan dimension of the largest diffuser or rooflight (see diagram 5.3)
		5	50 ⁽⁵⁾⁽⁶⁾	3 ⁽⁶⁾
	Circulation spaces except protected stairways	5	15 ⁽⁵⁾	3

NOTES:

1. This table does not apply to products that meet the provisions in table 5.1.
2. Smaller panels can be grouped together provided that both of the following satisfy the dimensions in diagram 5.2 or 5.3.
 - a. The overall size of the group.
 - b. The space between one group and any others.
3. Lighting diffusers of TP(a) flexible rating should be used only in panels of a maximum of 5m² each – see paragraph 5.19.
4. There are no limits on the use of class D-s3, d2 materials in small rooms. See table 5.1.
5. The minimum separation between each panel should be maintained. Therefore, in some cases, this value for maximum percentage area might not be achieved.
6. Class D-s3, d2 rooflights to rooms in industrial and other non-residential purpose group buildings may be spaced 1800mm apart provided the rooflights are both:
 - a. evenly distributed
 - b. of a maximum area that does not exceed 20% of the area of the room.

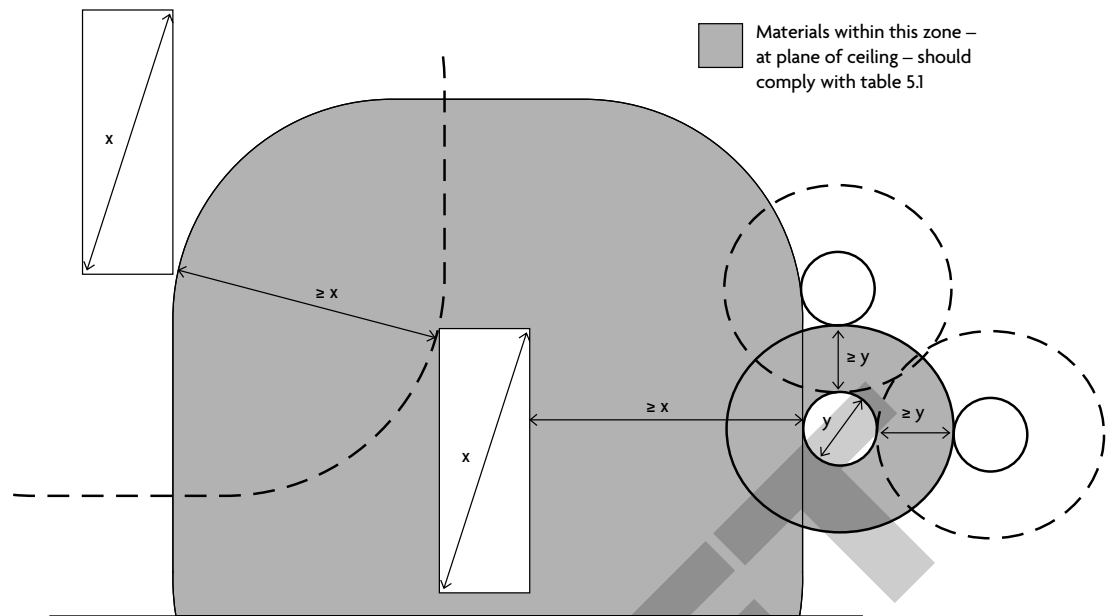


Diagram 5.3 Layout restrictions on small class D-s3, d2 plastic rooflights, TP(b) rooflights and TP(b) lighting diffusers

Requirement B3: Internal fire spread (structure)

These sections deal with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
Internal fire spread (structure)	
<p>B3. (1) The building shall be designed and constructed so that, in the event of fire, its stability will be maintained for a reasonable period.</p> <p>(2) A wall common to two or more buildings shall be designed and constructed so that it adequately resists the spread of fire between those buildings. For the purposes of this sub-paragraph a house in a terrace and a semi-detached house are each to be treated as a separate building.</p> <p>(3) Where reasonably necessary to inhibit the spread of fire within the building, measures shall be taken, to an extent appropriate to the size and intended use of the building, comprising either or both of the following:</p> <p>(a) sub-division of the building with fire-resisting construction;</p> <p>(b) installation of suitable automatic fire suppression systems.</p> <p>(4) The building shall be designed and constructed so that the unseen spread of fire and smoke within concealed spaces in its structure and fabric is inhibited.</p>	<p>Requirement B3(3) does not apply to material alterations to any prison provided under section 33 of the Prison Act 1952.</p>

Intention

In the Secretary of State's view, requirement B3 is met by achieving all of the following.

- For defined periods, loadbearing **elements of structure** withstand the effects of fire without loss of stability.
- Compartmentation of **buildings** by **fire resisting** construction elements.
- Protection of openings in **fire-separating elements** to maintain continuity of the fire separation.
- Inhibition of the unseen spread of fire and smoke in hidden voids.

Section 6: Loadbearing elements of structures

Fire resistance standard

- 6.1** As a minimum, **elements of structure** should have the fire resistance given in Appendix B, table B2.
- 6.2** Appendix B includes all of the following.
- Provisions to ensure that where one **element of structure** supports or stabilises another **element of structure**, the supporting element has no less fire resistance than the other element (see table B3).
 - Measures so that elements common to more than one **building** or **compartment** are constructed to the standard of the greater of the relevant provisions.
 - Special provisions about fire resistance of **elements of structure** in **single storey buildings**.
 - Concessions in respect of fire resistance of **elements of structure** in basements where one or more sides of the basement are open at ground level.

Exclusions from the provisions for elements of structure

- 6.3** The following are excluded from the definition of 'element of structure'.
- A structure that supports only a roof, unless either of the following applies.
 - The roof performs the function of a floor, such as for parking vehicles, or as a **means of escape**.
 - The structure is essential for the stability of an **external wall** that needs to be **fire resisting**.
 - The lowest floor of the **building**.
 - A **platform floor**.
 - A loading **gallery**, fly **gallery**, stage grid, lighting bridge or any **gallery** provided for similar purposes or for maintenance and repair.

Additional guidance

- 6.4** If a loadbearing wall is any of the following, guidance in other sections may also apply.
- A **compartment wall** (including a wall common to two **buildings**): section 7.
 - Enclosing a **place of special fire hazard**: section 7, paragraph 7.5.
 - Protecting a **means of escape**: sections 2 to 4.
 - An **external wall**: sections 12 and 13.
 - Enclosing a **firefighting shaft**: section 17.
- 6.5** If a floor is also a **compartment floor**, see section 7.

Raised storage areas

- 6.6** The normal provisions for fire resistance may be too onerous to apply to raised, free-standing floors (sometimes supported by racking) in **single storey buildings** used for industrial and storage purposes. The introduction of raised storage areas can alter the effective number of **storeys** in the **building** (see the definition of 'storey' in Appendix A).
- 6.7** A structure that does not have a minimum fire resistance of REI 60 (for **buildings** without a sprinkler system; REI 30 for **buildings** with a sprinkler system throughout) is acceptable if it satisfies all of the following conditions.
- a. The structure meets both of the following.
 - i. It has only one tier.
 - ii. It is used for storage purposes *only*.
 - b. The people likely to be on the floor at any one time are both of the following.
 - i. Few in number.
 - ii. Not members of the public.
 - c. The floor is open above and below to the **room** or space in which it is situated.
 - d. The **means of escape** from the floor is in accordance with sections 2 to 4.
 - e. The floor meets both of the following.
 - i. It is not more than 10m in width or length.
 - ii. It is a maximum of half the floor area of the space in which it is situated.

The limitations in e may be adjusted if any of the following apply.
 - f. If the lower level has an automatic fire detection and alarm system meeting the recommendations of **BS 5839-1**, then the floor size may be increased to not more than 20m in either width or length.
 - g. If agreed with the **building control body** and the fire and rescue service, then it may be possible to vary this dimension and area. However, the safety of firefighters and the distance they may need to travel over or under the floor must be considered.
 - h. If the **building** is fitted throughout with an automatic sprinkler system complying with paragraph 10.1, then no limits are set for the size of the floor.

Section 7: Compartmentation

Provision of compartmentation

All purpose groups

- 7.1 A wall common to two or more buildings should be a compartment wall.
- 7.2 Parts of a building occupied mainly for different purposes should be separated from one another by compartment walls and/or compartment floors. Compartmentation is *not* needed if one of the different purposes is ancillary to the other.
- 7.3 Effective compartmentation relies on both of the following.
 - a. Fire resistance should be continuous at the join between elements forming a compartment.
 - b. Any openings between two compartments should not reduce the fire resistance.
- 7.4 The lowest floor in a building does not need to be a compartment floor.

Protected shafts

- 7.5 Stairs and service shafts connecting compartments should be protected to restrict the spread of fire between the compartments. These are called protected shafts. Walls or floors surrounding a protected shaft are considered to be compartment walls or compartment floors.

Places of special fire hazard

- 7.6 Fire resisting construction enclosing these places should achieve minimum REI 30. These walls and floors are not compartment walls and compartment floors.

Institutional buildings including health care

- 7.7 All floors should be constructed as compartment floors.
- 7.8 Paragraphs 2.42 and 2.43 give guidance on the provisions for compartment walls in care homes that use progressive horizontal evacuation.

Other residential buildings

- 7.9 All floors should be compartment floors.

Non-residential buildings

- 7.10 In buildings of a non-residential purpose group (groups 3 to 7), the following should be compartment walls and compartment floors.
 - a. Every wall needed to divide the building to observe the compartment size limits in table 7.1 (diagram 7.1a).
 - b. Every floor, if the building or separated part of the building (see paragraph 7.17) has a storey with a floor at more than 30m above ground level (diagram 7.1b).

- c. The floor of the ground storey, if the building has one or more basements (diagram 7.1c), except in small premises (see paragraph 2.4).
 - d. The floor of every basement storey (except the lowest floor), if the building or separated part has a basement more than 10m below ground level (diagram 7.1d).
 - e. Where the building forms part of a shopping complex: every wall and floor described in BS 9999 as needing to be constructed to the standard for a compartment wall or compartment floor.
 - f. If the building comprises 'shops and commercial', 'industrial' or 'storage' premises: every wall or floor dividing a building into separate occupancies (spaces used by different organisations, whether they fall within the same purpose group or not).
 - g. See also the provision in paragraph 4.47 for store rooms in shops to be separated from retail areas by fire resisting construction (minimum REI 30).
- 7.11** In a two storey building in the 'shops and commercial' or 'industrial' purpose groups, where the use of the upper storey is ancillary to the use of the ground storey, the ground storey may be treated as a single storey building for fire compartmentation purposes where all of the following apply.
- a. The area of the upper storey does not exceed the lower of:
 - i. 20% of the area of the ground storey
 - ii. 500m².
 - b. The upper storey is compartmented from the lower one.
 - c. The upper storey has a means of escape independent from the lower storey escape routes.

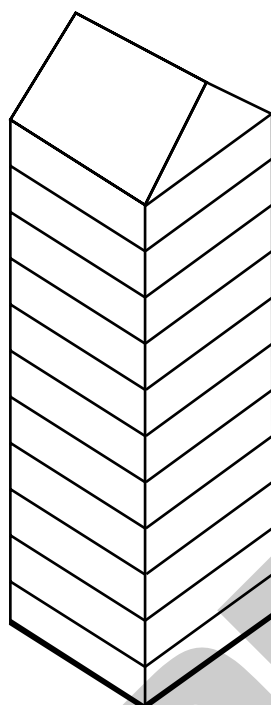
Buildings containing one or more atria

- 7.12** Detailed advice on atria in buildings is given in BS 9999. For the purposes of this document, BS 9999 applies only where the atrium breaches a compartment.

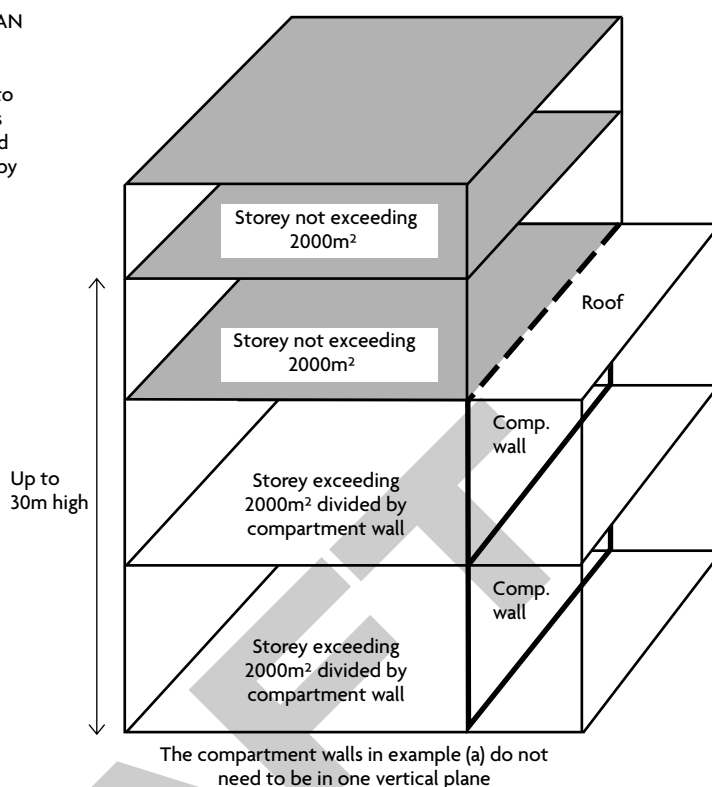
A. EXAMPLE OF COMPARTMENTATION IN AN UNSPRINKLERED SHOP see paragraph 7.10a

None of the floors in this case would need to be compartment floors, but the two storeys exceeding 2000m² would need to be divided into compartments not more than 2000m² by compartment walls.

B. COMPARTMENTATION IN TALL BUILDINGS see paragraph 7.10b

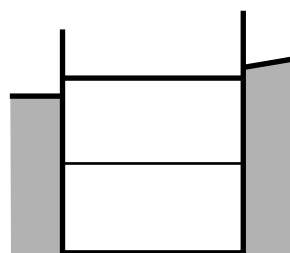


In a building over 30m in height all storeys should be separated by compartment floors. For advice on the special conditions in atrium buildings see BS 9999



C. SHALLOW BASEMENT see paragraph 7.10c

Only the floor of the ground storey need be a compartment floor if the lower basement is at a depth of not more than 10m



D. DEEP BASEMENTS see paragraph 7.10d

All basement storeys to be separated by compartment floors if any storey is at a depth of more than 10m

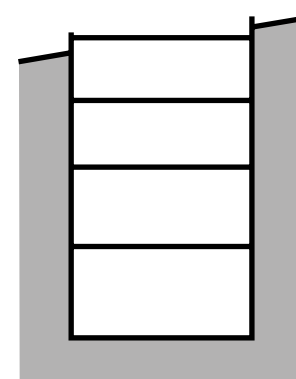


Diagram 7.1 Compartment floors: illustration of guidance in paragraph 7.10

Table 7.1 Maximum dimensions of building or compartment (non-residential buildings)

Purpose group of building or part	Height of floor of top storey above ground level (m)	Floor area of any one storey in the building or any one storey in a compartment (m ²)		
		In multi-storey buildings		In single storey buildings
Office	No limit	No limit		No limit
Assembly and recreation, shop and commercial:				
a. Shops – without sprinkler system	No limit	2000		2000
Shops – with sprinkler system ⁽¹⁾	No limit	4000		No limit
b. Elsewhere – without sprinkler system	No limit	2000		No limit
Elsewhere – with sprinkler system ⁽¹⁾	No limit	4000		No limit
Industrial ⁽²⁾				
Without sprinkler system	Not more than 18 More than 18	7000 2000 ⁽³⁾		No limit N/A
With sprinkler system ⁽¹⁾	Not more than 18 More than 18	14,000 4000 ⁽³⁾		No limit N/A
	Height of floor of top storey above ground level (m)	Maximum compartment volume (m ³)	Maximum floor area (m ²)	Maximum height (m) ⁽⁴⁾
		Multi-storey buildings	Single-storey buildings	
Storage ⁽²⁾ and other non-residential:				
a. Car park for light vehicles	No limit	No limit	No limit	No limit
b. Any other building or part:				
Without sprinkler system	Not more than 18 More than 18	20,000 4000 ⁽³⁾	20,000 N/A	18 N/A
With sprinkler system ⁽¹⁾	Not more than 18 More than 18	40,000 8000 ⁽³⁾	No limit	No limit

NOTES:

1. 'With sprinkler system' means that the building is fitted throughout with an automatic sprinkler system in accordance with section 10.
2. In certain industrial and storage uses that are under other legislation, for example the storage of LPG and certain chemicals, additional limitations on floor area and/or additional sprinkler provisions might apply.
3. This reduced limit applies only to storeys that are a minimum of 18m above ground level. Below this height the higher limit applies.
4. Compartment height is measured from finished floor level to the underside of the roof or ceiling.

Construction of compartment walls and compartment floors

General

- 7.13** All compartment walls and compartment floors should achieve both of the following.
- Form a complete barrier to fire between the compartments they separate.
 - Have the appropriate fire resistance, as given in Appendix B, tables B2 and B3.
- 7.14** Timber beams, joists, purlins and rafters may be built into or carried through a masonry or concrete compartment wall if the openings for them are both:
- as small as practicable
 - fire-stopped.
- If trussed rafters bridge the wall, failure of the truss due to a fire in one compartment should not cause failure of the truss in another compartment.
- 7.15** Where services could provide a source of ignition, the risk of fire developing and spreading prematurely into adjacent compartments should be controlled.

Compartment walls between buildings

- 7.16** Adjoining buildings should only be separated by walls, not floors. Compartment walls common to two or more buildings should achieve both of the following.
- Run the full height of the building in a continuous vertical plane.
 - Be continued through any roof space to the underside of the roof.

Separated parts of buildings

- 7.17** Compartment walls forming a separated part of a building should run the full height of the building in a continuous vertical plane.
- Separated parts can be assessed independently to determine the appropriate standard of fire resistance in each. The two separated parts can have different standards of fire resistance.

Other compartment walls

- 7.18** Compartment walls not described in paragraphs 7.16 and 7.17 should run the full height of the storey in which they are situated.
- 7.19** Compartment walls in a top storey beneath a roof should be continued through the roof space.

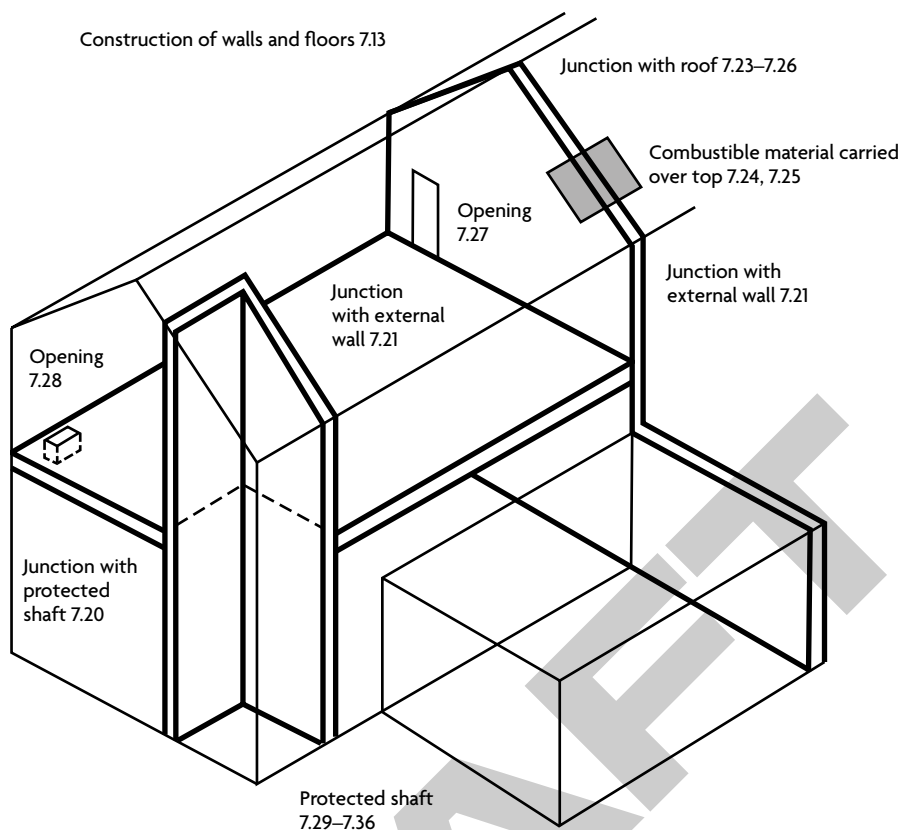


Diagram 7.2 Compartment walls and compartment floors with reference to relevant paragraphs in section 7

Junction of compartment wall or compartment floor with other walls

- 7.20** At the junction with another **compartment wall** or an **external wall**, the fire resistance of the compartmentation should be maintained. Fire-stopping that meets paragraphs 9.23 to 9.28 should be provided.
- 7.21** At the junction of a **compartment floor** and an **external wall** with no fire resistance (such as a curtain wall), the **external wall** should be restrained at floor level. The restraint should reduce movement of the wall away from the floor if exposed to fire.
- 7.22** **Compartment walls** should be able to accommodate deflection of the floor, when exposed to fire, by either of the following means.
- Between the wall and floor, provide a head detail that is capable of maintaining its integrity while deforming.
 - Design the wall so it maintains its integrity by resisting the additional vertical load from the floor above.

Where **compartment walls** are located within the middle half of a floor between vertical supports, the deflection may be assumed to be 40mm unless a smaller value can be justified by assessment. Outside this area, the limit can be reduced linearly to zero at the supports.

For steel beams that do not have the required fire resistance, reference should be made to SCI Publication P288.

Junction of compartment wall with roof

7.23 A **compartment wall** should achieve both of the following.

- a. Meet the underside of the roof covering or deck, with fire-stopping to maintain the continuity of fire resistance.
- b. Be continued across any eaves.

7.24 To reduce the risk of fire spreading over the roof from one **compartment** to another, a 1500mm wide zone of the roof, either side of the wall, should have a covering classified as $B_{ROOF}(t4)$, on a substrate or deck of a **material of limited combustibility**, as set out in diagram 7.3a.

Thermoplastic **rooflights** that, because of paragraph 14.7, are regarded as having a $B_{ROOF}(t4)$ classification are *not* suitable for use in that zone.

7.25 Combustible boarding used as a substrate to the roof covering, any wood wool slabs and any timber tiling battens, fully bedded in mortar or other suitable material for the width of the wall (diagram 7.3b), may extend over the **compartment wall** in **buildings** that are both of the following.

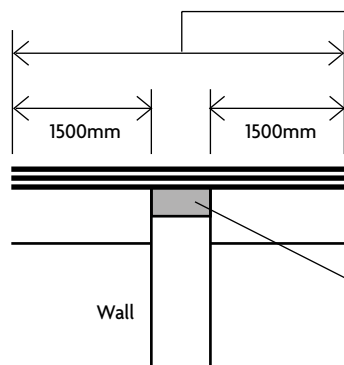
- a. A maximum of 15m high.
- b. In one of the following **purpose groups**.
 - i. Residential (other than institutional).
 - ii. Office.
 - iii. Assembly and recreation.

Double-skinned insulated roof sheeting with a thermoplastic core should incorporate a minimum 300mm wide band of material rated class A2-s3, d2 or better, centred over the wall.

7.26 As an alternative to paragraph 7.24 or 7.25, the **compartment wall** may extend through the roof for a minimum of either of the following (see diagram 7.3c).

- a. Where the height difference between the two roofs is less than 375mm, 375mm above the top surface of the adjoining roof covering.
- b. 200mm above the top surface of the adjoining roof covering where either of the following applies.
 - i. The height difference between the two roofs is 375mm or more.
 - ii. The roof coverings either side of the wall are of a material classified as $B_{ROOF}(t4)$.

a. ANY BUILDING OR COMPARTMENT



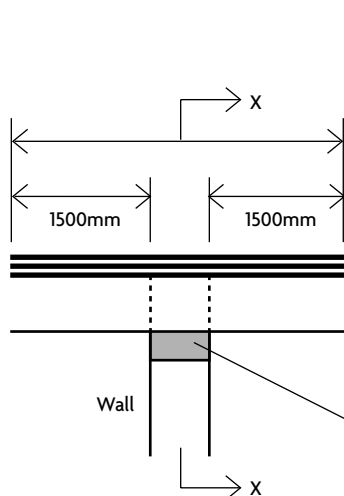
Roof covering over this distance to be designated $B_{\text{ROOF}}(t4)$ rated on deck of material of limited combustibility. Roof covering and deck could be composite structure, e.g. profiled steel cladding.

Double-skinned insulated roof sheeting should incorporate a band of material of limited combustibility at least 300mm wide centred over the wall.

If roof support members pass through the wall, fire protection to these members for a distance of 1500mm on either side of the wall may be needed to delay distortion at the junction (see note to paragraph 7.14).

Resilient fire-stopping to be carried up to underside of roof covering, e.g. roof tiles.

b. RESIDENTIAL (NOT INSTITUTIONAL), OFFICE OR ASSEMBLY USE AND NOT MORE THAN 15M HIGH



Roof covering to be designated $B_{\text{ROOF}}(t4)$ rated for at least this distance.

Boarding (used as a substrate), wood wool slabs or timber tiling battens may be carried over the wall provided that they are fully bedded in mortar (or other no less suitable material) where over the wall.

Thermoplastic insulation materials should not be carried over the wall.

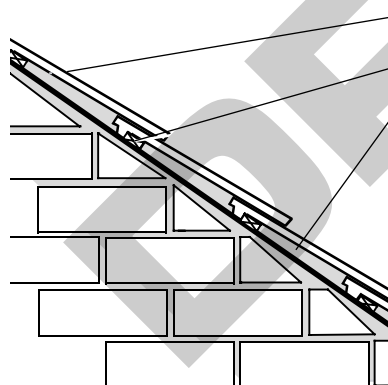
Double-skinned insulated roof sheeting with a thermoplastic core should incorporate a band of material of Class A2-s3, d2 at least 300mm wide centred over the wall.

Sarking felt may also be carried over the wall.

If roof support members pass through the wall, fire protection to these members for a distance of 1500mm on either side of the wall may be needed to delay distortion at the junction (see note to paragraph 7.14).

Fire-stopping to be carried up to underside of roof covering, boarding or slab.

Section X-X



Roof covering to be designated $B_{\text{ROOF}}(t4)$ rated for at least 1500mm either side of wall.

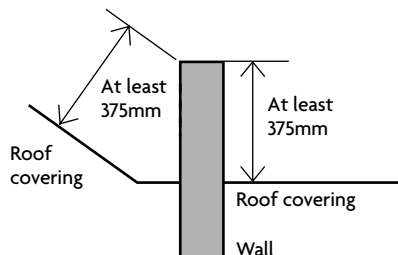
Roofing battens and sarking felt may be carried over the wall.

Fire-stopping to be carried up to underside of roof covering. Above and below sarking felt.

NOTES:

1. Fire-stopping should be carried over the full thickness of the wall.
2. Fire-stopping should be extended into any eaves.
3. The compartment wall need not necessarily be constructed of masonry.

c. ANY BUILDING OR COMPARTMENT



The wall should be extended up through the roof for a height of at least 375mm above the top surface of the adjoining roof covering.

Where there is a height difference of at least 375 mm between two roofs or where the roof coverings on either side of the wall are $B_{\text{ROOF}}(t4)$ rated the height of the upstand/parapet wall above the highest roof may be reduced to 200mm.

Diagram 7.3 Junction of compartment wall with roof

Openings in compartmentation

Openings in compartment walls separating buildings or occupancies

7.27 Openings in a **compartment wall** common to two or more **buildings**, or between different occupancies in the same **building**, should be limited to those for either of the following.

- a. A **fire doorset** providing a **means of escape**, which has the same fire resistance as the wall and is fitted as described in Appendix C.
- b. The passage of a **pipe** that meets the provisions in section 9.

Openings in other compartment walls, or in compartment floors

7.28 Openings should be limited to those for any of the following.

- a. **Fire doorsets** fitted as described in Appendix C.
- b. **Pipes**, ventilation ducts, service cables, chimneys, **appliance ventilation ducts** or ducts encasing one or more flue pipes, meeting the provisions in section 9.
- c. Refuse chutes of class A1 construction
- d. **Atria** designed in accordance with **BS 9999**.
- e. **Protected shafts** that conform to the provisions in the following paragraphs.

Protected shafts

7.29 Any stair or other shaft passing directly from one **compartment** to another should be enclosed in a **protected shaft**. **Protected shafts** should be used for the following only, but may also include sanitary accommodation and washrooms.

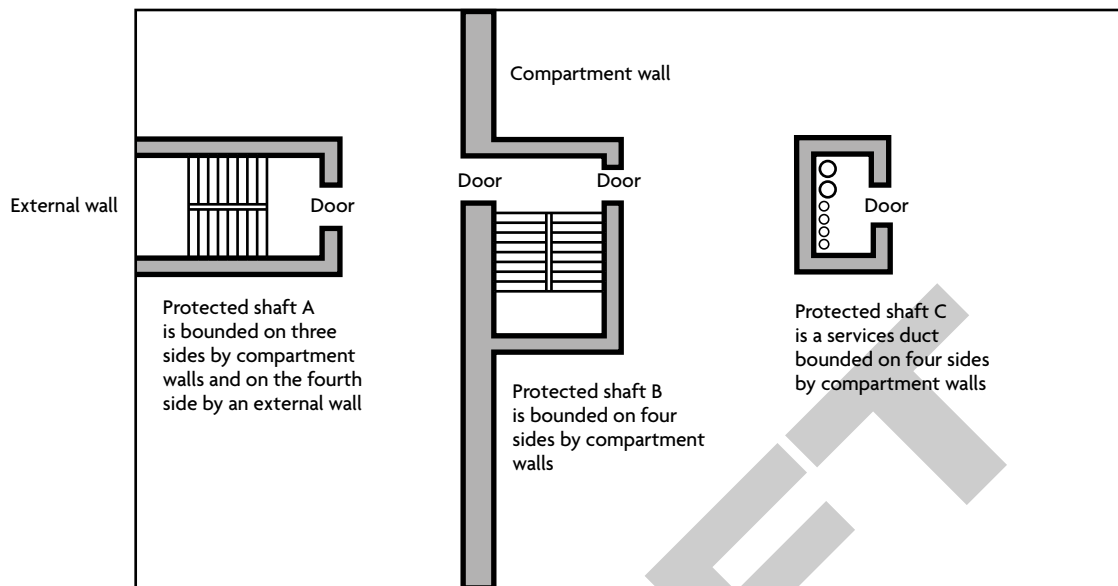
- a. Stairs.
- b. Lifts.
- c. Escalators.
- d. Chutes.
- e. Ducts.
- f. **Pipes**.
- g. Additional provisions apply for both of the following.
 - i. **Protected shafts** that are **protected stairways**: sections 2 to 4.
 - ii. Stairs that are also **firefighting stairs**: section 17.

Construction of protected shafts

7.30 The construction enclosing a **protected shaft** (diagram 7.4) should do all of the following.

- a. Form a complete barrier to fire between the **compartments** connected by the shaft.
- b. Have the appropriate fire resistance given in Appendix B, table B2, *except for uninsulated glazed screens that meet the provisions of paragraph 7.31*.
- c. Satisfy the provisions for ventilation and the treatment of openings in paragraphs 7.35 and 7.36.

Protected shafts provide for the movement of people (e.g. stairs, lifts) or for passage of goods, air or services such as pipes or cables between different compartments. The elements enclosing the shaft (unless formed by adjacent external walls) are compartment walls and floors. The diagram shows three common examples which illustrate the principles.



The shaft structure (including any openings) should meet the relevant provisions for: compartment walls (see paragraphs 7.13 to 7.19), external walls (see sections 12 and 13 and diagram 3.3).

Diagram 7.4 Protected shafts

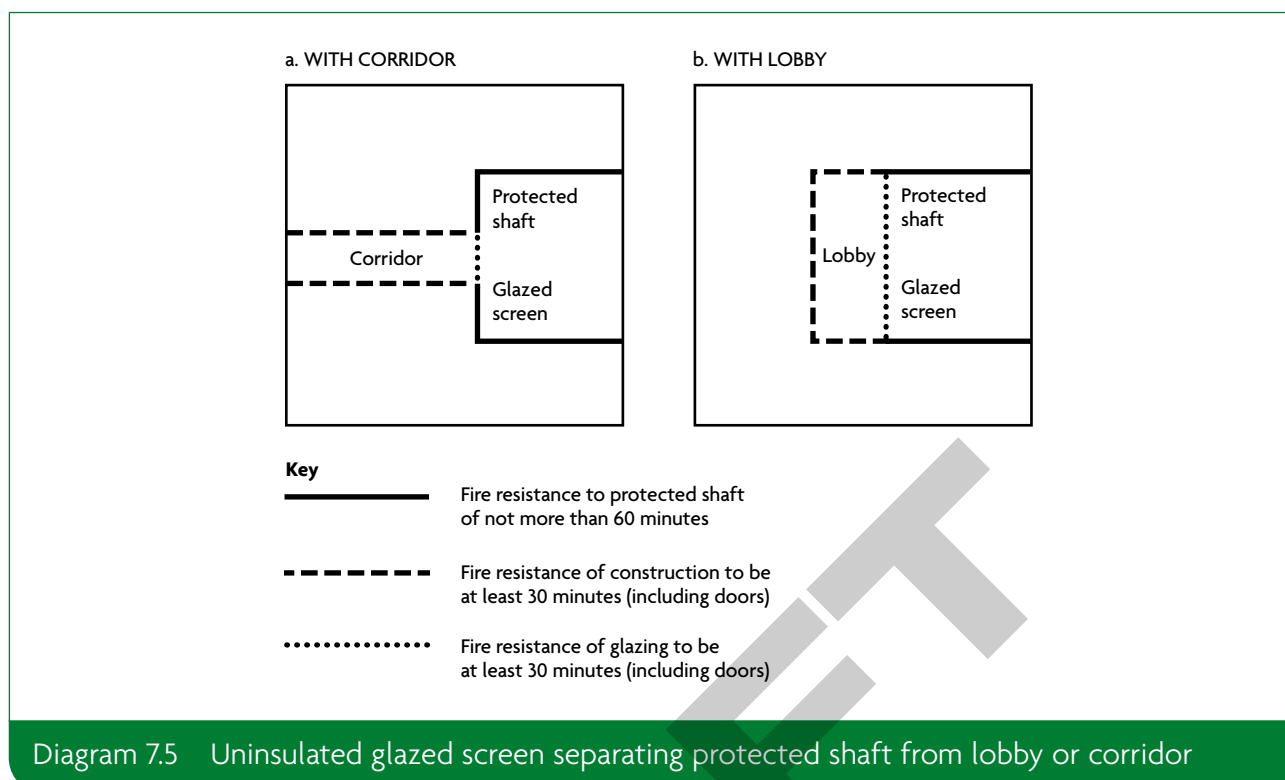
Uninsulated glazed screens to protected shafts

7.31 An uninsulated glazed screen may be incorporated in the enclosure to a **protected shaft** between a stair and a lobby or corridor entered from the stair. The enclosure must conform to diagram 7.5 and meet all of the following conditions.

- The standard of fire resistance for the stair enclosure is not more than REI 60.
- The glazed screen complies with the following.
 - It has at least 30 minutes' integrity.
 - It meets the guidance on limits on areas of uninsulated glazing in Appendix B, table B4.
- The lobby or corridor is enclosed to at least a 30 minute standard.

7.32 Where the measures in diagram 7.5 are not provided, then both of the following apply.

- The enclosing walls should comply with Appendix B, table B2.
- The doors should comply with Appendix B, table B4.



Pipes for oil or gas and ventilation ducts in protected shafts

7.33 A **protected shaft** containing a stair and/or a lift *should not* also contain either of the following.

- A **pipe** that conveys oil, other than in the mechanism of a hydraulic lift.
- A ventilating duct. Two exceptions are as follows.
 - A duct provided for pressurising the stairway to keep it smoke free.
 - A duct provided only to ventilate the stairway.

A **pipe** that is completely separated from a **protected shaft** by **fire resisting** construction is not considered to be contained within that shaft.

7.34 In a **protected shaft**, any **pipe** carrying natural gas or LPG should be both of the following.

- Of screwed steel or all-welded steel construction.
- Installed in accordance with both of the following.
 - The Pipelines Safety Regulations 1996.
 - The Gas Safety (Installation and use) Regulations 1998.

Ventilation of protected shafts conveying gas

7.35 A **protected shaft** conveying piped flammable gas should be ventilated direct to the outside air, by ventilation openings at high and low level in the shaft.

Any extension of the **storey** floor into the **protected shaft** should not compromise the free movement of air throughout the entire length of the shaft.

Guidance on shafts conveying piped flammable gas, including the size of ventilation openings, is given in **BS 8313**.

Openings into protected shafts

7.36 The **external wall** of a **protected shaft** does not normally need to have fire resistance. Situations where there are provisions are given in paragraphs 3.30 (**external walls** to **protected stairways**, which may also be **protected shafts**), and 17.1 (**firefighting shafts**).

Openings in other parts of the enclosure to a **protected shaft** should be limited to the following.

- a. If a wall common to two or more **buildings** forms part of the enclosure, only the following openings should be made in that wall.
 - i. A **fire doorset** providing a **means of escape**, which has the same fire resistance as the wall and is fitted in accordance with the provisions in Appendix C.
 - ii. The passage of a **pipe** that meets the provisions in section 9.
- b. Other parts of the enclosure (other than an **external wall**) should only have openings for any of the following.
 - i. **Fire doorsets** of the appropriate fire resistance, fitted in accordance with the provisions in Appendix C.
 - ii. The passage of **pipes** which meet the provisions in section 9.
 - iii. Inlets to, outlets from and openings for a ventilation duct (if the shaft contains or serves as a ventilating duct), meeting the provisions in section 9.
 - iv. The passage of lift cables into a lift machine **room** (if the shaft contains a lift). If the machine **room** is at the bottom of the shaft, the openings should be as small as practicable.

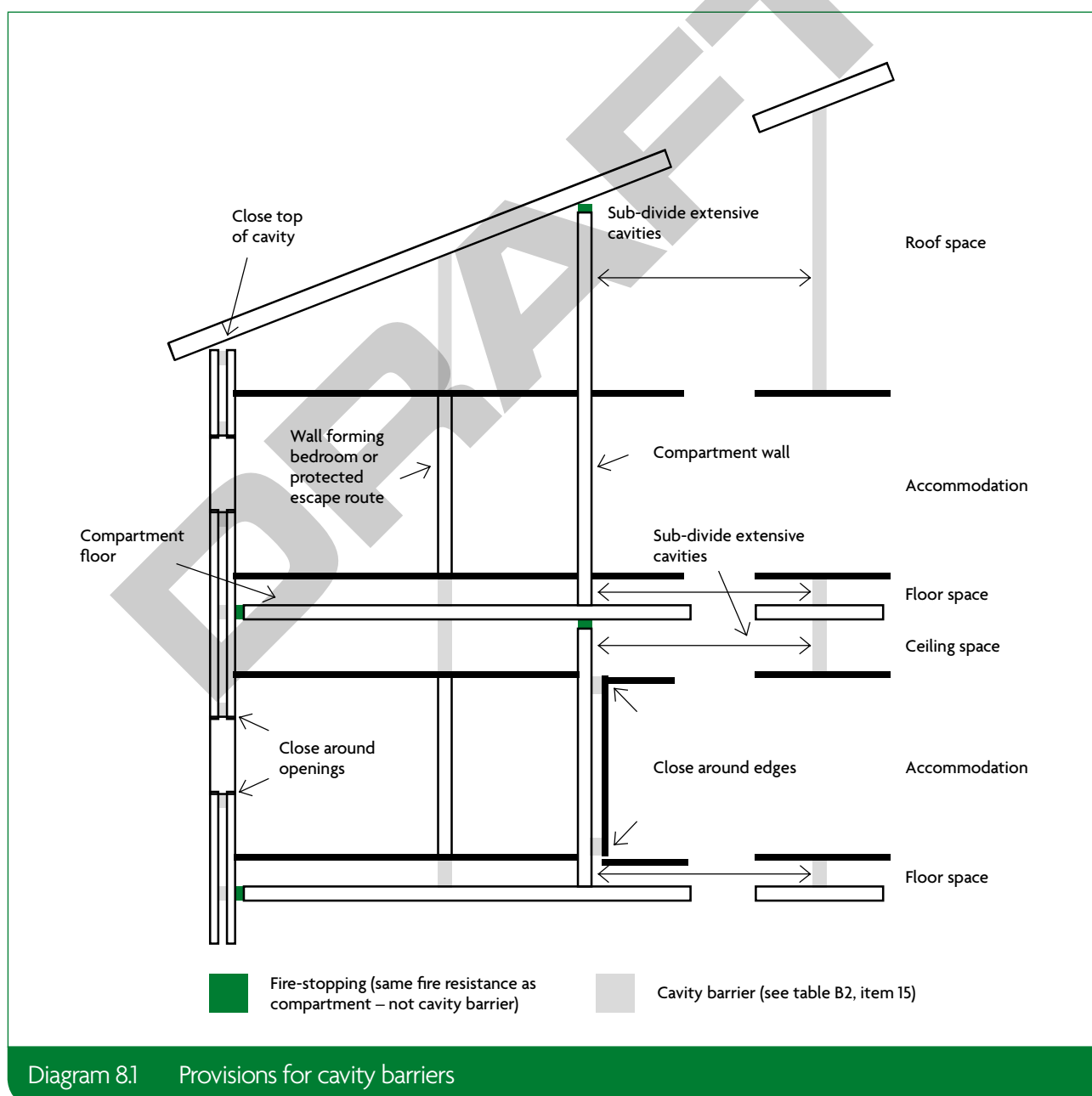
Section 8: Concealed spaces (cavities)

Provision of cavity barriers

8.1 Where cavities could create a pathway around a fire-separating element, cavity barriers should be provided for both of the following.

- To divide cavities (including extensive cavities).
- To close the edges of cavities.

See diagram 8.1. Cavity barriers should not be confused with fire-stopping details (section 9).



Pathways around fire-separating elements

Junctions and cavity closures

- 8.2** Except where a wall meets the conditions of diagram 8.2, **cavity barriers** should be provided at all of the following.
- At the edges of cavities, including around openings.
 - At the junction between an external cavity wall and every **compartment floor** and **compartment wall**.
 - At the junction between an internal cavity wall and every **compartment floor**, **compartment wall** or other wall or door assembly forming a **fire resisting** barrier.
- 8.3** It is not appropriate to complete a line of **compartment walls** by fitting **cavity barriers** above them. The wall should extend to the underside of the floor or roof above.

Protected escape routes

- 8.4** If the **fire resisting** construction of a protected **escape route** is either:
- Not carried to full **storey** height.
 - At the top **storey**, not carried to the underside of the roof covering
- then the cavity *above or below* the **fire resisting** construction should be either:
- fitted with **cavity barriers** on the line of the enclosure.
 - for cavities above the **fire resisting** construction, enclosed on the lower side by a **fire resisting ceiling** (minimum EI 30) that extends throughout the **building**, **compartment** or **separated part** (see diagram 8.3).

Cavities affecting alternative escape routes

- 8.5** In divided corridors, **cavity barriers** may be needed to prevent **alternative escape routes** being affected by fire and/or smoke (see paragraph 2.34 and diagram 2.8).

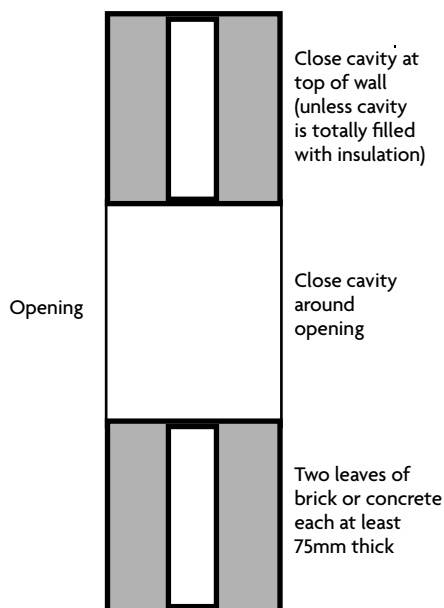
Separation of bedrooms

- 8.6** The enclosures of bedrooms in **buildings** in the 'institutional' and 'other residential' **purpose groups** should be treated in the same way as protected escape routes, following the guidance in paragraph 8.4.

Double-skinned corrugated or profiled roof sheeting

- 8.7** **Cavity barriers** are not required between double-skinned corrugated or profiled insulated roof sheeting, if the sheeting complies with all of the following.
- The sheeting is rated class A2-s3, d2 or better.
 - Both surfaces of the insulating layer have a minimum surface spread of flame rating of class C-s3, d2.
 - Both surfaces of the insulating layer make contact with the inner and outer skins of cladding (diagram 8.4).

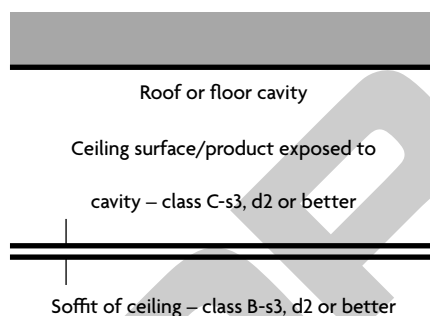
SECTION THROUGH CAVITY WALL



NOTES:

- Domestic meter cupboards may be installed provided that:
 - there are no more than two cupboards per dwelling
 - the openings in the outer wall leaf are not more than $800 \times 500\text{mm}$ for each cupboard
 - the inner leaf is not penetrated except by a sleeve not more than $80 \times 80\text{mm}$, which is fire-stopped.
- Combustible materials may be placed within the cavity.

Diagram 8.2 Cavity walls excluded from provisions for cavity barriers

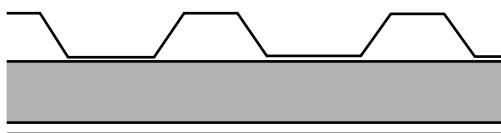


NOTES:

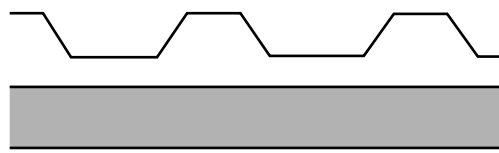
- The ceiling should:
 - have at least 30 minutes' fire resistance
 - be imperforate, except for an opening described in paragraph 8.16
 - extend throughout the building or compartment
 - not be easily demountable.
- The national classifications do not automatically equate with the equivalent European classifications, therefore products cannot typically assume a European class unless they have been tested accordingly.
- When a classification includes 's3, d2', this means that there is no limit set for smoke production and/or flaming droplets/particles.

Diagram 8.3 Fire resisting ceiling below concealed space

a. ACCEPTABLE WITHOUT CAVITY BARRIERS



b. CAVITY BARRIERS NECESSARY



The insulation should make contact with both skins of sheeting. See also diagram 7.3a regarding the need for a fire break where such roofs pass over the top of a compartment wall.

Diagram 8.4 Provisions for cavity barriers in double-skinned insulated roof sheeting

Extensive cavities

Maximum dimensions of concealed spaces

8.8 Cavity barriers should be used to divide any cavity (including roof spaces). Table 8.1 sets out maximum dimensions for undivided concealed spaces.

Table 8.1 Maximum dimensions of cavities in non-domestic buildings (purpose groups 2 to 7)

Location of cavity	Class of surface/product exposed in cavity (excluding the surface of any pipe, cable or conduit, or any insulation to any pipe)	Maximum dimension in any direction (m)
Between roof and a ceiling	Any	20
Any other cavity	Any of: a. class A1 b. class A2-s3, d2 c. class B-s3, d2 d. class C-s3, d2	20
	None of the above classes	10

8.9 Table 8.1 does not apply to any of the following cavities.

- A cavity in a wall that is fire resisting only because it is loadbearing.
- A cavity in a wall that meets the conditions of diagram 8.2.
- A floor or roof cavity above a fire resisting ceiling (diagram 8.3) that extends throughout the building or compartment to a maximum of 30m.
- In a building not put to residential or institutional use, a cavity that does not contain combustible insulation and is formed either:
 - behind the external skin of an external cladding system with a masonry or concrete inner leaf a minimum of 75mm thick
 - by overcladding an existing masonry (or concrete) external wall or an existing concrete roof.
- A cavity that meets the conditions of paragraph 8.7.
- A cavity below a floor next to the ground or next to oversite concrete, if either:
 - the cavity is less than 1000mm in height
 - the cavity is not normally accessible by people, unless there are openings in the floor such that it is possible for combustibles to accumulate in the cavity (in which case cavity barriers should be provided and access should be provided to the cavity for cleaning).

8.10 If a single room with a ceiling or underfloor cavity exceeds the dimensions in table 8.1, cavity barriers need only be provided on the line of the enclosing walls/partitions of that room, if both of the following are true.

- The cavity barriers are a maximum of 40m apart.
- The surface of the material/product exposed in the cavity is class C-s3, d2 or better.

8.11 If the undivided area exceeds 40m in one or both directions, there is no limit to its size if all of the following are met.

- a. Together, the **room** and cavity form a **compartment** separated from the rest of the **building**.
- b. Both of the following apply.
 - i. The **building** is fitted with an automatic fire detection and alarm system meeting **BS 5839-1**.
 - ii. To satisfy **BS 5839-1**, detectors are only required in the cavity.
- c. Both of the following apply.
 - i. The cavity is used as a plenum.
 - ii. The recommendations for recirculating air distribution systems in **BS 9999** are followed.
- d. Both of the following apply.
 - i. The exposed surface of the material/product used in the construction of the cavity is class B-s3, d2 or better.
 - ii. The supports and fixings in the cavity are class A1.
- e. The flame spread rating of any **pipe** insulation system is class C-s3, d2 or better.
- f. Any electrical wiring in the void is laid in metal trays or metal conduit.
- g. Other than those in d–f, any materials are class A2-s3, d2 or better.

Construction and fixings for cavity barriers

8.12 **Cavity barriers**, tested from each side separately, should provide a minimum of both of the following:

- a. 30 minutes' integrity (E 30)
- b. 15 minutes' insulation (I 15).

They may be formed by a construction provided for another purpose if it achieves the same performance.

8.13 **Cavity barriers** in a stud wall or partition, or provided around openings, may be formed of any of the following.

- a. Steel, a minimum of 0.5mm thick (including as a window or door frame).
- b. Timber, a minimum of 38mm thick (including as a window or door frame).
- c. Polythene-sleeved mineral wool, or mineral wool slab, under compression when installed in the cavity.
- d. Calcium silicate, cement-based or gypsum-based boards, a minimum of 12mm thick.

8.14 **Cavity barriers** should be tightly fitted to a rigid construction and mechanically fixed in position. If this is not possible (e.g. where a **cavity barrier** joins to slates, tiles, corrugated sheeting or similar materials) the junction should be fire-stopped.

8.15 **Cavity barriers** should be fixed so their performance is unlikely to be made ineffective by any of the following.

- a. Movement of the **building** due to subsidence, shrinkage or temperature change, and movement of the external envelope due to wind.
- b. During a fire, collapse of services penetrating the **cavity barriers**.

- c. During a fire, failure of the **cavity barrier** fixings. (In roof spaces, where **cavity barriers** are fixed to roof members, there is no expectation of fire resistance from roof members provided for the purpose of support.)
- d. During a fire, failure of any material or construction to which **cavity barriers** join or by which they are supported. (For example, a **suspended ceiling** that continues over a **fire resisting** wall or partition collapses, and the **cavity barrier** fails prematurely because the **ceiling** was not designed to provide a minimum fire resistance of EI 30.)

Openings in cavity barriers

8.16 Openings should be limited to the following.

- a. **Fire doorsets** with a minimum E30 rating, fitted in accordance with Appendix C.
- b. The passage of **pipes** that follow the provisions in section 9.
- c. The passage of cables or conduits containing one or more cables.
- d. Openings fitted with a suitably mounted automatic **fire damper**.
- e. Ducts that are either:
 - i. **fire resisting** (minimum E 30)
 - ii. fitted with a suitably mounted automatic **fire damper** where they pass through the **cavity barrier**.

8.17 If a **cavity barrier** is provided in accordance with paragraph 8.6 and the partition is not a **fire resisting** partition, then paragraph 8.16 does not apply. However, both of the following apply.

- a. The number of openings in the barrier should be kept to a minimum.
- b. Any penetrations should be sealed to restrict the passage of smoke with an approved fire-stopping material.

Section 9: Protection of openings and fire-stopping

Introduction

- 9.1 The performance of a **fire-separating element** should not be impaired. Every joint, imperfect fit and opening for services should be sealed. Fire-stopping delays the spread of fire and, generally, the spread of smoke as well.

Openings for pipes

- 9.2 Pipes passing through a **fire-separating element**, unless in a **protected shaft**, should meet one of the alternatives A, B or C below.

Alternative A: Proprietary seals (any pipe diameter)

- 9.3 Provide a proprietary, tested sealing system that will maintain the fire resistance of the wall, floor or **cavity barrier**.

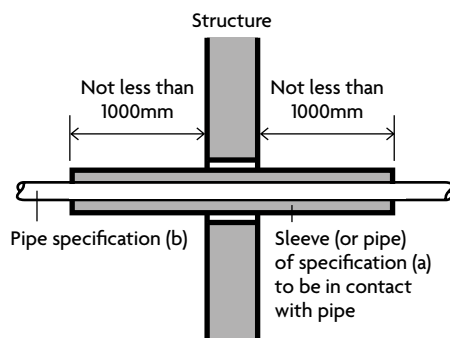
Alternative B: Pipes with a restricted diameter

- 9.4 Where a proprietary sealing system is not used, **fire-stop** around the **pipe**, keeping the opening as small as possible. The nominal internal diameter of the **pipe** should not exceed the relevant dimension given in table 9.1. The diameter given in table 9.1 for pipes of specification (b) used in situation 2 assumes that the pipes are part of an above-ground drainage system and are enclosed as shown in diagram 9.4. If they are not, the smaller diameter given for situation 3 should be used.

Alternative C: Sleeving

- 9.5 A **pipe** with a maximum nominal internal diameter of 160mm may be used with a class A1 sleeving, as shown in diagram 9.1, if the **pipe** is made of one of the following.
- Lead.
 - Aluminium.
 - Aluminium alloy.
 - Fibre-cement.
 - uPVC.

The specification for non-combustible and uPVC **pipes** is given in the notes to table 9.1.



NOTES:

1. Make the opening in the structure as small as possible and provide fire-stopping between pipe and structure.
2. See table 9.1 for materials specification.
3. The sleeve should be class A1.

Diagram 9.1 Pipes penetrating structure

Table 9.1 Maximum nominal internal diameter of pipes passing through a compartment wall/floor

Situation	Pipe material and maximum nominal internal diameter (mm)		
	(a) Non-combustible material ⁽¹⁾	(b) Lead, aluminium, aluminium alloy, uPVC ⁽²⁾ , fibre-cement	(c) Any other material
1. Structure (but not a wall separating buildings) enclosing a protected shaft that is not a stairway or a lift shaft	160	110	40
2. Any other situation	160	40	40

NOTES:

1. Any material rated class A1 (such as cast iron, copper or steel) which, if exposed to a temperature of 800°C, will not soften or fracture to the extent that flame or hot gas will pass through the wall of the pipe.
2. uPVC pipes that comply with **BS 4514**, and uPVC pipes that comply with **BS 5255**.

Mechanical ventilation and air-conditioning systems

General

- 9.6 Ductwork should not help to transfer fire and smoke through the **building**. Exhaust points should be sited away from **final exits**, combustible building cladding or roofing materials and openings into the **building**.
- 9.7 Ventilation ducts supplying or extracting air directly to or from a **protected stairway** should not also serve other areas. A separate ventilation system should be provided for each **protected stairway**.
- 9.8 A **fire and smoke damper** should be provided where ductwork enters each section of the **escape route** it serves. It should be operated by a smoke detector or suitable fire detection system. **Fire and smoke dampers** should close when smoke is detected.

9.9 In a system that recirculates air, smoke detectors should be fitted in the extract ductwork before both of the following.

- a. The point where recirculated air is separated from air to be discharged to the outside.
- b. Any filters or other air cleaning equipment.

When smoke is detected, detectors should do one of the following to divert smoke outside the building.

- a. Cause the system to immediately shut down.
- b. Switch the ventilation system from recirculating mode to extraction.

9.10 Non-domestic kitchens, car parks and plant rooms should have separate and independent extraction systems. Extracted air should not be recirculated.

9.11 Ventilation and air-conditioning systems should be compatible with smoke control systems when operating under fire conditions.

Ventilation ducts and flues passing through fire-separating elements

General

9.12 If air handling ducts pass through fire-separating elements, the integrity of the elements should be maintained using one or more of the following four methods. In most ductwork systems, a combination of the four methods is best to combat potential fire dangers.

- a. Method 1 – thermally activated fire dampers.
- b. Method 2 – fire resisting enclosures.
- c. Method 3 – protection using fire resisting ductwork.
- d. Method 4 – automatically activated fire and smoke dampers triggered by smoke detectors.

9.13 Further information on fire resisting ductwork is given in the ASFP Blue Book.

Kitchen extract

9.14 Methods 1 and 4 should not be used for extract ductwork serving kitchens. The likely build-up of grease within the duct can adversely affect dampers.

Ducts passing through protected escape routes

9.15 Method 1 should not be used for extract ductwork passing through the enclosures of protected escape routes (diagrams 9.2 and 9.3). Large volumes of smoke can pass thermal devices without triggering them.

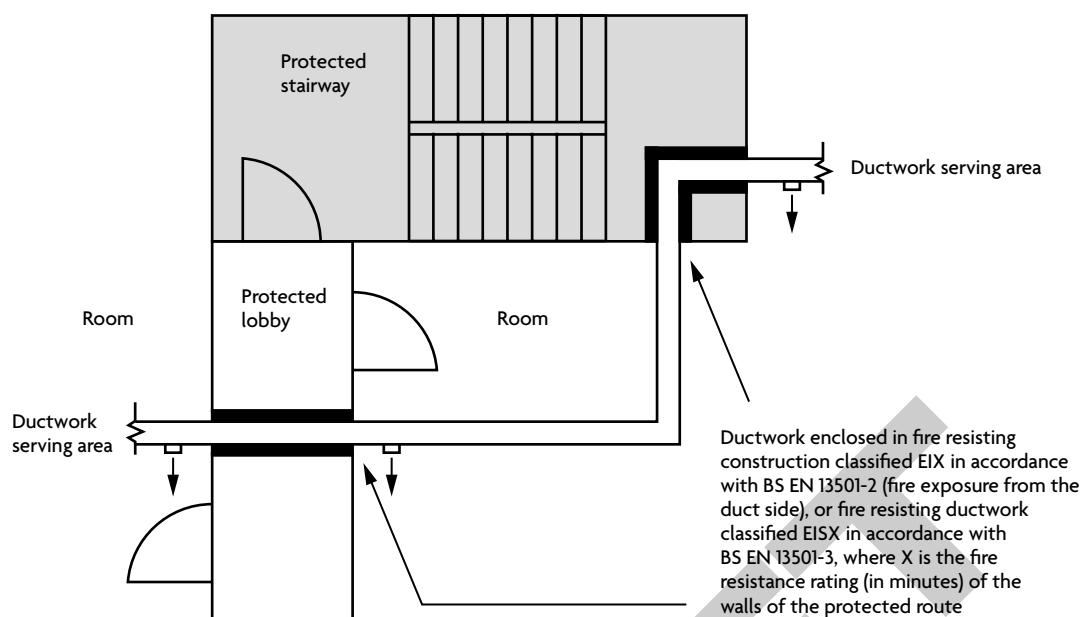


Diagram 9.2 Ductwork passing through protected routes – method 2 or method 3

An ES classified **fire and smoke damper** which is activated by a suitable fire detection system (method 4) may also be used for **escape routes**.

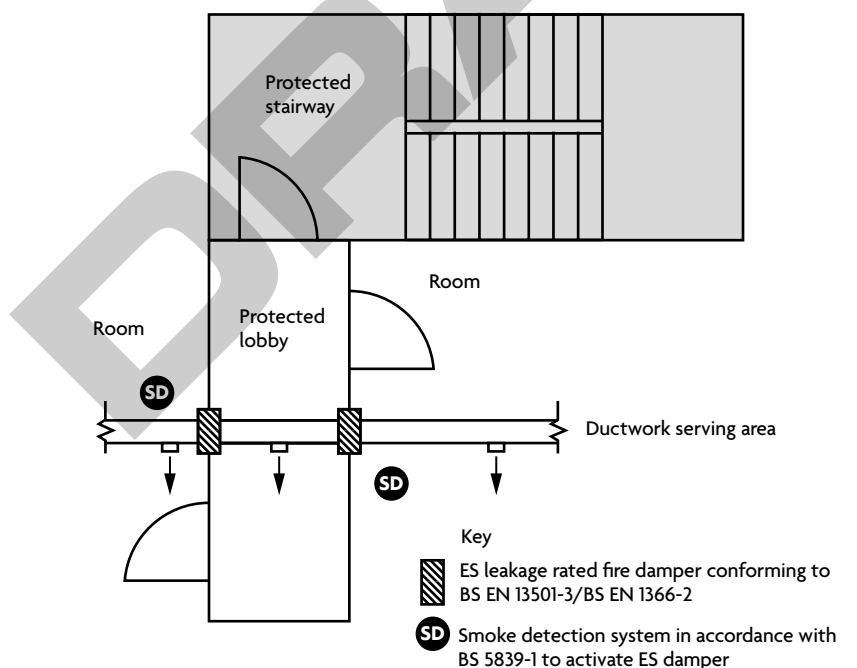
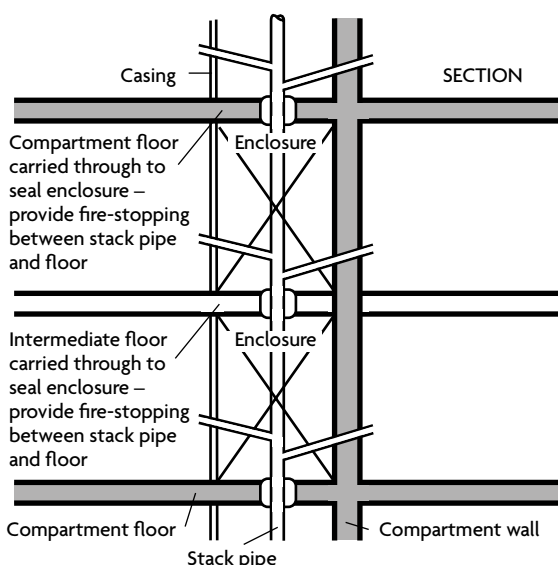


Diagram 9.3 Ductwork passing through protected routes – method 4

**NOTES:**

1. The enclosure should:
 - a. be bounded by a compartment wall or floor, an outside wall, an intermediate floor or a casing (see specification at 2 below)
 - b. have internal surfaces (except framing members) of class B-s3, d2 or better
NOTE: When a classification includes 's3, d2', this means that there is no limit set for smoke production and/or flaming droplets/particles)
 - c. not have an access panel which opens into a circulation space or bedroom
 - d. be used only for drainage, or water supply, or vent pipes for a drainage system.
2. The casing should:
 - a. be imperforate except for an opening for a pipe or an access panel
 - b. not be of sheet metal
 - c. have (including any access panel) not less than 30 minutes' fire resistance.
3. The opening for a pipe, in either the structure or the casing, should be as small as possible and fire-stopped around the pipe.

Diagram 9.4 Enclosure for drainage or water supply pipes

Installation and specification of fire dampers

- 9.16** Both **fire dampers** and **fire and smoke dampers** should be all of the following.
- a. Sited within the thickness of the **fire-separating elements**.
 - b. Securely fixed.
 - c. Sited such that, in a fire, expansion of the ductwork would not push the **fire damper** through the structure.
- 9.17** Access to the **fire damper** and its actuating mechanism should be provided for inspection, testing and maintenance.
- 9.18** **Fire dampers** should meet both of the following.
- a. Conform to **BS EN 15650**.
 - b. Have a minimum E classification of 60 minutes.
- 9.19** **Fire and smoke dampers** should meet both of the following.
- a. Conform to **BS EN 15650**.
 - b. Have an ES classification of a minimum of 60 minutes.
- 9.20** Smoke detectors should be sited so as to prevent the spread of smoke as early as practicable by activating the **fire and smoke dampers**. Smoke detectors and **automatic release mechanisms** used to activate **fire dampers** and/or **fire and smoke dampers** should conform to **BS EN 54-7** and **BS 5839-3** respectively.

Further information on **fire dampers** and/or **fire and smoke dampers** is given in the ASFP Grey Book.

Sleeping risks

9.21 Where the use of the **building** involves a sleeping risk, **fire dampers** or **fire and smoke damper** should be actuated by both of the following.

- Smoke detector-controlled **automatic release mechanisms**.
- Thermally actuated devices.

However, in a situation where both of the following are true:

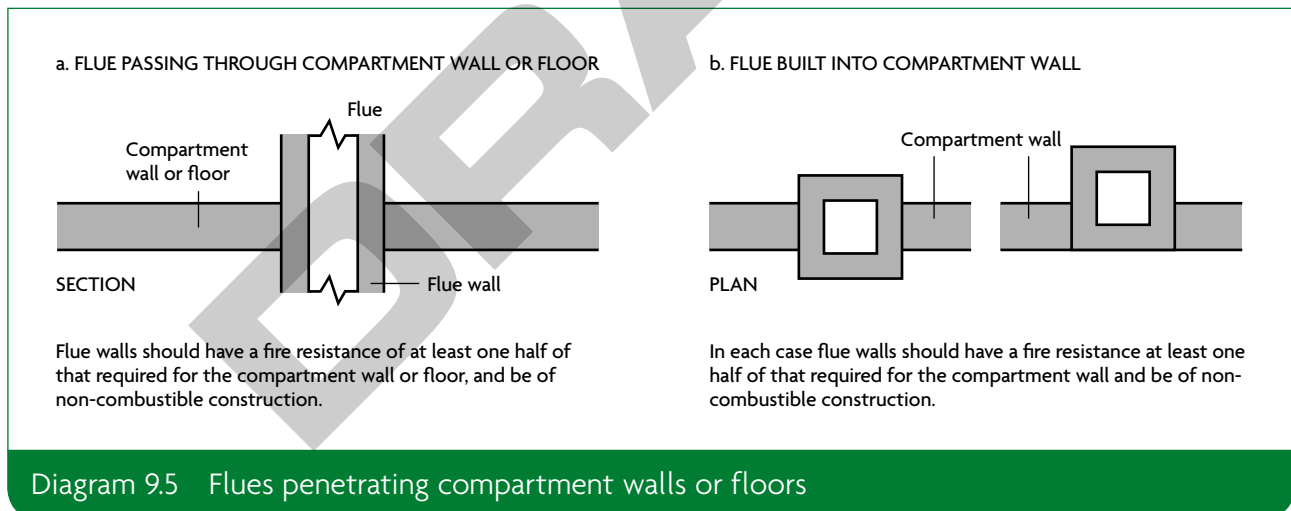
- all occupants of the **building** can be expected to make an unaided escape
- an L1 **fire alarm system** is installed in accordance with **BS 5839-1**

then both of the following exceptions may be made.

- If, on the detection of smoke, the alarm system signals the immediate evacuation of all the occupants of the **building**, then **fire dampers** and/or **fire and smoke dampers** need not be actuated by smoke detectors.
- If the **building** is divided into fire **compartments** and the alarm system is arranged to signal the immediate evacuation of the occupants of the fire **compartment** in which the fire has been detected, then smoke detector-operated **fire dampers** or **fire and smoke dampers** need only be provided where ductwork enters or leaves the fire **compartment**.

Flues, etc.

9.22 The wall of a flue or duct should have a fire resistance that is at least half of any **compartment wall** or **compartment floor** it passes through or is built into (diagram 9.5).



Fire-stopping

9.23 In addition to any other provisions in this section, both of the following should be met.

- a. Joints between fire-separating elements should be fire-stopped.
- b. Openings through a fire resisting element for pipes, ducts, conduits or cable should be all of the following.
 - i. As few as possible.
 - ii. As small as practicable.
 - iii. Fire-stopped (allowing thermal movement in the case of a pipe or duct).

9.24 Materials used for fire-stopping should be reinforced with (or supported by) materials rated class A2-s3, d2 or better to prevent displacement in both of the following cases.

- a. Where the unsupported span is greater than 100mm.
- b. Where non-rigid materials are used (unless tested to show their suitability).

9.25 Proprietary, tested fire-stopping and sealing systems are available and may be used. Different materials suit different situations and not all are suitable in every situation.

9.26 Other fire-stopping materials include the following.

- a. Cement mortar.
- b. Gypsum-based plaster.
- c. Cement-based or gypsum-based vermiculite/perlite mixes.
- d. Glass fibre, crushed rock, blast furnace slag or ceramic-based products (with or without resin binders).
- e. Intumescent mastics.

9.27 Guidance on the design, installation and maintenance of measures to contain fires or slow their spread is given in *Ensuring Best Practice for Passive Fire Protection in Buildings* produced by the Association for Specialist Fire Protection (ASFP).

9.28 Further information on generic systems, their suitability for different applications, and guidance on test methods, is given in the ASFP Red Book.

Section 10: Sprinkler systems and fire suppression

- 10.1** Where required, sprinkler systems should be provided throughout the **building** or **separated part**, unless acting as a compensatory feature to address a specific risk. They should be designed and installed in accordance with either of the following.
- For residential **buildings**, **BS 9251** and **BS 9252**.
 - For non-residential **buildings**, or residential **buildings** outside the scope of **BS 9251**, either of the following.
 - The requirements of **BS 5306-2**, including the relevant hazard classification together with the additional requirements for life safety.
 - The requirements of **BS EN 12845**, including the relevant hazard classification together with the special requirements for life safety systems.

Any sprinkler system installed to satisfy the requirements of Part B of the Building Regulations should be regarded as a life safety system. However, there may be some circumstances in which a life safety requirement specified in **BS 5306-2** or **BS EN 12845** is inappropriate or unnecessary.

Further guidance can also be found in the BAFSA's *Sprinklers for Safety: Use and Benefits of Incorporating Sprinklers in Buildings and Structures*.

- 10.2** If the provisions in a **building** vary from those in this document, sprinkler protection can also sometimes be used to compensate.

Alternative fire suppression systems are available. They should be designed and tested for use in **buildings** and be fit for their intended purpose.

- 10.3** For non-residential sprinkler systems designed and installed to **BS 5306-2**, water supplies should consist of either of the following.
- Two single water supplies complying with clause 13.1.2, independent of each other.
 - Two stored water supplies meeting all of the following conditions.
 - Gravity or suction tanks should be Type A or Type D or their equivalent (see clause 17.4.11.6).
 - Any pump arrangements should comply with clause 17.4.1.5.
 - While meeting the requirements for inflow, either of the following should apply.
 - The capacity of each tank should be at least half the specified minimum water volume of a single full capacity tank appropriate to the hazard.
 - The capacity of one tank should be half the specified water volume of a single full capacity tank, and the other should at least half the minimum volume of a reduced capacity tank (see table 25) appropriate to the hazard.

The total design capacity of the water supply in iii, including any inflow for a reduced capacity tank, should be at least that of a single full holding capacity tank that complies with table 21, 22, 23 or 24, as appropriate to the hazard and pipework design.

10.4 For non-residential sprinkler systems designed and installed to **BS EN 12845**, water supplies should consist of either of the following.

- a. Two single water supplies complying with clause 9.6.1, independent of each other.
- b. Two stored water supplies meeting all of the following conditions.
 - i. Gravity or suction tanks should satisfy all the requirements of clause 9.6.2(b), other than capacity.
 - ii. Any pump arrangements should comply with clause 10.2.
 - iii. While meeting the requirements for inflow, either of the following should apply.
 - The capacity of each tank should be at least half the specified minimum water volume of a single full capacity tank, appropriate to the hazard.
 - One tank should be at least equivalent to half the specified water volume of a single full capacity tank, and the other shall not be less than the minimum volume of a reduced capacity tank (see clause 9.3.4) appropriate to the hazard.

The total capacity of the water supply in iii, including any inflow for a reduced capacity tank, should be at least that of a single full holding capacity tank that complies with table 9, table 10 or clause 9.3.2.3, as appropriate to the hazard and pipework design.

10.5 For the systems described in paragraphs 10.3 and 10.4, both of the following apply if pumps are used to draw water from two tanks.

- a. Each pump should be able to draw water from either tank.
- b. Any one pump, or either tank, should be able to be isolated.

The sprinkler water supplies should not be used as connections for other services or other fixed firefighting systems.

Section 11: Special provisions for car parks

- 11.1** Car parks merit different measures to restrict fire spread within **buildings**, for the following reasons.
- The fire load is well defined.
 - The probability of fire spreading from one **storey** to another in a well ventilated car park is low. Guidance is therefore given for three ventilation methods.

Open-sided car parks

Natural ventilation

- 11.2** For the purposes of assessing fire resistance, a **building, compartment or separated part** containing a car park may be regarded as open-sided when it complies with all of the following.
- There are no **basement storeys**.
 - Each **storey** is naturally ventilated by permanent openings at each car parking level. The aggregate vent area is a minimum of 1/20 of that level's floor area, at least half of which is provided equally by two opposite walls.
 - Where one **element of structure** supports, carries or stabilises another, the fire resistance of the supporting element at least matches the minimum period of fire resistance for the other element.
 - In mixed use **buildings**, the fire resistance of any element that supports, carries or stabilises an element in the other part of the **building** should at least match the minimum period of fire resistance for the other element.
 - All materials used in the construction should be class A1 rated, except for the following.
 - Any surface finish applied to a floor or roof of the car park (or within any **building, compartment or separated part** adjoining the structure enclosing it), if the finish meets requirements B2 and B4.
 - Any **fire doorset**.
 - Any attendant's kiosk not exceeding 15m² in area.
 - Any shop mobility facility.

Car parks that are not open-sided

11.3 For car parks that do not have the ventilation set out in paragraph 11.2, the required fire resistance is given in Appendix B, table B3. Ventilation should be either natural or mechanical.

Natural ventilation

11.4 Each storey should be ventilated by permanent openings at each car parking level. The openings can be at ceiling level. The aggregate free vent area should be a minimum of 1/40 of that level's floor area, at least half of which should be provided equally by two opposite walls.

Mechanical ventilation

11.5 If the minimum standard of natural ventilation is not possible, a system of mechanical ventilation should be provided that complies with all of the following.

- a. The system should be both of the following.
 - i. Independent of any other ventilating system (other than any system that provides normal ventilation to the car park).
 - ii. Designed to operate at 10 air changes per hour during a fire.
- b. The system should run in two parts, each of which is:
 - i. capable of extracting 50% of the rates set out in item a
 - ii. able to operate alone or with the other part
 - iii. provided with an independent power supply capable of operating if the main supply fails.
- c. 50% of the outlets should be at high level and 50% at low level.
- d. The system should use E, I and S ductwork in accordance with **BS EN 1366-8**.

For further information on equipment for removing hot smoke, refer to **BS EN 12101-3**. An alternative method of providing smoke ventilation from enclosed car parks is given in **BS 7346-7**.

Requirement B4: External fire spread

These sections deal with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
External fire spread	
B4. (1) The external walls of the building shall adequately resist the spread of fire over the walls and from one building to another, having regard to the height, use and position of the building. (2) The roof of the building shall adequately resist the spread of fire over the roof and from one building to another, having regard to the use and position of the building.	

Intention

Resisting fire spread over external walls

The external envelope of a **building** should not contribute to undue fire spread from one part of a **building** to another part. This intention can be met by constructing **external walls** so that both of the following are satisfied.

- The risk of ignition by an external source to the outside surface of the building and spread of fire over the outside surface is restricted.
- The materials used to construct **external walls** and how they are assembled do not contribute to the rate of fire spread up the outside of the **building**.

The extent to which this is necessary depends on the **height** of the **building**.

Resisting fire spread from one building to another

The external envelope of a **building** should not provide a medium for undue fire spread to adjacent **buildings** or be readily ignited by fires in adjacent **buildings**. This intention can be met by constructing **external walls** so that all of the following are satisfied.

- The risk of ignition by an external source of the outside surface of the **building** is restricted.
- The amount of thermal radiation that falls on a neighbouring **building** from window openings and other **unprotected areas** in the **building** on fire is not enough to start a fire in the other **building**.
- Flame spread over the roof and/or fire penetration from external sources through the roof is restricted.

The extent to which this is necessary depends on the use of the **building** and its position in relation to adjacent **buildings** and therefore the **site boundary**.

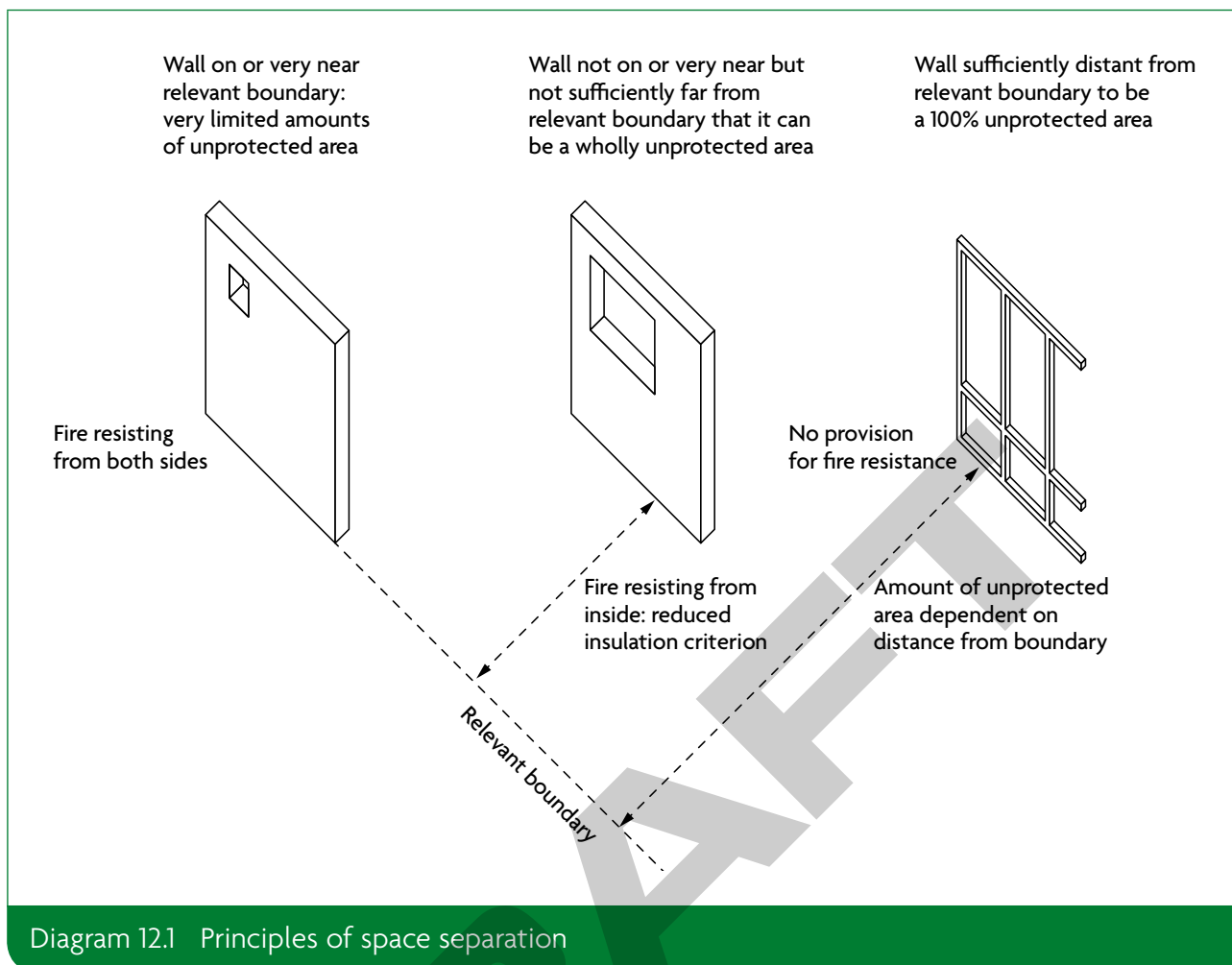
Section 12: Resisting fire spread from one building to another

Introduction

- 12.1** The following assumptions enable a reasonable standard of resistance to be specified.
- a. The size of a fire depends on the compartmentation within the **building**. A fire may involve a complete **compartment**, but will not spread to other **compartments**.
 - b. The intensity of fire is related to the **building** use, but can be moderated by a sprinkler system.
 - c. Fires in 'residential' and 'assembly and recreation' **purpose group buildings** represent a greater risk to life.
 - d. A **building** on the far side of the **boundary** meets both of the following conditions.
 - i. Has a similar elevation to the one in question.
 - ii. Is at the same distance from the common **boundary**.
 - e. The radiated heat passing through any part of the **fire resisting external wall** may be discounted.
- 12.2** If a reduced separation distance between **buildings**, or increased amount of **unprotected area**, is required, smaller **compartments** should be considered.

Boundaries

- 12.3** The fire resistance of a wall depends on its distance from the **relevant boundary** (see diagram 12.1). Separation distances are measured to boundaries to ensure that the location and design of **buildings** on adjoining sites have no influence on the **building** under consideration.
- 12.4** The **boundary** that a wall faces is the **relevant boundary** (diagram 12.2). It may be one of the following applies.
- a. The **site boundary**.
 - b. The centre line of a space where further development is unlikely.
 - c. An assumed **notional boundary** between two **buildings** on the same **site** (diagram 12.3) where either of the following conditions is met.
 - i. One or both of the **buildings** are in the 'residential' or 'assembly and recreation' **purpose groups**.
 - ii. The **buildings** will be operated/managed by different organisations.



This diagram sets out the rules that apply in respect of a boundary for it to be considered as a relevant boundary.

For a boundary to be relevant it should comply with one of the following.

- Coincide with the side of the building.
- Be parallel to the side of the building.
- Be at an angle of not more than 80 degrees to the side of the building.

This boundary is at less than 80 degrees to side C and is therefore relevant to side C

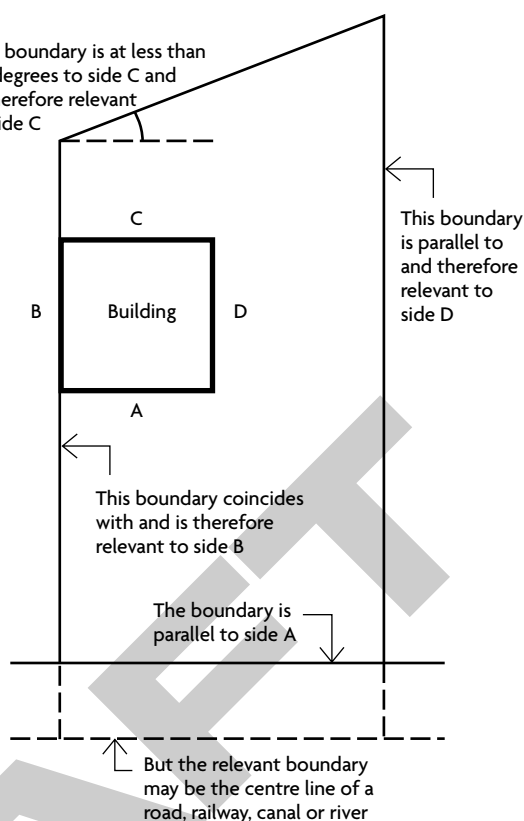
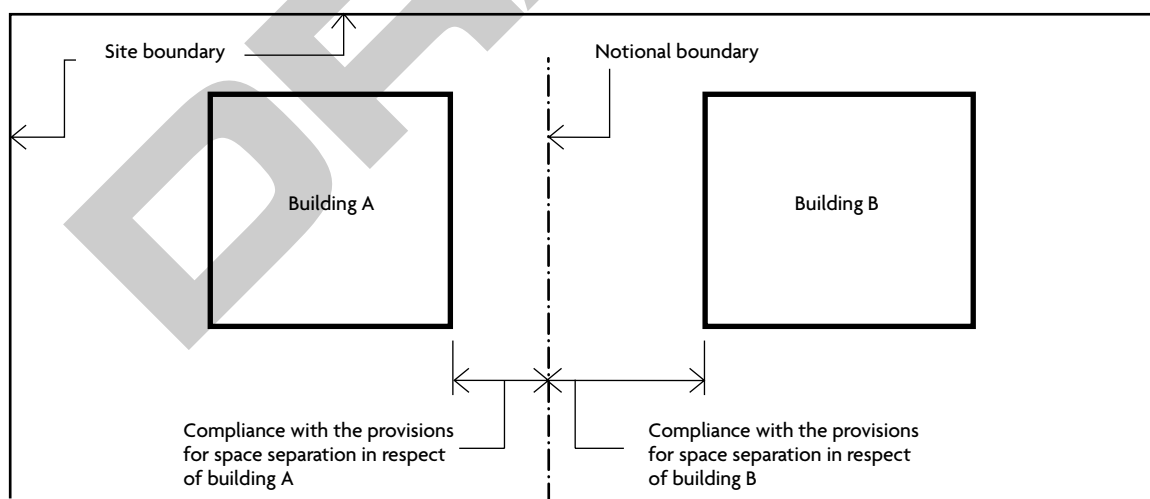


Diagram 12.2 Relevant boundary



The notional boundary should be set in the area between the two buildings using the following rules.

- The notional boundary is assumed to exist in the space between the buildings and is positioned so that one of the buildings would comply with the provisions for space separation having regard to the amount of its unprotected area. In practice, if one of the buildings is existing, the position of the boundary will be set by the space separation factors for that building.
- The siting of the new building, or the second building if both are new, can then be checked to see that it also complies, using the notional boundary as the relevant boundary for the second building.

Diagram 12.3 Notional boundary

Unprotected areas and fire resistance

12.5 Parts of an **external wall** with less fire resistance than the appropriate amount given in Appendix B, table B2, are called **unprotected areas**.

External walls on, and within 1000mm of, the relevant boundary

12.6 **Unprotected areas** should meet the conditions in diagram 12.4 and the rest of the wall should be **fire resisting** from both sides.

External surface materials facing the **boundary** should be class B-s3, d2 or better.

External walls 1000mm or more from the relevant boundary

12.7 **Unprotected areas** should not exceed the result given by one of the methods in paragraph 12.15, and the rest of the wall (if any) should be **fire resisting** but only from the inside of the **building**.

External walls of protected shafts forming stairways

12.8 Exclude **external walls** of stairs in **protected shafts** when assessing **unprotected areas** (see diagram 3.3 and section 7).

Small unprotected areas

12.9 In an otherwise protected wall, small **unprotected areas** may be ignored where they meet the conditions in diagram 12.4.

Status of combustible surface materials as unprotected area

12.10 Where a **fire resisting external wall** has a surface material that is class B-s3, d2 or worse and is more than 1mm thick, that part of the wall should be classified as an **unprotected area** equating to half its area (diagram 12.5).

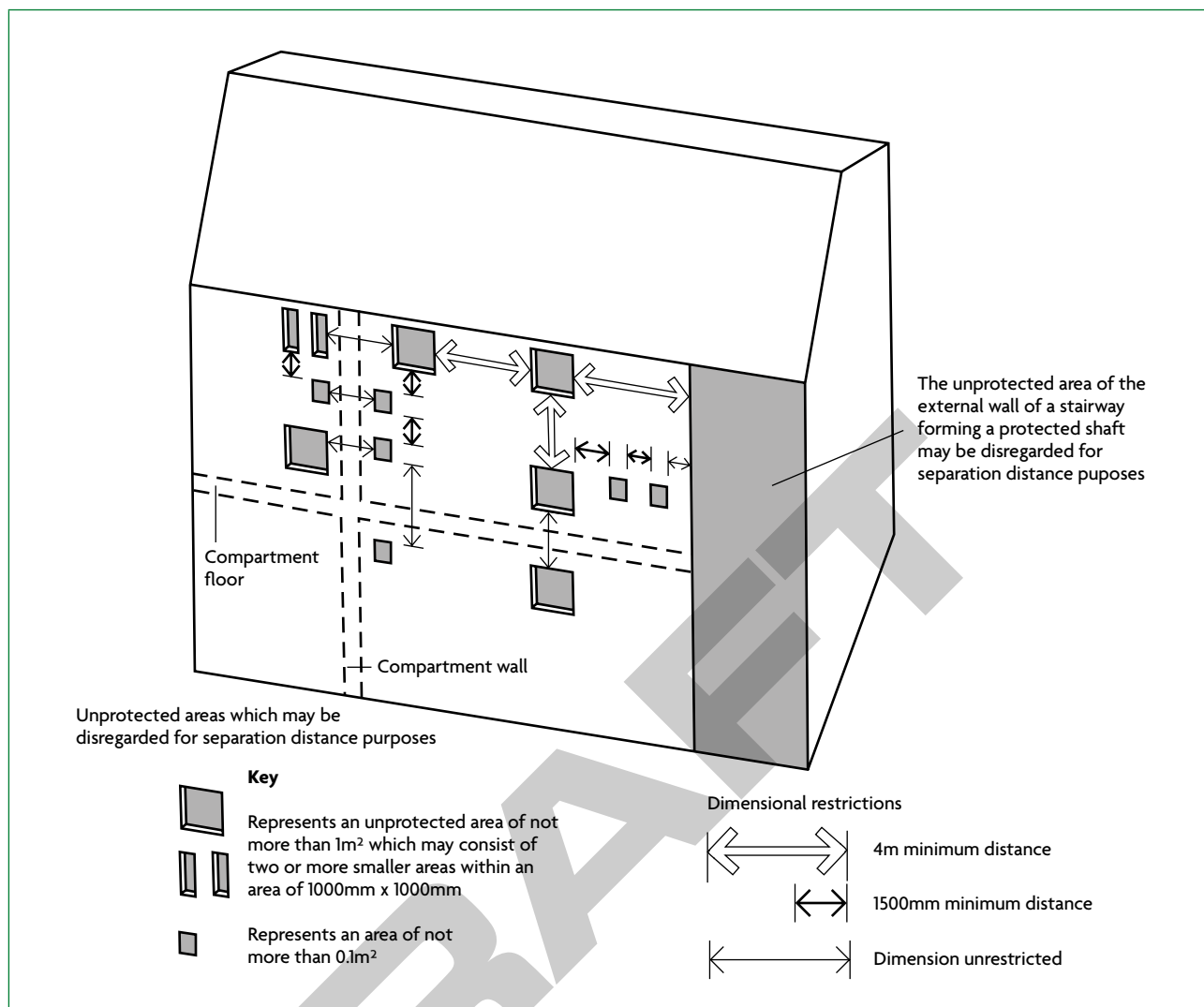


Diagram 12.4 Unprotected areas which may be disregarded in assessing the separation distance from the boundary

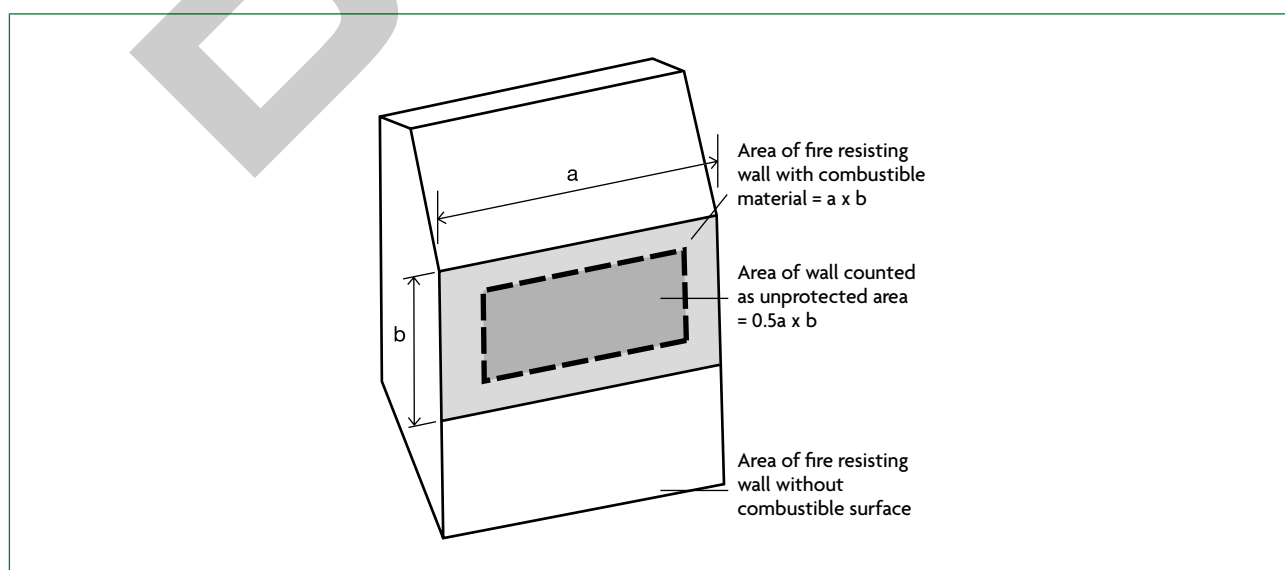


Diagram 12.5 Status of combustible surface material as unprotected area

Large uncompartmented buildings

12.11 For the purposes of assessing **unprotected area**, walls of uncompartmented **buildings** that are a minimum of 30m above mean ground level may be ignored.

Canopies

12.12 Where both of the following apply, separation distances may be determined from the wall rather than from the edge of the canopy (diagram 12.6).

- The canopy is attached to the side of a **building**.
- The edges of the canopy are a minimum of 2m from the **relevant boundary**.

Canopies that fall within class 6 or class 7 of Schedule 2 to the regulations (Exempt Buildings and Work) are exempt from the Building Regulations.

12.13 Space separation may be disregarded if a canopy is all of the following.

- Free-standing.
- Above a limited risk or controlled hazard.
- A minimum of 1000mm from the **relevant boundary**.

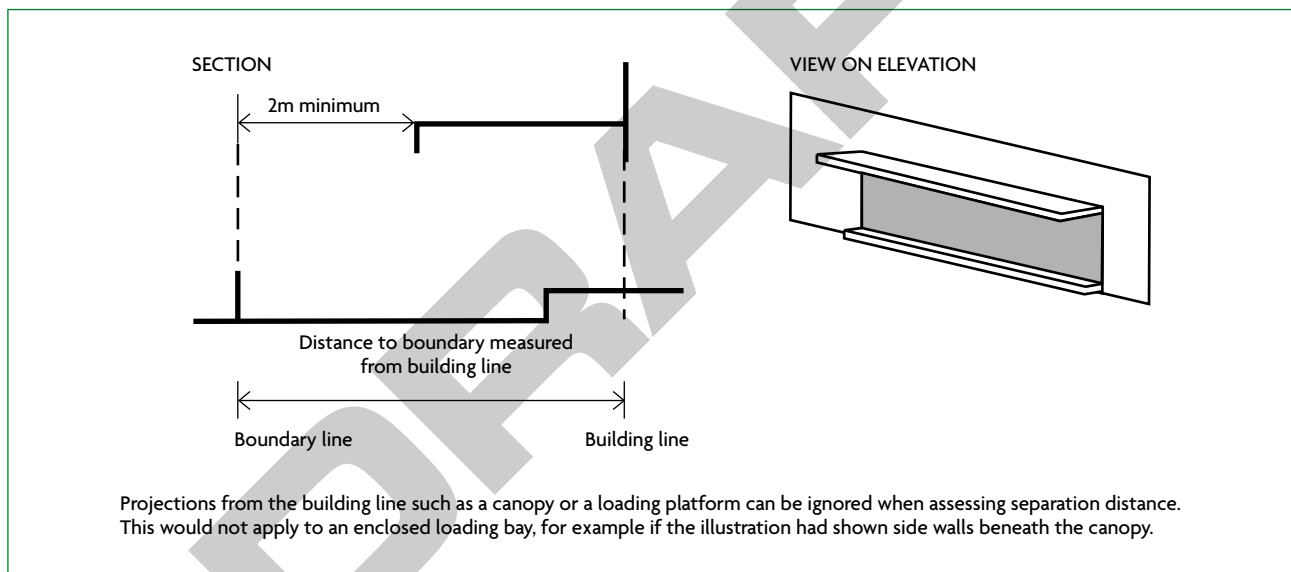


Diagram 12.6 The effect of a canopy on separation distance

Roofs

12.14 Roofs with a pitch of more than 70 degrees to the horizontal should be assessed in accordance with this section. Vertical parts of a pitched roof, such as dormer windows, should be included, *only* if the slope of the roof exceeds 70 degrees.

It is a matter of judgement whether a continuous run of dormer windows that occupies most of a steeply pitched roof should be treated as a wall rather than a roof.

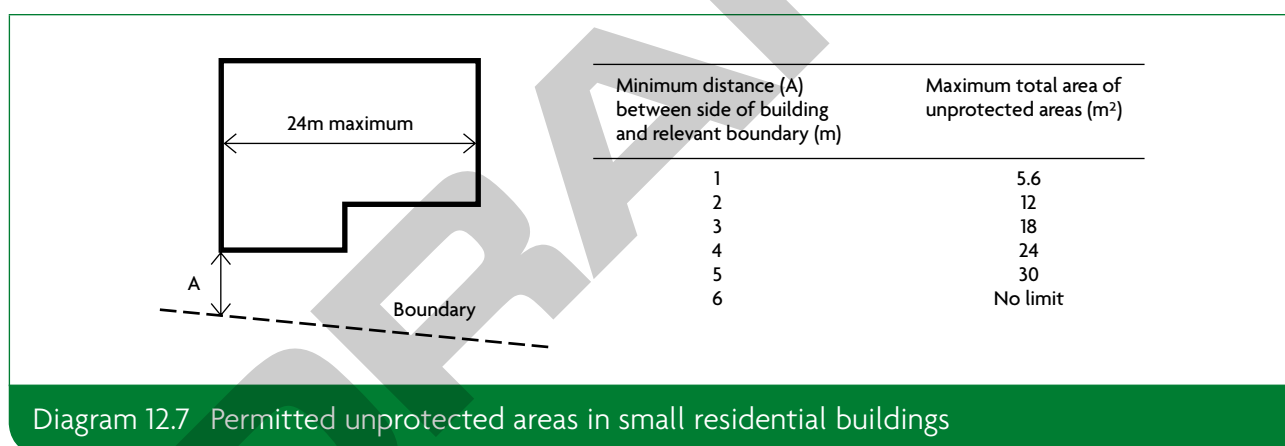
Methods for calculating acceptable unprotected area

12.15 Two simple methods are given for calculating the acceptable amount of **unprotected area** in an **external wall** that is a minimum of 1000mm from any point on the **relevant boundary**. More precise methods are described in BRE report BR 187, and may be used instead.

Method 1

12.16 This method applies to small **buildings** intended to be used for 'residential' purposes (not 'institutional').

12.17 The **building** should not exceed three **storeys** in **height** (excluding basements) or 24m in length. Each side of the **building** should meet the limits stated in diagram 12.7. Any areas falling within the limits shown in diagram 12.4 can be ignored.



Method 2

12.18 This method may be used for **buildings** or **compartments** intended for any use and for which method 1 is not appropriate.

12.19 Except for an open-sided car park in **purpose group 7(b)** (see paragraph 11.2), the **building** should not exceed 10m in **height**. Each side of the **building** should meet the limits in table 12.1. Areas falling within the limits in diagram 12.4 can be ignored.

Table 12.1 Permitted unprotected areas in small buildings or compartments

Minimum distance between side of building and relevant boundary (m)		Maximum total percentage of unprotected area (%)
Purpose groups		
Residential, office, assembly and recreation (1)	Shop and commercial, industrial, storage and other non-residential (2)	(3)
Not applicable	1	4
1	2	8
2.5	5	20
5	10	40
7.5	15	60
10	20	80
12.5	25	100

NOTES:

1. Intermediate values may be obtained by interpolation.
2. For buildings fitted with an automatic sprinkler system, see paragraph 12.20.
3. For open-sided car parks in purpose group 7(b), the distances set out in column (1) may be used instead of those in column (2).
4. The total percentage of unprotected area is found by dividing the total unprotected area by the area of a rectangle that encloses all the unprotected areas, and multiplying the result by 100.

Sprinkler systems

12.20 If a building is fitted throughout with a sprinkler system in accordance with section 10, either of the following is permitted.

- a. The boundary distance can be halved, to a minimum distance of 1m.
- b. The amount of unprotected area can be doubled.

Atrium buildings

12.21 If a building contains one or more atria, the recommendations in **BS 9999** clause B8 should be followed.

Section 13: Resisting fire spread over external walls

This text is subject to a separate consultation “Banning the use of combustible materials in the external walls of high-rise residential buildings” – www.gov.uk/government/consultations/banning-the-use-of-combustible-materials-in-the-external-walls-of-high-rise-residential-buildings

- 13.1** To reduce the risk of fire spreading over the external walls, where a building with a storey 18m or more above ground level, materials in or on the external walls should meet class A2-s3, d2 or better (not including gaskets, sealants, and other components exempted under Regulation []).
- a. Materials that do not meet class A2-s3, d2 or better can be used if they are enclosed within the cavity of masonry cavity walls that comply with diagram 8.2.
- NOTE:** Cavity barriers should be provided in accordance with section 8.
- NOTE:** The total amount of combustible material may also be limited to meet the need to resist fire spread from one building to another (see section 11).
- 13.2** As an alternative to 13.1, external walls should meet the performance criteria given in BRE report BR 135, using full-scale test results from **BS 8414-1** or **BS 8414-2**.

Section 14: Resisting fire spread over roof coverings

Introduction

- 14.1** 'Roof covering' describes one or more layers of material, but not the roof structure as a whole.
- 14.2** Provisions for the fire properties of roofs are given in other parts of this document.
- Requirement B1 – for roofs that are part of a **means of escape**.
 - Requirement B2 – for the internal surfaces of **rooflights** as part of internal linings.
 - Requirement B3 – for roofs that are used as a floor and for roofs passing over a **compartment wall**.
 - Section 12: the circumstances in which a roof is subject to the provisions for space separation.

Separation distances

- 14.3** Separation distance is the minimum distance from the roof, or part of the roof, to the **relevant boundary** (paragraph 12.4). Table 14.1 sets out separation distances by the type of roof covering and the size and use of the **building**.

In addition, roof covering products (and/or materials) defined in Commission Decision 2000/553/EC of 6 September 2000, implementing Council Directive 89/106/EEC, can be considered to fulfil all of the requirements for the performance characteristic 'external fire performance' without the need for testing, *provided that any national provisions on the design and execution of works are fulfilled*, and can be used without restriction.

- 14.4** The performance of **rooflights** is specified in a similar way to the performance of roof coverings. Plastic **rooflights** may also be used.

Plastic rooflights

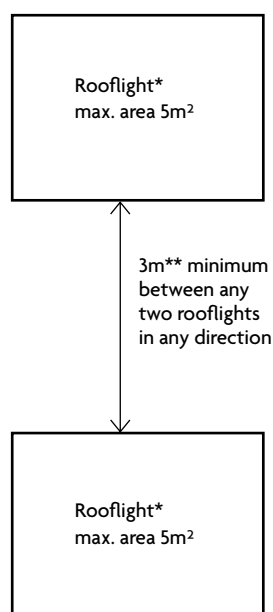
- 14.5** Table 14.2 sets the limitations for using plastic **rooflights** whose lower surface has a minimum class D-s3, d2 rating.
- 14.6** Table 14.3 and diagram 14.1 set the limitations for using **thermoplastic materials** with a TP(a) rigid or TP(b) classification. The method of classifying **thermoplastic materials** is given in Appendix B.
- 14.7** Other than for the purposes of diagram 5.2, polycarbonate or uPVC **rooflights** achieving a minimum of class C-s3, d2 rating can be regarded as having an $B_{ROOF}(t4)$ classification.

Unwired glass in rooflights

- 14.8** When used in **rooflights**, unwired glass a minimum of 4mm thick can be regarded as having a $B_{ROOF}(t4)$ classification.

Thatch and wood shingles

- 14.9** If the performance of thatch or wood shingles cannot be established, they should be regarded as having an $E_{ROOF}(t4)$ classification in table 14.1.



- * Or group of rooflights amounting to no more than 5m²
 ** Class D-s3, d2 rooflights to rooms in industrial and other non-residential purpose groups may be spaced 1800mm apart provided the rooflights are evenly distributed and do not exceed 20% of the area of the room

NOTES:

1. There are restrictions on the use of plastic rooflights in the guidance to requirement B2 in section 5.
2. Surrounding roof covering to be a material of limited combustibility for at least 3m distance.
3. Where diagram 7.3a or 7.3b applies, rooflights should be at least 1500mm from the compartment wall.

Diagram 14.1 Limitations on spacing and size of plastic rooflights that have a class D-s3, d2 or TP(b) lower surface

Table 14.1 Limitations on roof coverings (paragraphs 14.3 to 14.9)

Designation† of covering of roof or part of roof	Distance from any point on relevant boundary			
	Less than 6m	At least 6m	At least 12m	At least 20m
B _{ROOF} (t4)	●	●	●	●
C _{ROOF} (t4)	○	●	●	●
D _{ROOF} (t4)	○	● ^{(1)/(2)}	● ⁽¹⁾	●
E _{ROOF} (t4)	○	● ^{(1)/(2)}	● ⁽¹⁾	● ⁽¹⁾
F _{ROOF} (t4)	○	○	○	● ^{(1)/(2)}

● Acceptable.

○ Not acceptable.

NOTES:

Separation distances do not apply to enclosed/covered walkways. However, see diagram 7.3 if the roof passes over the top of a compartment wall.

Polycarbonate and uPVC rooflights that achieve a class C-s3, d2 rating by test may be regarded as having a B_{ROOF}(t4) classification.

Openable polycarbonate and uPVC rooflights that achieve a class C-s3, d2 rating by test, see paragraph 14.7, may be regarded as having a B_{ROOF}(t4) classification.

1. Not acceptable on any of the following buildings.
 - a. Industrial, storage or other non-residential purpose group buildings of any size.
 - b. Any other buildings with a cubic capacity of more than 1500m.
2. Acceptable on buildings not listed in (1) if both of the following apply.
 - a. Part of the roof is a maximum of 3m in area and a minimum of 1500mm from any similar part.
 - b. The roof between the parts is covered with a material rated class A2-s3, d2 or better.

Table 14.2 Class D-s3, d2 plastic rooflights: Limitations on use and boundary distance

Minimum classification on lower surface ⁽¹⁾	Space that rooflight can serve	Minimum distance from any point on relevant boundary to rooflight with an external designation† of:	
		$E_{\text{ROOF}}(t4)$ or $D_{\text{ROOF}}(t4)$	$F_{\text{ROOF}}(t4)$
Class D-s3, d2	a. Balcony, verandah, carport, covered way or loading bay that has at least one longer side wholly or permanently open	6m	20m
	b. Detached swimming pool		
	c. Conservatory, garage or outbuilding, with a maximum floor area of 40m ²		
	d. Circulation space ⁽²⁾ (except a protected stairway)	6m ⁽³⁾	20m ⁽³⁾
	e. Room ⁽²⁾		

NOTES:

- † The designation of external roof surfaces is explained in Appendix B. None of the above designations are suitable for protected stairways. Polycarbonate and uPVC rooflights that achieve a class C-s3, d2 rating by test, see paragraph 14.7, may be regarded as having a $B_{\text{ROOF}}(t4)$ classification. Where diagram 7.3a or 7.3b applies, rooflights should be a minimum of 1500mm from the compartment wall. If double-skinned or laminate products have upper and lower surfaces of different materials, the more onerous distance applies.
1. See also the guidance to requirement B2 in section 5.
 2. Single-skinned rooflight only, in the case of non-thermoplastic material.
 3. The rooflight should also meet the provisions of diagram 14.1.

Table 14.3 TP(a) and TP(b) plastic rooflights: Limitations on use and boundary distance

Minimum classification on lower surface ⁽¹⁾	Space which rooflight can serve	Minimum distance from any point on relevant boundary to rooflight with an external surface classification ⁽¹⁾ of:	
		TP(a)	TP(b)
1. TP(a) rigid	Any space except a protected stairway	6m ⁽²⁾	Not applicable
2. TP(b)	a. Balcony, verandah, carport, covered way or loading bay, which has at least one longer side wholly or permanently open	Not applicable	6m
	b. Detached swimming pool		
	c. Conservatory, garage or outbuilding, with a maximum floor area of 40m ²		
	d. Circulation space ⁽³⁾ (except a protected stairway)	Not applicable	6m ⁽⁴⁾
	e. Room ⁽³⁾		

NOTES:

- None of the above designations are suitable for protected stairways. Polycarbonate and uPVC rooflights which achieve a class C-s3, d2 rating by test may be regarded as having a $B_{\text{ROOF}}(t4)$ designation. Where diagram 7.3a or 7.3b applies, rooflights should be at least 1500mm from the compartment wall. If double-skinned or laminate products have upper and lower surfaces of different materials, the more onerous distance applies.
1. See also the guidance to requirement B2 in section 5.
 2. No limit in the case of any space described in 2(a), (b) and (c).
 3. Single-skinned rooflight only, in the case of non-thermoplastic material.
 4. The rooflight should also meet the provisions of diagram 14.1.

Requirement B5: Access and facilities for the fire service

These sections deal with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

Requirement

Requirement

Access and facilities for the fire service

- B5.** (1) The building shall be designed and constructed so as to provide reasonable facilities to assist fire fighters in the protection of life.
- (2) Reasonable provision shall be made within the site of the building to enable fire appliances to gain access to the building.

Limits on application

Intention

Provisions covering access and facilities for the fire service are to safeguard the health and safety of people in and around the **building**. Their extent depends on the size and use of the **building**. Most firefighting is carried out within the **building**. In the Secretary of State's view, requirement B5 is met by achieving all of the following.

- a. External access enabling fire appliances to be used near the **building**.
- b. Access into and within the **building** for firefighting personnel to both:
 - i. search for and rescue people
 - ii. fight fire.
- c. Provision of internal fire mains and other facilities for firefighters to complete their tasks.
- d. Ventilation of heat and smoke from a fire in a basement.

Where deviating from the general guidance, it is advisable to seek advice from the fire and rescue service as early as possible (even if there is no statutory duty to consult). If an alternative approach is taken to providing the **means of escape**, outside the scope of this approved document, additional provisions for firefighting access may be required.

Section 15: Fire mains and hydrants

Introduction

15.1 Fire mains are installed for the fire and rescue service to connect hoses for water. They may be either of the following.

- a. The 'dry' type, which are:
 - i. normally kept empty
 - ii. supplied through a hose from a fire and rescue service pumping appliance.
- b. The 'wet' type, which are:
 - i. kept full of water
 - ii. supplied by pumps from tanks in the building.

There should be a facility to replenish a wet system from a pumping appliance in an emergency.

Provision of fire mains

15.2 Buildings with firefighting shafts should have fire mains in both of the following.

- a. The firefighting shafts.
- b. Where necessary, in protected escape stairs.

The criteria for providing firefighting shafts and fire mains are given in section 17.

15.3 Buildings without firefighting shafts may be provided with fire mains where vehicle access is not provided in accordance with table 16.1.

In these cases, outlets from fire mains should be located as described in paragraph 15.4. Stairs do not need to be designed as firefighting shafts.

Design and construction of fire mains

15.4 If a firefighting shaft is provided, outlets from fire mains should be within the protected stairway or protected lobby (see diagram 17.1).

15.5 Buildings with a storey more than 50m above vehicle access level should be provided with wet fire mains.

15.6 Guidance on other aspects of fire mains design and construction is given in BS 9990.

Provision of private hydrants

15.7 A building requires additional fire hydrants if both of the following apply.

- a. It has a compartment with an area more than 280m².
- b. It is being erected more than 100m from an existing fire hydrant.

- 15.8** Additional hydrants should be provided in accordance with the following.
- a. For **buildings** provided with fire mains – within 90m of dry fire main inlets.
 - b. For **buildings** not provided with fire mains – hydrants should be both of the following.
 - i. Within 90m of an entrance to the **building**.
 - ii. A maximum of 90m apart.
- 15.9** Each fire hydrant should be clearly indicated by a plate, fixed nearby in a conspicuous position, in accordance with **BS 3251**.
- 15.10** An alternative source of water supply should be provided where any of the following apply.
- a. No piped water supply is available.
 - b. Pressure and flow in the water main are insufficient.
 - c. An alternative source of supply is proposed.
- The alternative source of water supply should be one of the following.
- d. A charged static water tank with a minimum capacity of 45,000 litres.
 - e. A spring, river, canal or pond that is capable of fulfilling both of the following conditions.
 - i. Providing or storing a minimum of 45,000 litres of water at all times.
 - ii. Providing access, space and a hardstanding for a pumping appliance.
 - f. Any other water supply that the local fire and rescue service considers appropriate.

Section 16: Vehicle access

Buildings not fitted with fire mains

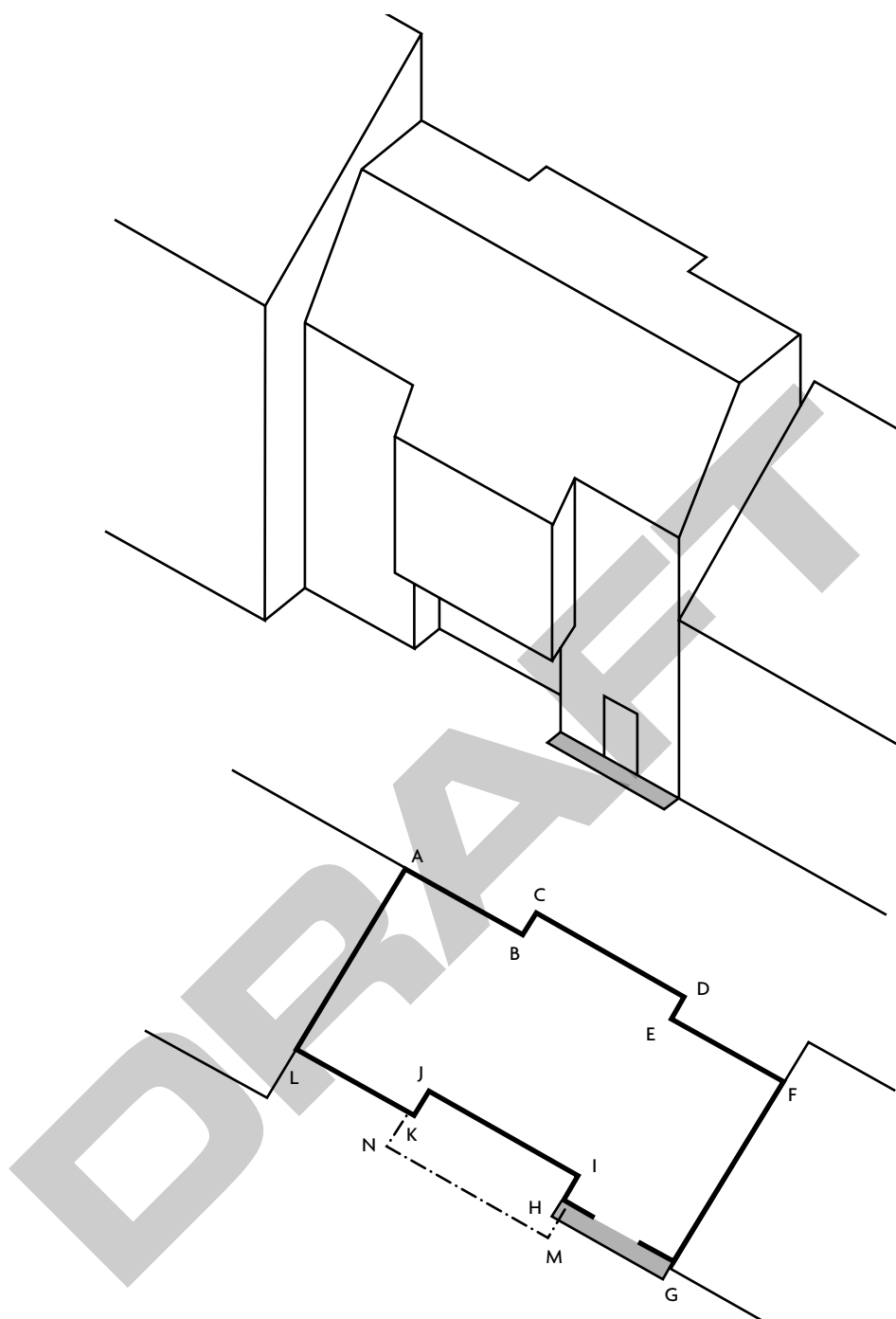
- 16.1** For small buildings (up to 2000m², with a top storey a maximum of 11m above ground level), vehicle access for a pump appliance should be provided to whichever is the less onerous of the following.
- 15% of the perimeter.
 - Within 45m of every point of the footprint of the building (see diagram 16.1).
- 16.2** For all other buildings, provide vehicle access in accordance with table 16.1.
- 16.3** Every elevation to which vehicle access is provided should have a door, a minimum of 750mm wide, to give access into the building. The maximum distance between doors, or between a door and the end of the elevation, is 60m (e.g. a 150m elevation would need a minimum of two doors).

Table 16.1 Fire and rescue service vehicle access to buildings not fitted with fire mains

Total floor area ⁽¹⁾ of building (m ²)	Height of floor of top storey above ground (m) ⁽²⁾	Provide vehicle access to:	Type of appliance
Up to 2000	Up to 11 Over 11	See paragraph 16.1 15% of perimeter	Pump High reach
2000–8000	Up to 11 Over 11	15% of perimeter 50% of perimeter	Pump High reach
8000–16,000	Up to 11 Over 11	50% of perimeter 50% of perimeter	Pump High reach
16,000–24,000	Up to 11 Over 11	75% of perimeter 75% of perimeter	Pump High reach
Over 24,000	Up to 11 Over 11	100% of perimeter 100% of perimeter	Pump High reach

NOTES:

- The sum of the area of all storeys in the building (excluding basements).
- For purpose group 7(a) (storage) buildings, measure height to mean roof level (see Appendix D).



Plan of building AFGL where AL and FG are walls in common with other buildings.

The footprint of the building is the maximum aggregate plan perimeter found by the vertical projection of any overhanging storey onto a ground storey (i.e. ABCDEFGHNMKL).

The perimeter of the building for the purposes of table 16.1 is the sum of the lengths of the two external walls, taking account of the footprint i.e. (A to B to C to D to E to F) + (G to H to M to N to K to L).

If the dimensions of the building are such that table 16.1 requires vehicle access, the shaded area illustrates one possible example of 15% of the perimeter. Note: There should be a door into the building in this length (see paragraph 16.3).

If the building does not have walls in common with other buildings, the lengths AL and FG would be included in the perimeter.

Diagram 16.1 Example of building footprint and perimeter

Buildings fitted with fire mains

16.4 For buildings fitted with dry fire mains, both of the following apply.

- Access should be provided for a pumping appliance to within 18m of each fire main inlet connection point. Inlets should be on the face of the building.
- The fire main inlet connection point should be visible from the appliance.

16.5 For buildings fitted with wet mains, access for a pumping appliance should comply with both of the following.

- Within 18m, and within sight of, an entrance giving access to the fire main.
- Within sight of the inlet to replenish the suction tank for the fire main in an emergency.

16.6 For buildings that have no provision made in sections 15 and 17, vehicle access may be as described in paragraph 16.4 or 16.5, rather than table 16.1.

Design of access routes and hardstandings

16.7 Access routes and hardstandings should meet the guidance in table 16.2. Requirements can only be made for the site of the works.

It may not be reasonable to upgrade the route across a site to a small building. The building control body, in consultation with the fire and rescue service, should consider options from doing no work to upgrading certain features, such as sharp bends.

16.8 Where access to an elevation is provided in accordance with table 16.1, the following requirements should be met depending on the building height.

- Buildings up to 11m, excluding small buildings (paragraph 16.1): pump appliance access should be provided adjacent to the building for the specified percentage of the total perimeter.
- Buildings over 11m: access routes should meet the guidance in diagram 16.2.

16.9 Where access is provided for high reach appliances in accordance with table 16.1, overhead obstructions (such as cables and branches) should be avoided in the zone shown in diagram 16.2.

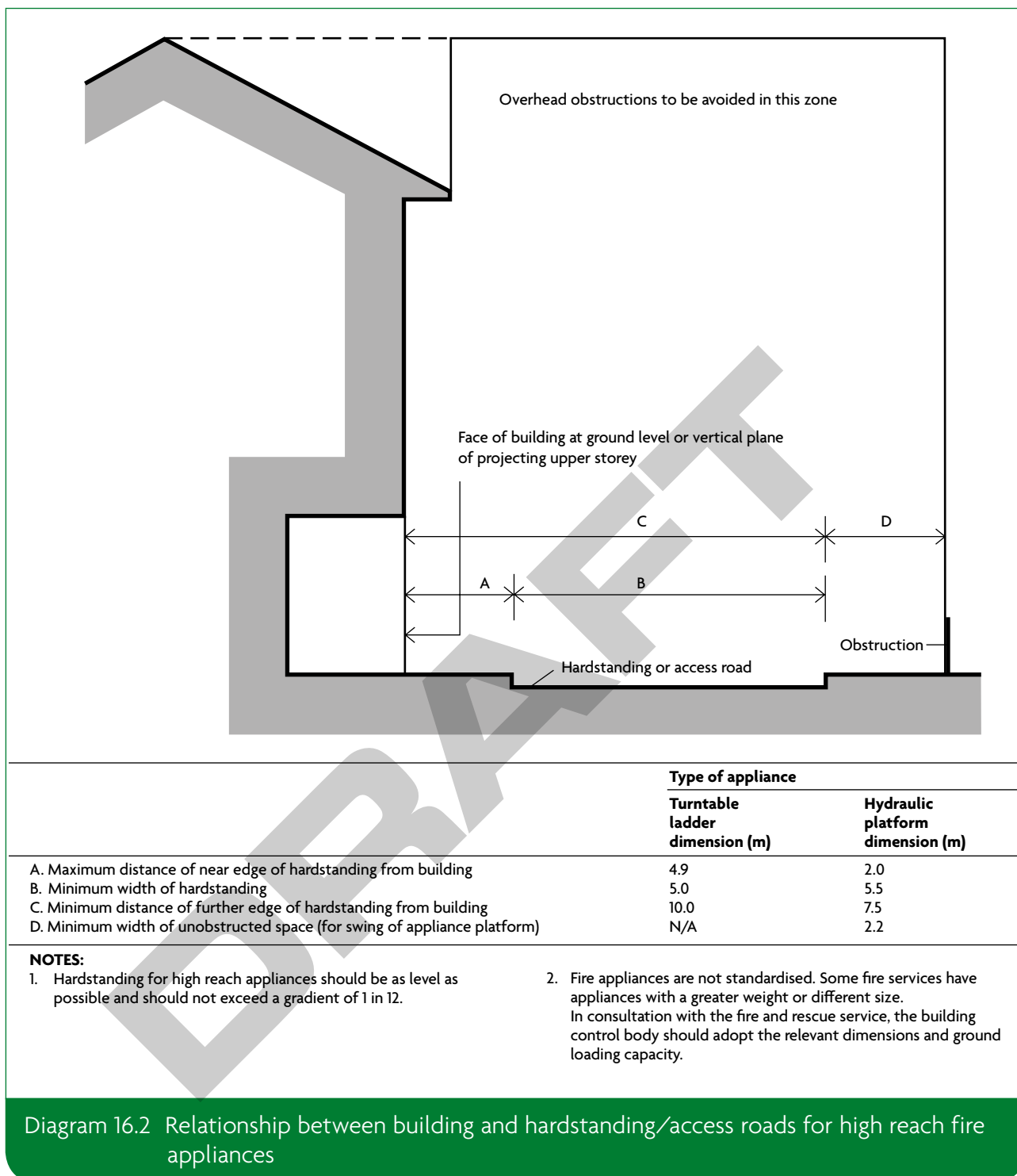
16.10 Dead-end access routes longer than 20m require turning facilities, as in diagram 16.3. Turning facilities should meet the guidance in table 16.2.

Table 16.2 Typical fire and rescue service vehicle access route specification

Appliance type	Minimum width of road between kerbs (m)	Minimum width of gateways (m)	Minimum turning circle between kerbs (m)	Minimum turning circle between walls (m)	Minimum clearance height (m)	Minimum carrying capacity (tonnes)
Pump	3.7	3.1	16.8	19.2	3.7	12.5
High reach	3.7	3.1	26.0	29.0	4.0	17.0

NOTES:

- Fire appliances are not standardised. The building control body may, in consultation with the local fire and rescue service, use other dimensions.
- The roadbase can be designed to 12.5 tonne capacity. Structures such as bridges should have the full 17-tonne capacity. The weight of high reach appliances is distributed over a number of axles, so infrequent use of a route designed to accommodate 12.5 tonnes should not cause damage.



Fire and rescue service vehicles should not have to reverse more than 20m from the end of an access road.

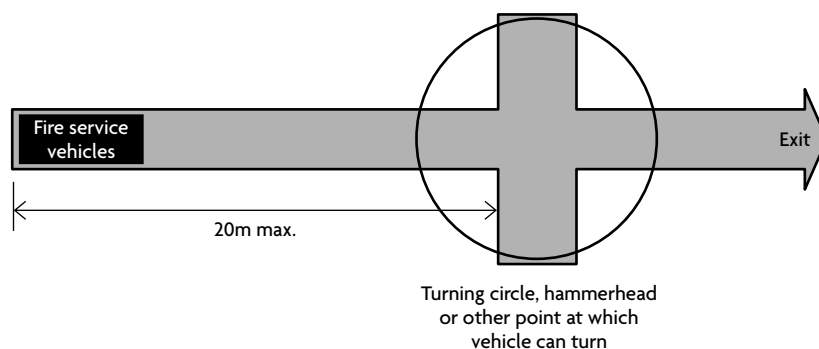
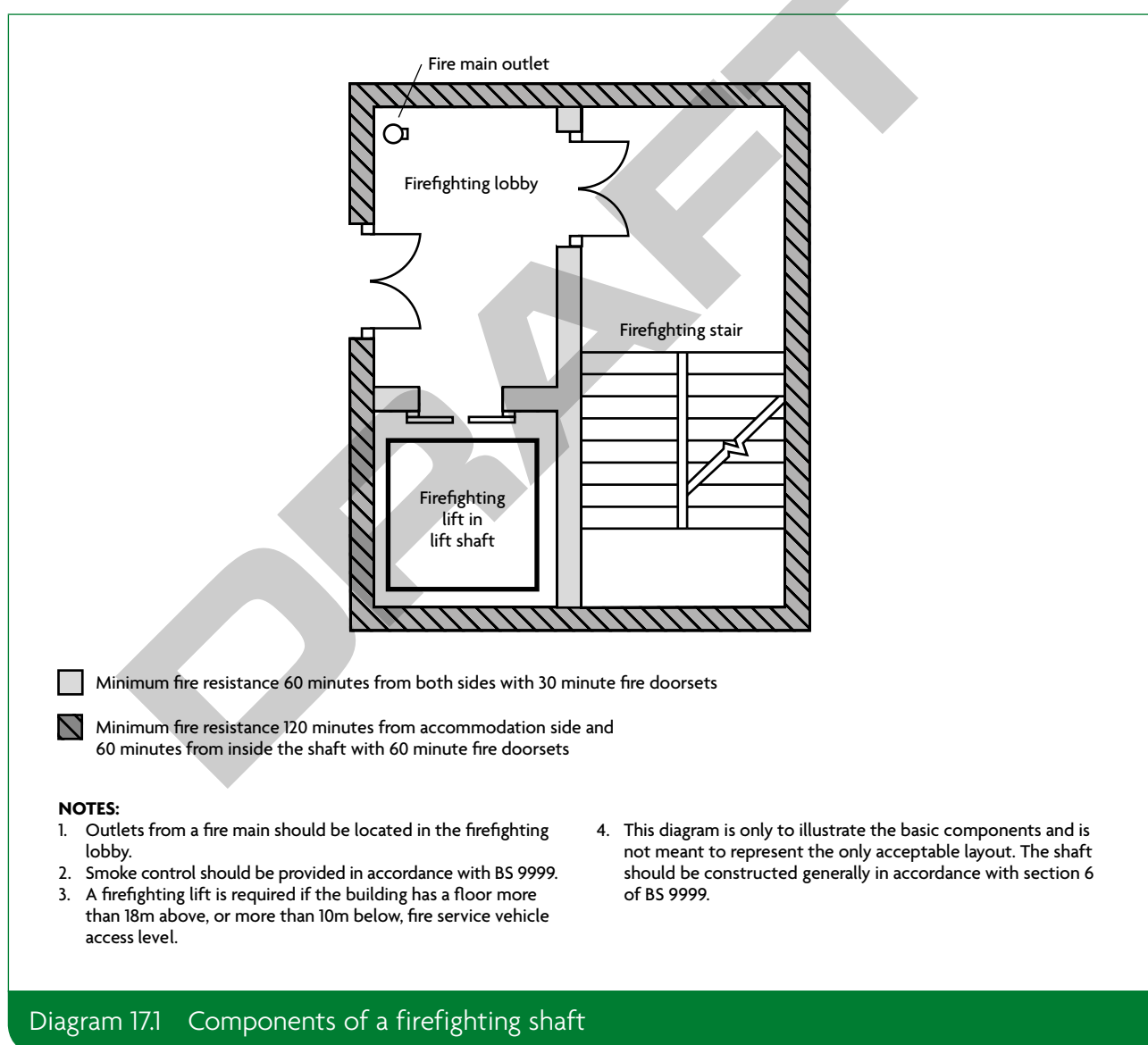


Diagram 16.3 Turning facilities

Section 17: Access to buildings for firefighting personnel

Introduction

- 17.1** Facilities for fire and rescue, such as firefighting lifts, firefighting stairs and firefighting lobbies, are combined in protected firefighting shafts (diagram 17.1). Section 7 gives guidance on the design and construction of protected shafts.

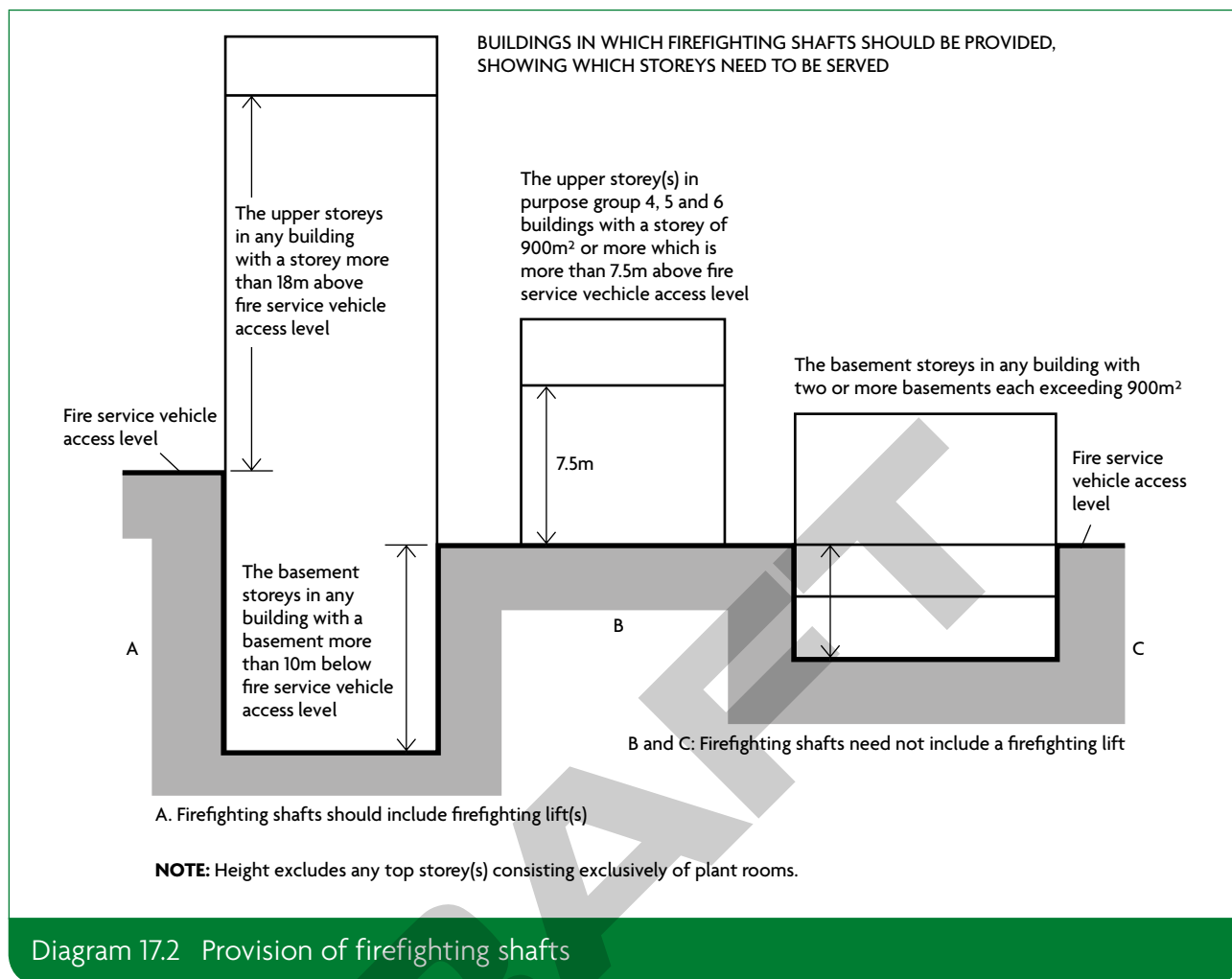


Provision of firefighting shafts

- 17.2** A building with a storey more than 18m above the fire and rescue service vehicle access level should have firefighting shafts containing firefighting lifts. Shafts are not required to serve a basement that is not large or deep enough to need one (see diagram 17.2).
- 17.3** A building with basement storeys should have firefighting shafts in accordance with the following.
- There is a basement more than 10m below the fire and rescue service vehicle access level. The firefighting shafts should contain firefighting lifts.
 - There are two or more basement storeys, each with a minimum area of 900m². The firefighting shafts do not need to include firefighting lifts.

The building's height and size determines whether shafts also serve upper storeys.

- 17.4** Firefighting shafts should serve all storeys through which they pass.
- 17.5** Firefighting shafts in shopping complexes should be in accordance with BS 9999 Annex E.
- 17.6** A minimum of two firefighting shafts should be provided to buildings with a storey that has both of the following.
- A floor area of 900m² or more.
 - A floor level 18m or more above the fire and rescue service vehicle access level.
- 17.7** At least two firefighting shafts, which need not include firefighting lifts, should be provided if buildings meet all of the following (see diagram 17.2).
- They are in purpose groups 4, 5 or 6.
 - They have a storey area of 900m² or more.
 - They have a storey height of 7.5m or more above fire and rescue service vehicle access level.



Location of firefighting shafts

- 17.8** A sufficient number of **firefighting shafts** should be provided to comply with the maximum distances given in paragraph 17.9. Distances should be measured from the dry riser outlet on a route suitable for laying a hose, to every part of each **storey** more than 18m (7.5m in buildings covered by paragraph 17.7) above the fire and rescue service vehicle access level.
- 17.9** The maximum distances should be as per the following.
- If the **building** is fitted throughout with an automatic sprinkler system in accordance with section 10: a maximum of 60m from a fire main outlet in a **firefighting shaft**.
 - If the building is not fitted throughout with an automatic sprinkler system, both of the following.
 - A maximum of 45m from a fire main outlet in a **protected stairway**. (Additional fire mains may need to be provided in escape stairs, which do not need to be **firefighting shafts**.)
 - A maximum of 60m from a fire main outlet in a **firefighting shaft**.

Design and construction of firefighting shafts

17.10 Every firefighting stair and firefighting lift should be approached from the accommodation through a firefighting lobby. Both the stair and lobby of the firefighting shaft should be provided with a means of venting smoke and heat (see clause 27.1 of **BS 9999**).

Only services associated with the firefighting shaft, such as ventilation systems and lighting for the shaft, should pass through or be contained within the firefighting shaft.

17.11 All firefighting shafts should have fire mains with outlet connections and valves at every storey.

17.12 A firefighting lift installation includes all of the following.

- a. Lift car.
- b. Lift well.
- c. Lift machinery space.
- d. Lift control system.
- e. Lift communications system.

The lift shaft should be constructed in accordance with section 6 of **BS 9999**.

Firefighting lift installations should conform to **BS EN 81-72** and **BS EN 81-20**.

Rolling shutters in compartment walls

17.13 The fire and rescue service should be able to manually open and close rolling shutters without the use of a ladder.

Section 18: Venting of heat and smoke from basements

Provision of smoke outlets

- 18.1** Smoke outlets, or smoke vents, allow heat and smoke to escape from the basement levels to the open air. They can also be used by the fire and rescue service to let cooler air into the basements (diagram 18.1).
- 18.2** Each basement space should have one or more smoke outlets.
- Where this is not practicable (for example, the plan area is deep and the amount of **external wall** is restricted by adjoining **buildings**), the perimeter basement spaces may be vented, with other spaces vented indirectly by opening connecting doors.
- If a basement is compartmented, each **compartment** should have one or more smoke outlets, rather than indirect venting.
- A **basement storey** or **compartment** containing **rooms** with doors or windows does not need smoke outlets.
- 18.3** Smoke outlets connecting directly to the open air should be provided from every **basement storey**, except for any **basement storey** that has either of the following.
- A maximum floor area of 200m².
 - A floor a maximum of 3m below the adjacent ground level.
- 18.4** Strong **rooms** need not be provided with smoke outlets.

Natural smoke outlets

- 18.5** Smoke outlets should be both of the following.
- Sited at high level in either the **ceiling** or wall of the space they serve.
 - Evenly distributed around the **perimeter**, to discharge to the open air.
- 18.6** The combined clear cross-sectional area of all smoke outlets should be a minimum of 1/40 of the area of the floor of the **storey** they serve.
- 18.7** Separate outlets should be provided from **places of special fire hazard**.
- 18.8** If the smoke outlet terminates at a point that is not readily accessible, it should be kept unobstructed and covered only with a non-combustible grille or louvre.
- 18.9** If the smoke outlet terminates in a readily accessible position, it may be covered by a panel, stallboard or pavement light that can be broken out or opened. The position of covered smoke outlets should be suitably indicated.
- 18.10** Outlets should not prevent the use of **escape routes** from the **building**.

Mechanical smoke extract

18.11 If **basement storeys** are fitted with a sprinkler system in accordance with section 10, a mechanical smoke extraction system may be provided as an alternative to natural venting. Sprinklers do not need to be installed on the other **storeys** unless needed for other reasons.

Car parks are not normally expected to be fitted with sprinklers (paragraph 11.1).

18.12 The air extraction system should comply with all of the following.

- a. It should give at least 10 air changes per hour.
- b. It should be capable of handling gas temperatures of 300°C for not less than one hour.
- c. It should do either of the following.
 - i. Be activated automatically if the sprinkler system activates.
 - ii. Be activated by an automatic fire detection system that conforms to **BS 5839-1** (minimum L3 standard).

Further information on equipment for removing hot smoke is given in **BS EN 12101-3**.

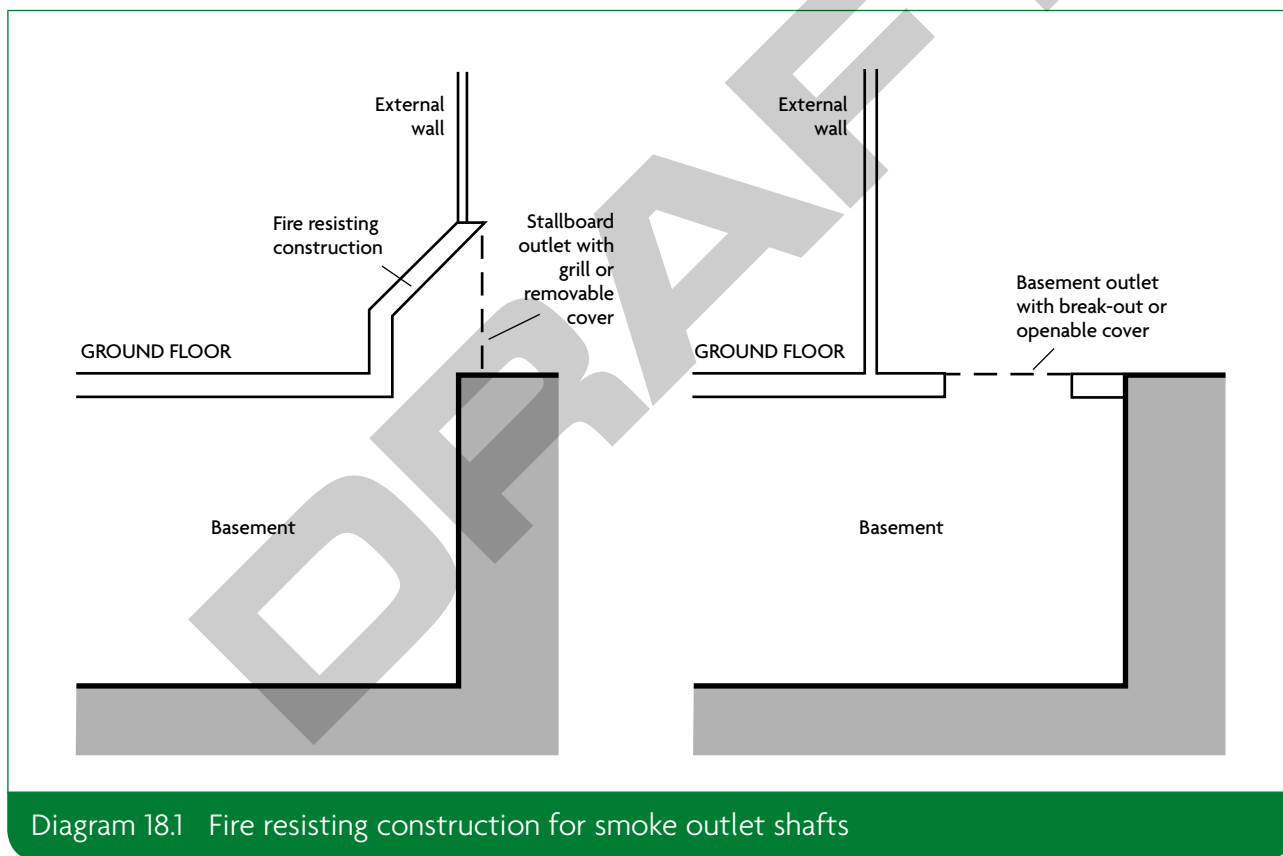


Diagram 18.1 Fire resisting construction for smoke outlet shafts

Construction of outlet ducts or shafts

- 18.13** Outlet ducts or shafts, including any bulkheads over them (see diagram 18.1), should be enclosed in construction of class A1 rating and fire resistance at least equal to that of the element through which they pass.
- 18.14** Natural smoke outlet shafts should be separated from each other using construction of class A1 rating and fire resistance at least equal to that of the **storeys** they serve, where the shafts are either of the following.
- From different **compartments** of the same **basement storey**.
 - From different **basement storeys**.

Basement car parks

- 18.15** The provisions for ventilation of basement car parks in section 10 satisfy the requirements for venting smoke from any basement used as a car park.

DRAFT

Regulation 38: Fire safety information

This section deals with the following regulation of the Building Regulations 2010.

- 38.** (1) This regulation applies where building work:
- (a) consists of or includes the erection or extension of a relevant building; or
 - (b) is carried out in connection with a relevant change of use of a building and Part B of Schedule 1 imposes a requirement in relation to the work.
- (2) The person carrying out the work shall give fire safety information to the responsible person not later than the date of completion of the work, or the date of occupation of the building or extension, whichever is the earlier.
- (3) In this regulation:
- (a) 'fire safety information' means information relating to the design and construction of the building or extension, and the services, fittings and equipment provided in or in connection with the building or extension which will assist the responsible person to operate and maintain the building or extension with reasonable safety;
 - (b) a 'relevant building' is a building to which the Regulatory Reform (Fire Safety) Order 2005 applies, or will apply after the completion of building work;
 - (c) a 'relevant change of use' is a material change of use where, after the change of use takes place, the Regulatory Reform (Fire Safety) Order 2005 will apply, or continue to apply, to the building; and
 - (d) 'responsible person' has the meaning given by article 3 of the Regulatory Reform (Fire Safety) Order 2005.

Section 19: Fire safety information

- 19.1** For building work involving the erection or extension of a relevant **building**, or the relevant change of use of a **building**, fire safety information should be given to the responsible person at one of the following times.
- When the project is complete.
 - When the **building** or extension is first occupied.
- 19.2** This section is a guide to the information that should be provided. Guidance is in terms of simple and complex **buildings**. The level of detail required should be considered on a case-by-case basis.

Simple buildings

- 19.3** Basic information on the location of fire protection measures may be sufficient. An as-built plan of the **building** should be provided showing all of the following.
- Escape routes.
 - Location of **fire-separating elements** (including **cavity barriers** in walk-in spaces).
 - Fire doorsets**, **fire doorsets** fitted with a **self-closing device** and other doors equipped with relevant hardware.
 - Locations of fire and/or smoke detector heads, alarm call points, detection/alarm control boxes, alarm sounders, fire safety signage, **emergency lighting**, fire extinguishers, dry or wet fire mains and other firefighting equipment, and hydrants outside the **building**.
 - Any sprinkler systems, including isolating valves and control equipment.
 - Any smoke control systems, or ventilation system with a smoke control function, including mode of operation and control systems.
 - Any high risk areas (e.g. heating machinery).
- 19.4** Details should be provided of all of the following.
- Specifications of any fire safety equipment provided, including routine maintenance schedules.
 - Any assumptions regarding the management of the **building** in the design of the fire safety arrangements.
 - Any provision enabling the evacuation of disabled people, which can be used when designing suitable personal emergency evacuation plans.

Complex buildings

- 19.5** A detailed record should be provided of both of the following.
- The fire safety strategy.
 - Procedures for operating and maintaining any fire protection measures.
- Further guidance is available in **BS 9999** (clause 9 and Annex H).

19.6 The records should include details of all of the following.

- a. The fire safety strategy, including all assumptions in the design of the fire safety systems (such as fire load). Any risk assessments or risk analysis.
- b. All assumptions in the design of the fire safety arrangements for the management of the building.
- c. All of the following.
 - i. Escape routes.
 - ii. Escape strategy (e.g. simultaneous or phased).
 - iii. Muster points.
- d. All passive fire safety measures, including all of the following.
 - i. Compartmentation (i.e. location of fire-separating elements).
 - ii. Cavity barriers.
 - iii. Fire doorsets.
 - iv. Fire doorsets fitted with a self-closing device and other doors equipped with relevant hardware (e.g. electronic security locks).
 - v. Duct dampers.
 - vi. Fire shutters.
- e. All of the following.
 - i. Fire detector heads.
 - ii. Smoke detector heads.
 - iii. Alarm call points.
 - iv. Detection/alarm control boxes.
 - v. Alarm sounders.
 - vi. Emergency communications systems
 - vii. CCTV.
 - viii. Fire safety signage.
 - ix. Emergency lighting.
 - x. Fire extinguishers.
 - xi. Dry or wet fire mains and other firefighting equipment.
 - xii. Other interior facilities for the fire and rescue service.
 - xiii. Emergency control rooms.
 - xiv. Location of hydrants outside the building.
 - xv. Other exterior facilities for the fire and rescue service.

- f. All active fire safety measures, including both of the following.
 - i. Sprinkler system(s) design, including isolating valves and control equipment.
 - ii. Smoke control system(s) (or heating, ventilating and air conditioning system with a smoke control function) design, including mode of operation and control systems.
- g. Any high-risk areas (e.g. heating machinery) and particular hazards.
- h. Plans of the building as built, showing the locations of the above.
- i. Both of the following.
 - i. Specifications of any fire safety equipment provided, including all of the following.
 - Operational details.
 - Operators' manuals.
 - Software.
 - System zoning.
 - Routine inspection, testing and maintenance schedules.
 - ii. Records of any acceptance or commissioning tests.
- j. Any provision to enable the evacuation of disabled people.
- k. Any other details appropriate for the specific building.

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Appendix A: Key terms

NOTE: Except for the items marked * (which are from the Building Regulations 2010), these definitions apply only to Approved Document B.

NOTE: The terms defined below are key terms used in this document only. Refer to **BS 4422** for further guidance on the definitions of common terms used in the fire safety industry which are not listed below.

Access room A room that the only escape route from an inner room passes through.

Alternative escape routes Escape routes that are sufficiently separated by direction and space or by fire resisting construction to ensure that one is still available if the other is affected by fire.

Alternative exit One of two or more exits, each of which is separate from the other.

Appliance ventilation duct A duct to deliver combustion air to a gas appliance.

Atrium (plural atria) A continuous space that passes through one or more structural floors within a building, not necessarily vertically.

NOTE: Enclosed lift wells, enclosed escalator wells, building services ducts and stairways are not classified as atria.

Automatic release mechanism A device that normally holds a door open, but closes it automatically if any one of the following occurs.

- Smoke is detected by automatic apparatus of a suitable nature and quality in a suitable location.
- A hand-operated switch, fitted in a suitable position, is operated.
- The electricity supply to the device, apparatus or switch fails.
- The fire alarm system, if any, is operated.

Basement storey A storey with a floor that, at some point, is more than 1200mm below the highest level of ground beside the outside walls. (However, see Appendix B, table B3, for situations where the storey is considered to be a basement only because of a sloping site.)

Boundary The boundary of the land that belongs to a building, or, where the land abuts a road, railway, canal or river, the centre line of that road, railway, canal or river.

***Building** Any permanent or temporary building but not any other kind of structure or erection. A reference to a building includes a reference to part of a building.

Building Control Body A term that includes both local authority building control and approved inspectors.

Cavity barrier A construction other than a smoke curtain, to perform either of the following functions.

- Close a concealed space to stop smoke or flame entering.
- Restrict the movement of smoke or flame within a concealed space.

Ceiling Part of a building that encloses a room, protected shaft or circulation space, and is exposed overhead.

NOTE: The soffit of a rooflight, but not the frame, is included as part of the surface of the ceiling. An upstand below a rooflight is considered as a wall.

Circulation space A space (including a protected stairway) mainly used as a means of access between a room and an exit from the building or compartment.

Class 0 A product performance classification for wall and ceiling linings. The relevant test criteria are set out in Appendix B, table B1.

Compartment (fire) A building or part of a building, comprising one or more rooms, spaces or storeys, that is constructed to prevent the spread of fire to or from another part of the same building or an adjoining building.

NOTE: A roof space above the top storey of a compartment is included in that compartment. (See also 'Separated part'.)

Compartment wall or floor A fire resisting wall or floor to separate one fire compartment from another.

NOTE: Provisions relating to construction are given in section 7.

Concealed space or cavity A space enclosed by elements of a building (including a suspended ceiling) or contained within an element, but that *is not* a room, cupboard, circulation space, protected shaft, or space within a flue, chute, duct, pipe or conduit.

Dead end An area from which escape is possible in one direction only.

Direct distance The shortest distance from any point within the floor area to the nearest storey exit, measured within the external enclosures of the building, and ignoring walls, partitions and fittings other than the enclosing walls and partitions to protected stairways.

Dwelling A unit where one or more people live (whether or not as a sole or main residence) in either of the following situations.

- A single person or by people living together as a family.
- A maximum of six people living together as a single household, including where care is provided for residents.

Element of structure Any of the following.

- A member that forms part of the structural frame of a building, or any other beam or column.
- A loadbearing wall or loadbearing part of a wall.
- A floor.
- A gallery (but *not* a loading gallery, fly gallery, stage grid, lighting bridge, or any gallery provided for similar purposes or for maintenance and repair).
- An external wall
- A compartment wall (including a wall that is common to two or more buildings).

Emergency lighting Lighting for use when the power supply to the normal lighting fails.

Escape lighting The part of the emergency lighting that is provided to ensure that the escape route is illuminated at all material times.

Escape route The route along which people can escape from any point in a building to a final exit.

Evacuation lift A lift that may be used to evacuate people in a fire.

Exit passageway A protected passageway that connects a protected stairway to a final exit.

NOTE: Exit passageways should be protected to the same standard as the stairway they serve.

External wall The external wall of a building includes a part of a roof pitched at more than 70 degrees to the horizontal if that part of the roof is beside a space within the building to which people have access (but *not* access only for repair or maintenance).

Final exit The end of an escape route from a building that gives direct access to a street, passageway, walkway or open space, and is sited to ensure that people rapidly disperse away from the building so that they are no longer in danger from fire and/or smoke.

NOTE: Windows are not acceptable as final exits.

Fire alarm system Combination of components for giving an audible and/or other perceptible alarm of fire.

Fire damper A mechanical or intumescent device within a duct or ventilation opening that operates automatically and is designed to prevent the spread of fire. A fire damper should achieve an integrity E classification and/or an ES classification to **BS EN 13501-3** when tested to **BS EN 1366-2**. Intumescent fire dampers may be tested to **BS ISO 10294-5**.

Fire and smoke damper A fire damper which, when tested to **BS EN 1366-2**, both:

- meets the ES classification requirements in **BS EN 13501-3**
- achieves the same fire resistance in relation to integrity as the element of the building through which the duct passes.

Intumescent fire dampers may be tested to **BS ISO 10294-2**.

Fire doorset A door or shutter which, together with its frame and furniture as installed in a building, is intended (when closed) to resist the spread of fire and/or gaseous products of combustion and meets specified performance criteria to those ends.

NOTE: A fire doorset may have one or more leaves. The term includes a cover or other form of protection to an opening in a fire resisting wall or floor, or in a structure that surrounds a protected shaft.

Firefighting lift A lift with additional protection and with controls that enable it to be used by the fire and rescue service when fighting a fire. (See section 17.)

Firefighting lobby A protected lobby that provides access from a firefighting stair to the accommodation area and to any associated firefighting lift.

Firefighting shaft A protected enclosure that contains a firefighting stair, firefighting lobbies and, if provided, a firefighting lift together with its machine room.

Firefighting stair A protected stairway that connects to the accommodation area through only a firefighting lobby.

Fire resisting (fire resistance) The ability of a component or a building to satisfy, for a stated period of time, some or all of the appropriate criteria given in the relevant standard.

Fire-separating element A compartment wall, compartment floor, cavity barrier and construction that encloses a protected escape route and/or a special fire hazard.

Fire-stop A seal provided to close an imperfection of fit or design tolerance between elements or components, to restrict the spread of fire and smoke.

***Flat** A separate and self-contained premises constructed or adapted for residential purposes that forms part of a larger building. Each flat is divided horizontally from some part of the building as a whole.

Gallery A floor or balcony that does not extend across the full extent of a building's footprint and is open to the floor below.

Height (of a building or storey for the purposes of Approved Document B Volume 1 and 2)

- Height of a building is measured as shown in Appendix D, diagram D4.
- Height of the floor of the top storey above ground level is measured as shown in Appendix D, diagram D6.

Inner room Room from which escape is possible only by passing through another room (the access room).

Live/work unit A flat that is a workplace for people who live there, its occupants and for people who do not live on the premises.

Material of limited combustibility A material that meets the performance specification for which the test criteria are set out in Appendix B, table B1. Materials of limited combustibility include non-combustible materials.

Means of escape Structural means that provide one or more safe routes for people to go, during a fire, from any point in the building to a place of safety.

Measurement

- Width of a doorway, cubic capacity, area, height of a building and number of storeys are measured as shown in Appendix D, diagrams D1 to D7.
- Occupant capacity, travel distance, escape route and stairs are measured as described in Appendix D.

Notional boundary A boundary presumed to exist between two buildings on the same site.

Open spatial planning The internal arrangement of a building in which more than one storey or level is contained in one undivided volume, e.g. split-level floors. For the purposes of this document there is a distinction between open spatial planning and an atrium space.

Perimeter (of a building) The maximum aggregate plan perimeter, found by vertical projection onto a horizontal plane. (See section 16.)

Pipe Includes pipe fittings and accessories. The definition of 'pipe' *excludes* a flue pipe and a pipe used for ventilating purposes, other than a ventilating pipe for an above ground drainage system).

Place of special fire hazard A room such as any of the following.

- Oil-filled transformer room.
- Switch gear room.
- Boiler room.
- Storage space for fuel or other highly flammable substance(s).
- Room that houses a fixed internal combustion engine.

Platform floor (also called an access or raised floor) A floor that is supported by a structural floor, but with an intervening concealed space to house services.

Protected circuit An electrical circuit that is protected against fire.

Protected corridor/lobby A corridor or lobby that is adequately protected from fire in adjoining areas by fire resisting construction.

Protected entrance hall/landing A circulation area, consisting of a hall or space in a flat, that is enclosed with fire resisting construction other than an external wall of a building.

Protected shaft A shaft that enables people, air or objects to pass from one compartment to another, and which is enclosed with fire resisting construction.

Protected stairway A stair that leads to a final exit to a place of safety and that is adequately enclosed with fire resisting construction. Included in the definition is any exit passageway between the foot of the stair and the final exit.

Purpose group A classification of a building according to the purpose to which it is intended to be put. (See table 0.1.)

Relevant boundary The boundary or notional boundary that one side of the building faces and/or coincides with, and that is parallel or at an angle of a maximum of 80 degrees to that side of the building.

Rooflight A dome light, lantern light, skylight, ridge light, glazed barrel vault or other element to admit daylight through a roof.

Room (for the purposes of requirement B2) An enclosed space within a building that is not used solely as a circulation space. The term includes not only conventional rooms, but also cupboards that are not fittings and large spaces such as warehouses and auditoria. The term *does not* include voids such as ducts, ceiling voids and roof spaces.

School A place of education for children between 2 and 19 years old. The term includes nursery schools, primary schools and secondary schools as defined in the Education Act 1996.

Self-closing device A device that closes a door, when open at any angle, against a door frame.

NOTE: If the door is in a cavity barrier, rising butt hinges (which are different from the self-closing device mentioned above) are acceptable.

Separated part (of a building) Part of a building that is separated from another part of the same building by a compartment wall. The wall runs the full height of the part and is in one vertical plane. (See Appendix D, diagram D5.)

Single storey building A building that consists of a ground storey only. Basements are not counted as storeys in a building (see Appendix D). A separated part that consists of a ground storey only, with a roof to which access is only provided for repair or maintenance, may be treated as a single storey building.

Site (of a building) The land occupied by the building, up to the boundaries with land in other ownership.

Storey Includes any of the following.

- Any gallery in an assembly building (purpose group 5).
- Any gallery in any other type of building if its area is more than half that of the space into which it projects.
- A roof, unless it is accessible only for maintenance and repair.

NOTE: The building is regarded as a multi-storey building if both of the following apply.

- There is more than one gallery.

- The total aggregate area of all the galleries in one space is more than half the area of that space.

Storey exit A final exit, or a doorway that gives direct access into a protected stairway, firefighting lobby or external escape route.

NOTE: If an institutional building is planned to enable progressive horizontal evacuation, a door in a compartment wall is considered a storey exit for the purposes of requirement B1.

Suspended ceiling (fire-protecting) A ceiling suspended below a floor that adds to the fire resistance of the floor.

Thermoplastic material Any synthetic polymeric material that has a softening point below 200°C if tested to **BS EN ISO 306** Method A120. Specimens for this test may be fabricated from the original polymer where the thickness of material of the end product is less than 2.5mm.

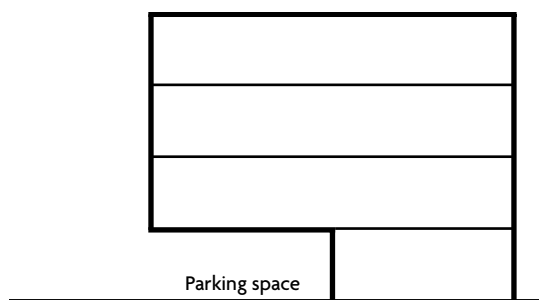
Travel distance (unless otherwise specified, e.g. as in the case of flats) The distance that a person would travel from any point within the floor area to the nearest storey exit, in view of the layout of walls, partitions and fittings.

Unprotected area (in relation to a side or external wall of a building) All of the following.

- Windows, doors or other openings.

NOTE: Neither of the following should be regarded as unprotected areas:

- Windows that are not openable and are designed and glazed to give the necessary level of fire resistance.
- Recessed car parking areas as shown in diagram A1.
- Any part of the external wall that has less than the relevant fire resistance set out in section 12.
- Any part of the external wall to the external face of which combustible material more than 1mm thick is attached or applied, whether for cladding or any other purpose. Combustible material in this context is any material which does not have a class B-s3, d2 rating.



NOTE: The parking area should be both of the following.

- a. Open fronted.
- b. Separated from the remainder of the building by a compartment wall(s) and floor(s) having not less than the period of fire resistance specified in table B3 in Appendix B.

Diagram A1 Recessed car parking areas

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Appendix B: Performance of materials, products and structures

This text is subject to a separate consultation “Amendments to statutory guidance on assessments in lieu of test in Approved Document B (Fire Safety)” – www.gov.uk/government/consultations/approved-document-b-fire-safety-amendments-to-statutory-guidance-on-assessments-in-lieu-of-tests

Introduction

- B1** Much of the guidance in this document is given in terms of performance classifications in relation to British or European Standards. In such cases the performance of products and systems should be demonstrated using one of the following methods.
- They should be in accordance with a specification or design that has been shown by a specific test to be capable of meeting that performance classification.
 - They should have been assessed in lieu of a specific test from relevant test evidence as being capable of meeting that performance classification.
 - They should have been designed by using relevant design standards in order to meet that performance classification.
- B2** Any test evidence used to demonstrate the fire performance classification of a product or system should be carefully checked to ensure that it is applicable to the intended use. Small differences in detail, such as fixing method, joints, dimensions, the introduction of insulation materials and air gaps (ventilated or not), can significantly affect the performance.
- B3** Where it is proposed to assess the classification of a product or system in lieu of carrying out a specific test (as in B1b above), this should be done in accordance with the relevant standard for extended application for the test in question.
- For performance classifications where there is no specific standard for extended application, assessment reports should be produced in accordance with the principles of **BS EN 15725** and should include details of the test evidence that has been used to support the assessment.
- B4** Tests and assessments should be carried out by organisations with the necessary expertise. Organisations listed as ‘notified bodies’ in accordance with the European construction products regulation or laboratories accredited by the United Kingdom Accreditation Service for the relevant test standard can be assumed to have the necessary expertise.

NOTE: Standard fire tests do not directly measure fire hazard. They measure or assess the response of a material or system to exposure to one or more aspects of fire conditions. Performance in fire tests is only one of a number of factors that should be taken into account.

Fire resistance

- B5** Common to all of the provisions of Part B of the Building Regulations is the property of fire resistance. Fire resistance is a measure of one or more of the following.
- Resistance to collapse** (loadbearing capacity), which applies to loadbearing elements only, denoted R in the European classification of the resistance to fire performance.
 - Resistance to fire penetration** (integrity), denoted E in the European classification of the resistance to fire performance.
 - Resistance to the transfer of excessive heat** (insulation), denoted I in the European classification of the resistance to fire performance.
- B6** The standards of fire resistance necessary for a particular building are based on assumptions about the severity of fires and the consequences should an element fail. Fire severity is estimated in very broad terms from the use of the building (its purpose group), on the assumption that the building contents (which constitute the fire load) are similar for buildings with the same use.
- B7** Because the use of buildings may change, a precise estimate of fire severity based on the fire load due to a particular use may be misleading. Therefore if a fire engineering approach of this kind is adopted, the likelihood that the fire load may change in the future needs to be considered.
- B8** Performance in terms of the fire resistance to be met by elements of structure, doors and other forms of construction is classified in accordance with one of the following.
- BS EN 13501-2.**
 - BS EN 13501-3.**
 - BS EN 13501-4.**
- B9** Fire resistance is measured in minutes. This relates to time elapsed in a standard test and should not be confused with real time.
- B10** The fire resistance necessary for different circumstances is set out in the following tables.
- Table B2 gives the specific requirements for each element of structure.
 - Table B3 sets out the minimum periods of fire resistance for elements of structure.
 - Table B4 sets out limitations on the use of uninsulated fire resisting glazed elements.
- B11** This document uses the European classification system for fire resistance set out in **BS EN 13501-2** to **4**; however, there may be some products lawfully on the market using the classification system set out in previous editions. In those situations the equivalent values given in table B1 can be used.

Roofs

- B12** Performance of the resistance of roofs to external fire exposure is measured in terms of penetration through the roof construction and the spread of flame over its surface.
- B13** Roof constructions are classified within the European system as $B_{\text{ROOF}}(t4)$, $C_{\text{ROOF}}(t4)$, $D_{\text{ROOF}}(t4)$, $E_{\text{ROOF}}(t4)$ or $F_{\text{ROOF}}(t4)$ in accordance with **BS EN 13501-5**. $B_{\text{ROOF}}(t4)$ indicates the highest performance, and $F_{\text{ROOF}}(t4)$ the lowest.
- B14** **BS EN 13501-1** refers to four separate roof tests. The suffix (t4) used in paragraph B13 indicates that Test 4 is to be used for the purposes of this approved document.

Reaction to fire

- B15** Reaction to fire relates to the degree to which a product will contribute, by its own decomposition, to a fire under specified conditions. Products, other than floorings, are classified as A1, A2, B, C, D or E (with class A1 being the highest performance and E being the lowest) in accordance with **BS EN 13501-1**.
- B16** The classes of reaction to fire performance of A2, B, C, D and E are accompanied by additional classifications related to the production of smoke (s1, s2, s3) and/or flaming droplets/particles (d0, d1, d2). These additional classifications are not used in this document.
- B17** To reduce the testing burden on manufacturers, **BS EN 13238** defines a number of standard substrates that produce test results representative of different end use applications. The standard substrate selected for testing should take account of the intended end use applications (field of application) of the product and represent end use substrates that have a density of a minimum of 75% of the standard substrate's nominal density. The classification for reaction to fire achieved during testing is only valid when the product is used within this field of application, i.e. when the product is fixed to a substrate of that class in its end use.
- B18** Standard substrates include gypsum plasterboard (**BS EN 520**) with a density of $700 \pm 100 \text{ kg/m}^3$, calcium silicate board (**BS EN 14306**) $870 \pm 50 \text{ kg/m}^3$ and fibre-cement board $1800 \pm 200 \text{ kg/m}^3$.

NOTES:

- Standard calcium silicate board is not representative of gypsum plasterboard end use (due to the paper layer), but would be representative of most gypsum plasters (with densities of more than 650 kg/m^3).
- Classifications based on tests using a plasterboard substrate would also be acceptable for products bonded to a gypsum plaster end use substrate.

Thermoplastic materials

- B19** **Thermoplastic material** is any synthetic polymeric material that has a softening point below 200°C if tested to **BS EN ISO 306** Method A120. Products formed from these materials cannot always be classified in the normal way. In those circumstances the following approach can be followed.
- B20** For the purposes of requirements B2 and B4, **thermoplastic materials** should be classified as TP(a) rigid, TP(a) flexible or TP(b), as follows:
- TP(a) rigid**
 - rigid solid uPVC sheet
 - solid (as distinct from double- or multi-skinned) polycarbonate sheet a minimum of 3mm thick
 - multi-skinned rigid sheet made from uPVC or polycarbonate that has a class 1 rating when tested to **BS 476-7**
 - any other rigid thermoplastic product, a specimen of which (at the thickness of the product as put on the market), when tested to **BS 2782-0** Method 508A, performs so that both:
 - the test flame extinguishes before the first mark
 - the duration of flaming or afterglow does not exceed 5 seconds following removal of the burner.

b. **TP(a) flexible**

Flexible products a maximum of 1mm thick that comply with the Type C requirements of **BS 5867-2** when tested to **BS 5438** Test 2 with the flame applied to the surface of the specimens for 5, 15, 20 and 30 seconds respectively, but excluding the cleansing procedure; and

c. **TP(b)**

- i. rigid solid polycarbonate sheet products a maximum of 3mm thick, or multi-skinned polycarbonate sheet products that do not qualify as TP(a) by test
- ii. other products which, when a specimen of the material between 1.5 and 3mm thick is tested in accordance with **BS 2782-0** Method 508A, have a maximum rate of burning of 50mm/minute.

NOTE: If it is not possible to cut or machine a 3mm thick specimen from the product, then a 3mm test specimen can be moulded from the same material as that used to manufacture the product.

B21 A **thermoplastic material** alone when used as a lining to a wall or **ceiling** cannot be assumed to protect a substrate. The surface rating of both **thermoplastic material** and substrate must therefore meet the required classification.

If, however, the **thermoplastic material** is fully bonded to a non-thermoplastic substrate, then only the surface rating of the composite needs to meet the required classification.

B22 **Thermoplastic materials** used for window glazing, **rooftlights** and lighting diffusers within suspended **ceilings** do not need to comply with paragraph A34 onwards. They are described in the guidance on requirements B2 and B4.

National classifications for reaction to fire

B23 This document uses the European classification system for reaction to fire set out in **BS EN 13501-1**; however, there may be some products lawfully on the market using the classification system set out in previous editions. Where this is the case, table B1 can be used for the purposes of this document.

Table B1 Reaction to fire equivalence

BS EN 13501 classification	Equivalent
A1	Non-combustible
A2	Limited combustibility
B	Class 0
C	Class 1 to BS 476-7
D	Class 3 to BS 476-7

B24 Non-combustible means any material that, when tested to **BS 476-11**, does not either:

- a. flame
- b. cause a rise in temperature on either the thermocouple at the centre of the specimen or in the furnaces.

B25 'Limited combustibility' means either of the following.

- a. Any material of density 300kg/m^3 or more, which, when tested to **BS 476-11** both:
 - i. does not flame
 - ii. causes a rise in temperature on the furnace thermocouple not exceeding 20°C .
- b. Any material of density less than 300kg/m^3 , which, when tested to **BS 476-11**, both:
 - i. does not flame for more than 10 seconds
 - ii. causes a rise in temperature on the thermocouple at the centre of the specimen or in the furnace that is a maximum of 35°C and on the furnace thermocouple that is a maximum of 25°C .

B26 **Class 0** means any material that meets both of the following criteria.

- a. Class 1 to **BS 476-7**.
- b. Has a fire propagation index (I) of a maximum of 12 and sub-index (i1) of a maximum of 6, determined by using the method given in **BS 476-6**. Index of performance (I) relates to the overall test performance, whereas sub-index (i1) is derived from the first three minutes of the test.

Table B2 Specific provisions of the test for fire resistance of elements of structure, etc.

Part of building	Equivalent provisions when tested to the relevant part of BS 476 ⁽¹⁾ (minutes)			Minimum provisions when tested to the relevant European Standard (minutes) ⁽⁹⁾	Type of exposure
	Loadbearing capacity ⁽²⁾	Integrity	Insulation		
1. Structural frame, beam or column.	See table B3	Not applicable	Not applicable	R see table B3	Exposed faces
2. Loadbearing wall (which is not also a wall described in any of the following items).	See table B3	Not applicable	Not applicable	R see table B3	Each side separately
3. Floors ⁽³⁾					
a. between a shop and flat above	60 min or see table B3 (whichever is greater)	60 min or see table B3 (whichever is greater)	60 min or see table B3 (whichever is greater)	REI 60 or see table B3 (whichever is greater)	From underside ⁽⁴⁾
b. any other floor – including compartment floors.	See table B3	See table B3	See table B3	REI see table B3	
4. Roofs					
a. any part forming an escape route	30 min or see table B3	30 min or see table B3	30 min or see table B3	REI 30 REI see table B3	From underside ⁽⁴⁾
b. any roof that performs the function of a floor.					
5. External walls					
a. any part a maximum of 1000mm from any point on the relevant boundary ⁽⁵⁾	See table B3	See table B3	See table B3	REI see table B3	Each side separately
b. any part a minimum of 1000mm from the relevant boundary ⁽⁵⁾	See table B3	See table B3	15 min	RE see table B3 and REI 15	From inside the building
c. any part beside an external escape route (see section 3, diagram 3.4).	30 min	30 min	No provision ^{(6), (7)}	RE 30	From inside the building
6. Compartment walls Separating either:					
a. a flat from any other part of the building (see paragraph 7.1 of Approved Document B Volume 1)	60 min or see table B3 (whichever is less)	60 min or see table B3 (whichever is less)	60 min or see table B3 (whichever is less)	REI 60 or see table B3 (whichever is less)	Each side separately
b. occupancies.					
7. Compartment walls (other than in item 6)	See table B3	See table B3	See table B3	REI see table B3	Each side separately

Table B2 Continued

Part of building	Equivalent provisions when tested to the relevant part of BS 476 ⁽¹⁾ (minutes)			Minimum provisions when tested to the relevant European Standard (minutes) ⁽⁹⁾	Type of exposure
	Loadbearing capacity ⁽²⁾	Integrity	Insulation		
8. Protected shafts Excluding any firefighting shaft:					Each side separately
a. any glazing	Not applicable	30	No provision ⁽⁷⁾	E 30	
b. any other part between the shaft and a protected lobby/corridor	30 min	30 min	30 min	REI 30	
c. any part not described in (a) or (b) above.	See table B3	See table B3	See table B3	REI see table B3	
9. Enclosure (that does not form part of a compartment wall or a protected shaft) to a:					Each side separately
a. protected stairway	30 min	30 min	30 min ⁽⁸⁾	REI 30 ⁽⁸⁾	
b. lift shaft.	30 min	30 min	30 min	REI 30	
10. Firefighting shafts	120 min	120 min	120 min	REI 120	From side remote from shaft
a. construction that separates firefighting shaft from rest of building	60 min	60 min	60 min	REI 60	From shaft side
b. construction that separates firefighting stair, firefighting lift shaft and firefighting lobby.	60 min	60 min	60 min	REI 60	Each side separately
11. Enclosure (that is not a compartment wall or described in item 8) to a:					Each side separately
a. protected lobby	30 min	30 min	30 min ⁽⁸⁾	REI 30 ⁽⁸⁾	
b. protected corridor.	30 min	30 min	30 min ⁽⁸⁾	REI 30 ⁽⁸⁾	
12. Sub-division of a corridor	30 min	30 min	30 min ⁽⁸⁾	REI 30 ⁽⁸⁾	Each side separately

Table B2 Continued

Part of building	Equivalent provisions when tested to the relevant part of BS 476 ⁽¹⁾ (minutes)			Minimum provisions when tested to the relevant European Standard (minutes) ⁽⁹⁾	Type of exposure
	Loadbearing capacity ⁽²⁾	Integrity	Insulation		
13. Fire resisting construction					Each side separately
a. construction that encloses places of special fire hazard	30 min	30 min	30 min	REI 30	
b. construction between store rooms and sales area in shops	30 min	30 min	30 min	REI 30	
c. fire resisting subdivision	30 min	30 min	30 min	REI 30	
d. construction that encloses bedrooms and ancillary accommodation in care homes.	30 min	30 min	30 min	REI 30	
14. Enclosure in a flat to a protected entrance hall, or to a protected landing.	30 min	30 min	30 min ⁽⁸⁾	REI 30 ⁽⁸⁾	Each side separately
15. Cavity barrier	Not applicable	30 min	15 min	E 30 and EI 15	Each side separately
16. Ceiling	Not applicable	30 min	30 min	EI 30	From underside
17. Duct described in paragraph 9.15.	Not applicable	30 min	No provision	E 30	From outside
18. Casing around a drainage system described in diagram 9.4.	Not applicable	30 min	No provision	E 30	From outside
19. Flue walls described in diagram 9.5.	Not applicable	Half the period given in table B3 for the compartment wall/floor	Half the period given in table B3 for the compartment wall/floor	EI half the period given in table B3 for the compartment wall/floor	From outside

Table B2 Continued

Part of building	Equivalent provisions when tested to the relevant part of BS 476 ⁽¹⁾ (minutes)			Minimum provisions when tested to the relevant European Standard (minutes) ⁽⁹⁾	Type of exposure
	Loadbearing capacity ⁽²⁾	Integrity	Insulation		
20. Fire doorsets	See table C1				

NOTES:

1. BS 476-20 for general principles BS 476-21 for loadbearing elements, BS 476-22 for non-loadbearing elements, BS 476-23 for fire-protecting suspended ceilings and BS 476-24 for ventilation ducts. BS 476-8 results are acceptable for items tested or assessed before 1 January 1988.
2. Applies to loadbearing elements only (see paragraph B5).
3. Guidance on increasing the fire resistance of existing timber floors is given in BRE Digest 208.
4. Only if a suspended ceiling meets the appropriate provisions should it be relied on to add to the fire resistance of the floor.
5. Such walls may contain areas that need not be fire resisting (unprotected areas). See section 12.
6. Unless needed as part of a wall in item 5a or 5b.
7. Except for any limitations on glazed elements given in table B4.
8. See table B4 for permitted extent of uninsulated glazed elements.
9. National classifications do not necessarily equate to European classifications. For a European classification, products should be tested accordingly.
In the European classification:
'R' is the resistance to fire in terms of loadbearing capacity.
'E' is the resistance to fire in terms of integrity.
'I' is the resistance to fire in terms of insulation.

Table B3 Minimum periods of fire resistance

Purpose group of building	Minimum periods of fire resistance (minutes) in a:					
	Basement storey* including floor over		Ground or upper storey			
	Depth (m) of the lowest basement		Height (m) of top floor above ground, in a building or separated part of a building			
	More than 10	Up to 10	Up to 5	Up to 18	Up to 30	More than 30
1. Residential:						
a. Block of flats						
– without sprinkler system	90 min	60 min	30 min [†]	60 min ^{•#}	90 min [•]	Not permitted
– with sprinkler system	90 min	60 min	30 min [†]	60 min ^{•#}	90 min [•]	120 min [•]
b. Institutional	90 min	60 min	30 min [†]	60 min	90 min	120 min ^{**}
c. Other residential	90 min	60 min	30 min [†]	60 min	90 min	120 min ^{**}
2. Office:						
– without sprinkler system	90 min	60 min	30 min [†]	60 min	90 min	Not permitted
– with sprinkler system ⁽²⁾	60 min	60 min	30 min [†]	30 min [†]	60 min	120 min ^{**}
3. Shop and commercial:						
– without sprinkler system	90 min	60 min	60 min	60 min	90 min	Not permitted
– with sprinkler system ⁽²⁾	60 min	60 min	30 min [†]	60 min	60 min	120 min ^{**}
4. Assembly and recreation:						
– without sprinkler system	90 min	60 min	60 min	60 min	90 min	Not permitted
– with sprinkler system ⁽²⁾	60 min	60 min	30 min [†]	60 min	60 min	120 min ^{**}
5. Industrial:						
– without sprinkler system	120 min	90 min	60 min	90 min	120 min	Not permitted
– with sprinkler system ⁽²⁾	90 min	60 min	30 min [†]	60 min	90 min	120 min ^{**}
6. Storage and other non-residential:						
a. any building or part not described elsewhere:						
– without sprinkler system	120 min	90 min	60 min	90 min	120 min	Not permitted
– with sprinkler system ⁽²⁾	90 min	60 min	30 min [†]	60 min	90 min	120 min ^{**}
b. car park for light vehicles:						

Table B3 Continued

Purpose group of building	Minimum periods of fire resistance (minutes) in a:					
	Basement storey* including floor over		Ground or upper storey			
	Depth (m) of the lowest basement		Height (m) of top floor above ground, in a building or separated part of a building			
	More than 10	Up to 10	Up to 5	Up to 18	Up to 30	More than 30
i. open sided car park ⁽³⁾	Not applicable	Not applicable	15 min ^{†‡}	15 min ^{†‡}	15 min ^{†‡}	60–120 min ^{**}
ii. any other car park	90 min	60 min	30 min [†]	60 min ⁽⁴⁾	90 min ⁽⁴⁾	60–120 min ^{**}

NOTES:

For single storey buildings, the periods under the heading 'up to 5' apply. If single storey buildings have basements, for the basement storeys the period appropriate to their depth applies.

* For the floor over a basement, or if there is more than one basement, the floor over the topmost basement, the higher of the period for the basement storey and the period for the ground or upper storey applies.

† For compartment walls that separate buildings, the period is increased to a minimum of 60 minutes.

• For any floor that does not contribute to the support of the building within a flat of more than one storey, the period is reduced to 30 minutes.

** For elements that do not form part of the structural frame, the period is reduced to 90 minutes.

‡ For elements that protect the means of escape, the period is increased to 30 minutes.

For flat conversions, refer to paragraph 6.6 of Approved Document B Volume 1 regarding the acceptability of 30 minutes.

1. Refer to note 1, table B2 for the specific provisions of test.

2. 'With sprinkler system' means that the building is fitted throughout with an automatic sprinkler system in accordance with section 10.

3. The car park should comply with the relevant provisions in the guidance on requirement B3, section 11 of Volume 2.

4. For the purposes of meeting the Building Regulations, the following types of steel elements are deemed to have satisfied the minimum period of fire resistance of 15 minutes when tested to the European test method.

i. Beams supporting concrete floors maximum $H_p/A=230\text{m}^{-1}$ operating under full design load.

ii. Free-standing columns, maximum $H_p/A=180\text{m}^{-1}$ operating under full design load.

iii. Wind bracing and struts, maximum $H_p/A=210\text{m}^{-1}$ operating under full design load.

Guidance is also available in **BS 5950-8**.

Application of the fire resistance standards in table B3

B27 The following guidance should be used when applying the fire resistance standards in table B3.

- a. If one **element of structure** supports or carries or gives stability to another, the fire resistance of the supporting element should be no less than the minimum period of fire resistance for the other element (whether that other element is loadbearing or not). In some circumstances, it may be reasonable to vary this principle, for example:
 - i. if the supporting structure is in the open air and is not likely to be affected by the fire in the building
 - ii. if the supporting structure is in a different **compartment**, with a **fire-separating element** (that has the higher standard of fire resistance) between the supporting and the separated structure
 - iii. if a plant room on the roof needs greater fire resistance than the elements of structure that support it.
- b. If an **element of structure** forms part of more than one **building** or **compartment**, that element should be constructed to the standard of the higher of the relevant provisions.
- c. If, due to the slope of the ground, one side of a basement is open at ground level (which allows smoke to vent and gives access for firefighting) for **elements of structure** in that **storey** it may be appropriate to adopt the standard of fire resistance that applies to above-ground structures.
- d. Although most **elements of structure** in a **single storey building** may not need fire resistance (see the guidance on requirement B3, paragraph 6.3a), fire resistance is needed if one of the following applies to the element.
 - i. It is part of, or supports, an **external wall**, and there is provision in the guidance on requirement B4 to limit the extent of openings and other unprotected areas in the wall.
 - ii. It is part of, or supports, a **compartment wall**, including a wall that is common to two or more **buildings**.
 - iii. It supports a **gallery**.

B28 For the purposes of this paragraph, the ground **storey** of a **building** that has one or more **basement storeys** and no upper **storeys** may be considered as a **single storey building**. The fire resistance of the **basement storeys** should be that specified for basements.

Table B4 Limitations on the use of uninsulated glazed elements on escape routes.
These limitations *do not* apply to glazed elements that satisfy the relevant insulation criterion, see table B2

Position of glazed element	Maximum total glazed area in parts of a building with access to:			
	A single stairway		More than one stairway	
	Walls	Door leaf	Walls	Door leaf
Flats				
1. Within the enclosures of a protected entrance hall or protected landing, or within fire resisting separation shown in section 3, diagram 3.4, of Approved Document B Volume 1.	Fixed fanlights only	Unlimited above 1100mm from floor	Fixed fanlights only	Unlimited above 1100mm from floor
General				
2. Between residential/sleeping accommodation and a common escape route (corridor, lobby or stair)	Nil	Nil	Nil	Nil
3. Between a protected stairway ⁽¹⁾ and either: a. the accommodation b. a corridor that is not a protected corridor <i>other than in item 2 above</i> .	Nil	25% of door area	Unlimited above 1100mm ⁽²⁾	50% of door area
4. Between either: a. a protected stairway ⁽¹⁾ and a protected lobby or protected corridor b. accommodation and a protected lobby <i>other than in item 2 above</i> .	Unlimited above 1100mm from floor	Unlimited above 100mm from floor	Unlimited above 100mm from floor	Unlimited above 100mm from floor
5. Between the accommodation and a protected corridor that forms a dead end, other than in item 2 above.	Unlimited above 1100mm from floor	Unlimited above 100mm from floor	Unlimited above 1100mm from floor	Unlimited above 100mm from floor
6. Between accommodation and any other corridor, or sub-dividing corridors, <i>other than in item 2 above</i> .	Not applicable	Not applicable	Unlimited above 100mm from floor	Unlimited above 100mm from floor
7. Beside an external escape route.	Unlimited above 1100mm from floor	Unlimited above 1100mm from floor	Unlimited above 1100mm from floor	Unlimited above 1100mm from floor
8. Beside an external escape stair (see paragraph 3.32 and diagram 3.4) or roof escape (see paragraph 2.39).	Unlimited	Unlimited	Unlimited	Unlimited

NOTES:

1. If the protected stairway is also a protected shaft or a firefighting stair (see section 17), there may be further restrictions on the use of glazed elements.
2. Measured vertically from the landing floor level or the stair pitch line.
3. The 100mm limit is intended to reduce the risk of fire spreading from a floor covering.

Items 1 and 4 apply also to single storey buildings.

Fire resisting glass should be marked with the name of the manufacturer and the name of the product.

Further guidance can be found in *A guide to best practice in the specification and use of fire-resistant glazed systems* published by the Glass and Glazing Federation.

Appendix C: Fire doorsets

- C1** All fire doorsets should have the performance shown in table C1, based on one of the following.
- Fire resistance in terms of integrity, for a period of minutes, when tested to **BS 476-22**, e.g. FD 30. A suffix (S) is added for doorsets where restricted smoke leakage at ambient temperatures is needed.
 - As determined with reference to Commission Decision 2000/367/EC regarding the classification of the resistance to fire performance of construction products, construction works and parts thereof. All fire doorsets should be classified in accordance with **BS EN 13501-2**, tested to the relevant European method from the following.
 - BS EN 1634-1.**
 - BS EN 1634-2.**
 - BS EN 1634-3.**
 - As determined with reference to European Parliament and Council Directive 95/16/EC (which applies to lifts that permanently serve buildings and constructions and specified safety components) on the approximation of laws of Member States relating to lifts ('Lifts Directive') implementing the Lifts Regulations 1997 (SI 1997/831) and calling upon the harmonised standard **BS EN 81-58**.
- C2** The performance requirement is in terms of integrity (E) for a period of minutes. An additional classification of S_a is used for all doors where restricted smoke leakage at ambient temperatures is needed.
- C3** The requirement is for test exposure from each side of the doorset separately. The exception is lift doors, which are tested from the landing side only.
- C4** Any test evidence used to verify the fire resistance rating of a doorset or shutter should be checked to ensure both of the following.
- It adequately demonstrates compliance.
 - It is applicable to the **complete installed assembly**. Small differences in detail may significantly affect the rating.
- Until relevant harmonised product standards are published, for the purposes of meeting the Building Regulations, products tested in accordance with **BS EN 1634-1** (with or without pre-fire test mechanical conditioning) that achieve the minimum performance in table C1 will be deemed to satisfy the provisions.
- C5** All fire doorsets, including to flat entrances, should be fitted with a self-closing device, except for all of the following.
- Fire doorsets to cupboards.
 - Fire doorsets to service ducts normally locked shut.
 - Fire doorsets within flats.

- C6** If a **self-closing device** would be considered to interfere with the normal approved use of the **building**, self-closing fire doors may be held open by one of the following.
- A fusible link, but not if the doorset is in an opening provided as a **means of escape** unless it complies with paragraph C7.
 - An **automatic release mechanism** activated by an automatic fire detection and alarm system.
 - A door closer delay device.
- C7** Two **fire doorsets** may be fitted in the same opening if each door is capable of closing the opening, so the total fire resistance is the sum of their individual resistances. If the opening is provided as a **means of escape**, both **fire doorsets** should be self-closing.
- If one **fire doorset** is capable of being easily opened by hand and has a minimum of 30 minutes' fire resistance, the other **fire doorset** should comply with both of the following.
- Be fitted with an automatic **self-closing device**.
 - Be held open by a fusible link.
- C8** **Fire doorsets** often do not provide any significant insulation. Unless providing both integrity and insulation in accordance with Appendix B, table B2, a maximum of 25% of the length of a **compartment wall** should consist of door openings.
- Where it is practicable to maintain a clear space on both sides of the doorway, the above percentage may be greater.
- C9** Rolling shutters should be capable of manual opening and closing for firefighting purposes (see section 17). Rolling shutters across a **means of escape** should only be released by a heat sensor, such as a fusible link or electric heat detector, in the immediate vicinity of the door.
- Unless a shutter is also intended to partially descend as part of a **boundary** to a smoke reservoir, shutters across a **means of escape** should not be closed by smoke detectors or a **fire alarm system**.
- C10** Unless shown to be satisfactory when tested as part of a **fire doorset** assembly, the essential components of any hinge on which a fire door is hung should be made entirely from materials that have a minimum melting point of 800°C.
- C11** Except for doorsets listed in paragraph C12, all **fire doorsets** should be marked with the one of the following fire safety signs, complying with **BS 5499-5**, as appropriate.
- To be kept closed when not in use – mark 'Fire door keep shut'.
 - To be kept locked when not in use – mark 'Fire door keep locked shut'.
 - Held open by an **automatic release mechanism** or free swing device – mark 'Automatic fire door keep clear'.
- All **fire doorsets** should be marked on both sides, except **fire doorsets** to cupboards and service ducts, which should be marked on the outside.
- C12** The following **fire doorsets** are not required to comply with paragraph C11.
- Doors to and within **flats**.
 - Bedroom doors in 'other residential' premises.
 - Lift entrance/landing doors.

C13 The performance of some doorsets is linked to the minimum periods of fire resistance for **elements of structure** given in tables B2 and B3. Limitations on the use of uninsulated glazing in **fire doorsets** are given in table B4.

C14 Recommendations for the specification, design, construction, installation and maintenance of **fire doorsets** constructed with non-metallic door leaves are given in **BS 8214**.

Guidance on timber **fire resisting** doorsets, in relation to the new European test standard, may be found in *Timber fire resisting doorsets: Maintaining performance under the new European test standard* published by the Timber Research and Development Association (TRADA).

Guidance for metal doors is given in *Code of practice for fire resisting metal doorsets* published by the Door and Shutter Manufacturers' Association (DSMA) in 2010.

C15 Hardware used on fire doors can significantly affect their performance in a fire. Notwithstanding the guidance in this approved document, guidance is available in *Hardware for fire and escape doors* published by the Door and Hardware Federation (DHF) and Guild of Architectural Ironmongers (GAI).

Table C1 Provisions for fire doorsets

Position of door		Minimum fire resistance of door in terms of integrity (minutes) when tested to BS 476-22⁽¹⁾	Minimum fire resistance of door in terms of integrity (minutes) when tested to the relevant European Standard ⁽³⁾
1.	In a compartment wall separating buildings	Same as for the wall in which the door is fitted, but a minimum of 60 minutes	Same as for the wall in which the door is fitted, but a minimum of 60 minutes
2.	In a compartment wall:		
	a. if it separates a flat from a space in common use	FD 30S ⁽²⁾	E 30 S _a ⁽²⁾
	b. enclosing a protected shaft forming a stairway wholly or partly above the adjoining ground in a building used for flats, other residential, assembly and recreation, or office purposes	FD 30S ⁽²⁾	E 30 S _a ⁽²⁾
	c. enclosing a protected shaft forming a stairway not described in (b) above	Half the period of fire resistance of the wall in which it is fitted, but 30 minutes minimum and with suffix S ⁽²⁾	Half the period of fire resistance of the wall in which it is fitted, but 30 minutes minimum and with suffix S _a ⁽²⁾
	d. enclosing a protected shaft forming a lift or service shaft	Half the period of fire resistance of the wall in which it is fitted, but 30 minutes minimum	Half the period of fire resistance of the wall in which it is fitted, but 30 minutes minimum
	e. not described in (a), (b), (c) or (d) above.	Same as for the wall in which it is fitted, but add S ⁽²⁾ if the door is used for progressive horizontal evacuation under the guidance to requirement B1	Same as for the wall in which it is fitted, but add S _a ⁽²⁾ if the door is used for progressive horizontal evacuation under the guidance to requirement B1
3.	In a compartment floor	Same as for the floor in which it is fitted	Same as for the floor in which it is fitted

Table C1 Continued

Position of door		Minimum fire resistance of door in terms of integrity (minutes) when tested to BS 476-22 ⁽¹⁾	Minimum fire resistance of door in terms of integrity (minutes) when tested to the relevant European Standard ⁽³⁾
4.	Forming part of the enclosures of:		
	a. a protected stairway (except as described in item 9)	FD 30S ⁽²⁾	E 30 S _a ⁽²⁾
	b. a lift shaft (see paragraph 4.35b) that does not form a protected shaft in 2(b), (c) or (d) above.	FD 30	E 30
5.	Forming part of the enclosure of:		
	a. a protected lobby approach (or protected corridor) to a stairway	FD 30S ⁽²⁾	E 30 S _a ⁽²⁾
	b. any other protected corridor	FD 20S ⁽²⁾	E 20 S _a ⁽²⁾
	c. a protected lobby approach to a lift shaft (see paragraph 4.39)	FD 30S ⁽²⁾	E 30 S _a ⁽²⁾
6.	Giving access to an external escape route	FD 30	E 30
7.	Sub-dividing:		
	a. corridors connecting alternative exits	FD 20S ⁽²⁾	E 20 S _a ⁽²⁾
	b. dead-end portions of corridors from the remainder of the corridor	FD 20S ⁽²⁾	E 20 S _a ⁽²⁾
8.	Any door within a cavity barrier	FD 30	E 30
9.	Any door that forms part of the enclosure to a protected entrance hall or protected landing in a flat	FD 20	E 20
10.	Any door that forms part of the enclosure:		
	a. to a place of special fire risk	FD 30	E 30
	b. to ancillary accommodation in care homes (see paragraph 2.51).	FD 30	E 30

NOTES:

- To BS 476-22 (or BS 476-8 subject to paragraph B8 in Appendix B).
- Unless pressurisation techniques that comply with BS EN 12101-6 are used, these doors should also comply with one of the following conditions.
 - Have a leakage rate not exceeding 3m³/m/hour (from head and jambs only) when tested at 25 Pa under BS 476-31.1
 - Meet the additional S_a classification when tested to BS EN 1634-3.
- National classifications do not necessarily equate with European classifications. For a European classification, products should be tested accordingly.

Appendix D: Methods of measurement

Occupant capacity

D1 The occupant capacity of a room, storey, building or part of a building is either:

- a. the maximum number of people it is designed to hold
- b. the number calculated by dividing the area of room or storey(s) (m²) by a floor space factor (m² per person) such as given in table D1 for guidance.

Counters and display units should be included when measuring area. All of the following should be *excluded*.

- a. Stair enclosures.
- b. Lifts.
- c. Sanitary accommodation.
- d. Any other fixed part of the building structure.

Travel distance

D2 Travel distance is measured as the shortest route. Both of the following should be observed.

- a. If there is fixed seating or other fixed obstructions, the shortest route is along the centre line of the seatways and gangways.
- b. If the route includes a stair, the shortest route is along the pitch line on the centre line of travel.

Table D1 Floor space factors ⁽¹⁾

Type of accommodation ^{(2), (3)}	Floor space factor (m ² /person)
1. Standing spectator areas, bar areas (within 2m of serving point), similar refreshment areas	0.3
2. Amusement arcade, assembly hall (including a general purpose place of assembly), bingo hall, club, crush hall, dance floor or hall, venue for pop concert and similar events and bar areas without fixed seating	0.5
3. Concourse, queuing area or shopping mall ⁽⁴⁾⁽⁵⁾	0.7
4. Committee room, common room, conference room, dining room, licensed betting office (public area), lounge or bar (other than in (1) above), meeting room, reading room, restaurant, staff room or waiting room ⁽⁶⁾	1.0
5. Exhibition hall or studio (film, radio, television, recording)	1.5
6. Skating rink	2.0
7. Shop sales area ⁽⁷⁾	2.0
8. Art gallery, dormitory, factory production area, museum or workshop	5.0
9. Office	6.0
10. Shop sales area ⁽⁸⁾	7.0
11. Kitchen or library	7.0
12. Bedroom or study-bedroom	8.0
13. Bed-sitting room, billiards or snooker room or hall	10.0
14. Storage and warehousing	30.0
15. Car park	Two persons per parking space

NOTES:

1. As an alternative to using the values in the table, the floor space factor may be determined by reference to actual data taken from similar premises. Where appropriate, the data should reflect the average occupant density at a peak trading time of year.
2. Where accommodation is not directly covered by the descriptions given, a reasonable value based on a similar use may be selected.
3. Where any part of the building is to be used for more than one type of accommodation, the most onerous factor(s) should be applied. Where the building contains different types of accommodation, the occupancy of each different area should be calculated using the relevant space factor.
4. Refer to section 4 of **BS 9999** for detailed guidance on the calculation of occupancy in common public areas in shopping complexes.
5. For detailed guidance on appropriate floor space factors for concourses in sports grounds refer to *Concourses* published by the Football Licensing Authority.
6. Alternatively the occupant capacity may be taken as the number of fixed seats provided, if the occupants will normally be seated.
7. Shops excluding those under item 10, but including: supermarkets and department stores (main sales areas), shops for personal services such as hairdressing and shops for the delivery or collection of goods for cleaning, repair or other treatment or for members of the public themselves carrying out such cleaning, repair or other treatment.
8. Shops (excluding those in covered shopping complexes but including department stores) trading predominantly in furniture, floor coverings, cycles, prams, large domestic appliances or other bulky goods, or trading on a wholesale self-selection basis (cash and carry).

Width

D3 Width is measured according to the following.

- a. For a **door (or doorway)**, the clear width when the door is open (diagram D1).
- b. For an **escape route**, either:
 - i. when the route is defined by walls: the width at 1500mm above floor level
 - ii. elsewhere: the minimum width of passage available between any fixed obstructions.
- c. For a **stair**, the clear width between the walls or balustrades. On **escape routes** and stairs, handrails and strings intruding into the width by a maximum of 100mm may be ignored. Rails used for guiding a stair-lift may be ignored, but it should be possible to park the lift's chair or carriage in a position that does not obstruct the stair or landing.

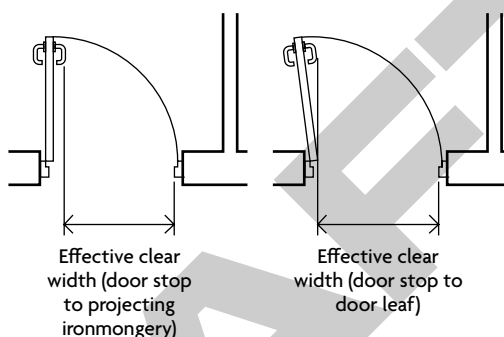
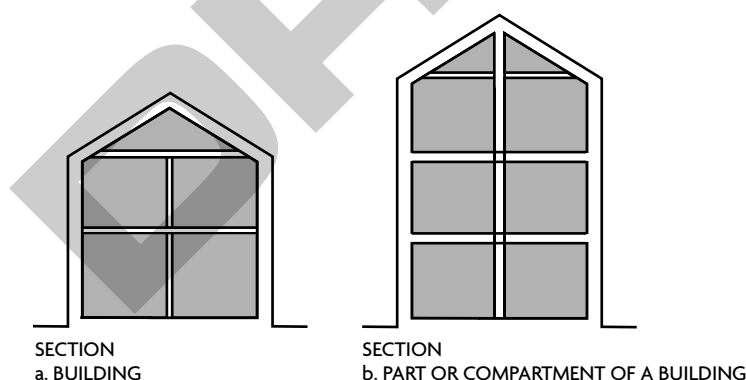


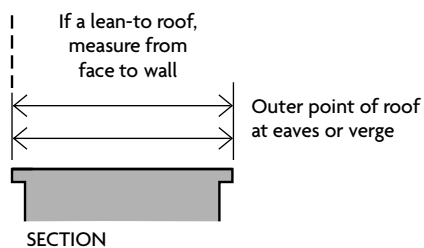
Diagram D1 Measurement of door width



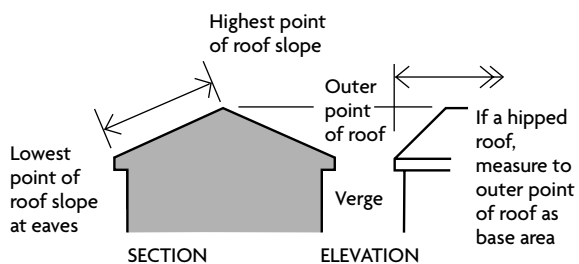
In every case measure the volume contained by the following elements.

- a. Under surface of roof as appropriate.
- b. Upper surface of lowest floor.
- c. The inner surface of enclosed walls (when there is not an enclosing outside wall, measure to the outermost edge of the floor, ignoring internal walls and partitions).

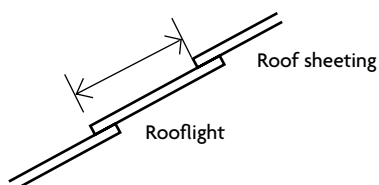
Diagram D2 Cubic capacity



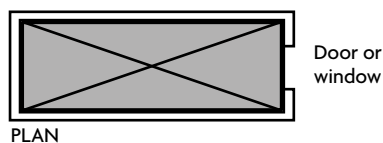
1. Flat or monopitch



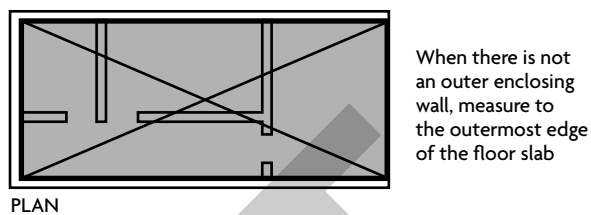
2. Double pitch



3. Rooflight, surface area: roofs and rooflights, in each case measure the visible area



4. Floor area: room, garage, conservatory or outbuilding, measure to inner surface of enclosing walls



5. Floor area: storey, part or compartment, measure to inner surface of enclosing walls and include internal walls and partitions

Diagram D3 Area

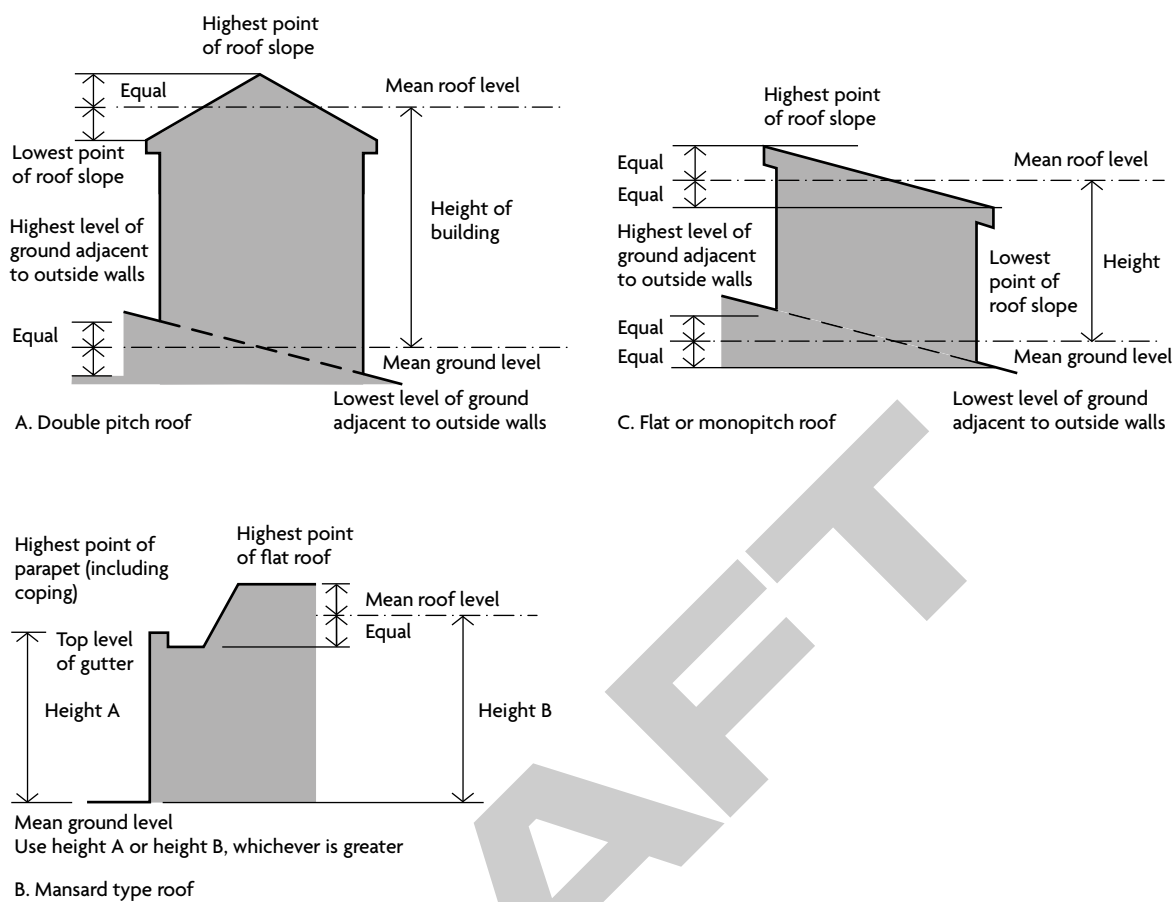
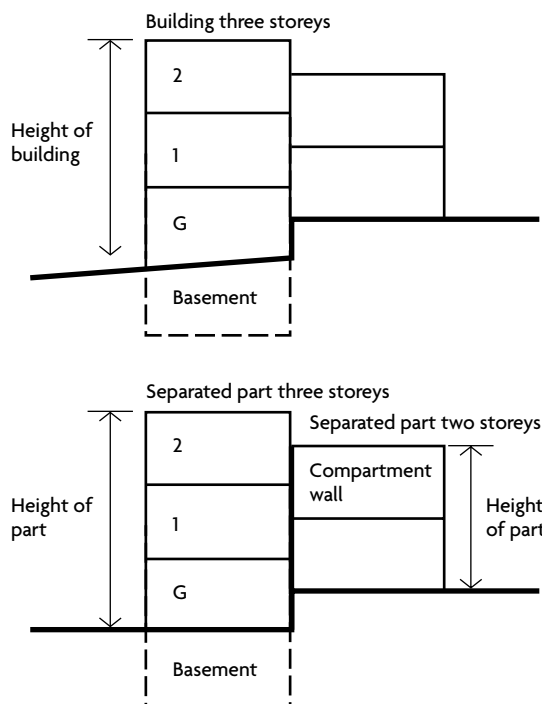


Diagram D4 Height of building



To count the number of storeys in a building, or in a separated part of a building, count only at the position which gives the greatest number and exclude any basement storeys.

NOTES:

1. In assembly buildings, a gallery is included as a storey, but not if it is a loading gallery, fly gallery, stage grid, lighting bridge, or any gallery provided for similar purposes, or for maintenance and repair.
2. In other purpose group buildings, galleries are not counted as a storey.

Diagram D5 Number of storeys

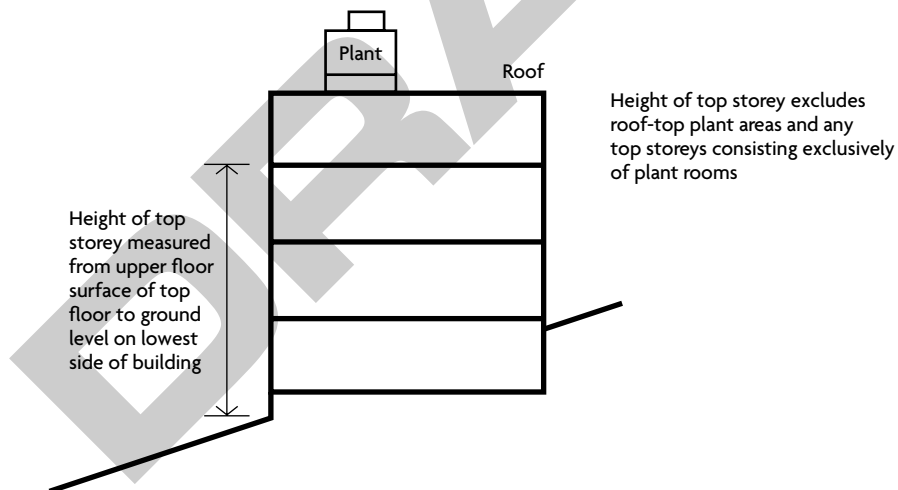
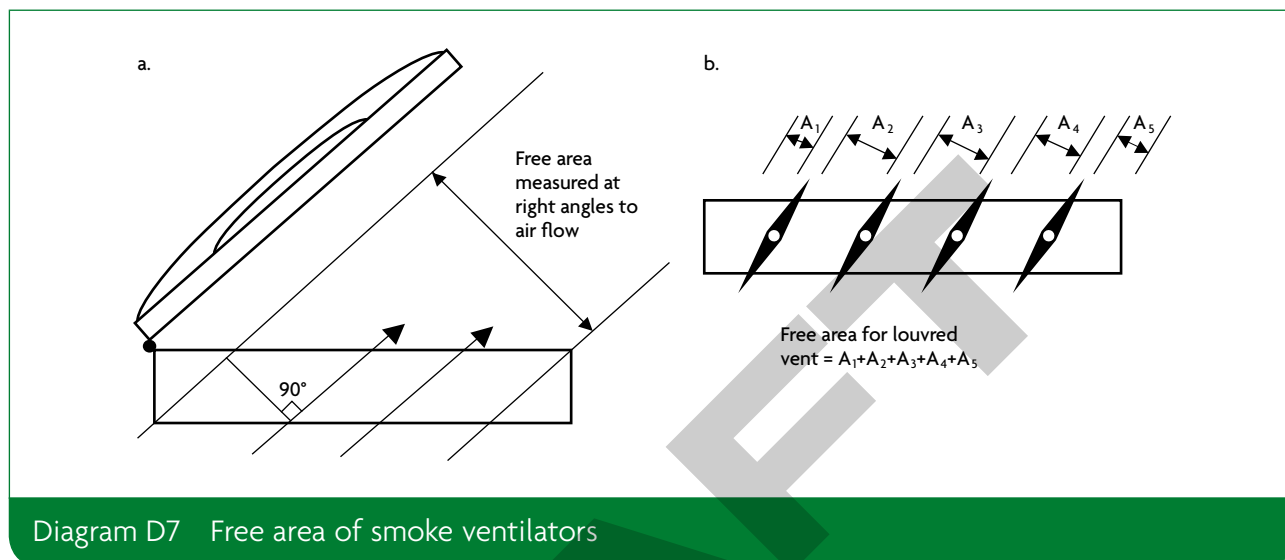


Diagram D6 Height of top storey in building

Free area of smoke ventilators

- D4** The free area of a smoke ventilator should be measured by either of the following.
- The declared aerodynamic free area in accordance with **BS EN 12101-2**.
 - The total unobstructed cross-sectional area, measured in the plane where the area is at a minimum and at right angles to the direction of air flow (diagram D7).



Appendix E: Standards referred to

British Standards

NOTE: All the British standard and European standards can be purchased at the following address: <https://shop.bsigroup.com/>. Alternatively access to the British and European standard may be gained at public reference libraries.

BS 476

Fire tests on building materials and structures

BS 476-6

Method of test for fire propagation for products [1989 + A1 2009]

BS 476-7

Method of test to determine the classification of the surface spread of flame of products [1997]

BS 476-8

Test methods and criteria for the fire resistance of elements of building construction [1972]

BS 476-20

Fire tests on building materials and structures. Method for determination of the fire resistance of elements of construction (general principles) [1987]

BS 476-11

Method for assessing the heat emission from building materials [1982]

BS 476-21

Methods for determination of the fire resistance of loadbearing elements of construction [1987]

BS 476-22

Methods for determination of the fire resistance of non-loadbearing elements of construction [1987]

BS 476-23

Methods for determination of the contribution of components to the fire resistance of a structure [1987]

BS 476-24

Method for determination of the fire resistance of ventilation ducts [1987]

BS 476-31.1

Methods for measuring smoke penetration through doorsets and shutter assemblies. Method of measurement under ambient temperature conditions [1983]

BS 2782-0

Methods of testing. Plastics. Introduction [2011]

BS 3251

Specification. Indicator plates for fire hydrants and emergency water supplies [1976]

BS 4422

Fire. Vocabulary [2005]

BS 4514

Unplasticized PVC soil and ventilating pipes of 82.4mm minimum mean outside diameter, and fittings and accessories of 82.4mm and of other sizes. Specification [2001]

BS 5255

Specification for thermoplastics waste pipe and fittings [1989]

BS 5266-1

Emergency lighting. Code of practice for the emergency lighting of premises [2016]

BS 5306-2

Fire extinguishing installations and equipment on premises. Specification for sprinkler systems [1990]

BS 5395-2

Stairs, ladders and walkways. Code of practice for the design of helical and spiral stairs [1984]

BS 5438

Methods of test for flammability of textile fabrics when subjected to a small igniting flame applied to the face or bottom edge of vertically oriented specimens [1989]

BS 5499

Graphical symbols and signs

BS 5499-1

Safety signs, including fire safety signs. Specification for geometric shapes, colours and layout [2002]

BS 5499-5

Safety signs, including fire safety signs. Signs with specific safety meanings [2002]

BS 5839

Fire detection and fire alarm systems for buildings

BS 5839-1

Code of practice for system design, installation, commissioning and maintenance of systems in non-domestic premises [2017]

BS 5839-2

Specification for manual call points [1983]

BS 5839-3

Specification for automatic release mechanisms for certain fire protection equipment [1988]

BS 5839-8

Code of practice for the design, installation, commissioning and maintenance of voice alarm systems [2013]

BS 5839-9

Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems [2011]

BS 5867-2

Fabrics for curtains and drapes. Flammability requirements. Specification [2008]

BS 5906

Waste management in buildings. Code of practice [2005]

BS 5950-8

Structural use of steelwork in building. Code of practice for fire resistant design [2003]

BS 7157

Method of test for ignitability of fabrics used in the construction of large tented structures [1989]

BS 7273

Code of practice for the operation of fire protection measures

BS 7273-1

Electrical actuation of gaseous total flooding extinguishing systems [2006]

BS 7273-2

Mechanical actuation of gaseous total flooding and local application extinguishing systems [1992]

BS 7273-3

Electrical actuation of pre-action watermist and sprinkler systems [2008]

BS 7346-7

Components for smoke and heat control systems. Code of practice on functional recommendations and calculation methods for smoke and heat control systems for covered car parks [2013]

BS 7974

Application of fire safety engineering principles to the design of buildings. Code of practice [2001]

BS 8214

Timber-based fire door assemblies. Code of practice [2016]

BS 8313

Code of practice for accommodation of building services in ducts [1997]

BS 8414

Fire performance of external cladding systems

BS 8414-1

Test method for non-loadbearing external cladding systems applied to the masonry face of a building [2015 + A1 2017]

BS 8414-2

Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame [2015 + A1 2017]

BS 8519

Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications. Code of practice [2010]

BS 9251

Fire sprinkler systems for domestic and residential occupancies. Code of practice [2014]

BS 9252

Components for residential sprinkler systems. Specification and test methods for residential sprinklers [2011]

BS 9990

Non automatic fire-fighting systems in buildings. Code of practice [2015]

BS 9999

Fire safety in the design, management and use of buildings. Code of practice [2017]

European Standards

BS EN 54

Fire detection and fire alarm systems

BS EN 54-7

Smoke detectors. Point detectors using scattered light, transmitted light or ionization [2001]

BS EN 54-11

Manual call points [2001]

BS EN 81

Safety rules for the construction and installation of lifts

BS EN 81-20

Lifts for the transport of persons and goods. Passenger and goods passenger lifts [2014]

BS EN 81-58

Examination and tests. Landing doors fire resistance test [2018]

BS EN 81-72

Particular applications for passenger and goods passenger lifts. Firefighters lifts [2015]

BS EN ISO 306

Plastics. Thermoplastic materials. Determination of Vicat softening temperature (VST) [2013]

BS EN 520

Gypsum plasterboards. Definitions, requirements and test methods [2004 + A1 2009]

BS EN 1125

Building hardware. Panic exit devices operated by a horizontal bar, for use on escape routes. Requirements and test methods [2008]

BS EN 1155

Building hardware. Electrically powered hold-open devices for swing doors. Requirements and test methods [1997]

BS EN 1366

Fire resistance tests for service installations

BS EN 1366-2

Fire dampers [2015]

BS EN 1366-8

Smoke extraction ducts [2004]

BS EN 1634

Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware

BS EN 1634-1

Fire resistance test for door and shutter assemblies and openable windows [2014 + A1 2018]

BS EN 1634-2

Fire resistance characterisation test for elements of building hardware [2008]

BS EN 1634-3

Smoke control test for door and shutter assemblies [2004]

BS ISO 10294

Fire resistance tests

BS ISO 10294-2

Fire dampers for air distribution systems. Classification, criteria and field of application of test results [1999]

BS ISO 10294-5

Fire dampers for air distribution systems. Intumescent fire dampers [2005]

BS EN 12101

Smoke and heat control systems

BS EN 12101-2

Natural smoke and heat exhaust ventilators [2017]

BS EN 12101-3

Specification for powered smoke and heat control ventilators (Fans) [2015]

BS EN 12101-6

Specification for pressure differential systems. Kits [2005]

BS EN 12845

Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance [2015]

BS EN 13238

Reaction to fire tests for building products. Conditioning procedures and general rules for selection of substrates [2010]

BS EN 13501

Fire classification of construction products and building elements

BS EN 13501-1

Classification using test data from reaction to fire tests [2007 + A1 2009]

BS EN 13501-2

Classification using data from fire resistance tests, excluding ventilation services [2016]

BS EN 13501-3

Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers [2005 + A1 2009]

BS EN 13501-4

Classification using data from fire resistance tests on components of smoke control systems [2016]

BS EN 13501-5

Classification using data from external fire exposure to roof tests [2016]

BS EN 14306

Thermal insulation products for building equipment and industrial installations. Factory made calcium silicate (CS) products. Specification [2015]

BS EN 15102

Decorative wall coverings. Roll and panel form [2007 + A1 2011]

BS EN 15650

Ventilation for buildings. Fire dampers [2010]

BS EN 15725

Extended application reports on the fire performance of construction products and building elements [2010]

BS EN 50200

Method of test for resistance to fire of unprotected small cables for use in emergency circuits [2015]

Appendix F: Other documents referred to

Legislation

(available via www.legislation.gov.uk)
Education Act 1996

Safety of Sports Grounds Act 1975

Gas Safety (Installation and Use) Regulations 1998
(SI 1998 No. 2451)

Pipelines Safety Regulations 1996 (SI 1996 No 825)

Health and Safety (Safety Signs and Signals)
Regulations 1996 (SI 1996/341)

Regulatory Reform (Fire Safety) Order 2005
(SI 2005/1541)

Commission Decision 2000/367/EC of 3 May 2000
implementing Council Directive 89/106/EEC

Commission Decision 2000/553/EC of 6
September 2000 implementing Council Directive
89/106/EEC

Other documents

Publications

Association for Specialist Fire Protection (ASFP)

ASFP Red book – *Fire stopping and penetration
seals for the construction industry*, 4th Edition
(www.asfp.org.uk)

ASFP Grey book – *Fire and smoke resisting
dampers*
(www.asfp.org.uk)

ASFP Blue book – *Fire resisting ductwork*,
2nd Edition
(www.asfp.org.uk)

British Automatic Fire Sprinkler Association (BAFSA)

*Sprinklers for Safety: Use and Benefits of
Incorporating Sprinklers in Buildings and Structures*,
(2006) ISBN: 0 95526 280 1
(www.bafsa.org.uk)

Building Research Establishment Limited (BRE)

BRE report (BR 135) *Fire performance of external
thermal insulation for walls of multi-storey
buildings*, 3rd Edition [2013]
(www.bre.co.uk)

BRE report (BR 187) *External fire spread:
Building separation and boundary distances*,
2nd Edition [2014]
(www.bre.co.uk)

BRE Digest 208 *Increasing the fire resistance
of existing timber floors* [1988]
(www.bre.co.uk)

BRE report (BR 274) *Fire safety of PTFE-based
materials used in buildings* [1994]
(www.bre.co.uk)

BRE report (BR 368) *Design methodologies for smoke and heat exhaust ventilation* [1999]
(www.bre.co.uk)

Department for Education

Building Bulletin (BB) 100: *Design for fire safety in schools* [2007]
(www.dfes.gov.uk)

Department of Health

Health Technical Memorandum (HTM) 05-02: *Firecode. Guidance in Support of Functional Provisions (Fire Safety in the Design of Healthcare Premises)* [2015]
(www.dh.gov.uk)

HTM 88: *Guide to Fire Precautions in NHS Housing in the Community for Mentally Handicapped (or Mentally Ill) People*
(www.dh.gov.uk)

Door and Hardware Federation and Guild of Architectural Ironmongers

Hardware for fire and escape doors [2012]
(www.firecode.org.uk)

Door and Shutter Manufacturers' Association (DSMA)

Code of practice for fire resisting metal doorsets [2010]
(www.dhfonline.org.uk)

Fire Protection Association (FPA)

Design guide for the fire protection of buildings [2000]
(www.thefpa.co.uk)

Football Licensing Authority

Concourses [2006]
(www.flaweb.org.uk/home.php)

Glass and Glazing Federation (GGF)

A guide to best practice in the specification and use of fire-resistant glazed systems [2011]
(www.ggf.org.uk)

Health and Safety Executive (HSE)

Safety signs and signals: The Health and Safety Regulations 1996. Guidance on regulations, L64 [2015]
(www.hse.gov.uk)

International Association of Cold Storage Contractors (IACSC)

Design, construction, specification and fire management of insulated envelopes for temperature controlled environments [1999]
(www.gcca.org/about/europe)

Passive Fire Protection Forum

Ensuring best practice for passive fire protection in buildings, 2nd Edition [2014]
(www.pfpf.org)

Sports Grounds Safety Authority

Guide to Safety at Sports Grounds [2007]

Steel Construction Institute (SCI)

SCI Publication 288 Fire safe design: A new approach to multi-storey steel-framed buildings (Second Edition) [2000]
(www.steel-sci.org)

Timber Research and Development Associations (TRADA)

Timber fire resisting doorsets: Maintaining performance under the new European test standard [2002]
(www.trada.co.uk)

List of approved documents

The following documents have been published to give guidance on how to meet the Building Regulations. You can find the date of the edition approved by the Secretary of State at www.gov.uk.

Approved Document A

Structure

Approved Document B

Fire safety

Volume 1: Dwellings

Approved Document B

Fire safety

Volume 2: Buildings other than dwellings

Approved Document C

Site preparation and resistance to contaminants and moisture

Approved Document D

Toxic substances

Approved Document E

Resistance to the passage of sound

Approved Document F

Ventilation

Approved Document G

Sanitation, hot water safety and water efficiency

Approved Document H

Drainage and waste disposal

Approved Document J

Combustion appliances and fuel storage systems

Approved Document K

Protection from falling, collision and impact

Approved Document L1A

Conservation of fuel and power in new dwellings

Approved Document L1B

Conservation of fuel and power in existing dwellings

Approved Document L2A

Conservation of fuel and power in new buildings other than dwellings

Approved Document L2B

Conservation of fuel and power in existing buildings other than dwellings

Approved Document M

Access to and use of buildings

Volume 1: Dwellings

Approved Document M

Access to and use of buildings

Volume 2: Buildings other than dwellings

Approved Document P

Electrical safety – Dwellings

Approved Document Q

Security – Dwellings

Approved Document 7

Materials and workmanship

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