

BS 9991:2011



BSI Standards Publication

Fire safety in the design, management and use of residential buildings – Code of practice

bsi.

...making excellence a habit.
AVA Documents™
Document Sharing Hub

Publishing and copyright information

The BSI copyright notice displayed in this document indicates when the document was last issued.

© BSI 2011

ISBN 978 0 580 67919 3

ICS 91.040.30; 13.220.01

The following BSI references relate to the work on this standard:

Committee reference FSH/14

Draft for comment 11/30203947 DC

Publication history

First (present) edition, December 2011

Amendments issued since publication

Date	Text affected
------	---------------

Contents

Foreword v

Section 1: General 1

Introduction 1

1 Scope 6

2 Normative references 6

3 Terms and definitions 9

4 General recommendations and background 14

Section 2: Designing means of escape 18

5 General 18

6 Means of escape and provision for rescue from houses 19

7 Means of escape from flats and maisonettes 21

8 Means of escape from sheltered, extra care and other special housing 32

9 Internal planning of flats 33

Section 3: Stairs and final exits 42

10 Number and siting of common stair 42

11 Width of common stairs 42

12 Enclosure of common stairs 42

13 Basement stairs 44

14 Stairs within mixed-use developments 45

15 Access lobbies and corridors to protected stairways 45

16 External stairs 46

17 Discharge from common stairs and final exits 47

Section 4: Access and facilities for fire-fighting 48

18 General recommendations for fire-fighting facilities 48

19 Fire-fighting access 48

20 Water supplies for fire and rescue service fire-fighting use 53

21 Information for fire and rescue service use 54

Section 5: Active fire protection 55

22 Fire detection and alarm systems 55

23 Sprinkler and watermist systems 56

24 Manual fire-fighting equipment 57

25 Special risk protection 57

26 Smoke control 58

Section 6: Design for construction 66

27 Fire resistance 66

28 Compartmentation 74

29 External fire spread and building separation 75

30 Concealed spaces 86

31 Materials 91

32 Service ducts, pipes and shafts 92

33 Glazed fire-resisting elements 96

34 Active fire curtain/barrier assemblies 99

35 Openings 100

36 Floors and ramps on escape routes 108

37 Design and construction of common stairs 108

Section 7: Mechanical systems for ducted heating, ventilation and air conditioning (HVAC) 109

38 HVAC systems within individual dwellings 109

39 HVAC systems serving the whole building or interconnecting dwellings and other residential units 109

Section 8: Ancillary accommodation to flats and maisonettes 112

- 40 Ancillary accommodation 112
- 41 Installation of engineering services 114
- 42 Engineering service installation rooms 114
- 43 Gas services, installation and service pipes 114
- 44 Electrical services 115
- 45 Gas and electricity meters 115
- 46 Lighting 116
- 47 Lift machine rooms and machinery spaces 117
- 48 Communal heating, ventilation and air conditioning systems 117
- 49 Refuse storage, disposal and incineration 118
- 50 Car parks and domestic garages 118

Section 9: Management 120

- 51 Management of sheltered housing 120
- 52 Evacuation of disabled occupants or occupants that require assistance to escape 120
- 53 Residents 121
- 54 Caretakers 121
- 55 Maintenance of fire protection measures 121
- 56 Maintenance of building plant and equipment 122
- 57 Ensuring that systems respond properly in an emergency 122

Section 10: Building works: Material alterations, extensions, refurbishment, change of use, disuse, decommissioning and demolition 125

- 58 Design of works 125
- 59 Change of use 125
- 60 Refurbishments 125
- 61 Dwellings in disuse and areas decommissioned 125
- 62 Managing building work and material alterations 126
- 63 Building works to occupied or partly occupied buildings 126

Annexes

Annex A Additional considerations for property and business continuity protection 127

Annex B Atria 131

Annex C Private Balconies (open or enclosed) 145

Annex D Advice to occupiers of dwellings in residential buildings 146

Annex E Methods of smoke control 151

Bibliography 155

List of figures

Figure 1 – Alternative arrangements for escape via the ground storey in houses exceeding 4.5 m in height 20

Figure 2 – Maisonette with alternative exits from each room not on the floor of entrance 22

Figure 3 – Maisonette with protected entrance hall and protected landing 23

Figure 4 – Open-plan maisonette 24

Figure 5 – Common escape routes in balcony/deck approach buildings 26

Figure 6 – Common escape routes in single-stair buildings more than 11 m in height 28

Figure 7 – Common escape routes in multi-stair buildings 29

Figure 8 – Common escape routes in small single-stair buildings 31

Figure 9 – Furnished areas in sheltered housing corridors 33

Figure 10 – Flat with restricted travel distance 35

Figure 11 – Flat with a protected entrance hall and restricted travel distance 35

Figure 12 – Flat with an alternative exit 36

Figure 13 – Flat (entered from below) with a restricted travel distance 38

Figure 14 – Flat (entered from below) with a protected entrance hall and restricted travel distance	39
Figure 15 – Flat (entered from above or below) with an alternative exit	40
Figure 16 – Protected routes forming an internal angle	43
Figure 17 – Fire resistance of areas adjacent to external stairs	46
Figure 18 – Components of a residential fire-fighting shaft	51
Figure 19 – Provisions for external surfaces of walls	77
Figure 20 – Relevant boundaries	78
Figure 21 – Notional boundaries	79
Figure 22 – Combustible surface material as unprotected area	80
Figure 23 – Exclusions from unprotected area calculations	81
Figure 24 – Roof covering adjoining line of compartmentation	84
Figure 25 – Limitations on spacing and size of plastics roof lights having a Class 3 or TP(b) lower surface	86
Figure 26 – Provisions for cavity barriers	87
Figure 27 – Cavity wall excluded from provisions for cavity barriers	88
Figure 28 – Fire-resisting ceiling below concealed space	89
Figure 29 – Provisions for cavity barriers in double-skinned insulated roof sheeting	90
Figure 30 – Flues and compartment walls and floors	94
Figure 31 – Enclosure for drainage or water supply pipes	96
Figure 32 – Pipes penetrating structure	96
Figure B.1 – Occupancy category decision process	132
Figure B.2 – Exemplar 1: Atrium base, no control required	133
Figure B.3 – Exemplar 2: Atrium base; no control required	134
Figure B.4 – Exemplar 3a: Atrium base; controlled fire load	135
Figure B.5 – Exemplar 3b: Atrium base; controlled fire load	136
Figure B.6 – Exemplar 3c: Atrium base; controlled fire load	137
Figure B.7 – Exemplar 4: Atrium base; controlled fire load	138
Figure D.1 – General fire safety advice for occupiers of dwellings in residential buildings	148
Figure D.2 – Example of a fire instruction notice for use in flats	150
Figure D.3 – Example of a fire instruction notice for use in other residential buildings	151

List of tables

Table 1 – Lobby ventilation	44
Table 2 – Minimum fire resistance performance	69
Table 3 – Fire resistance periods for elements of structure (independent of ventilation conditions)	73
Table 4 – Fire resistance periods for elements of structure (based on ventilation conditions)	73
Table 5 – Limitations on fire-protecting suspended ceilings	74
Table 6 – Small residential unprotected area limits and boundary distances	83
Table 7 – Separation distances for roof coverings	84
Table 8 – Separation distance for plastics roof lights	85
Table 9 – Maximum nominal interior diameter of pipes passing through a compartment wall/floor	95
Table 10 – Limitations on non-insulating fire-resisting glazed elements installed in buildings containing flats or maisonettes	99
Table 11 – Provisions for fire doors	102
Table 12 – Maximum travel distances in areas of ancillary accommodation	113
Table 13 – Structural fire protection of areas of ancillary accommodation	113

Summary of pages

This document comprises a front cover, an inside front cover, pages i to vi, pages 1 to 158, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 31 December 2011. It was prepared by Technical Committee FSH/14, *Fire precautions in buildings*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 5588-1:1990, which is withdrawn.

Relationship with other publications

This standard complements BS 9999, *Code of practice for fire safety in the design, management and use of buildings*, which excludes individual dwelling houses from its scope.

Information about this document

This is a full revision of BS 5588-1:1990.

Use of this document

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

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

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

Presentational conventions

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

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

Contractual and legal considerations

NOTE References are made throughout this British Standard to legislation and guidance applicable in the UK. However, it is recognized that the standard might be used outside the UK, and in such circumstances, readers of the standard need to be aware of the legislative requirements and sources of further information applicable in their own countries.

Broadly speaking, fire safety legislation in the UK sets out fire safety objectives for various types of premises and their associated activities, and specifies who is responsible for ensuring that they are met. Individual items of legislation generally refer to, and give legal force to, named sets of regulations that are more detailed than the parent legislation. They either specify how certain activities are to be performed, and duties discharged, or they state functional requirements, i.e. they describe the outcome(s) required. When functional requirements are given, the regulations usually refer to other technical guidance and/or standards, including British Standards. Reference is made throughout the text to legislative material of which users of this British Standard need to be aware.

Attention is particularly drawn to regulatory requirements in respect of the following principal stages in the lifetime of a building:

- a) *planning* – type, size, use, appearance, access and location of a proposed building;
- b) *construction* – materials, methods, nature and extent of both structural and installed fire safety features, internal and external arrangements for access, and proximity to other buildings;
- c) *use* – occupants' activities, including storage and use of materials, provision of first aid fire-fighting equipment and fire safety training for occupants, and maintaining means of escape;
- d) *maintenance* – maintenance of fire safety systems and equipment in occupied and unoccupied buildings;
- e) *material alterations and extensions* – changes in fire risk or fire safety provisions; fire safety arrangements during construction work;
- f) *change of use* – changes in fire risk or fire safety provisions;
- g) *demolition* – fire safety arrangements during demolition work;
- h) *when empty* – empty buildings are particularly vulnerable to arson.

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

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

In particular, attention is drawn to the following regulations which may be amended from time to time. The commentary in this British Standard reflects the state of the regulations in 2011.

- The Building (Amendment) Regulations 2011 [1];
- The Regulatory Reform (Fire Safety) Order 2005 [2];
- The Housing Act 2004 [3];
- The Equality Act 2010 [4];
- The Gas Safety (Installation and Use) Regulations 1998 [5];
- The Pipelines Safety Regulations 1996 [6];
- The Petroleum (Consolidation) Act 1928 [7];
- The Dangerous Substances and Explosive Atmospheres Regulations 2002 [8];
- The Construction (Design and Management) Regulations 2007 [9];
- The Furniture and Furnishings (Fire) (Safety) Regulations 1988 [10].

Section 1: General

Introduction

0.1 General principles

The design of buildings for fire safety relies upon an understanding of the sources of fire, materials and systems likely to be involved in fire, and the likely spread of fire.

The recommendations and guidance given in this British Standard are based on the assumption that under normal circumstances (i.e. except in the case of arson) a fire is unlikely to start in two different places in a building. Further information on the spread of fire is given in 4.1.

All fire safety measures, procedures, etc., need to take into account the particular circumstances of the individual building or complex concerned. The same recommendations generally apply to both existing and new buildings, but existing buildings, especially historic buildings, often pose problems which are unlikely to arise in new buildings. In assessing the fire safety management needs of an existing building which is being modified, it is essential to have a full understanding of the existing structure and any fire safety provisions incorporated, and to take into account all of the following:

- a) any change in use of the premises which could affect the fire risk profile (e.g. increased fire load and process risks, changes to sleeping risk, seasonal changes);
- b) how the necessary fire safety levels can be practicably achieved in the existing premises and whether they are appropriate;
- c) historic and environmental aspects of the premises and to what extent they need to be disturbed;
- d) legislation and guidance introduced since the premises were originally constructed, or last altered, or since their fire safety was last assessed;
- e) the interrelationship between life safety and measures to protect property/contents;
- f) business continuity.

Historic buildings present particular challenges, as many are listed and permitted material alterations are therefore limited without the agreement of the appropriate authorities. For such buildings, it is advisable to seek the advice of consultative bodies, such as English Heritage, in the early stages of design. The appropriate authorities sometimes agree to limited modifications to improve life safety where, in turn, there will be added long-term protection and preservation of the original building fabric. Specific issues relating to historic buildings can be divided into four areas:

- 1) the preservation of the ambience and important features of the building such as timber linings to accommodation stairs and slender cast iron structure, both of which can sometimes conflict with the desired fire safety construction but can be accommodated with suitable compensating features;
- 2) the existing construction of the building, including hidden features such as the extent of cavities through which fire could spread and the quality of walls, partitions and floors (the fire resistance of which might be unknown or questionable). Life safety can often be addressed by the use of suitable compensating features, but these do not always cover property protection and business interests;

- 3) the fire performance of the building structure. Although modern construction standards seldom apply to historic buildings, action to improve the level of fire and life safety might be necessary based on change of use or due to the need to reduce the fire risk and potential for loss of the structure and/or interior in any other context;
- 4) the sensitivity of historic structures and interiors (finishes and contents) to fire and smoke damage.

In both new construction and upgrading existing buildings, the various aspects of fire precautions are interrelated and weaknesses in some areas can be compensated for by strengths in others. A higher standard under one of the areas might be of benefit in respect of one or more of the other areas. BS 9991 provides a level of flexibility that allows the fire protection measures and the risks to be assessed to enable reasonable practical solutions to be designed.

Fire precautions in all premises – however old – need to be seen as a whole, a package aimed at achieving an acceptable standard of fire safety. In modifying existing structures, if the new work can be shown not to have a negative impact on the remainder, it is likely that no work will be needed on the remainder, although it might be possible to offer improvement as good practice.

The principles and recommendations in this British Standard apply straightforwardly where premises have a single main use and are contained in a single, separate building. However, complications might arise where a building comprises two or more different main uses. In such cases it is important to consider the effect of one risk on another. A fire in a shop or unattended office could have serious consequences on, for example, a residential use in the same building. Similarly, a high fire risk in one part of a building could seriously affect other areas in another part of that building.

Amongst the factors that need to be taken into account in establishing a minimum package of fire protection measures are:

- i) the potential users of the building;
- ii) the hazard posed by one occupancy to another;
- iii) provision for giving warning in case of fire, including any automatic fire detection;
- iv) the provision of automatic fire suppression systems and smoke control arrangements;
- v) the overall management and control of the building or development, from a fire safety point of view;
- vi) structural fire protection and compartmentation.

BS 9991 provides guidance on the provision of measures to control or mitigate the effects of fire. The primary objective is to ensure that an adequate standard of life safety can be achieved in the event of fire in the building. This can also have the effect of assisting the fire and rescue service and/or of providing some property and environmental protection. There are references throughout this British Standard to occupant safety, fire-fighter safety and property protection, to draw attention to the different considerations these could raise.

0.2 Flats and maisonettes

0.2.1 General principles

The means of escape from a flat or a maisonette of limited height is relatively simple. With increasing height more complex provisions are needed because emergency egress through upper windows becomes increasingly hazardous.

The provisions for means of escape for flats or maisonettes are based on the assumptions that:

- a) fire will occur within the flat or maisonette (e.g. not in a stairwell);
- b) there can be no reliance on external rescue (e.g. a portable ladder);
- c) the flat or maisonette will have a high degree of compartmentation and therefore there will be a low probability of fire spread beyond the flat or maisonette of origin, so simultaneous evacuation of the building is unlikely to be necessary; and
- d) where fires do occur in the common parts of the building, the materials and construction used in such areas will prevent the fire from spreading beyond the immediate vicinity (although in some cases communal facilities exist which require additional measures to be taken).

Whilst a simultaneous evacuation is normally unnecessary (see **E.1** regarding stay put strategy), there will be some occasions where operational conditions are such that the fire and rescue service decide to evacuate the building. In these situations the occupants of the building will need to use the common stair, sometimes whilst fire-fighting is in progress. As such, the measures in this British Standard for the protection of common stairs are designed to ensure they remain available for use over an extended period.

0.2.2 Protection of common escape routes

When making provision for the protection of common escape routes, i.e. from the exit of an individual dwelling to the final exit, it is essential to have a full understanding of the existing structure and any fire safety provisions incorporated, and to take into account the considerations given in **0.1a)** to **0.1f)**.

Further guidance and recommendations regarding compartmentation and common escape routes can be found in Clause **28** and Section **2**.

0.2.3 Smoke control in common parts

It is probable that some smoke from a fire in a flat or maisonette will enter the common parts of the building, i.e. the common corridor and/or lobby, for example as a result of occupants escaping or through the operational procedures of fire-fighters. It is therefore necessary to provide some means of controlling smoke in the common corridors/lobbies to provide protection to the common areas.

Smoke can be controlled in the common areas through fitted ventilation systems which are either natural or mechanical. These ventilation systems have two main purposes: the first of which is to provide some protection to the stair core and the second of which is to aid fire-fighters when tackling a fire. Ventilation systems can also be used to compensate for extended travel distances within the common corridor leading to the stairs and thereby help occupants to escape safely. Where smoke control is used to provide compensation for extended travel distances, it is the responsibility of the designers to demonstrate that the ventilation system can provide tenable conditions (see Annex E) for the occupants using the route with extended travel distances.

0.2.4 Protection of common stairs

Common stairs need to be able to conform to the applicable travel distance recommendations and provide alternative directions of travel from any dwelling served by those stairs other than accepted dead ends to enable occupants to exit the building safely. All common stairs need to have a level of fire protection involving fire-resisting construction and a smoke control system which enables them to provide occupants of the building with a safe means of escape.

The fire-resisting enclosure of a common stair is provided to prevent smoke and heat from entering the stairway and rendering it impassable for escape purpose and fire spreading from one storey to another. The use of space within a protected stairway is restricted (further information is detailed in this British Standard). Once inside a protected stairway, a person can be considered to be safe from the immediate danger of flame and smoke. They can then proceed to a place of ultimate safety at their own pace. While unprotected stairways are acceptable for daily human traffic around buildings, their vulnerability to fire and smoke mean that it is vital that they are not used extensively as a means of escape from fire.

Special provision needs to be given to basement stairs, as it is more probable that the stairs at this level will become filled with smoke and heat, than ground or upper stories if a fire occurs at basement level.

0.2.5 Fire alarm and fire detection system

In most flats, the installation of smoke alarms or fire detection and alarm systems can significantly increase the level of safety by automatically giving an early warning of fire. Generally a common fire alarm and/or fire detection system would not be provided for the evacuation of the occupants. This is to ensure that during the initial stages of a fire in a flat or maisonette, only those persons in the immediate area of the fire are alerted. Recommendations for fire alarm and fire detection systems are given in Section 5.

0.2.6 Fire suppression system

The installation of an automatic fire suppression system can offer designers considerable flexibility. For example, a sprinkler system in combination with improved detection can permit flats to have inner rooms where they would otherwise not be acceptable. A sprinkler system controls the fire to a small size, reducing the production of smoke and toxic gases and preventing the fire from spreading beyond the room or dwelling of origin. This means that there can be flexibility achieved in the design of the building.

0.3 Sheltered, extra care and other special housing

Where residents are likely to be less mobile, have other impairments or are otherwise vulnerable to emergency situations, designers need to consider the characteristics of the residents of the building and incorporate an appropriate range of fire precautionary measures that will secure a full level of fire safety that is compatible with both the residents' needs and abilities and a feasible and reasonable supporting management regime.

Buildings within this category of residence are diverse and can include housing for the elderly, children and people with a physical or mental impairment. Residents are likely to display varying levels of physical ability and mental cognizance and many will therefore require assistance to respond to a fire event. Fire strategies will need to apply graduated fire precautionary measures dependent upon the occupancy profile, the size, height and population of the building and the degree of management support being provided.

The recommendations in this standard cover those buildings that are designed for independent living, i.e. designed as houses or flats and that may include the provision of various levels of on-site support and communal facilities (this category is likely to include all levels of sheltered housing, extra care and certain other specific special housing uses).

0.4 Management of fire safety

It is a fundamental assumption that features described in this British Standard will require management and maintenance throughout the life of the building.

Managing fire safety is the whole process throughout the life of a building, starting with the initial design, which is intended both to minimize the incidence of fire and to ensure that, when a fire does occur, appropriate fire safety systems (including active, passive, and procedural systems) are in place and are fully functional. Fire safety procedures and maintenance schedules are developed at the design stage and included in the building manual which is handed over to the person responsible for fire safety of the building in order to enable a suitable and sufficient fire risk assessment to be carried out.

NOTE Attention is drawn to the Regulation 38 of the Building (Amendment) Regulations 2011 [1] and the Regulatory Reform (Fire Safety) Order 2005 [2].

The management of fire safety is thus an essential element in averting the loss of life in the event of a fire. Although many buildings will never have a serious life-threatening fire, it is essential for fire safety procedures to be planned for every building. Often, the one common element in multi-fatality fires is that, when fire is discovered or when the alarm is raised, the occupants of premises, be they staff or members of the public, react and respond in ways which are different from those assumed or expected by the building designer. There are a number of stages by which people react to a fire alarm. Initially they tend to seek information regarding the validity of the warning. They then gather belongings or seek associates or family. Only then do they seek to travel to a place of ultimate safety. The management of fire safety is intended to increase awareness and increase the probability of appropriate behaviour, to minimize the threat from the fire.

There have been numerous fire incidents, both large and small, where there have been lives lost or put at risk as a result of the safety systems provided being inappropriate or not being used effectively.

It is now widely acknowledged that the design and engineering put into a building for life safety can only do its job properly if it can be managed, maintained and tested over the whole life of the building, and if any staff who might be present are trained to handle incidents and operate effective and tested emergency plans.

Once the designer or engineer has handed over the building, then good management of fire safety becomes the key element to fire safety for the life of the building.

Effective management of fire safety can contribute to the protection of the building occupants in many ways:

- a) by working to prevent fires occurring in the first place;
- b) by monitoring the fire risks on an ongoing basis and taking appropriate action to eliminate or reduce the risk;
- c) by being aware of the types of people in the building (such as disabled people, elderly people, children, pregnant women, etc.) and any special risks or needs;
- d) by ensuring that all of the fire safety measures in the building are kept in working order, and in particular that the means of escape are always available;
- e) by training any staff in the appropriate action to be taken in the event of a fire.

These tasks differ in detail depending on the occupancy of the building.

1 Scope

This British Standard gives recommendations and guidance on the design, management and use of the following building types, to achieve reasonable standards of fire safety for all people in and around:

- a) dwellings (single-family dwelling houses, self-contained flats or maisonettes);
- b) residential accommodation blocks (e.g. for students or hospital staff), with individual bedrooms and the provision of kitchen/sanitary facilities constructed within a fire compartment, accommodating not more than six persons;
- c) sheltered housing and extra care housing.

It is not applicable to hotels, caravans/mobile homes, hospitals, residential care/nursing homes, places of lawful detention, hostels or houses of multiple occupancy.

This British Standard is applicable to the design of new buildings, and to material alterations, extensions and material change of use of an existing building. It also provides guidance on the ongoing management of fire safety in a building throughout the entire life cycle of the building, including guidance for designers to ensure that the overall design of a building assists and enhances the management of fire safety. It can be used as a tool for assessing existing buildings, although fundamental change in line with the guidelines might well be limited or not practicable.

NOTE 1 See the Building (Amendment) Regulations 2011 [1] regarding the definition of material alterations, extensions and material change of use.

The recommendations and guidance given in this British Standard are intended to safeguard the lives of building occupants and fire-fighters. Whilst some of the recommendations and guidance might also assist in the achievement of other fire safety objectives – such as protection of property, the environment, communities and business/service viability – additional measures might be necessary which are outside the scope of this British Standard.

This British Standard does not cover fire safety design strategies for extreme events such as terrorist actions.

NOTE 2 Requirements for means of escape from caravans and mobile homes are given in BS 3632.

NOTE 3 Refer to section 255 of the Housing Act 2004 [3] regarding the definition of an HMO.

2 Normative references

Standards publications

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

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

BS 799-5, *Oil burning equipment – Part 5: Carbon steel oil storage tanks – Specification*

BS 3251, *Specification – Indicator plates for fire hydrants and emergency water supplies*

BS 4514, *Unplasticized PVC soil and ventilating pipes of 82.4 mm minimum mean outside diameter, and fittings and accessories of 82.4 mm and of other sizes – Specification*

BS 5234 (both parts), *Partitions (including matching linings)*

- BS 5255, *Specification for thermoplastics waste pipe and fittings*
- BS 5266-1, *Emergency lighting – Part 1: Code of practice for the emergency lighting of premises*
- BS 5306-0, *Fire protection installations and equipment on premises – Part 0: Guide for selection of installed systems and other fire equipment*
- BS 5306-3, *Fire extinguishing installations and equipment on premises – Part 3: Commissioning and maintenance of portable fire extinguishers – Code of practice*
- BS 5306-8, *Fire extinguishing installations and equipment on premises – Part 8: Selection and installation of portable fire extinguishers – Code of practice*
- BS 5395-1, *Stairs – Part 1: Code of practice for the design of stairs with straight stairs and winders*
- BS 5410-1, *Code of practice for oil firing – Part 1: Installations up to 45 kW output capacity for space heating and hot water supply purposes*
- BS 5410-2, *Code of practice for oil firing – Part 2: Installations of 45 kW and above output capacity for space heating, hot water and steam supply services*
- BS 5852, *Methods of test for assessment of the ignitability of upholstered seating by smouldering and flaming ignition sources*
- BS 5839-1, *Fire detection and fire alarm systems for buildings – Part 1: Code of practice for system design, installation, commissioning and maintenance*
- BS 5839-6, *Fire detection and fire alarm systems for buildings – Part 6: Code of practice for the design, installation and maintenance of fire detection and fire alarm systems in dwellings*
- BS 5867-2, *Fabrics for curtains, drapes and window blinds – Part 2: Flammability requirements – Specification*
- BS 5906, *Waste management in buildings – Code of practice*
- BS 6180, *Barriers in and about buildings – Code of practice*
- BS 6262-4, *Glazing for buildings – Part 4: Code of practice for safety related to human impact*
- BS 6263-2, *Care and maintenance of floor surfaces – Part 2: Code of practice for resilient sheet and tile flooring*
- BS 6400 (all parts), *Specification for installation, exchange, relocation and removal of gas meters with a maximum capacity not exceeding 6 m*
- BS 6644, *Specification for installation of gas-fired hot water boilers of rated inputs between 70 kW (net) and 1.8 MW (net) (2nd and 3rd family gases)*
- BS 6798, *Specification for installation of gas-fired boilers of rated input not exceeding 70 kW net*
- BS 7157:1989, *Method of test for ignitability of fabrics used in the construction of large tented structures*
- BS 7176, *Specification for resistance to ignition of upholstered furniture for non-domestic seating by testing composites*
- BS 7273-4, *Code of practice for the operation of fire protection measures – Part 4: Actuation of release mechanisms for doors*
- BS 7346-3, *Components for smoke and heat control systems – Part 3: Specification for smoke curtains*
- BS 7346-7, *Components for smoke and heat control systems – Part 7: Code of practice on functional recommendations and calculation methods for smoke and heat control systems for covered car parks*

- BS 7671, *Requirements for electrical installations – IEE wiring regulations – Seventeenth edition*
- BS 8214, *Code of practice for fire door assemblies with non-metallic leaves*
- BS 8313, *Code of practice for accommodation of building services in ducts*
- BS 8414-1, *Fire performance of external cladding systems – Part 1: Test methods for non-loadbearing external cladding systems applied to the face of a building*
- BS 8414-2, *Fire performance of external cladding systems – Part 2: Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame*
- BS 8519:2010, *Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications – Code of practice*
- BS 9251, *Sprinkler systems for residential and domestic occupancies – Code of practice*
- BS 9990:2006, *Code of practice for non-automatic fire-fighting systems in buildings*
- BS 9999:2008, *Code of practice for fire safety in the design, management and use of buildings*
- BS EN 3 (all parts), *Portable fire extinguishers*
- BS EN 81 (all parts), *Safety rules for the construction and installation of lifts*
- BS EN 1154, *Building hardware – Controlled door closing devices – Requirements and test methods*
- BS EN 1363 (all parts), *Fire resistance tests*
- BS EN 1364 (all parts), *Fire resistance tests for non-loadbearing elements*
- BS EN 1365 (all parts), *Fire resistance tests for loadbearing elements*
- BS EN 1366 (all parts), *Fire resistance tests for service installations*
- BS EN 1634-1, *Fire resistance tests for door and shutter assemblies – Part 1: Fire resistance tests for doors, shutters and openable windows*
- BS EN 1634-3, *Fire resistance tests for door and shutter assemblies – Part 3: Smoke control doors and shutters*
- BS EN 12101 (all parts), *Smoke and heat control systems*
- BS EN 12101-1, *Smoke and heat control systems – Part 1: Specification for smoke barriers*
- BS EN 12101-3, *Smoke and heat control systems – Part 3: Specification for powered smoke and heat exhaust ventilators*
- BS EN 12101-6, *Smoke and heat control systems – Part 6: Specification for pressure differential systems – Kits*
- BS EN 12845, *Fixed firefighting systems – Automatic sprinkler systems – Design, installation and maintenance*
- BS EN 13501 (all parts), *Fire classification of construction products and building elements*
- BS EN 13501-1, *Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests*
- BS EN 13501-2, *Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services*

BS EN 13501-3, *Fire classification of construction products and building elements – Part 3: Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers*

BS ISO 3864-1, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs and safety markings*

DD 8458-1, *Fixed fire protection systems – Part 1: Residential and domestic watermist systems – Code of practice for design and installation*

DD 8489-1, *Fixed fire protection systems – Industrial and commercial watermist systems – Part 1: Code of practice for design and installation*

Other publications

[N1] COLWELL, S. and MARTIN, B. *Fire performance of external thermal insulation for walls of multi-storey buildings*. BR 135. Second edition. Watford: Building Research Establishment, 2003. ISBN 978 1 860 81622 3.

[N2] UKLPG. *Code of practice 1: Part 2 – Bulk LPG storage at fixed installations for domestic purposes*. Incorporating amendment 2. UKLPG, 2000.

[N3] HEALTH AND SAFETY EXECUTIVE. *The keeping of LPG in cylinders and other containers*. Guidance note CS4. HSE, 1986.

3 Terms and definitions

For the purposes of this British Standard the following definitions apply.

3.1 access level

level used for normal access to the building that either incorporates, or leads directly to, a place of ultimate safety

3.2 access room

room through which the only escape route from an inner room passes

3.3 alternative escape route (from a house)

route from any point within a room of a house that gives easy access to a second stair, a balcony or a flat roof by means of which a person can reach a place of ultimate safety

3.4 alternative exit (from a flat or maisonette)

one of two or more exits from within a flat or maisonette, each of which is separate from the other giving access to a route leading to a place of ultimate safety

3.5 ancillary accommodation

all parts of the building that are ancillary to the dwellings, such as rooms associated with engineering services, common amenity areas, refuse rooms and covered car parks

NOTE See 3.10 for common amenity area.

3.6 atrium (plural: atria)

space within a building, not necessarily vertically aligned, passing through one or more structural floor

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

3.7 balcony approach

design in which each dwelling is approached externally via an open balcony

3.8 basement

storey of a building that is below the ground storey

3.9 Class 0 (material or surface)

material or surface that is either:

- a) of limited combustibility throughout; or
- b) classified as Class 1 when tested in accordance with BS 476-7, which has a fire propagation index of not more than 12, and a subindex i_1 of not more than 6, when tested in accordance with BS 476-6.

NOTE Class 0 is not identified in any British Standard test. European Classification B-s3, d2 is the general equivalent of Class 0. The European classifications are described in BS EN 13501-1. They are based on a combination of four European test methods, namely: BS EN ISO 1182; BS EN ISO 1716; BS EN 13823; and BS EN ISO 11925-2:2002. The national classifications do not automatically equate with the equivalent classification in Europe, therefore, products cannot typically assume a European class, unless they have been tested accordingly.

3.10 common amenity area

area containing household facilities that are remote from individual dwellings

NOTE Examples of common amenity areas include kitchens, laundries, drying areas and occupiers' stores.

3.11 common stair

stairway serving more than one flat or occupancy

3.12 competent person

person, suitably trained and qualified by knowledge and practical experience, and provided with the necessary instructions, to enable the required task(s) to be carried out correctly

3.13 corridor access

design in which each dwelling is approached via a common horizontal internal access or circulation space which may include a common entrance hall

NOTE This is also referred to as a corridor approach.

3.14 dead end

area from which escape is possible in one direction only

3.15 deck approach

design in which each dwelling is approached externally via a wide approach balcony that is not enclosed

NOTE This is also known as a deck access.

3.16 dual-entry fire-fighting lift

fire-fighting lift provided with two sets of doors, one used for normal operations and the other in the fire-fighting mode

3.17 dwelling

unit of residential accommodation, occupied (whether or not as a sole or main residence):

- a) by a single person or by people living together as a family; or
- b) by not more than six residents living together as a single household, including a household where care is provided for residents

3.18 dwelling of origin

dwelling in which a fire has originated

- 3.19 emergency escape lighting**
lighting provided, for use when the normal lighting fails, to ensure illumination of the escape route(s) at all times
- 3.20 escape route**
route forming part of the means of escape from any point in a building to a final exit
- 3.21 extra care housing**
accommodation in a housing scheme for which specialized accommodation and support services are available to residents 24 hours a day
NOTE Residents receive a more intensive level of support in extra care housing than is usually provided in sheltered housing.
- 3.22 final exit**
termination of an escape route from a building giving direct access to a street, passageway, walkway or open space sited so that people can rapidly disperse from a building
NOTE Rapid dispersal from a building allows people to get out of danger from fire and/or smoke from a fire within the building.
- 3.23 fire door**
door or shutter device, including any frame and all dedicated fittings, provided for the passage of persons, air or objects, which is intended, when closed, to resist the passage of fire and/or gaseous products of combustion and is capable of meeting specified performance criteria to those ends
- 3.24 fire-fighting lift**
lift designed with additional protection and controls that enable it to be used under the direct control of the fire and rescue service when fighting a fire
NOTE See 19.3.2.2.
- 3.25 fire-fighting lobby**
protected lobby providing access from a fire-fighting stair to dwellings and the fire-fighting lift
- 3.26 fire-fighting shaft**
protected enclosure containing a fire-fighting stair, fire-fighting lobbies, a fire main and, if provided, a fire-fighting lift together with any machinery space
- 3.27 fire-fighting stair**
protected stairway providing access to dwellings directly through a fire-fighting lobby
- 3.28 fire resistance**
ability of an item to fulfil for a stated period of time the required fire stability and/or integrity and/or thermal insulation, and/or other expected duty specified in a standard fire resistance test, e.g. the relevant part of BS 476
- 3.29 flat**
dwelling, forming part of a larger building, that has all of its rooms on one level or, in the case of split level flats, not more than half a storey height apart
- 3.30 free area**
total unobstructed cross sectional area of an opening, vent, etc., measured in the plane where the area is at a minimum and at right angles to the direction of air flow
NOTE The free areas of openings, vents etc. refer to the geometric free area.

- 3.31 gallery**
floor or balcony which does not extend across the full extent of a building's footprint and is open to the floor below
- 3.32 ground storey**
storey, the floor of which is situated at such a level or levels that any given point on its perimeter is at, or about, or not more than 1.2 m below, the level of the finished surface of the ground adjoining the building in the vicinity of that point
- 3.33 habitable room**
any room in a dwelling with the exception of any kitchen, utility room, bathroom or WC
- 3.34 higher fire risk area**
area with a fire risk higher than that of a dwelling
- 3.35 house**
self-contained building used as a single-family dwelling having one or more storeys or levels, that is not horizontally separated from any other dwelling forming part of the building, and that has its own main entrance door situated at ground level or at any level that serves as access level
- 3.36 independent alternative escape route**
one of two or more escape routes from a dwelling, with its own separate exit from the dwelling and which follows a route that is separate from the other(s)
- 3.37 inner room**
room from which escape is possible only by passing through the access room
NOTE For access room, see 3.2.
- 3.38 maisonette**
dwelling, forming part of a larger building, having rooms divided between two or more levels which are more than half a storey height apart
- 3.39 (material of) limited combustibility**
either:
a) a non-combustible material; or
b) any material of density 300 kg/m³ or more which, when tested in accordance with BS 476-11, does not flame and the rise in temperature on the furnace thermocouple is not more than 20 °C; or
c) any material with a non-combustible core of 8 mm thick or more, having combustible facings (on one or both sides) not more than 0.5 mm thick
- 3.40 means of escape**
structural means whereby a safe route (or routes) is (or are) provided for persons to travel from any point in a building to a place of ultimate safety
- 3.41 mixed-use building**
building containing dwellings together with other types of occupancy and where the dwellings are not ancillary to the other use
- 3.42 open-plan**
internal living arrangements that are almost entirely undivided by partitions
- 3.43 place of ultimate safety**
place in which persons are in no danger from fire

- 3.44 pressurization**
method of protecting escape routes against the ingress of smoke by maintaining the air within them at pressures higher than those in adjoining parts of the building
- 3.45 protected circuit**
electrical circuit protected against fire
- 3.46 protected corridor**
circulation area consisting of a corridor enclosed with fire-resisting construction
NOTE The protected corridor does not include any external walls of a building.
- 3.47 protected entrance hall/protected landing**
circulation area consisting of a hall or space within the dwelling that is enclosed with fire-resisting construction
NOTE The protected entrance hall/protected landing does not include any external walls of a building.
- 3.48 protected lobby**
circulation area consisting of a lobby enclosed with fire-resisting construction
NOTE The protected lobby does not include any external walls of a building.
- 3.49 protected stairway**
stair discharging through a final exit to a place of ultimate safety (including any exit passageway between the foot of the stair and the final exit) that is adequately protected from fire elsewhere in the building by fire-resisting construction
- 3.50 self-closing fire door**
fire door fitted with a device which fully closes the door, overriding the resistance of any latch
- 3.51 sheltered housing**
block(s) of flats and/or maisonettes, with each dwelling incorporating its own cooking and sanitary facilities, designed specifically to accommodate persons who might require assistance but who are otherwise independent
NOTE Examples of persons who might require assistance are elderly people. Sheltered housing might offer residents some form of assistance.
- 3.52 single stair**
common stair which is the only one to which dwellings in a block of flats or maisonettes have access
- 3.53 storey**
part of a building comprising all the rooms that are on the same level including any gallery having an area of more than half that of the space into which it projects and any roof, unless it is accessible only for maintenance or repair
- 3.54 storey exit**
final exit, or a doorway, giving direct access to a protected stairway or external escape route
- 3.55 travel distance**
actual distance to be travelled by a person along an escape route
NOTE Recommendations for maximum travel distances may apply to travel within dwellings and ancillary accommodation, and from dwellings and ancillary accommodation to storey exits.

4 General recommendations and background

4.1 Spread of fire and smoke

A common basis for designing fire safety measures lies in the identification of the possible causes and/or sources of fire and the evaluation of the manner in which it is likely to develop and spread through a building.

The recommendations and guidance given in this British Standard are based on the assumption that under normal circumstances (i.e. except in the case of arson) a fire is unlikely to start in two different places in a building at the same time.

Initially, a fire creates a hazard only in the part of the building in which it starts and is unlikely to involve a large area, although it can subsequently spread to other parts of the building. Fire is less likely to spread if passages, corridors, lobbies or stairways intended for use only for access or means of escape are kept clear of combustible materials.

It is unlikely that fire will originate in the building structure itself. Outbreak of fire is more likely to occur in furnishings, decorations, finished goods, raw materials and/or chemicals, equipment, electrical services, process plant or service plant in the building. The point of origin is therefore likely to be in bedrooms, kitchens, living rooms, offices, common rooms, storerooms or possibly in the service installations.

NOTE A fire can also originate outside the building in refuse, vehicles, goods etc. and spread to the building (e.g. via combustible materials); this might be accidental or it might be a result of arson. The potential impact on the building, the occupants and society at large needs to be assessed, and measures might be necessary to mitigate for the potential loss of social amenity to the community. This standard does not cover fires that originate outside a building, although it does give guidance on external fire spread between buildings.

When a fire occurs in an enclosed space, hot smoke-laden gases rise to form a layer, which at first has a tendency to flow under the ceiling and then deepens to fill the whole space. The fire tends to grow in area, the flames spreading to nearby combustible furnishings, fittings, exposed papers, etc. The flames increase in height until they reach the ceiling where they are deflected horizontally and, radiating downwards, accelerate fire growth. If the ceiling is combustible, it can ignite and add to the volume of flame and speed of fire growth. If the space has insufficient openings to provide a continuing air supply, the burning rate of the fire diminishes as it draws on increasingly vitiated air, but the gases generated are then extremely toxic.

Once ignited, combustible products give off hot smoke-laden and toxic gases. Convection and radiation also occur rapidly and, because of the extremely high temperature of the gases, other combustible materials and products within the area of the fire will ignite more easily, further accelerating the progress of the fire. It cannot always be assumed that the effects of the fire will be confined to the space in which it originated. If the enclosing walls have no fire resistance or do not form a fire compartment with a fire-resisting floor (or ceiling) above, the fire will soon penetrate at ceiling level, where the attack from the flames or hot gases is most severe, to the adjoining space. Even with fire-resisting construction, the buoyancy and expansion of the fire gases can cause them to be driven out of the space to affect other parts of the building.

If the fire gases penetrate into a vertical shaft, such as a stairwell, lift well or duct, they will rise rapidly, attacking the top of the shaft and spreading elsewhere if there are any openings in the shaft. In such circumstances, if a substantial flow of air reaches the fire through an aperture such as a window or door, the vertical shaft can act as a chimney and can greatly accelerate fire growth.

A fire occurring anywhere within a compartment of a building has, therefore, to be regarded as presenting a hazard to all occupants within that compartment, even though in the initial stages of fire development it might seem that the hazard is small and people are in no immediate danger. The extent of the risk to persons in other parts of the building is generally dependant on the level of fire compartmentation and more specifically on the measures provided to safeguard the common escape routes.

In the early stages of a fire, the most significant effects are usually those of smoke and other products of combustion. Smoke is often the first evidence of fire and is thus likely to be the first cause of alarm. When smoke extends down to head height it produces difficulty in breathing and impairs visibility, which interferes with the efforts of occupants to find their way towards the exits. People who are prevented or delayed from escaping by dense smoke can suffer from the toxic effects of the products of combustion that accompany the smoke. The asphyxiating effect caused by lack of oxygen, toxic properties or by the intense heat of the gases making up the smoke can cause intoxication, disorientation, incapacity, unconsciousness and, in the worst scenario, death.

The speed at which a space becomes untenable is mainly dependent on its volume and the fire growth rate. For higher and larger spaces the time taken to fill with smoke is longer and so there is more time for escape and longer travel distances are possible.

To facilitate escape it is thus necessary, in the development of a means of escape strategy:

- a) to ensure that protected escape routes are provided and that they are adequately safeguarded against the ingress of smoke;
- b) to limit the time people have to travel before they reach a protected route and/or a final exit;
- c) to consider reverse flows that might occur as a result of a particular escape route being unavailable or as a feature of an evacuation plan for disabled people.

After the outbreak of fire, the time during which the actions necessary for ensuring the safety of occupants can be carried out will vary depending on their location with respect to the fire and the design of the building. Where a fire in an occupied flat or maisonette is discovered by the occupants, who make their way out, leave the door closed and call the fire and rescue service, then the fire is expected to present little or no risk to the occupants of other dwellings, as it is unlikely to break out of the dwelling of origin for some considerable time (see also 0.2.1).

If extinction of the fire is delayed, there might be a direct risk to persons using any common access, through smoke and heat affecting the route. If the dwelling entrance door fails to close properly after the occupants' departure, the common corridor will be quickly filled with the products of combustion, and other occupants trying to use the corridor could be in serious difficulty.

If a fire starts (or is started) in an unoccupied dwelling, with no one to give the alarm, the fire may develop fully within the dwelling before occupants of nearby or adjacent dwellings are aware of it. After a time the dwelling entrance door might be penetrated with the consequence that the common corridor would be prejudiced by heat and smoke. If the dwelling entrance door opens on to an open balcony rather than an internal corridor, smoke might be of little consequence but, at a later stage, there could be difficulty in passing the door.

A fire can start (or be started) in an access corridor, lobby or stairway, or in ancillary accommodation, in a building containing flats or maisonettes. This is capable of rendering all circulation spaces, including stairways, impassable in a short period of time unless provision has been made in the design of the building

to prevent it. Complete safety cannot be assured, moreover, while there is any risk of a fire starting in an escape route or circulation space. It is essential, therefore, that the building is furnished and used in such a way as to reduce the risk of a fire occurring in circulation spaces.

In mixed-use buildings it is important to consider the effect of one risk upon another. A fire in an unattended office or shop premises could have serious consequences on any dwelling in the same building.

4.2 Variation of guidance

The guidance on means of escape in Section 2 permits variations to be made to travel distances on the basis that the level of risk can be reduced by the provision of additional fire protection measures. Such measures include:

- the provision of an active fire-fighting system (e.g. sprinklers);
- the provision of an enhanced smoke management system;
- the provision of an additional level of automatic fire detection.

Equally, the guidance on fire-fighting in Section 4 and on designing the building structure in Section 6 permits certain variations when such measures as an automatic sprinkler system are provided.

Designers, occupiers and approving authorities are thus able to allow a degree of flexibility in the provision of fire safety measures as part of the overall design package. However, there are limits on the extent of variation permitted within the scope of this British Standard.

4.3 Property and business continuity protection

The guidance and recommendations in this British Standard are primarily concerned with the protection of life. The provision of fire safety systems for life safety does not necessarily give adequate protection to property or to business continuity.

Property and business continuity protection is equally important within the housing sector as in any other business activity. Businesses that provide housing should assess their business continuity arrangements and provide appropriate measures to mitigate the effects of fire. This could also include the potential societal loss of people's homes and the need for re-housing and care following a fire. This should be an integral part of the design stage of a building and should also include an assessment of the ongoing maintenance requirements of the building as well as an assessment of the fire protection needs during construction.

It is therefore recommended that the potential for property and business loss is assessed so that such risks are understood and addressed. Carrying out such an assessment should be in accordance with guidance given in Annex A. Advice and guidance on the provision of fire precautions for the protection of property and the continuity of the business can also be found in Annex A and BS 9999:2008, 44.8.

4.4 Environment

Many fires or emissions from combustion processes damage the environment. The contents of, and activities within, any building catching fire are likely to cause pollution to a greater extent than products used in the fabric of the building itself.

This British Standard is concerned largely with accidental fires, and the main area for consideration of the environmental impact of such fires is the loss of control of pollutants as a consequence.

Appropriate steps at the design stage of any building can minimize the impact of accidental fire on the environment and, whilst the emphasis is likely to be on the

potential contents of the building, it would be responsible to consider the effects of using combustible materials in the building specification.

NOTE Fires that have been deliberately set might require additional measures to be taken which are outside the scope of this British Standard.

4.5 Atria

The primary objective is to ensure that the incorporation of an atrium into a new or existing building does not present an increased risk to life as a result of fire and smoke spread.

This British Standard is concerned only with those additional measures that might be required to compensate for any increased risk resulting from the inclusion of an atrium within a building. It is not intended to provide a fire-engineered solution for any particular design.

In atria, several storeys are contained in one volume. Atria are created by, for example:

- a) split-level floors;
- b) floors arranged as a spiral throughout the height of the building;
- c) balconies or gallery floors overlooking a central well or courtyard.

Atria can result in smoke and heat travelling readily throughout all levels of the building.

Atria should be designed in accordance with Annex B, using the occupancy category decision process given in Figure B.1 to determine whether the atrium building falls within the scope of this British Standard and, if it does, to determine a design solution.

NOTE The wide range of designs possible in atrium buildings makes it impossible for this British Standard to cover every conceivable scheme and its associated fire risk, therefore it deals only with atria up to a height of 18 m. Other buildings with a void through structural floors are covered in BS 9999:2008, Annex B. Design solutions and exemplars for atria that do not fall within the scope of this standard are given in BS 9999:2008, Annex C.

4.6 Inclusive design

Accessible means of escape, and the associated fire safety strategy, should be considered as an integral part of the design process, and not as a separate issue. Where a building is designed and managed inclusively to provide access for all users, the facilities provided should, where appropriate, be used to improve egress arrangements.

Special management procedures might be required where it is reasonably foreseeable that the proportion of disabled persons in a building will be relatively high. See Section 9 for guidance on building management.

NOTE Attention is drawn to the Equality Act 2010 [4] which places a duty of all employers and service providers not to discriminate against disabled people. It is vital to ensure that when making plans for the fire safety and management of buildings, the requirements of disabled people are properly taken into account at all times. It is important to note that the recommendations made in this British Standard are for escape not access. For example, certain dimensions might not provide suitable access for all people with impairments. Further guidance for access requirements can be found in BS 8300 which deals with the design of buildings and their approaches to meet the needs of disabled people. This explains how the built environment can be designed to anticipate, and overcome, restrictions that prevent disabled people making full use of premises and their surroundings.

Section 2: Designing means of escape

NOTE 1 Section 2 gives design guidance for means of escape in houses, flats and maisonettes. Some guidance is common to all three and is given first. The guidance that follows is specific, first for houses and then for flats and maisonettes.

NOTE 2 Means of escape for atria are covered in Annex B.

NOTE 3 Methods of measurements such as floor heights, heights of buildings and fire and rescue service access can be found in the Building Regulations 2000 – Approved Document B [11].

NOTE 4 Guidance on fire and safety signage can be found in the Building Regulations 2000 – Approved Document B [11].

5 General

5.1 Escape by way of doors and windows

Doors and windows that are to be used for means of escape or rescue should conform to the following recommendations.

- a) Escape windows should have an unobstructed openable area that is a minimum of 0.33 m², having the minimum dimensions of 450 mm in height and 450 mm in width.

NOTE The route through the window may be at an angle rather than on a horizontal plane.

- b) The bottom of any openable area should be not more than 1 100 mm above the floor of the room in which it is situated.
- c) Doors and windows that are provided for escape or rescue purposes from a room above ground level should conform to the following recommendations.
 - 1) If a window is a dormer window or a roof light, the distance from the eaves of the roof to the sill or vertical plane of the window or sill of the roof light should not exceed 1.5 m when measured along the roof.
 - 2) Any doors (including a French window or a patio window) should be guarded with a protective barrier in accordance with BS 6180.
 - 3) The ground beneath the window or balcony should be clear of any obstructions (such as iron railings or horizontally hung windows) and should be of a size and material that is suitable and safe for supporting a ladder.
 - 4) For security purposes many windows are kept locked with a key. Occupants should be advised to keep the key close to the escape window where it can be easily located.

A door or window should not face onto an internal shaft or enclosure unless escape to a place of ultimate safety is possible without re-entering the building.

5.2 Escape from basements

Any basement in which a bedroom is situated should be provided with:

- a) an alternative escape route; or
- b) a protected route via the ground floor leading to a final exit; or
- c) a door or window provided for means of escape conforming to 5.1.

A basement flat that is not provided with its own external entrance at the level of the basement should be provided with an alternative exit (see 7.2).

6 Means of escape and provision for rescue from houses

6.1 Single and two-storey houses

In single and two-storey houses the means of escape may be through the main entrance via the hall or alternatively through the window. Consequently, unless a protected escape route is provided, each bedroom should have a window in accordance with 5.1.

6.2 Escape from inner rooms in houses

For houses, a habitable room should not be an inner room unless it is on the ground level or one floor above ground level and is provided with a door or window conforming to 5.1 for escape or rescue purposes.

6.3 Houses with one floor more than 4.5 m above ground level

Houses with one floor more than 4.5 m above ground level should conform to one of the following:

- a) the top storey or level of the house should be separated from the lower storeys by fire-resisting construction and should be provided with an alternative escape route leading to its own final exit; or
- b) the internal stairway should be constructed as a protected stairway, connecting the ground and all upper storeys; and either deliver directly to a final exit [see Figure 1a)] or allow access to at least two independent escape routes leading to alternative final exits [see Figure 1b)]; or
- c) where an open-plan arrangement exists at ground level, in order to separate the ground floor from the upper storeys, either:
 - 1) a protected stairway should be provided; or
 - 2) the house should be fitted throughout with a sprinkler system designed and installed in accordance with BS 9251 in conjunction with a fire resisting partition and door, in order to separate the ground floor from the upper storeys. The fire-resisting door should be arranged such that occupants on the upper floors can access an escape window at first floor level, in accordance with 5.1, in the event of a fire in the open-plan area.

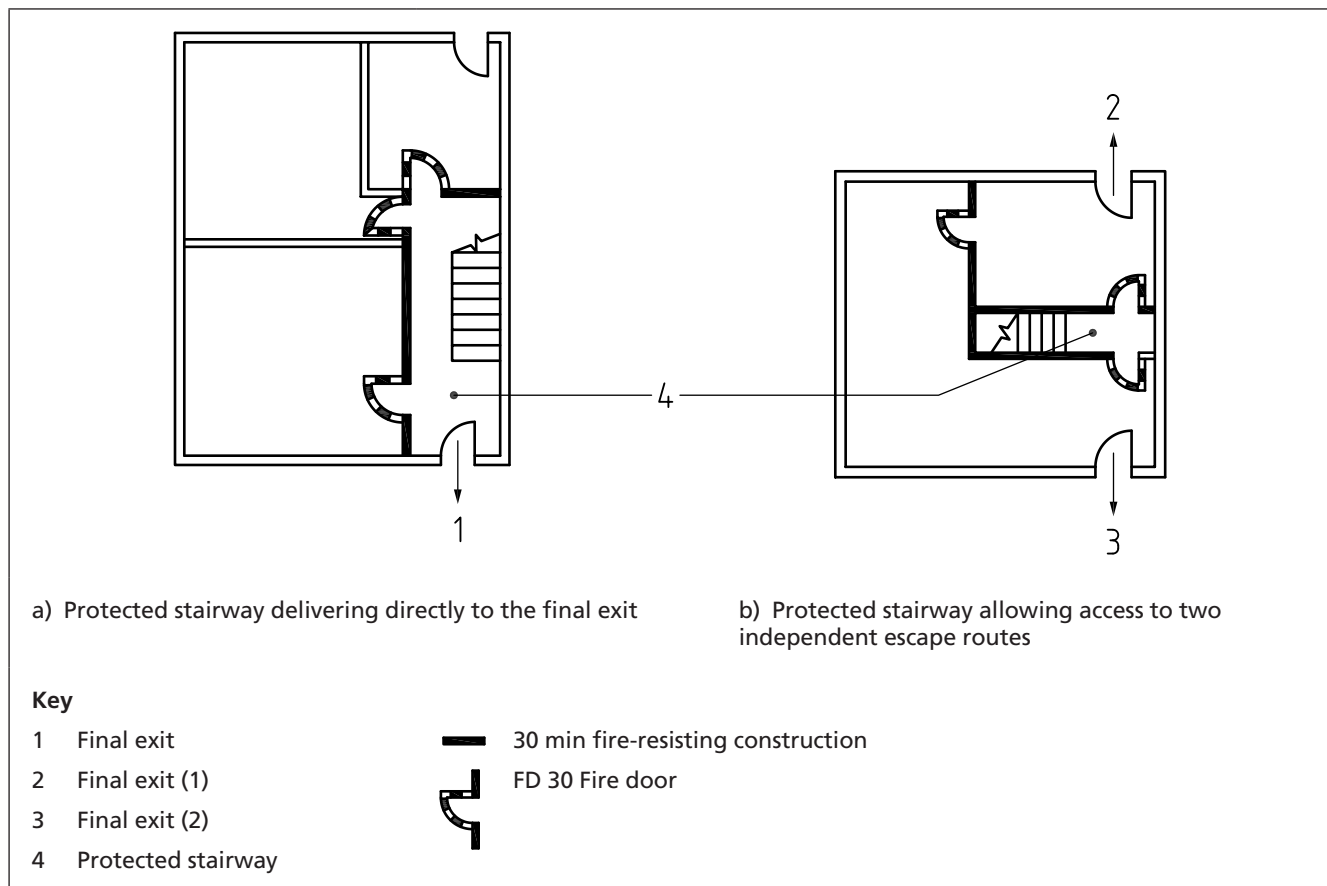
6.4 Houses with more than one floor higher than 4.5 m above ground level

Houses with more than one floor over 4.5 m above ground level should conform to 6.3 and the following.

Each storey or level situated 7.5 m or more above ground level should have either:

- a) an alternative escape route; or
- b) a protected stairway and a sprinkler system, designed and installed in accordance with BS 9251, fitted throughout the house.

Figure 1 Alternative arrangements for escape via the ground storey in houses exceeding 4.5 m in height



6.5 Loft conversions

Where a new storey is added by converting an existing roof space, provisions for escape should be protected throughout the full extent of the escape route.

A loft conversion to a two-storey house should have fire-resisting construction in the form of fire-resisting doors and fire-resisting partitions to protect the stairway.

This protected stairway should;

- a) be protected at all levels; and
- b) extend to the final exit; or
- c) allow access to at least two escape routes at ground level that are separated from each other by fire-resisting construction and fire doors.

Where an open-plan arrangement exists at ground level, one of the following should be provided:

- 1) a fire-resisting partition to enclose the escape route conforming to 6.5b) or 6.5c); or
- 2) sprinkler protection to the open-plan area, in conjunction with a fire-resisting partition and door, in order to separate the ground floor from the upper storeys. This door should be arranged such that the occupants of the new loft room are able to access an escape window conforming to 5.1 at first floor level in the event of a fire in the open-plan area.

Houses having a floor level of a loft conversion higher than 4.5 m above ground level should conform to 6.3 or 6.4, as applicable.

7 Means of escape from flats and maisonettes

COMMENTARY ON CLAUSE 7

The aim is to ensure that a fire which starts in any one dwelling will not obstruct the escape route of the occupants of any other dwelling. The planning of this part of the escape route depends on the number of common stairs serving the storey, the arrangement of the dwellings within the building and, in particular, the normal method of approach to dwellings having a common access (i.e. by an internal corridor or lobby or an external balcony or deck).

The provisions for means of escape for flats and maisonettes are based on the assumptions that:

- a) the fire is likely to occur in a flat or maisonette;*
- b) there is no reliance on external rescue (e.g. by portable ladder);*
- c) the building is provided with a high degree of compartmentation and therefore a low probability of fire spread beyond the dwelling of origin, so that simultaneous evacuation of the building is unlikely to be necessary;*
- d) although fires might occur in the common parts of the building, the materials and construction in those parts will prevent the fabric from being involved beyond the immediate vicinity; and*
- e) escape routes enable a person confronted by an outbreak of fire to make a safe escape without outside assistance.*

To facilitate escape it might be necessary that common escape routes are safeguarded by some form of smoke control (see Clause 26).

The reliance of fire safety on manipulative apparatus, e.g. lowering lines or throw-out ladders, for means of escape, or on external rescue from the lower storeys of a building by the fire and rescue service using mobile ladders, is not advisable.

General advice and recommendations on private and communal balconies can be found in Annex C.

For guidance on live-work units refer to the Building Regulations 2000 – Approved Document B [11].

7.1 General

Flats or maisonettes that are entered directly from outside the building at ground or access level should be considered as houses and conform to Clause 6 for the purposes of means of escape, instead of Clause 7.

Means of escape from small buildings should conform to 7.5.

All buildings with a floor higher than 30 m above ground level should be fitted with a sprinkler system (see Clause 23).

Enclosed private balconies serving a single dwelling should be treated as inner rooms and in accordance with Annex C.

Under normal conditions, lifts should not be used for escape from fire. Due consideration in the building design should be given to the use of evacuation lifts for disabled persons. Where lifts are to be used for evacuation purposes, they should conform to 8.4.

NOTE *The misuse or malfunctioning of lifts can cause deaths, attributed amongst other things to failure of the power supply or from lifts being called to or held at the fire floor.*

7.2 Alternative exits from flats and maisonettes

Alternative exits for flats and maisonettes should be provided in accordance with Clause 9.

Alternative exits from flats and maisonettes should:

- a) be sited away from the main entrance door to the dwelling such that it can still be used as an escape route;
- b) be in accordance with the approaches illustrated in Figure 2, Figure 3, Figure 4, Figure 12 or Figure 15;
- c) lead to a final exit or common stair:
 - 1) via a door leading onto an access corridor, common balcony or deck at the same or another level; or
 - 2) via a protected stairway leading to an access corridor, common balcony or deck at another level; or
 - 3) via a door leading onto an external stair or a protected stairway; or
 - 4) via a door leading onto an escape route across a flat roof leading to the head of a common or external stair.

The internal arrangement of any dwelling having an alternative exit should be such that access is possible from all habitable rooms either to the main entrance or to the alternative exit. Fire-resisting separation should be provided, to safeguard the occupants who need to use the alternative exit. It is not normally advisable to link balconies and pass doors between dwellings to provide escape via a flat roof into an adjoining building.

Figure 2 Maisonette with alternative exits from each room not on the floor of entrance

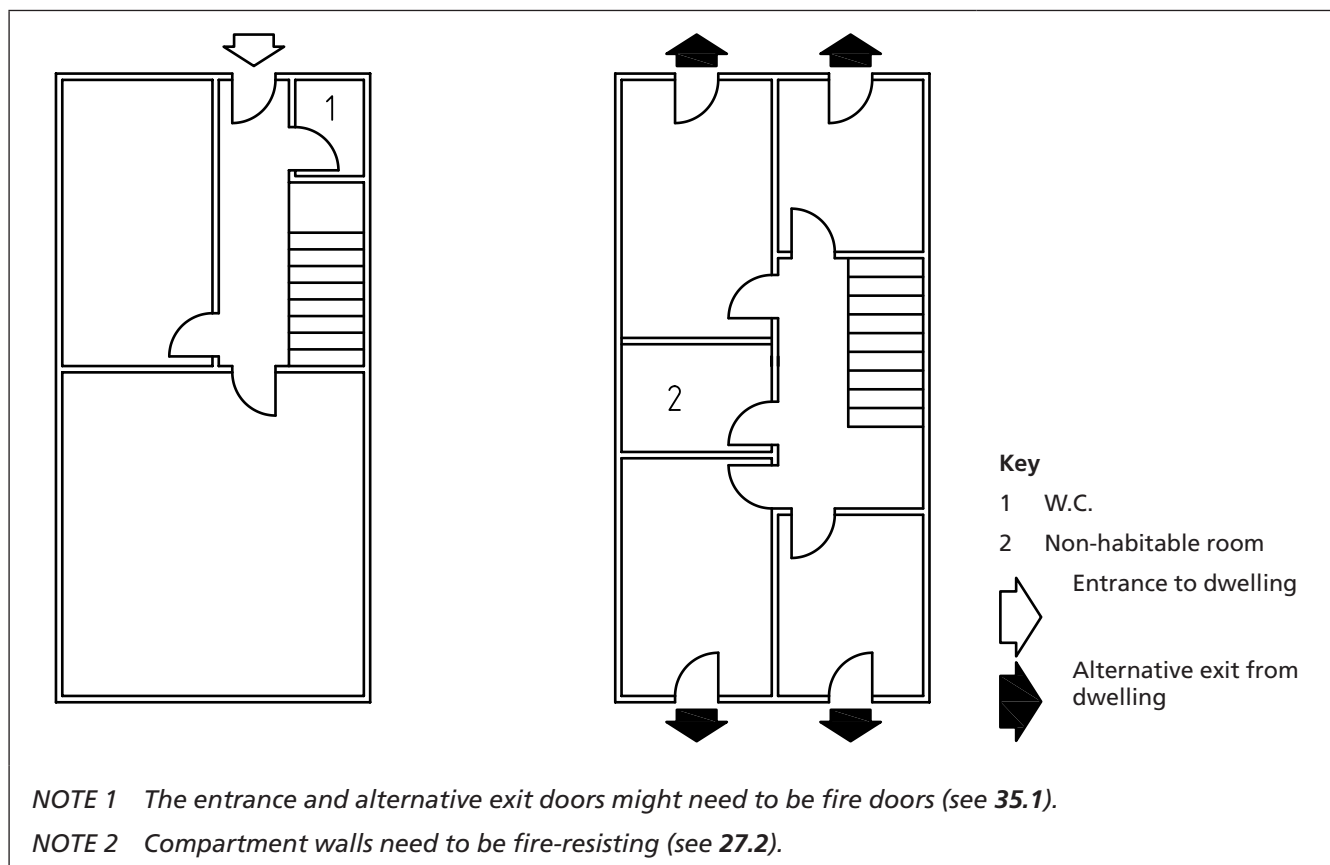
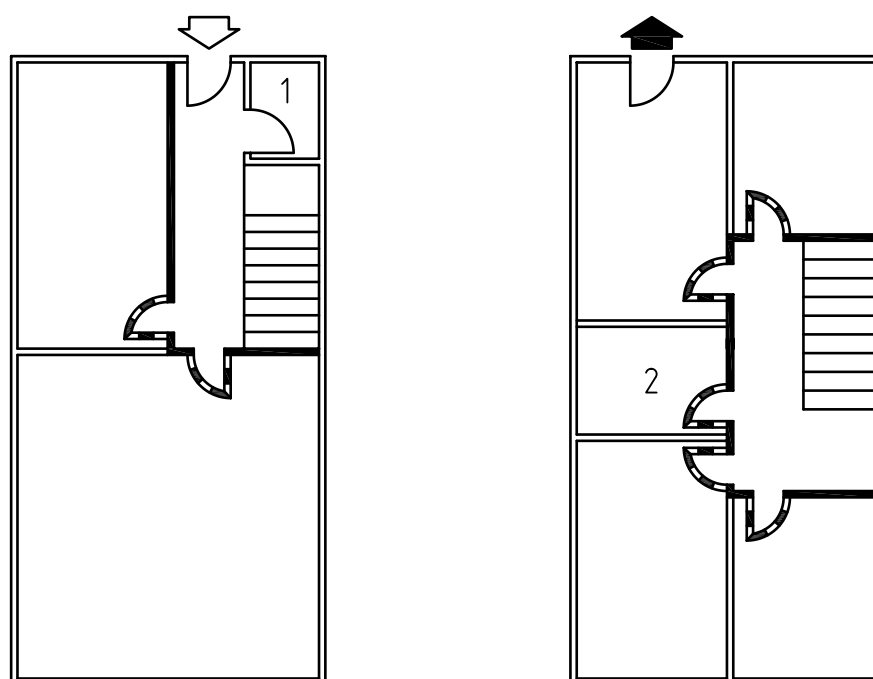


Figure 3 Maisonette with protected entrance hall and protected landing

**Key**

1 W.C.

2 Bathroom



Entrance to dwelling



Alternative exit from dwelling



30 min fire-resisting construction



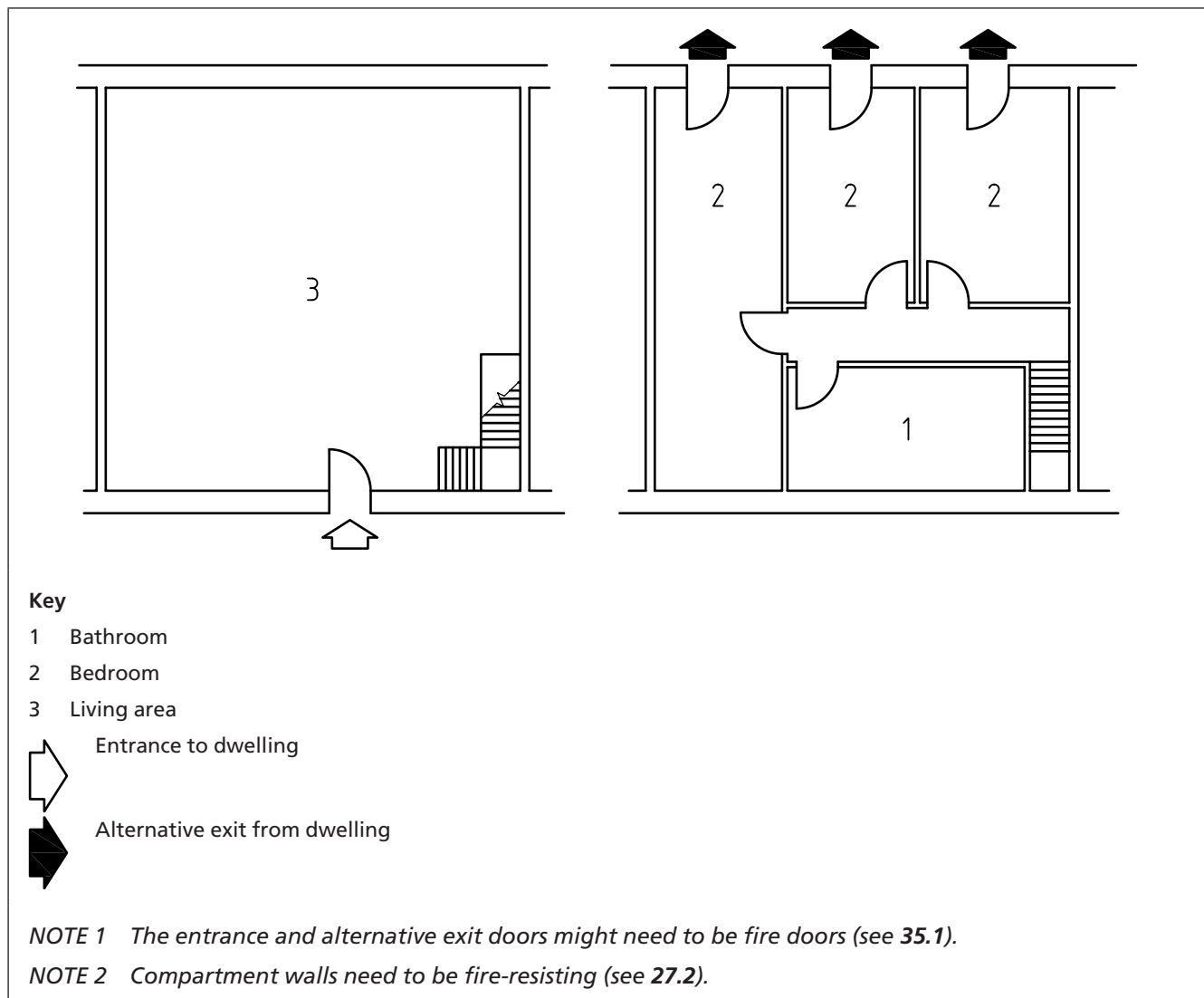
FD 30 fire door

NOTE 1 The entrance door might need to be a fire door (see 35.1).

NOTE 2 If the partitions between the bathroom and the adjacent rooms have a 30 min fire resistance then the partition between the bathroom and the hall need not be fire-resisting and the bathroom door need not be a fire door.

NOTE 3 Compartment walls need to be fire-resisting (see 27.2).

Figure 4 Open-plan maisonette



7.3 Escape routes from flats and maisonettes with balcony approach or deck approach

In general there is little risk of a balcony or deck becoming smoke-logged and there is thus no need to impose a limitation on the travel distance from the dwelling entrance to the stairway, although consideration should be given to the needs of the fire and rescue service, such as the distance between the nearest connection to a fire main and the flat and maisonette (see 19.1.3 and 20.1).

NOTE 1 Where an approach is via a balcony or deck having a width of more than 2 m or via a balcony that is adjoined to the building wall only where there is an entrance to a flat or maisonette, there is a risk that the balconies might become smoke-logged both laterally along the balcony and upon levels above.

Where there is only a single direction of escape, provision should be made for the safety of persons who might have to escape past the flat or maisonette on fire (see Figure 5).

NOTE 2 In order to avoid impediment to means of escape, it is inadvisable to allow storage of any kind on the balcony or deck approach.

Escape routes should conform to Figure 5.

Balconies and decks should conform to the following recommendations.

- a) The construction should provide a minimum fire resistance of 30 min.
- b) The walking surface should be imperforate.
- c) The sectional profile should be such that any fire plume breaking out of a flat or maisonette is directed outwards and upwards, and should be arranged such that smoke does not leak laterally along the soffit.
- d) The soffit above a balcony or deck having a width of more than 2 m should be designed with down-stands placed at 90° to the face of the building (on the line of separation between individual flats or maisonettes). Down-stands should project 0.3 m to 0.6 m below any other beam or down-stand parallel to the face of the building, or should be defined by calculation.

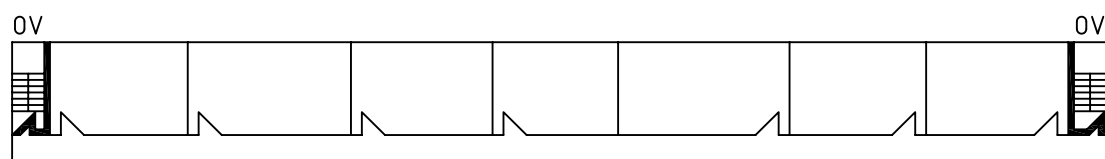
NOTE 3 Suitable calculations are given in the BS 7346 series and BRE Report 368 [12].

- e) Where the balcony or deck is adjoined to the building wall only at the place where there is an entrance to a flat or maisonette, unless it is a minimum of 1.8 m away from the face of the building, it should, in the case of single direction escape routes, be proven by calculation that the escape route is not subjected to hazardous exposure levels or smoke logging.

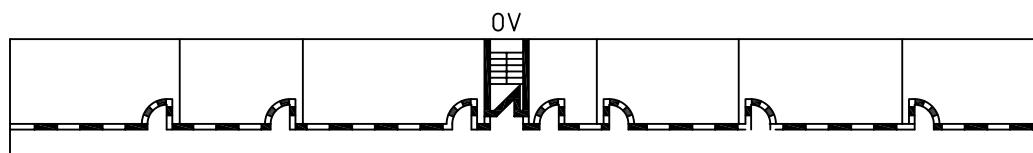
NOTE 4 Suitable calculations are given in the BS 7346 series and BRE Report 368 [12].

- f) Balconies providing a single direction of escape should be further safeguarded by the following provisions.
 - 1) The face of the building (excluding window openings) should provide at least 30 min fire resistance.
 - 2) Doors opening onto the balcony should be FD30 self closing doors.
 - 3) Window openings should not extend below a height of 1.1 m above the deck level.
 - 4) The external balustrade should be imperforate.
 - 5) Surface materials of the facing wall, balcony soffit and balustrade should be of a Class 0 rating.
- g) The length of balconies should be such that no point in any flat or maisonette is more than 45 m from a rising main landing valve or the approach position of a fire appliance (measured along the fire-fighting route of access).

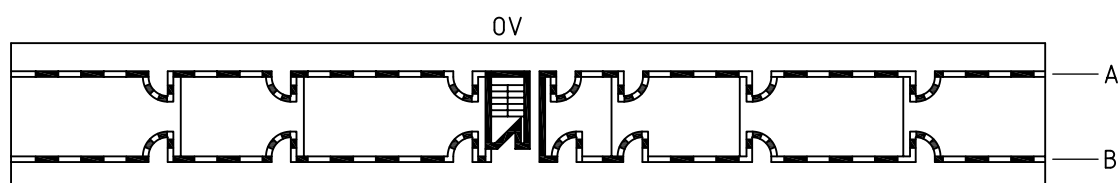
Figure 5 Common escape routes in balcony/deck approach buildings



a) Multi-stair building



b) Single-stair building



NOTE 1 Either external enclosure A or external enclosure B should be fire-resisting.

c) Single-stair building with an alternative exit from every dwelling

Key

OV Openable vent for fire and rescue service use from the top storey (1.0 m² minimum)

— Fire-resisting construction

— Fire-resisting construction up to a height of 1.1 m above deck level

— Self-closing FD30 fire door

— Self-closing FD 30S fire door

NOTE 2 Although there are no limitations on travel distance, all parts of the building need to be within 45 m of a fire main, measured along a line on which hose can be laid.

NOTE 3 The openable vents to the stairway may be replaced by an openable vent over the stair with remote operation in accordance with 26.2.3.3.

All doors breaching the 1.1 m high fire-resisting separation should be self-closing FD 30 fire doors.

7.4 Escape routes from flats and maisonettes with corridor or lobby approach

To prevent exposure of escaping occupants to smoke and heat in the internal corridor or lobby, either:

- a) the travel distance between the exit doors from the dwellings and a smoke-free area should be limited, and the amount of smoke and other combustion products in the internal corridor or lobby kept to a minimum by providing either cross-corridor fire doors and ventilation, or a mechanical smoke control system; or

NOTE 1 Smoke control is covered in Clause 26.

- b) an independent alternative escape route should be provided from each dwelling either by way of a corridor at another level or through an external common balcony in accordance with 7.3.

NOTE 2 The options given in a) and b) allow designers of flats and maisonettes with corridor or lobby approaches some flexibility.

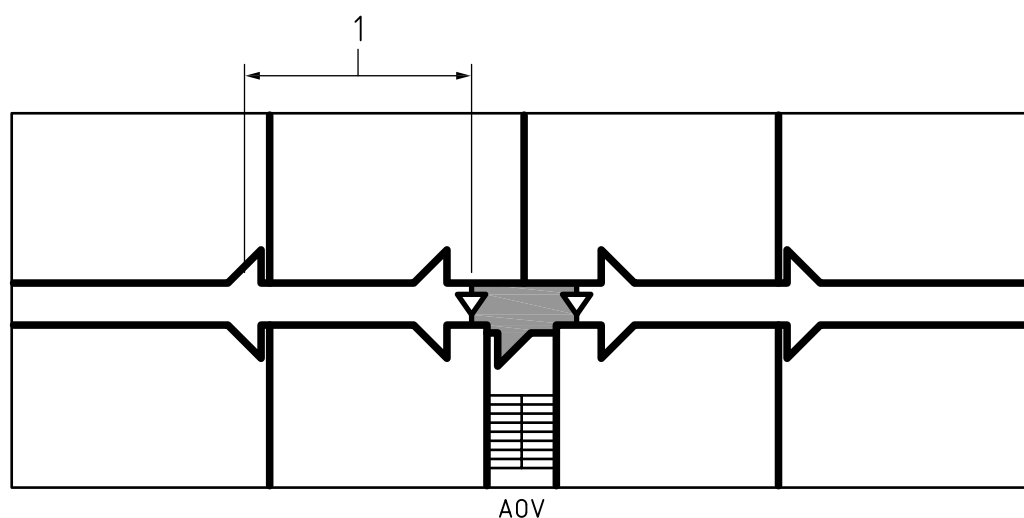
Where travel distances from the furthest dwelling entrance door to the means of escape staircase cannot be met then consideration may be given to the provision of a mechanical smoke ventilation system and the use of sprinkler systems, see 26.1.3 and Clause 23.

For buildings not provided with a mechanical smoke control system, escape routes should be provided that conform to Figure 6 and Figure 7.

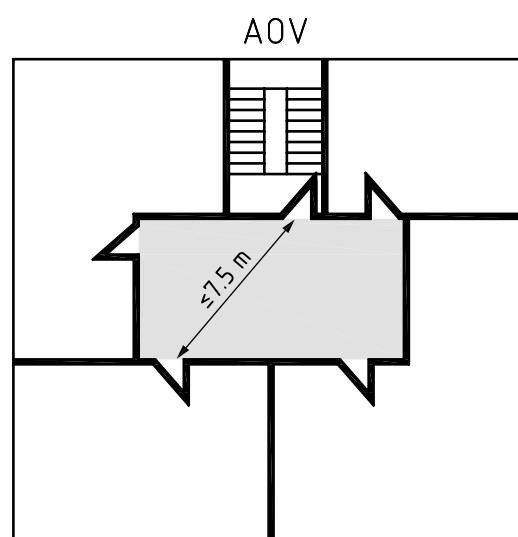
For buildings provided with a mechanical smoke control system, escape routes should also be provided that conform to Figure 6 and Figure 7, with the exception that cross-corridor fire doors and openable or automatically opening vents may be omitted.

NOTE 3 For smoke control recommendations, see Clause 26.

Figure 6 Common escape routes in single-stair buildings more than 11 m in height



a) Corridor access dwellings



b) Lobby access dwellings

Key

1 Maximum travel distance 7.5 m

AOV Automatically opening vent (1.0 m² minimum)

— Fire-resisting construction



Self-closing FD 30S fire door (double swing)



Self-closing FD 30S fire door

NOTE 1 Where all dwellings on a storey have independent alternative means of escape, the maximum travel distance may be increased to 30 m.

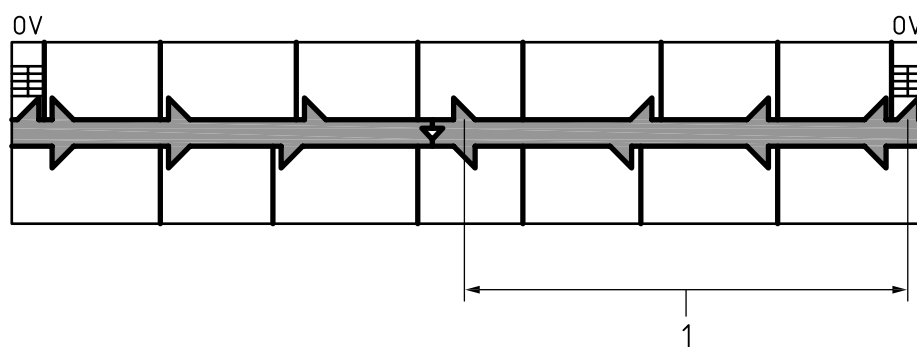
NOTE 2 Where a fire-fighting lift is required, it should be sited not more than 7.5 m from the door to the stair.

NOTE 3 The shaded area indicates the area requiring a smoke control system.

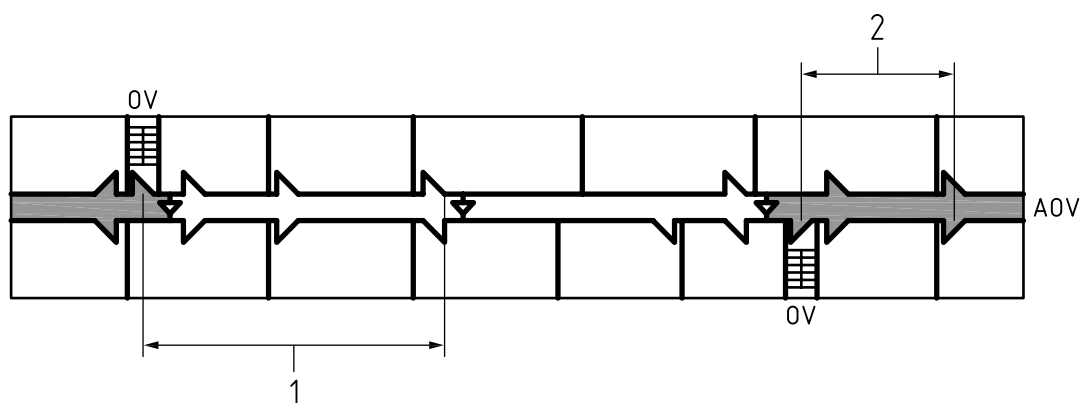
NOTE 4 The arrangements shown in a) and b) also apply to the top storey.

Where travel distance is measured to a stair lobby door, the lobby should not directly connect with any dwelling, storage space or any other space containing a potential fire hazard.

Figure 7 Common escape routes in multi-stair buildings

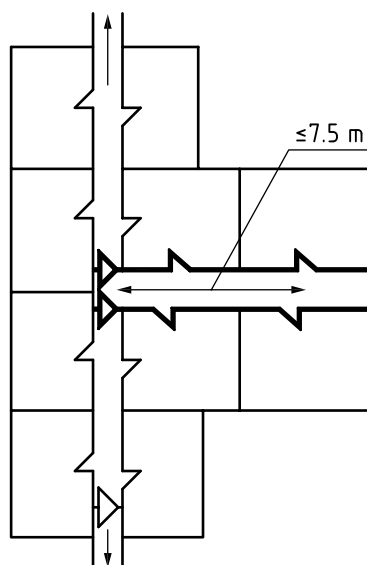


a) Corridor access dwellings (no dead ends)



NOTE 1 The central fire door may be omitted where the maximum travel distance does not exceed 15 m.

b) Corridor access dwellings with dead ends

**Key**

1 30 m

2 7.5 m

AOV Automatically opening vent (1.5 m² minimum)OV Openable vent for fire and rescue service use (1.0 m² minimum)
 Self-closing FD 30S fire door (double swing)

 Self-closing FD 30S fire door

c) T-junction with main corridor

NOTE 2 Where all dwellings on a storey have independent alternative means of escape, there are no limitations on travel distance. However, all parts of the building need to be within 45 m of a fire main, measured along a line on which hose can be laid.

NOTE 3 The openable vents to the stairway may be replaced by an openable vent over the stair.

NOTE 4 Shaded area indicates the area requiring a smoke control system.

NOTE 5 The arrangements shown also apply to the top storey.

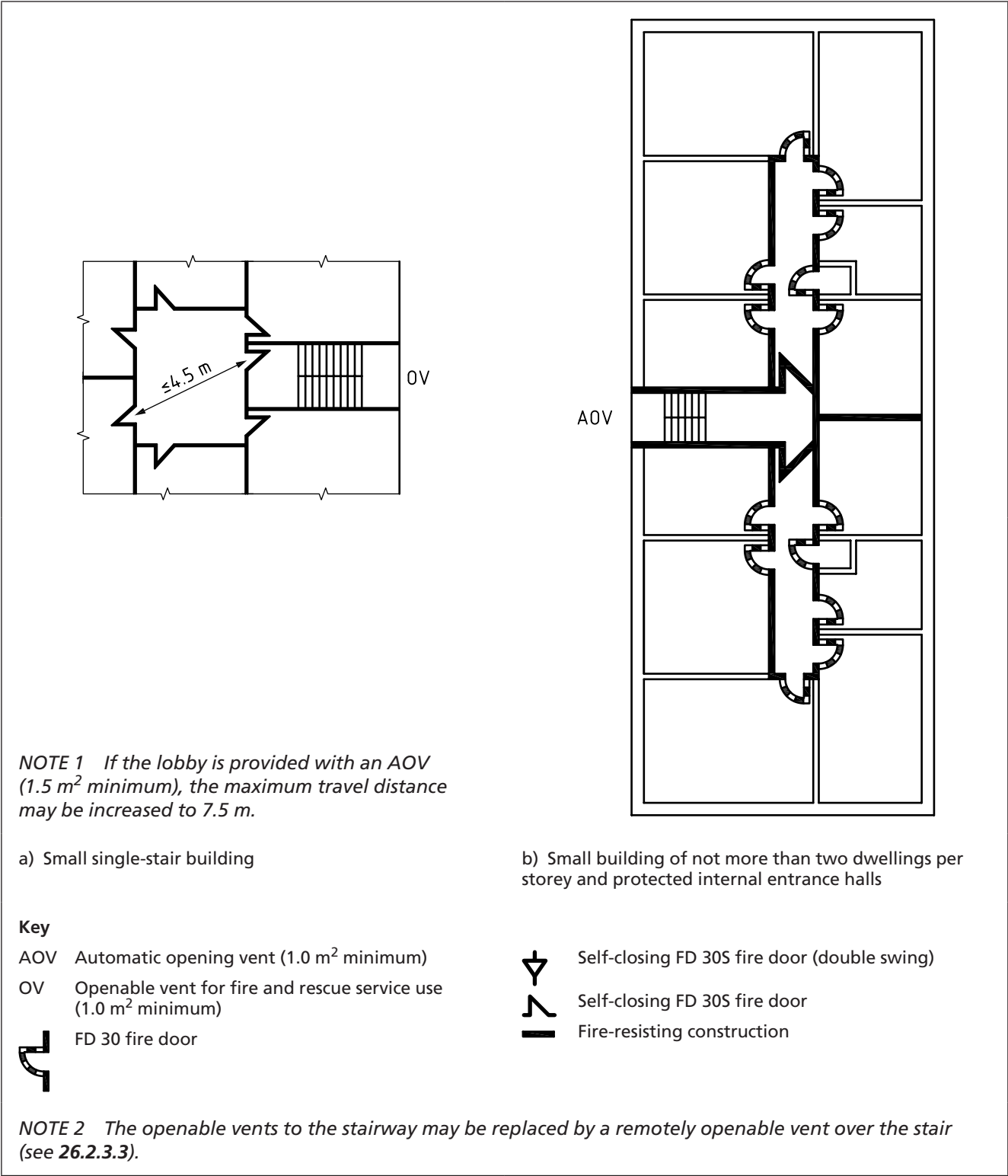
7.5 Small buildings

Where a building does not exceed 11 m in height and has no more than three storeys above ground storey and has a single stair:

- a) escape routes should be provided that conform to Figure 8;
- b) the stair should only connect to a covered car park at ground level or above if the car park is provided with permanent natural ventilation equivalent to 2.5% of the floor area of the car park, or is mechanically ventilated in accordance with BS 7346-7, and is separated by a protected, ventilated lobby (see 26.1.6);
- c) the stair should not serve ancillary accommodation unless the ancillary accommodation is separated from the stair by a protected lobby or corridor that is provided with permanent ventilation of not less than 0.4 m² for the control of smoke (see 26.1.6) or protected by a mechanical smoke control system;
- d) a high level openable vent should be provided at each floor level with a minimum free area of 1 m². Alternatively, a single openable vent which can be remotely operated from fire and rescue service access level may be provided at the head of the stair.

NOTE For connection to basement levels, see 13.2.

Figure 8 Common escape routes in small single-stair buildings



8 Means of escape from sheltered, extra care and other special housing

8.1 General

These buildings should be designed as self-contained flats in accordance with all the appropriate recommendations contained within this British Standard. In addition it may be necessary to augment the basic provisions with the applicable recommendations given in 8.2 to 8.7.

8.2 Travel distances

Protected stairway enclosures and protected corridor layouts incorporating fire subdivisions should be planned and constructed so that no person would have to travel more than 7.5 m from the flat entrance door along a corridor or lobby before reaching a fire door accessing either a protected stairway enclosure or another protected corridor zone.

Internal travel distances within the sheltered, extra care or special housing unit should be limited to 9 m or an alternative exit should be provided.

8.3 Protected stairways and corridor zones

When deciding on the dimensions of protected stairways and corridor zones, provision needs to be made for adequate refuge space for occupants to await further progressive evacuation.

NOTE This might have to include space for more than one wheelchair, which will be dependent on the building occupancy.

8.4 Vertical transportation

Consideration should be given to the numbers of residents who would need assistance to evacuate vertically. Where it is deemed necessary to assist vertical evacuation with an evacuation lift, the lift should conform to BS 9999:2008, 16.7, 46.9 and Annex G.

Where it is desired to use an ordinary passenger lift for the evacuation of disabled people, a risk assessment in accordance with BS 9999:2008, 46.9, should be carried out to assess the suitability of a particular lift.

8.5 Furnished areas in corridors

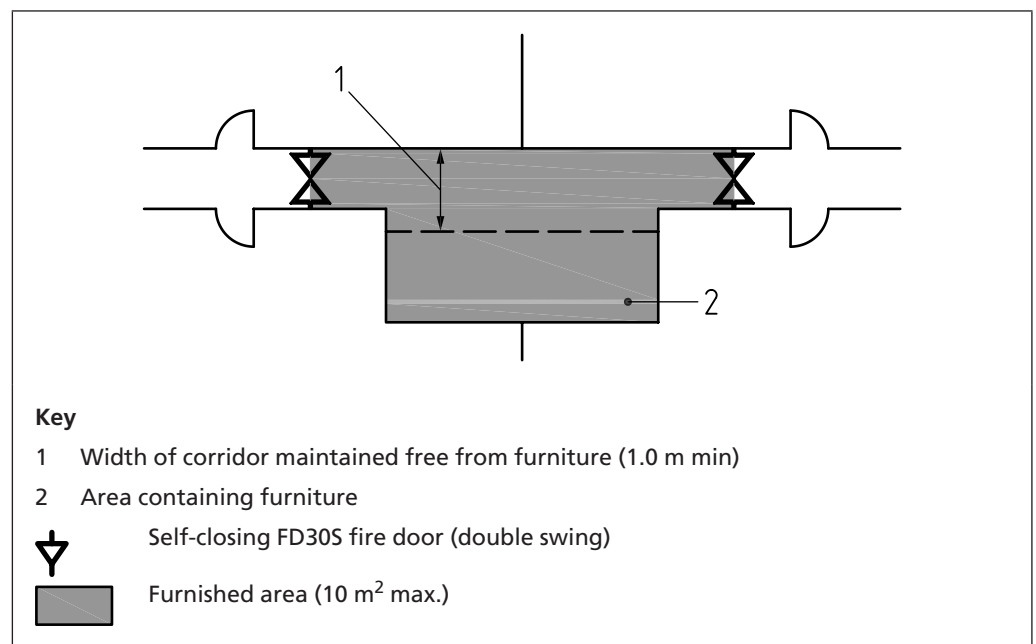
Furniture may be provided within common corridors in accordance with Figure 9.

Where furniture is provided in communal areas, it should conform to the medium hazard resistance to ignition classification specified in BS 7176. Curtains in communal areas should meet the performance requirements for classification as Type B or Type C when tested in accordance with BS 5867-2.

8.6 Doors

The needs of the sheltered, extra care or special housing should be assessed and the appropriate door closing devices and other door hardware should be selected and installed. Where self-closing doors might present an obstacle to the occupants of the building, then free swing door closers and hold-open devices within circulation spaces conforming to BS EN 1155 might be appropriate.

Figure 9 Furnished areas in sheltered housing corridors



8.7 Electric wheelchairs and mobility scooters

Consideration should be given to the storage and charging points associated with electric wheelchairs and scooters.

Where an area has been designated for storage of electric wheelchairs and scooters within the building, this area should be separated from the means of escape by fire-resisting construction of not less than 30 min. Electric charging points could introduce a fire risk into areas through which occupants might need to make their escape and as such should not be located in common access corridors or protected stairways.

Electric charging points installed within flats should not be located on an escape route.

9 Internal planning of flats

COMMENTARY ON CLAUSE 9

Clause 9 is concerned with the safety of occupants within their dwellings. The aim is to ensure that a fire that starts in a dwelling will not prejudice the escape of the occupants of that dwelling. The recommendations for the internal planning of a dwelling depend on whether it is a flat or maisonette, on its size, on whether it is situated at or close to ground level and whether it has an independent final exit.

There are several ways of providing safe escape routes: through the provision of an alternative exit (see 7.2); by ensuring that the escape route from any habitable room is by way of a protected entrance hall within which no likely source of fire exists, and within which the travel distance is limited; or by the limitation of the travel distance from any point in the flat to the flat entrance door.

These constraints are unnecessary in the case of ground floor flats entered from outside the building and for flats situated above the ground floor provided with their own external entrance at ground level. Similar considerations apply to flats entered from a podium deck.

9.1 General

Cooking facilities in open-plan flats or maisonettes should be located in such a way that they do not prevent exit if they are involved in a fire.

Flats or maisonettes having an independent external entrance at ground or access level should conform to Section 2.

Flats or maisonettes having more than one storey and not having an independent external entrance at ground or access level should:

- a) have an alternative exit from each habitable room that is not on the entrance floor of the dwelling; or
- b) have one alternative exit from each floor (other than the entrance floor), with a protected landing entered directly from all the habitable rooms on that floor; or
- c) where the vertical distance between the floor of the entrance storey and the floor above and the floor below it does not exceed 7.5 m, provide a protected stairway and a Grade D LD1 fire alarm system in accordance with BS 5839-6; or
- d) have a protected stairway and a sprinkler system (see Clause 23).

9.2 Basement flats

Any habitable room in a basement flat should not be an inner room, unless the room is provided with a door or window conforming to 5.1 for escape purposes.

9.3 Flats or maisonettes situated not more than 4.5 m above ground or access level

Any habitable room should not be an inner room unless the room is provided with a door or window conforming to 5.1 for escape purposes or with a Grade D LD1 fire alarm system in accordance with BS 5839-6 and a sprinkler system in accordance with BS 9251 or BS EN 12845 (see 9.7).

9.4 Flats situated more than 4.5 m above ground or access level

9.4.1 General

Flats that are situated more than 4.5 m above the ground or access level should conform to either 9.4.2, 9.4.3, 9.4.4, as applicable.

9.4.2 Flats entered on the same level as the flat

Flats having an entrance on the same level as the flat should conform to one of the following recommendations:

- a) the total travel distance from any point of the flat to the entrance door of the flat should be limited to 9 m. Cooking facilities should be sited away from the flat entrance door and the internal escape route (see Figure 10); or
- b) a protected internal hallway leading off to all habitable rooms having a travel distance not exceeding 9 m from the flat entrance door to the door of any habitable room (see Figure 11) should be provided; or
- c) all habitable rooms should be accessible from an internal hallway and have an alternative exit from the flat [see Figure 12a)]; or
- d) a 30 min fire-resisting construction should be provided between the living and sleeping areas of the flat and an alternative exit from the bedroom area should also be provided [see Figure 12b)].

Figure 10 Flat with restricted travel distance

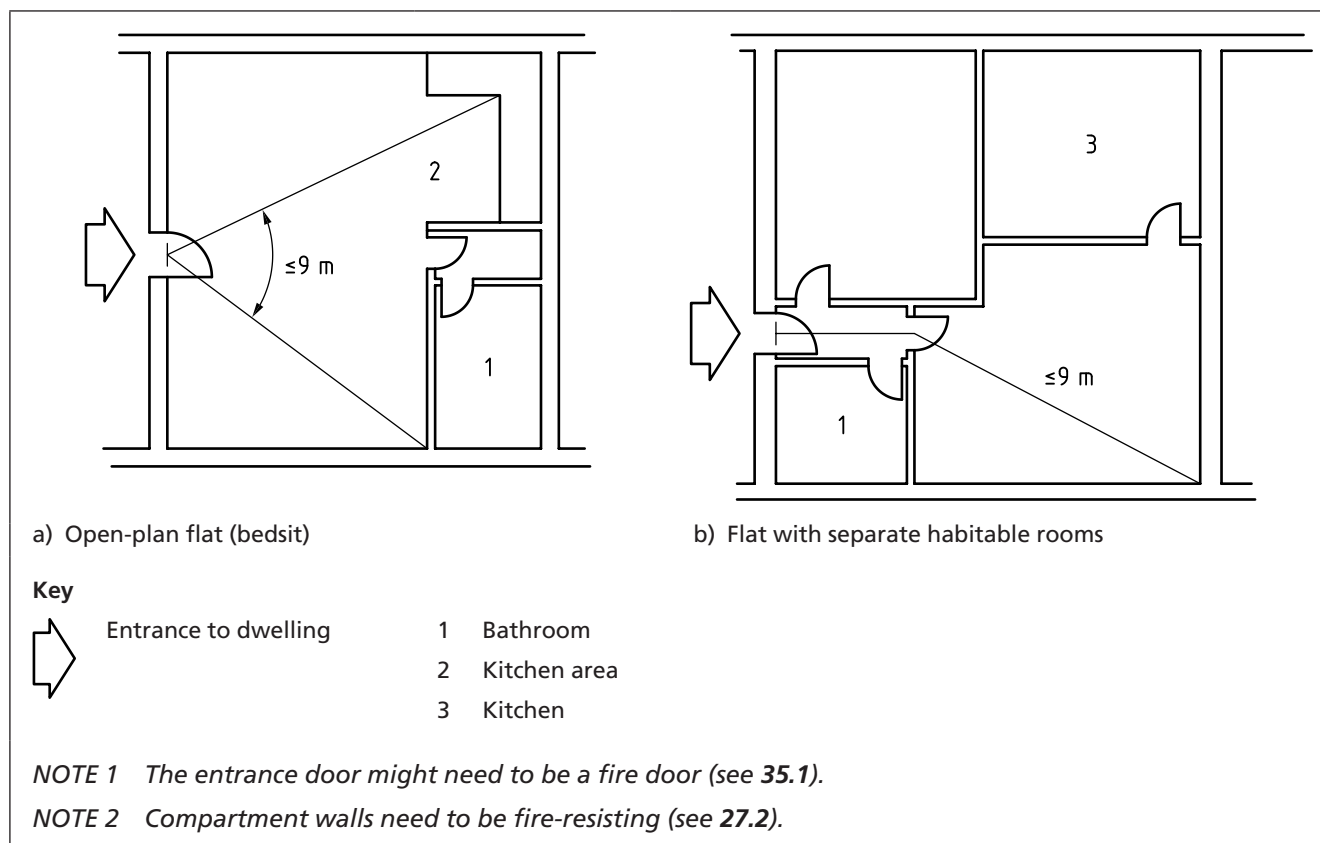


Figure 11 Flat with a protected entrance hall and restricted travel distance

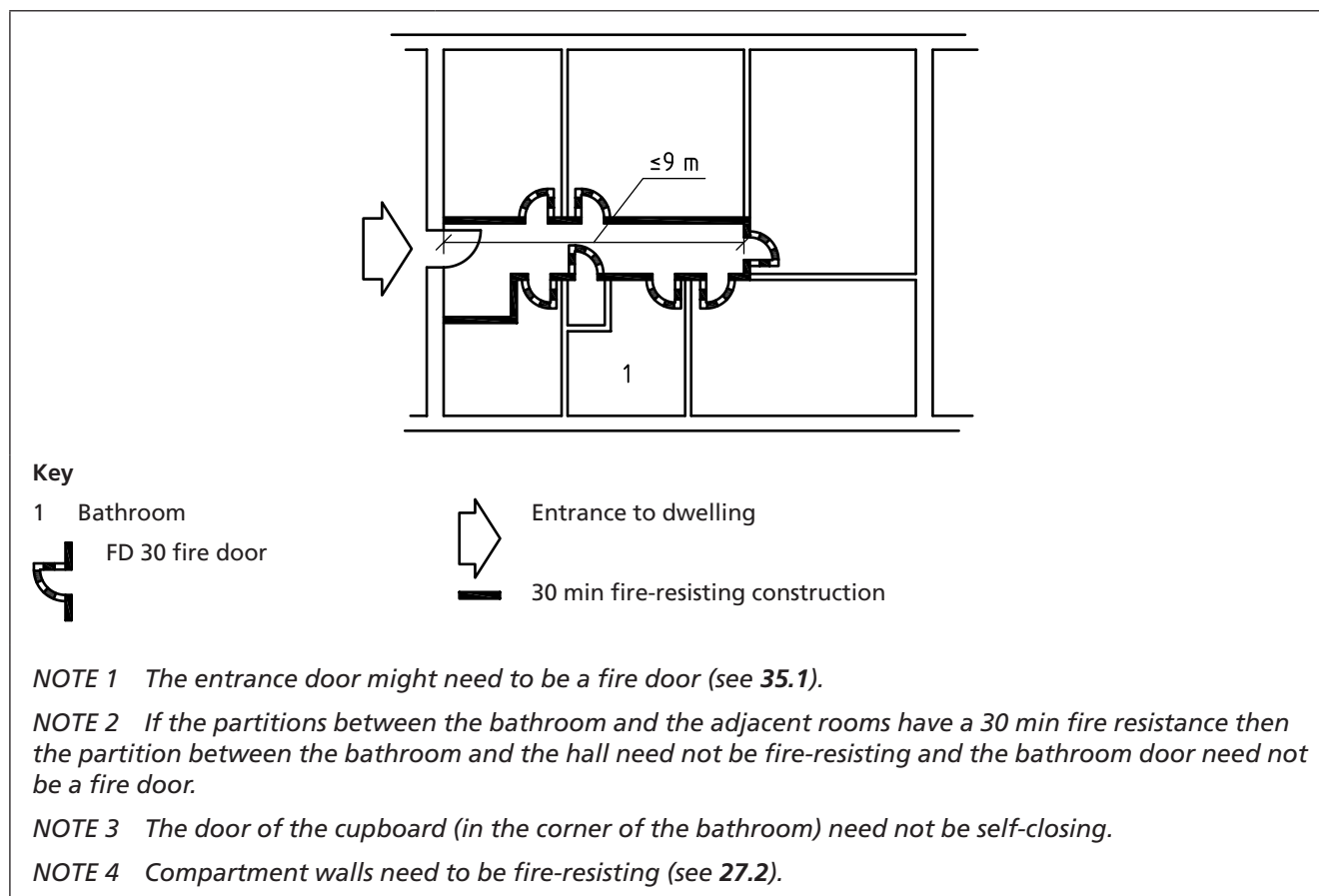
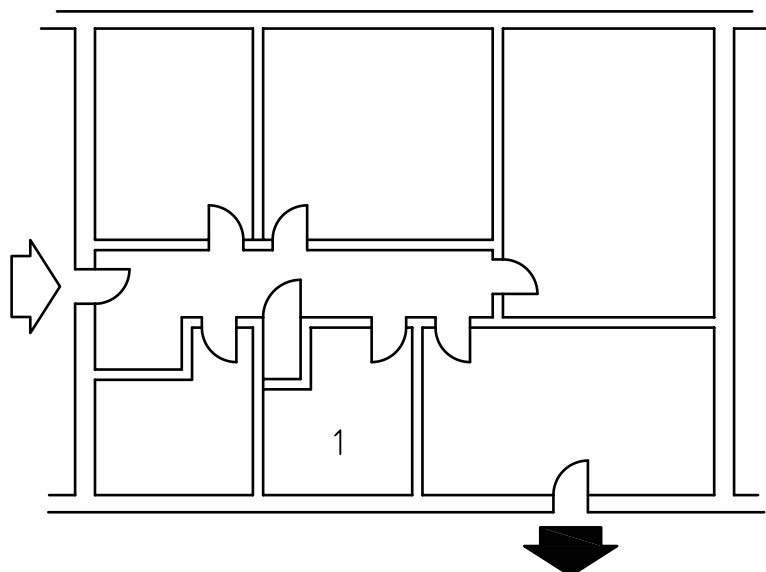
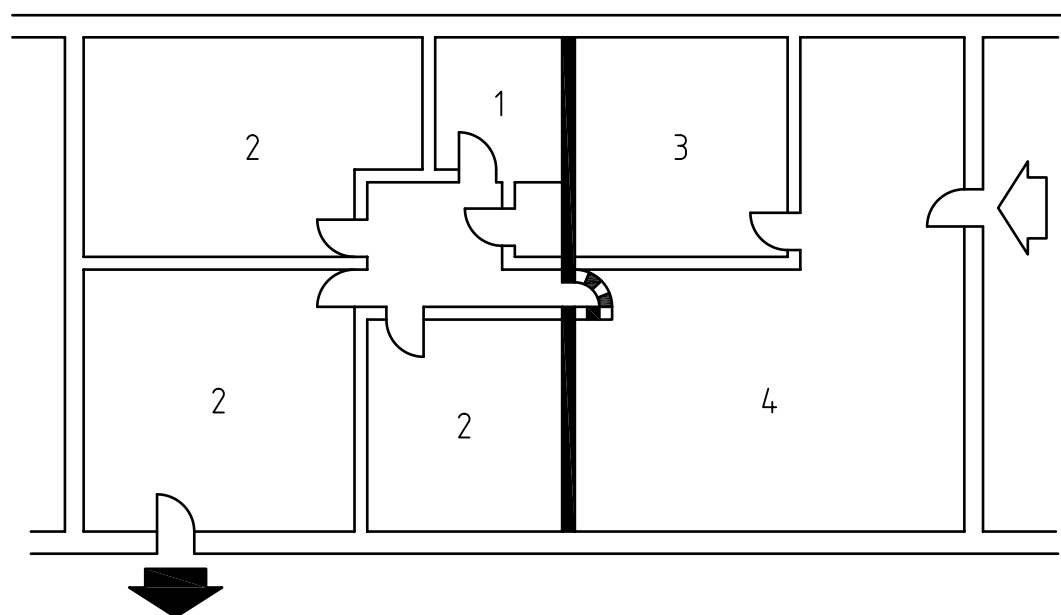


Figure 12 Flat with an alternative exit



a) Flat where all habitable rooms have direct access to an entrance hall



NOTE 1 The fire-resisting partition separates living and sleeping accommodation.

NOTE 2 The bedrooms are not classed as inner rooms because escape is possible in two directions.

b) Flat where all habitable rooms do not have direct access to an entrance hall

Key

- 1 Bathroom
- 2 Bedroom
- 3 Kitchen
- 4 Living area



Entrance to dwelling

Alternative exit from dwelling

30 min fire-resisting construction

FD 30 fire door

NOTE 3 The entrance and alternative exit doors might need to be fire doors (see 35.1).

NOTE 4 Compartment walls need to be fire-resisting (see 27.2).

9.4.3 Flats entered from a floor below the flat

Flats with the entrance on a floor below the flat should conform to one of the following recommendations:

- a) the total travel distance from any point of the flat to the head of the stair should be limited to 9 m. Cooking facilities should be sited away from the flat entrance door and the internal escape route (see Figure 13); or
- b) a protected internal hallway from which all habitable rooms can be accessed should be provided, having a travel distance not exceeding 9 m from the top of the stair to the door of any habitable room (see Figure 14); or
- c) all habitable rooms should be accessible from an internal hallway and an alternative exit should be provided from the upper floor of the flat [see Figure 15a)]; or
- d) a line of fire separation should be provided between the living and sleeping areas of the flat and should have an alternative exit from the bedroom area [see Figure 15b)].

9.4.4 Flats entered from a floor above the flat

Flats with the entrance on a floor above the flat should conform to one of the following recommendations:

- a) an alternative exit should be provided from the bedroom area of the lower floor level. Where habitable rooms do not have direct access to an enclosed hallway or landing, fire-resisting construction and fire-resisting doors should separate the living and sleeping areas [see Figure 15a) and Figure 15b)]; or
- b) a protected internal stairway and hallway or landing should be provided together with a Grade D LD1 automatic fire detection system conforming to BS 5839-6.

9.5 Internal planning of maisonettes

9.5.1 Maisonettes having no storey higher than 4.5 m above ground or access level

Maisonettes that do not have a storey that is situated higher than 4.5 m above the ground level or the access level can follow the same recommendations as those given for houses and should therefore conform to the relevant clauses in Section 2.

9.5.2 Maisonettes having a floor level higher than 4.5 m above ground or access level

Maisonettes that have a floor level that is situated higher than 4.5 m above the ground level or the access level should have the following:

- a) an alternative exit from any habitable room that is not on the entrance level of the maisonette (see Figure 2); or
- b) a protected stairway enclosure serving all habitable rooms and one alternative exit from every floor level other than the entrance level (see Figure 3); or
- c) a protected stairway enclosure and an LD1 automatic fire detection system conforming to BS 5839-6, if no floor is more than 7.5 m above or below the level of the entrance of the maisonette; or
- d) a protected stairway enclosure and domestic sprinkler coverage in accordance with BS 9251 or BS EN 12845.

Figure 13 Flat (entered from below) with a restricted travel distance

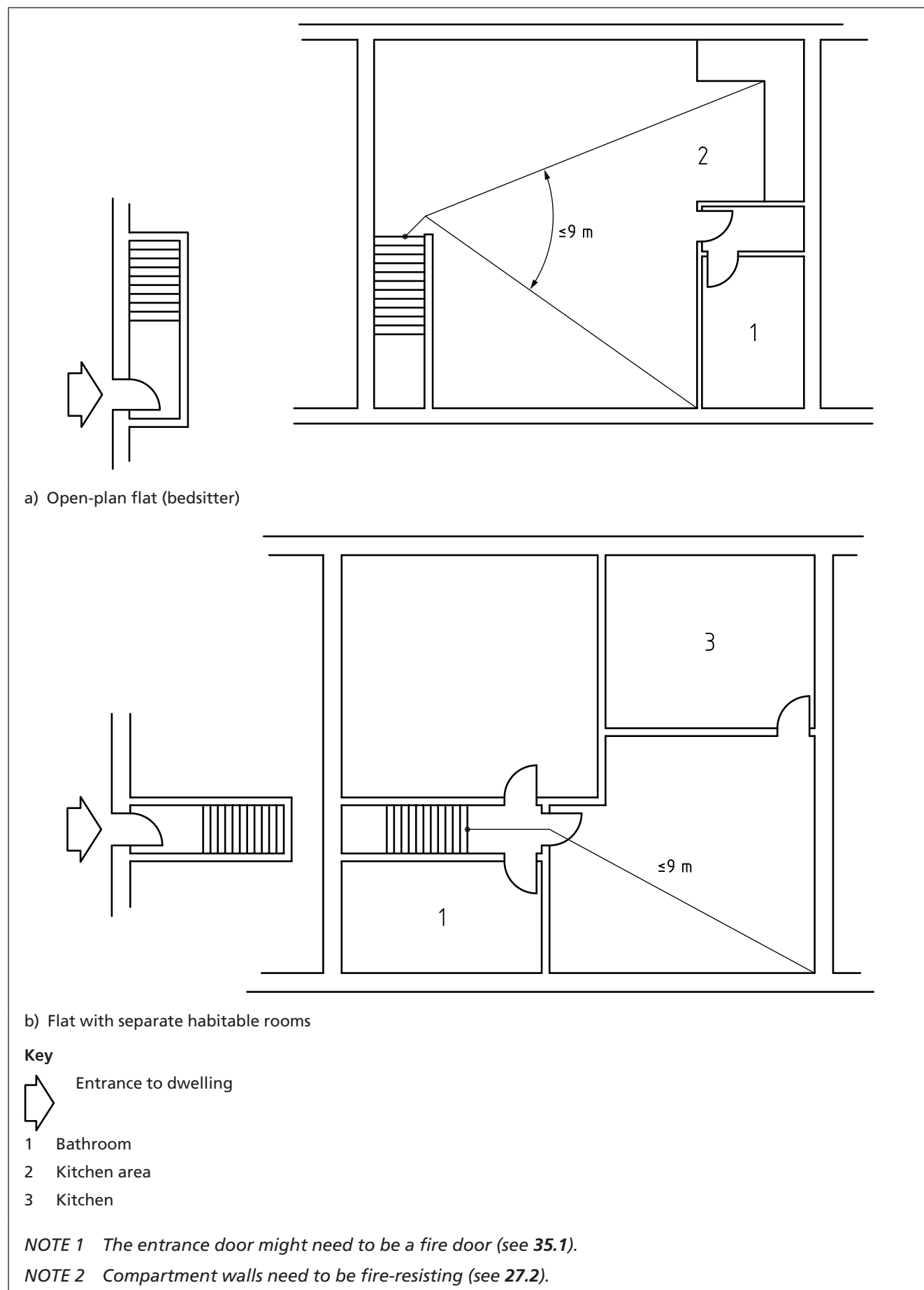


Figure 14 Flat (entered from below) with a protected entrance hall and restricted travel distance

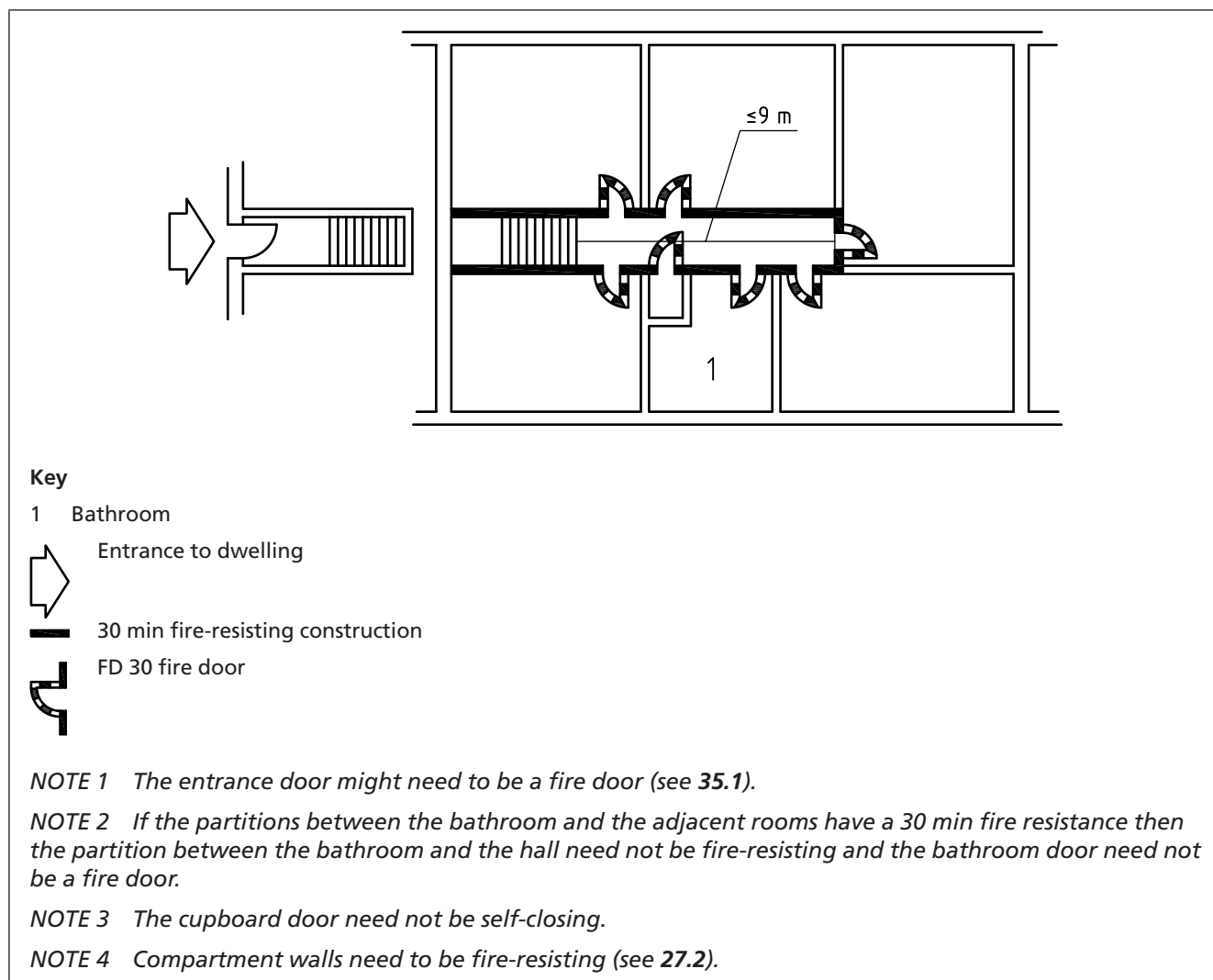
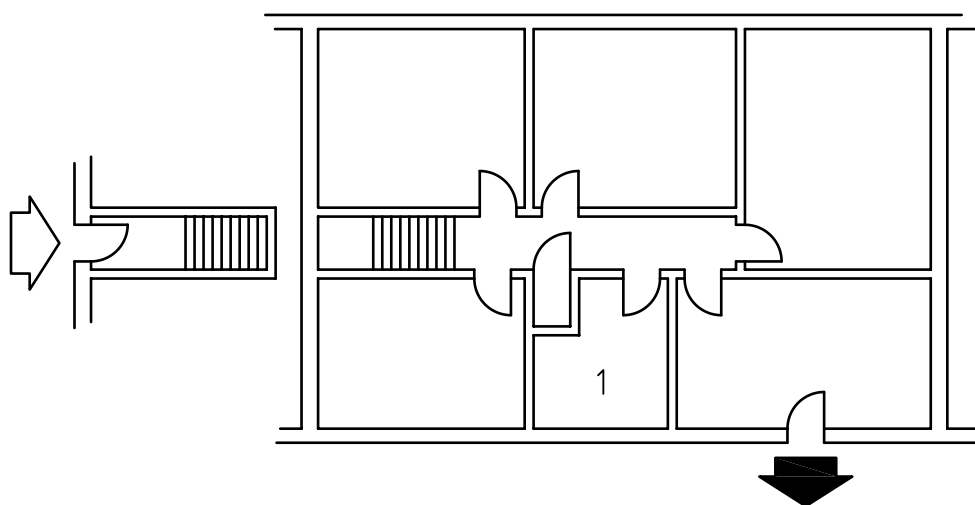
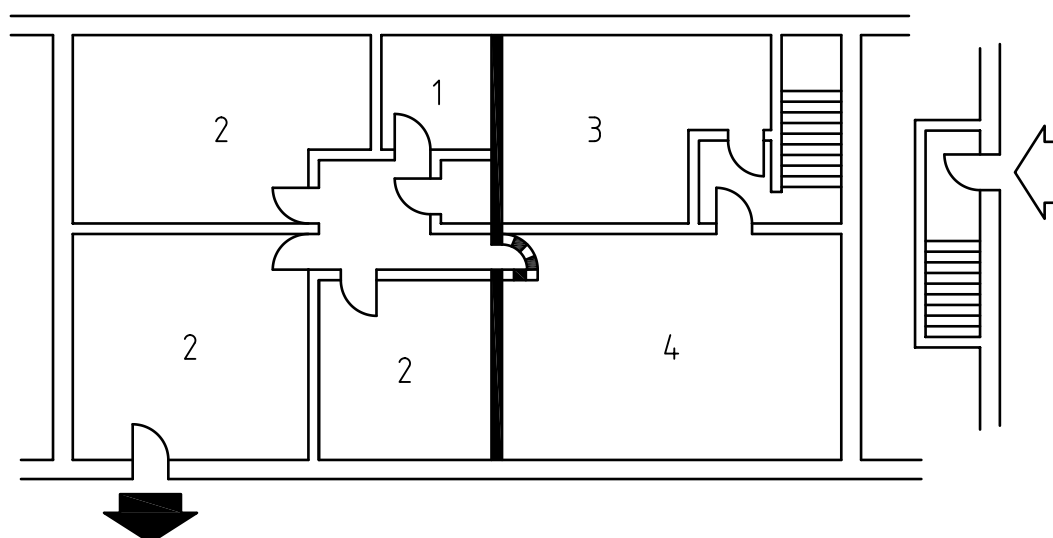


Figure 15 Flat (entered from above or below) with an alternative exit



a) Flat where all habitable rooms have direct access to an entrance hall



b) Flat where all habitable rooms do not have direct access to an entrance hall

NOTE 1 The fire-resisting partition separates living and sleeping accommodation.

NOTE 2 The bedrooms are not classed as inner rooms because escape is possible in two directions.

Key

— 30 min fire-resisting construction

FD 30 fire door



Entrance to dwelling



Alternative exit from dwelling

NOTE 3 The entrance and alternative exit doors might need to be fire doors (see 35.1).

NOTE 4 Compartment walls need to be fire-resisting (see 27.2).

9.6 Flats with galleries

Flats with galleries should conform to the following recommendations.

- a) The main level of the flat should be planned and constructed in accordance with Figure 12a), Figure 12b) or Figure 11, as applicable.
- b) Any cooking facilities within a room containing a gallery should, where practicable, be enclosed with fire-resisting construction. Where cooking facilities are not enclosed with fire-resisting construction, they should be positioned such that they do not create an obstruction to the escape route from the gallery or from the flat.
- c) The distance from the foot of the access stair to the gallery and the entrance door of the flat or a door leading to a protected entrance hall should not exceed 3 m.
- d) Where the travel distance from the head of the access stair to the gallery to any point in the gallery exceeds 7.5 m, an alternative exit should be provided from the gallery.
- e) Where the gallery exceeds 50% of the area of the floor below, the gallery should be treated as an inner room.

9.7 Open-plan flat design

Open-plan flats should not be used for sheltered housing or extra care housing.

Open-plan flats that do not have protected corridors or hallways but that have bedrooms that are inner rooms without having an alternative means of escape, and that are accessed directly from a lounge or similar type accommodation may be permitted as flats and basement flats, provided the open-plan flat is fitted throughout with a sprinkler system designed and installed in accordance with BS EN 12845 or BS 9251 and a fire alarm system in accordance with BS 5839-6, Grade D, LD1.

Open-plan flats should conform to the following.

- a) The size of the open-plan flat should not exceed 16 m x 12 m.
- b) Open-plan flats should be situated on a single level only.
NOTE 1 Single level flats exclude flats with galleries.
- c) The ceilings within the open-plan flat should have a minimum height of 2.25 m.
- d) The kitchen should be enclosed in open-plan flats having an area exceeding 10 m x 8 m. Cooking appliances in open-plan flats having an area smaller than 10 m x 8 m should not be adjacent to the entrance of the flat.

NOTE An open-plan flat design is not compatible with small, single staircase buildings reliant upon internal protected entrance halls for lobby protection to the staircase enclosure.

9.8 Internal planning of sheltered housing

Internal planning of sheltered housing should be in accordance with the appropriate provisions of Clause 8, and 9.1 to 9.5.

Section 3: Stairs and final exits

10 Number and siting of common stair

In buildings or parts of buildings occupied for non-residential purposes a single common stair would be considered acceptable only in very limited circumstances. However, in buildings comprising flats and/or maisonettes, because of the degree of compartmentation provided and the special provisions made for controlling the spread of smoke within common horizontal escape routes, whether or not a single common stair is acceptable depends entirely on any limitations imposed in respect of travel distances or, for balcony or deck approach dwellings, fire-fighting purposes.

A minimum of one common stair should be available from each storey providing access to dwellings.

Where necessary, additional common stairs should be provided to enable dwellings to conform to travel distance recommendations or, for balcony or deck approach dwellings, fire-fighting purposes (see Figure 5). Additional common stairs should be sited such that they provide effective alternative directions of travel from any dwelling served by those stairs other than accepted dead ends [see Figure 7b)].

11 Width of common stairs

The unobstructed width (measured between the walls and/or balustrades) of each common stair should be not less than 750 mm; a common stair which is a fire-fighting stair should have an unobstructed width (measured between the walls and/or balustrades) of 1.1 m. The width should be kept clear for a vertical distance of 2.0 m.

NOTE Handrails and strings that do not intrude more than 100 mm into these widths may be discounted when calculating the common stair width.

Where two or more common stairs are provided they should be located such that they are situated remotely from each other. Where a common corridor connects two or more storey exits, measures should be provided to prevent both stairs from being affected by the smoke from a single fire. Such measures may include subdivision by a self-closing fire door with, if necessary, an associated fire screen. The door should be positioned such that smoke is not likely to affect access to more than one storey exit.

12 Enclosure of common stairs

In buildings exceeding 18 m in height, one or more common stairs should be designed as fire-fighting stairs.

NOTE 1 See 19.3.2 and BS 9999:2008, Clause 21, for further information.

The following recommendations should be met for common stairs that are not fire-fighting stairs.

- a) No store room should open directly into a common stair.

NOTE 2 For recommendations for engineering services such as gas, electricity and refuse disposal, see Section 8.

- b) If a common stair projects beyond, is recessed from, or is an internal angle of, the external enclosures to a building:
 - 1) the distance between any opening in the external enclosure to the building and any opening in the enclosure to the stair should be not less than 1.8 m (see Figure 16);