

Fire precautions in the design, construction and use of buildings —

Part 10: Code of practice for shopping complexes

ICS 13.220.01; 91.040.20

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Fire Standards Policy Committee (FSM/-) to Technical Committee FSM/14, upon which the following bodies were represented:

- Association of Metropolitan Authorities
- British Fire Services' Association
- British Gas plc
- British Retailers Association
- British Telecommunications plc
- Building Employers Confederation
- Chartered Institution of Building Services Engineers
- Chief and Assistant Chief Fire Officers' Association
- Consumer Policy Committee of BSI
- Department of Education and Science
- Department of Health
- Department of the Environment (Property Services Agency)
- Department of the Environment (Building Research Establishment) (Fire Research Station)
- Department of the Environment (Construction Directorate)
- Department of the Environment for Northern Ireland
- Electricity Industry in UK
- Fire Brigades Union
- Health and Safety Executive
- Home Office
- Incorporated Association of Architects and Surveyors
- Institute of Building Control
- Institution of Fire Engineers
- Institution of Gas Engineers
- Institution of Structural Engineers
- London Fire and Civil Defence Authority
- Loss Prevention Council
- National Association of Fire Officers
- National Council of Building Material Producers
- Royal Institute of British Architects
- Royal Institution of Chartered Surveyors
- Scottish Office (Building Directorate)
- Society of Chief Building Regulation Officers
- Timber Research and Development Association

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Access Committee for England
- Association of Consulting Engineers
- British Automatic Sprinkler Association
- British Council of Shopping Centres
- British Fire Protection Systems Association Ltd.
- British Property Federation
- Flat Glass Manufacturers' Association
- Hevac Association
- Intumescent Fire Seals Association
- London District Surveyors Association
- Society of Fire Safety Engineers
- Warrington Fire Research Centre

This British Standard, having been prepared under the direction of the Fire Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 20 December 1991

© BSI 8 December 2004

The following BSI references relate to the work on this British Standard:
Committee reference FSM/14
Draft for comment 87/43818 DC

Amendments issued since publication

Amd. No.	Date	Comments
14994	8 December 2004	See national foreword

ISBN 0 580 19814 6

Contents

	Page
Committees responsible	Inside front cover
Foreword	iii
Section 1. General	
1 Scope	1
2 Definitions	1
3 Use of this code	6
Section 2. Analysis of the problem	
4 Planning in relation to fire	9
5 Escape from fire	10
6 Uncovered shopping complexes, small shopping developments and refurbishment of existing shopping complexes	12
Section 3. Facilities for the fire service	
7 Facilities for the fire service	13
Section 4. Planning of escape	
8 General	27
9 Escape routes serving units and other occupancies	28
10 Escape routes serving other public facilities	36
11 Escape routes serving non-public common areas and ancillary accommodation	38
12 Stairs and final exits	39
13 Wayfinding and spatial orientation (architectural design, fire safety signs and messages)	46
Section 5. Construction	
14 Construction	47
Section 6. Fire protection facilities	
15 General	57
16 Fire detection and alarm systems	57
17 Control of evacuation in a fire	60
18 Automatic fire protection systems and special risk protection	64
19 Manual firefighting equipment	66
20 Smoke control provisions	67
Section 7. Engineering services	
21 General	77
22 Boiler rooms, fuel storage areas, transformer, battery and switchgear rooms, and rooms housing fixed internal combustion engines	78
23 Waste storage and treatment	79
24 Gas services	79
25 Electrical services	79
26 Lighting	82
27 Heating, mechanical ventilation and air conditioning systems	83
28 Lifts and escalators	85
29 Incinerators	86
Section 8. Management	87

	Page
Appendix A Uncovered shopping complexes, small shopping developments, refurbished and existing premises incorporated into shopping complexes	89
Appendix B Impact resistance of partitions	90
Appendix C Commissioning and hand-over of smoke control systems	91
Publications referred to	93
Figure 1 — Unit exits, small exits, storey exits and final exits (plan)	3
Figure 2 — Smoke control zones and smoke reservoirs (cross-section)	5
Figure 3 — Access to floor areas in single-storey shopping complexes with no fire main	14
Figure 4 — Access to floor areas in single-storey shopping complexes with wet fire main	15
Figure 5 — Access to fire main inlets in multi-storey shopping complexes	16
Figure 6 — <i>Deleted</i>	16
Figure 7 — Access to floor areas from firefighting shafts in multi-storey shopping complexes	17
Figure 8 — Ventilation provisions for basement rooms	23
Figure 9 — Alternative escape routes from units	29
Figure 10 — Travel distance in covered malls	29
Figure 11 — Mall widths	32
Figure 12 — Example of calculation of mall exit widths	33
Figure 13 — Service corridors and goods lifts	35
Figure 14 — Escape routes across service areas	36
Figure 15 — Corridors connecting alternative exits	41
Figure 16 — Fire resistance of areas adjacent to external stairs	45
Figure 17 — Smoke reservoir common to several smoke control zones	69
Table 1 — Maximum travel distances in malls	30
Table 2 — Maximum travel distances (other than in malls)	40
Table 3 — Capacities of exits (other than from malls)	40
Table 4 — Capacity of a stair	43
Table 5 — Structural fire protection of certain facilities	51
Table 6 — Limitations on non-insulating fire-resisting glazed elements	52
Table 7 — Control room indications of status of fire protection equipment	64
Table 8 — Impact resistance tests for partitions	91

Foreword

This Code of practice was prepared under the direction of the Fire Standards Policy Committee. It is a revision of Fire Prevention Guide No. 1 “Fire precautions in town centre redevelopment” (HMSO, 1972).

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to text carry the number of the amendment. For example, text altered by Amendment No. 1 is indicated by **A1** **A1**.

All matters dealing with fire safety management are now located in BS 5588-12.

Other Parts of BS 5588 which are already published are as follows.

- *Part 0: Guide to fire safety codes of practice for particular premises/applications;*
- *Part 1: Code of practice for residential buildings;*
- *Part 4: Code of practice for smoke control using pressure differentials;*
- *Part 5: Code of practice for firefighting stairs and lifts;*
- *Part 6: Code of practice for places of assembly;*
- *Part 7: Code of practice for the incorporation of atria in buildings;*
- *Part 8: Code of practice for means of escape for disabled people;*
- *Part 9: Code of practice for ventilation and air conditioning ductwork;*
- *Part 11: Code of practice for shops, offices, industrial, storage and other similar buildings;*
- *Part 12: Managing fire safety.*

Attention is drawn to **3.3** which discusses the relationship between this code and the other Parts of BS 5588 which deal with fire precautions in the design of specific types of occupancy. In particular, this code is closely related to Part 11.

In this code a commentary on the relevant principles is followed by any recommendations that are made. The commentary is intended to provide an explanatory background to recommendations, especially if the recommendations might otherwise appear to be arbitrary.

NOTE Commentary text is printed in italics.

It has been assumed in the drafting of this code that the execution of its provisions will be entrusted to appropriately qualified and experienced people. 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.

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 does not of itself confer immunity from legal obligations.

In particular, attention is drawn to **3.4**, **5.5**, **10.3** and Clauses **16**, **19**, and **24**.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 95 and a back cover.

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

Section 1. General

1 Scope

This Part of BS 5588 relates to buildings which comprise a number of individually occupied premises to which common access is provided principally for the benefit of shoppers.

It deals with planning, construction and facilities for fire safety, and the provision of escape routes in case of fire, in new shopping complexes and in alterations and extensions to existing **[A1]** shopping **[A1]** complexes. It includes the measures and facilities necessary for preventing the rapid spread of fire and those required to assist firefighting, and it makes specific recommendations in terms of protection, number and position of exits, provides guidance on design principles for preventing the spread of fire and indicates the fire precautions necessary. The recommendations and guidance should, in the event of fire, safeguard the lives of people working in or visiting such **[A1]** shopping **[A1]** complexes, and may help to protect the **[A1]** shopping **[A1]** complex and its contents against the effects of fire.

Advice for managers of shopping complexes is included to aid them in making the best use of the design features of the **[A1]** shopping **[A1]** complex, and to act as a guide to designers in passing to their clients information about fire precautions designed into the **[A1]** shopping **[A1]** complex. Guidance is given **[A1]** in BS 5588-12 **[A1]** on the fire safety management of shopping complexes, on the control of, and upkeep of safety provisions in, the common areas and on the part which management and their staff need to play in initiating and directing emergency procedures.

Although this code deals primarily with the common public and non-public areas of shopping complexes, in order that an adequate standard of fire safety may be achieved in these areas the code includes some recommendations that affect the units forming the **[A1]** shopping **[A1]** complex (particularly shop units). Thus this code supplements other Parts of BS 5588 dealing with particular occupancies, when those occupancies form part of a shopping complex.

Appendix A deals with refurbished and existing premises incorporated into shopping complexes, and with uncovered shopping complexes and small shopping developments.

This code is not intended to apply to **[A1]** shopping **[A1]** complexes during the course of construction.

NOTE The titles of the publications referred to in this standard are listed on page 91.

2 Definitions

For the purposes of this Part of BS 5588 the following definitions apply.

2.1

ancillary accommodation

all parts of a shopping complex that are ancillary to the common areas (see 2.4) and are under the control of the management of the **[A1]** shopping **[A1]** complex (such as rooms associated with engineering services, servicing areas and refuse rooms)

NOTE For the purposes of this Part of BS 5588, car parks are not treated as ancillary accommodation.

2.2

basement

a storey that is below the ground storey (see 2.22)

2.3

canopy

any horizontal structure projecting into a void (see 2.44), e.g. the soffit of an upper level walkway which is not fully stepped back from the level below

2.4

common area

any part of a shopping complex other than a unit (see 2.42), other occupancy (e.g. place of assembly, office block or residential block) or area occupied by the management of the **[A1]** shopping **[A1]** complex

2.5

(fire) compartment

a building or part of a building, comprising one or more rooms, spaces or storeys, constructed to prevent the spread of fire to or from another part of the same building, or an adjoining building

2.6**class 0 material or surface**

either:

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

2.7**compartment floor/wall**

a fire-resisting floor or wall used in the separation of one fire compartment from another

2.8**covered shopping complex**

a shopping complex that includes a covered mall, i.e. any mall section (see **2.26**) in which:

- a) more than 15 m of the length of the mall is covered by a bridge or roof; or
- b) (where the mall has an open slot above it, formed for example by projecting continuous canopies) more than 50 % of its plan area is obscured; or
- c) (in any other case) at least 25 % of its plan area is obscured by a roof or by floors, bridges, galleries or canopies

2.9**dead end**

a place from which escape is possible in one direction only, or in directions less than 45° apart that are not separated by fire-resisting construction

2.10**depth (of a building)**

the level of the surface of the lowest point of the floor of the lowest storey, measured at the centre of that face of the building where the measurement is greatest from the level of the footway or paving in front of that face, or if there is no such footway or paving, from the level of the ground

2.11**elements of structure**

beams, columns, floors and loadbearing walls

2.12**escape lighting**

lighting provided, for use when the supply to the normal lighting fails, to ensure that the escape routes are illuminated at all material times

2.13**escape route**

a route forming part of the means of escape from any point in a shopping complex to a final exit

2.14**final exit**

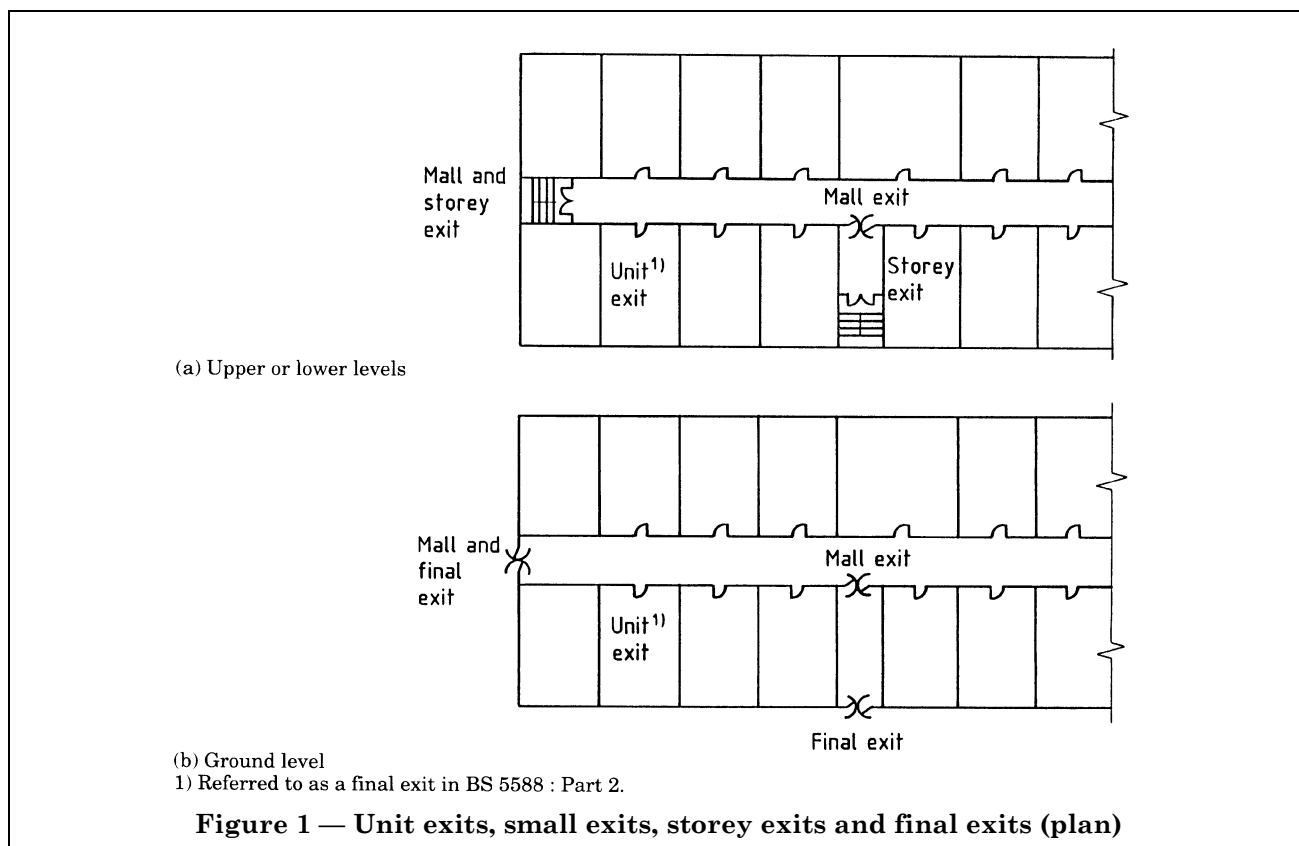
the termination of an escape route from a A_1 shopping A_1 complex giving direct access to a street, passageway, walkway or other open space sited to ensure the rapid dispersal of persons from the vicinity of the A_1 shopping A_1 complex so that they are no longer in danger from fire and/or smoke (See Figure 1.)

NOTE This might include a mall exit (see **2.25**), but not a unit exit (see **2.43**) delivering into a mall.

2.15**fire alarm/fire detection zone**

a subdivision of the A_1 shopping A_1 complex such that the occurrence of a fire within it will be indicated by the fire alarm system separately from an indication of fire in any other subdivision

NOTE Each small unit is considered as a zone. Larger single-storey or multi-level units may constitute more than one zone, depending upon their smoke control and fire separation arrangements.

**2.16****fire door (assembly)**

a door or shutter provided for the passage of persons, air or objects which, together with its frame and furniture as installed in a building, 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

2.17**firefighting lift**

a lift designated to have additional protection with controls that enable it to be used under the direct control of the fire service in fighting a fire

2.18**firefighting lobby**

a protected lobby providing access from a firefighting stair to the **A1** shopping **A1** complex and to the firefighting lift

2.19**firefighting shaft**

a protected enclosure containing a firefighting stair, firefighting lobbies and, if provided, a firefighting lift together with its machine room

2.20**firefighting stair**

a protected stairway communicating with the **A1** shopping **A1** complex only through a firefighting lobby

2.21**fire resistance**

the ability of a component or construction of a building to satisfy for a stated period of time some or all of the appropriate criteria specified in the relevant Part of BS 476

2.22**ground storey**

a 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

2.23**height (of a building)**

the level of the surface of the highest point of the floor of the highest storey (excluding any such storey consisting exclusively of plant rooms) measured at the centre of that face of the building where the measurement is greatest from the level of the footway or paving in front of that face, or if there is no such footway or paving, from the level of the ground

2.24**mall**

an access route for pedestrians in a shopping complex

2.25**mall exit**

a final exit (see 2.14) from a mall, or a storey exit (see 2.39), or an exit from a mall which leads directly to a storey exit or final exit by way of a protected corridor/passageway (see Figure 1)

2.26**mall section**

the length of mall between two mall exits

2.27**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

2.28**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 safety

2.29**non-combustible material**

any material capable of satisfying the performance requirements specified in BS 476-4, or any material which, when tested in accordance with BS 476-11, does not flame nor cause any rise in the temperature on either the centre (specimen) or furnace thermocouples

2.30**place of safety**

place in which persons are in no danger from fire

2.31**protected circuit**

an electrical circuit protected against fire

2.32**protected lobby/corridor**

a circulation area consisting of a lobby or corridor enclosed with fire-resisting construction (other than any part that is an external wall of a building)

2.33**protected stairway**

a stair discharging through a final exit to a place of safety (including any exit passageway between the foot of the stair and the final exit) that is adequately enclosed with fire-resisting construction

2.34**public common area**

a common area which is intended for public use

2.35**self-closing fire door**

a fire door fitted with a device which fully closes the door, overriding the resistance of any latch

2.36**shopping complex**

a structural combination of a number of commercial premises that includes areas providing common access for the public, principally for shopping purposes

2.37**smoke control zone**

the subdivision of a shopping complex for smoke control purposes (see Figure 2)

NOTE A smoke control zone may consist of:

- a) all or part of a unit; or
- b) all or part of a mall, together with those units (or parts of units) from which smoke may flow into a mall.

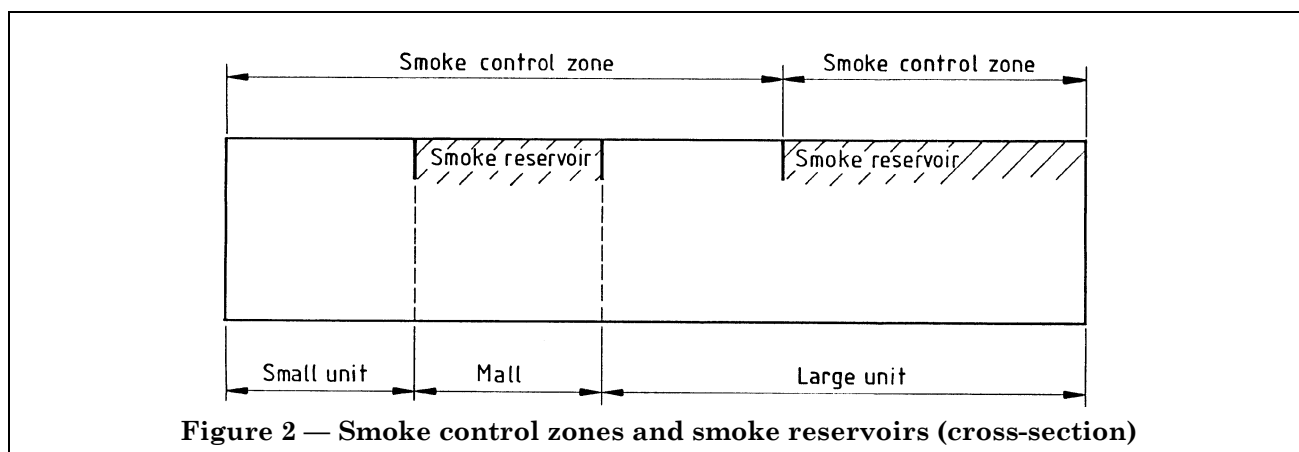


Figure 2 — Smoke control zones and smoke reservoirs (cross-section)

2.38**smoke reservoir**

a volume provided for the collection of smoke resulting from a fire in a unit or mall (see Figure 2)

2.39**storey exit**

a final exit (see 2.14), or doorway giving direct access to a protected stairway, firefighting lobby, or external escape route (see Figure 1)

2.40**travel distance**

the actual distance to be travelled by a person along an escape route to the nearest mall exit or storey exit, having regard to the layout of walls, partitions and fittings

2.41**uncovered shopping complex**

a shopping complex that does not include a covered mall (see 2.8)

2.42**unit**

premises in individual occupancy which forms part of a shopping complex

NOTE This includes all shops and any other business premises served by a mall or walkway, but does not include places of assembly, blocks of offices, hotels or dwellings accessible from a shopping complex.

2.43**unit exit**

the termination of an escape route from within a unit. This may be a point at which persons enter a common area (see Figure 1)

2.44**void**

an opening in a floor, connecting one level of a mall with another level

3 Use of this code**3.1 Safety measures**

The recommendations in this code are intended to provide safety from fire by promoting safe aspects of design, construction and management in the following areas:

- a) planning and protection of escape routes from any area that may be threatened by fire;
- b) construction and finishing with suitable materials and embodying adequate fire resistance in the structure;
- c) segregation of areas used by the public from those used for the general servicing of the **A1** shopping **A1** complex;
- d) fire warning systems and, where appropriate, systems for the automatic detection of fire;
- e) automatic fire extinguishing systems to limit the growth of fire;
- f) smoke control systems to maintain the effectiveness of escape routes;
- g) the provision of firefighting equipment, whether for use by the staff/management in containing fire in its early stages, or by way of assistance to the fire service;
- h) the provision of adequate and reasonable access to the **A1** shopping **A1** complex for the fire service, including facilities for the safe and rapid extinction of fire by the fire service and for the safety of the fire service personnel when firefighting;
- i) **A1** details of effective management controls can be found in BS 5588-12 **A1**.

3.2 Use of the principles and application of the recommendations

It is not possible to make comprehensive recommendations capable of covering every possible risk, and an intelligent appreciation of the principles and application of the recommendations of this code is therefore essential. The fire hazard of a particular type of unit and its contents, and the kinds of occupant together with their likely state of awareness and/or distraction, have to be appreciated in the design of a shopping complex. To use this code effectively, the behaviour of a fire occurring anywhere in the **A1** shopping **A1** complex and the response from people thus put at risk has to be anticipated.

Individual recommendations of this code applied in isolation may give little or no benefit, and could even reduce the level of fire safety. For maximum benefit all the recommendations should be applied. Although the basic principles and recommendations for escape from common public areas are described in Section 4, the most conscientious application of these recommendations would be undermined unless supported by the necessary measures relating to access and facilities for the fire service, construction, fire protection facilities, engineering services and management set out in Section 3, Section 5, Section 6, **A1** Section 7 and BS 5588-12 **A1**.

Although it is difficult to achieve a consistent standard of safety between shopping complexes which vary in size, location, facilities and design, the adoption of certain arbitrary values ought to provide some guarantee of a basic standard of safety.

This approach does not, however, make allowance where buildings exceed the minimum safety criteria, or where the design incorporates features which enhance some particular aspect of safety.

Therefore, an understanding and flexible use of the recommendations in this code is encouraged as it is not intended to enforce particular forms of design. However, it is particularly important that any variations from the code should be subject to a rigorous examination and justification.

3.3 Relationship to other codes of practice

The recommendations in this code are intended to be applied together with guidance related to specific types of occupancy of the units of a shopping complex. They are intended to supplement that guidance in circumstances which apply when the accommodation of those occupancies presents a mutual risk and when the escape routes with which they are independently provided terminate in the common covered areas of a shopping complex rather than in the open air.

Attention is particularly drawn to **9.1**, **16.1**, **18.2** and **26.5**, which recommend standards in connection with means of escape from small shop units and provisions for alarms of fire, sprinkler protection and escape lighting that are different from those recommended in **BS 5588-11**.

Where uses other than units form part of a shopping complex, the escape routes from these occupancies should generally be independent of the means of escape from the common parts of the shopping complex.

3.4 Relationship with statutory provisions

3.4.1 General

It is important to appreciate the relationships between this code and the various statutory provisions relevant to the design and construction of new buildings and to the fire precautions to be provided in existing buildings. The relevant legislation indicated in general terms in **3.4.2** and **3.4.3** has to be complied with in the event of a conflict with this code. However, there are two main ways in which this code is intended to supplement the legislation. The first is that, since Acts and Regulations are necessarily drafted in broad terms and cannot deal in detail with a wide variety of different situations, one of the objects of this code is to provide guidance for the building designer in matters not covered in sufficient detail by the legislation. Secondly, because the objectives of the legislation are mainly concerned with the health and safety of the general public, this code is of wider scope and includes matters relevant to the protection of the shopping complex and its contents from fire as well as the safety of the occupants.

3.4.2 Building Regulations

The design and construction of new buildings, and alterations of existing buildings, are controlled by the following statutory provisions collectively referred to as building regulations in this code.

England and Wales: The Building Regulations

Scotland: The Building Standards (Scotland) Regulations

Northern Ireland: Building Regulations (Northern Ireland)

3.4.3 Legislation and other regulations for fire safety in shopping complexes

In addition to the controls mentioned in **3.4.2**, fire safety and means of escape for a wide variety of buildings is dealt with principally under the following legislation.

England and Wales:

The Fire Precautions Act 1971, as amended by the Health and Safety at Work etc. Act 1974 and the Fire Safety and Safety of Places of Sport Act 1987.

The Building Act 1984.

Scotland:

The Fire Precautions Act 1971, as amended by the Health and Safety at Work etc. Act 1974 and the Fire Safety and Safety of Places of Sport Act 1987.

The Building (Scotland) Act 1959 (as amended).

Northern Ireland:

The Fire Services (Northern Ireland) Order 1984 and the Health and Safety at Work (Northern Ireland) Order 1978.

The Planning and Building Regulations (Amendment) (Northern Ireland) Order 1990.

There are also a number of local Acts as well as entertainment and other licensing legislation which deal with fire safety and means of escape. The designer should consult the fire authority and building authority at an early stage to make certain that the building as planned will meet the requirements those authorities may make, particularly if a fire certificate or licence may be necessary.

NOTE Under the Fire Precautions Act, 1971, fire authorities cannot require structural or other alterations relating to escape from the premises as a condition of the issue of a fire certificate, or under an improvement notice, if the plans of the building comply with building regulations, unless:

- a) there are regulations made under Section 12 of the Act and it is necessary to make requirements in order to satisfy those regulations; or
- b) the fire authority is satisfied that the means of escape in case of fire are inadequate by reason of matters or circumstances of which particulars were not required to be supplied to the local authority in connection with the deposit of plans for building regulation purposes.

3.5 Protection of property

Fire safety is often interpreted as meaning only the safety of persons (life safety), but it also includes the protection of property (property safety). For property the level of protection required is usually different from that for life safety purposes alone, where the evacuation time for persons to reach safety is as short as possible.

Fire safety requirements imposed in connection with building regulations are limited to life safety, i.e. The Building Regulations for England and Wales state that in connection with any requirement: "No obligation imposed by these regulations shall require anything to be done beyond what is necessary to secure reasonable standards of health and safety for persons in or about the building and others who may be affected by any failure to comply with that requirement". Even so, some life safety measures may also contribute to property protection.

Property protection includes the building and its contents, hence a higher level of fire-resisting separation and greater compartmentation than recommended in this code may be required to minimize loss or damage. As well as passive protection (see Section 4 and Section 5), active protection (see Section 6), should be considered. The level of active protection required will depend upon the nature and quantity of the contents and may contribute to life safety protection. Both passive and active protection will assist firefighters.

For these reasons it is strongly recommended that the Insurers be consulted at the design stage to incorporate what they require in addition to the levels of protection indicated in this code.

Allowances may be available against the cost of fire protection equipment installed in buildings, whether compulsorily or voluntarily. These in part may arise from discounts on insurance premiums, and attention is drawn to these, and the need to consult the rules and recommendations of the Loss Prevention Council (140 Aldersgate Street, London EC1A 4HY). Also, capital investment in fire protection equipment may be subject to tax concessions under the Finance Acts.

3.6 Diagrams

The figures in this code are intended to clarify concepts, and should not be taken as indicating the only acceptable forms of planning. Features not relevant to the concepts or principle(s) being illustrated are not shown.

3.7 Information to be given to clients

Designers are advised to inform their clients of the nature, function and capabilities of the fire precautions that have been designed into the **A1** shopping **A1** complex, and especially those whose nature may be less evident. This will enable a better understanding of the responsibility for ensuring that a high standard of safety is maintained.

The advice given in **A1** BS 5588-12 **A1** is intended not only as a guide to the management of fire precautions in a shopping complex, but also as a guide to the information concerning the fire precautions that have been designed into the **A1** shopping **A1** complex which designers are advised to pass to their clients.

Section 2. Analysis of the problem

4 Planning in relation to fire

4.1 General

Many early pedestrianized shopping centres were designed with single-level shop unit access and with the public circulation spaces open to the elements. However, with a few exceptions the trend is now for multi-level covered malls with a variety of sizes of unit, and much free space between them so that barriers are not created for shoppers. Early centres tended to be planned on simple straight axial lines, whereas current developments are often designed with a more complex circulation pattern, to achieve interest and encourage pedestrian flow. Lightness in structure and atmosphere is now the norm. Large open spaces and features such as atria and multi-level shop access are common. Aids to easy circulation, such as lifts and escalators, are emphasized in the overall design concept. Fountains and displays are included to add interest. Entertainment facilities and other uses may be included to add variety and attract custom in new developments and to improve existing ones.

The modern shopping complex offers a different set of fire safety problems from those that are common to a single shop, and this code considers these problems and how to mitigate possible fire hazards.

4.2 Site planning

The siting of shopping complexes that form part of the redevelopment of town centre sites is likely to be restricted by existing development. These restrictions might introduce additional fire safety problems, such as access arrangements for firefighters, servicing and car parking arrangements. It is also necessary to ensure that the interface between the [A1] shopping [A1] complex and any surrounding development is satisfactory. Existing shops and other buildings on the periphery of a [A1] shopping [A1] complex may be incorporated to their benefit into the new [A1] shopping [A1] complex, and it will then be necessary to ensure that their fire safety standards do not prejudice the fire safety of the new [A1] shopping [A1] complex, and that any necessary fire separation is provided.

Such problems are unlikely with “out-of-town” shopping complexes, and a large and relatively unrestricted site can offer the opportunity for large-scale leisure facilities and a wide range of other uses to be incorporated in the overall development. The impact of these activities on the commercial part of the [A1] shopping [A1] complex will need consideration.

4.3 Common public areas

A shopping complex is characterized by pedestrian malls that provide public access to the individual units. These malls are the principal common public areas in a [A1] shopping [A1] complex. Where malls are uncovered, fire safety problems are largely those of any conventional shopping development except that the malls need to be wide enough for means of escape purposes, and to restrict the likelihood of a fire in one unit affecting the one opposite. With covered malls, however, a number of fire safety problems arise and this code considers the means to overcome these problems.

First, a covered shopping complex aims to provide an atmosphere, independent of weather conditions, that is comfortable and attractive to shoppers. In a conventional “High Street” situation persons escaping from a fire in a shop are considered to be safe once they have left the shop and moved into the open air. However by enclosing these pedestrian routes a different set of fire safety conditions pertains. People exit into the mall from the affected unit and this additional stage in their escape needs to be effected with relative safety as the malls are a substitute for the public highway, where occupants escaping would expect to find freedom of movement and ultimate safety.

Motivation to escape is important. Research of several major fatal fires and evacuations suggests that in large internal spaces people in a crowd have difficulty in recognizing any immediate threat from a fire elsewhere in the building. People are also likely to underestimate how quickly a fire can spread. In a fire disaster, the uncertainty of the situation in its early stages is usually compounded by a serious delay in warning the public in time for them to start to evacuate and reach safety. To overcome these problems it is necessary to provide a package of related fire precautions measures, complementary staff training and evacuation management procedures, and to introduce appropriate means of escape criteria, aimed at achieving an acceptable level of means of escape conditions in these areas. These aspects are dealt with in Section 4, Section 5, [A1] Section 6 and BS 5588-12 [A1].

4.4 Atria

Atria pose fire safety problems similar to those in multi-level malls as in both cases there is a problem of ensuring that a fire at a lower level does not prejudice the safety of persons on an upper level, and hence some form of smoke control is needed. The form and extent of necessary fire safety provisions depends on a variety of factors that may influence the fire safety design, such as the degree of separation, if any, from accommodation round the atrium, the height and size of the atrium, and the use of the atrium floor.

BS 5588-7¹⁾ deals with fire precautions in buildings containing atria, and should be referred to in appropriate cases.

4.5 Servicing and car parking

As shopping complexes increase in size, so decisions about servicing arrangements become more critical. Servicing at ground level from surrounding open areas poses least fire safety problems. Whilst such an arrangement might be possible in some out-of-town shopping complexes, where site space is not at a premium, it is rarely an option in more urban forms of development, where basement, roof top, or even intermediate level servicing may be the only possibilities. Whatever the arrangements made for servicing, it is essential to ensure strict segregation of vehicular and pedestrian areas, and to provide adequate standards of fire separation between the shopping part of the development (including public common areas such as the malls) and any servicing areas.

Site considerations and local needs will generally determine the form and extent of car parking arrangements, but the relationship between the car parking areas and the rest of the development is important. In the event of an emergency evacuation, many people who arrived at the development by car will endeavour to leave via the car park in order to retrieve their cars. Whether or not this is acceptable will depend on the location and separation between the car parking areas and the rest of the shopping complex, but it is a situation that needs to be taken into account in planning for means of escape. A design that leads to a contraflow between people leaving the shopping complex by the normal escape routes, and people seeking to leave via the car park, is to be avoided.

Similarly, the locations of vehicular exits from the car park areas and fire service access points to the shopping complex need consideration. Depending on the size of the shopping complex, several fire service access points may be needed, and car park exits should not cause conflict with fire service access at these points.

5 Escape from fire

5.1 General

Design of means of escape and other fire precautions within individual units and other uses is dealt with in the relevant part of BS 5588 for the particular occupancy. However, where shopping units are incorporated into a covered shopping complex, the recommendations in those codes need to be varied because, for the shopping complex to function satisfactorily, the units generally need to open directly onto the malls without any intervening compartmentation. Shop fronts may be provided but normally these would not offer any measure of fire-resisting separation. Life safety is also affected by the large number of persons likely to be present and who may be simultaneously at risk in the event of fire, particularly during peak trading hours and peak shopping seasons.

As stated in 4.3, the malls are in effect a substitute for the open street during initial escape from a fire-affected unit, and because the main retail areas and the malls are often a single fire compartment, the impact that a fire in one unit might have on other units within the same fire compartment, and the consequences of the fire affecting persons escaping from these other units, are important considerations. In consequence, a package of fire safety features is needed. As these will affect the design of the individual units as well as the design of the common areas, it is important to realize that these features are largely interrelated and are not a series of individual items.

¹⁾ Footnote deleted

5.2 Means of escape and control of smoke in covered **[A1]** shopping **[A1]** complexes

Except in the case of larger shops on the periphery of a **[A1]** shopping **[A1]** complex, which have routes through the shop leading to the rest of the **[A1]** shopping **[A1]** complex, shoppers will tend to enter a **[A1]** shopping **[A1]** complex via the system of malls, and in a fire or other emergency they will tend to leave by the same route. Not only is this to be expected, but it is to be encouraged, as familiarity with the route will aid, rather than hinder, evacuation.

The consequence of accepting entrances onto malls from shops and other units as “storey exits” for evacuation purposes necessitates keeping the malls reasonably clear of smoke in the event of fire. If the provision of fire-and smoke-separating construction between every unit and the malls is discounted as an unreasonable constraint on design (and it may indeed often be impractical) then there are two ways to deal with the problem.

Hot smoky gases can be confined to, and extracted from, the unit of fire origin. This may be difficult to achieve, particularly where there are many small units, as each unit would need to have an individual smoke control system. The second way is to accept that it is not usually practicable to prevent smoke from entering the mall, and therefore not to hinder its movement into the mall whilst it is at the hot and buoyant stage. The concept then relies on restricting the sideways spread of smoke once it gets into the mall by the use of curtains at ceiling level. These create smoke reservoirs, from which smoke is extracted by natural or powered means at a rate which keeps the level of the underside of the smoke within the reservoir sufficiently high above the heads of any persons escaping so as to enable them to escape under the smoke layer with a reasonable degree of safety. Provided that the reservoirs are sufficiently limited in area, persons do not have to travel too far beneath the hot smoky layer, and should be able to progressively escape along the mall system to a clearer atmosphere, and eventually to leave the **[A1]** shopping **[A1]** complex.

In the event of evacuation from a fire in a covered shopping complex the primary route of escape is via the mall, and the various fire safety features are intended to enable the mall to be considered as a street for escape purposes. Despite this, a secondary means of egress from each unit is generally needed, except in very small units. In a “High Street” situation certain small shops would be acceptable with a single exit, but when shops of this size are included in a covered shopping complex a secondary exit from the rear of each unit is needed since the location of the fire might adversely affect escape of persons into the mall, not only from the unit of fire origin, but also from the one opposite. Subject to adequate fire separation from other parts of the **[A1]** shopping **[A1]** complex, servicing corridors at the rear of the units may often prove suitable for use as a secondary route. When this is done, management arrangements to ensure that the corridors are kept free from obstruction is essential. Shops above the size limit for “small shops” **[A1]** (see BS 5588-11) **[A1]** are likely to need more than one exit in any case, so additional arrangements are appropriate.

5.3 Restricting fire growth in covered **[A1]** shopping **[A1]** complexes

Whatever method of smoke control is adopted, an essential feature in the design of covered shopping complexes, and one that affects directly the design of individual units, is the need to restrict fire growth to an extent that will enable the smoke control system to cope. Thus in any covered shopping complex sprinkler protection is fundamental. The sprinkler system needs to be provided not only in all shopping areas, but also in storage and service areas, to avoid uncontrolled fire growth in these areas affecting the malls. Without sprinkler protection this could happen despite the provision of fire-resisting construction between these non-public areas and the units and public common areas. Similarly, where a mall is used to provide access to major areas of use other than shopping, then sprinkler protection of these other uses is likely to be needed if the users of the shopping part of the **[A1]** shopping **[A1]** complex are not to be unduly hazarded.

Whether or not sprinklers need to be provided in the malls will depend on the extent to which any significant fire load is introduced into the mall, e.g. by trading stalls and displays. It follows that the materials of construction used in the malls should themselves not contribute unduly to fire growth. This does not mean that all materials in these parts of a shopping complex should be wholly non-combustible, and limited amounts of combustible materials in shop signs and decorative features may be acceptable.

5.4 Internal subdivision in covered **[A]** shopping **[A]** complexes

Although a large part of a covered shopping complex might form a single fire compartment, a degree of fire separation within this volume is nevertheless still needed to restrict fire growth, for example by providing separation with fire-resisting construction between one unit and adjacent units. Similarly, and notwithstanding that units may have no fire separation at the point where they front onto a mall, some units may need to have floors constructed as compartment floors with any vertical connections provided by “protected shafts”. This would be appropriate mainly for units of large floor area, and in respect of units having an exit onto a mall at more than one level. Without such separation, a fire at one level in a unit would immediately affect the other level(s) and in consequence could affect more than one level of the mall at the same time.

5.5 Disabled persons

The Chronically Sick and Disabled Persons Act 1970, and the 1976 amendment, and for Northern Ireland, the Chronically Sick and Disabled Persons (Northern Ireland) Act 1970, require that buildings are designed so that they are accessible to disabled persons wherever this is reasonable and practicable. Building regulations also make requirements for access (and facilities) for the disabled.

BS 5810 gives guidance on access for disabled persons, whilst BS 5588-8 gives guidance on means of escape, stressing the need for effective management of the evacuation **[A]** (see BS 5588-12) **[A]**.

5.6 Management

Unified management is an essential feature of any shopping complex. Many of the features and facilities outlined in this clause and incorporated into a **[A]** shopping **[A]** complex necessitate close control by management. Often these controls are extremely sophisticated. A fire safety strategy on how the **[A]** shopping **[A]** complex will be used and managed is an essential consideration at the design stage if satisfactory escape from fire is to be effected. A high standard of management capability cannot be over-emphasized. Further details are given in **[A]** BS 5588-12 **[A]**.

5.7 Avoidance of manipulative apparatus for means of escape

Reliance for fire safety on manipulative apparatus for means of escape, or on external rescue from the lower storeys of a shopping complex by the fire service using mobile ladders, is not satisfactory. This code provides for the public and staff on any storey being able to escape safely from the **[A]** shopping **[A]** complex without outside assistance, should a fire occur.

5.8 Distances of travel

Some of the recommendations in this code include limitations on the distance of travel between two points: these are based on past experience and practice and represent the maximum distance a person can reasonably be expected to walk to escape from fire. Although it could not be said that a slightly greater distance would be so unsafe that it should under no circumstances be adopted, designers should aim to keep travel distances as short as possible, rather than designing to the maximum distance recommended. It should be noted that, should the nearest storey exit be unavailable, the distance to an alternative exit may exceed that given in Section 4.

6 Uncovered shopping complexes, small shopping developments and refurbishment of existing **[A]** shopping **[A]** complexes

Whilst the recommendations set out in this code are generally capable of being applied to most new shopping complexes, some variation is acceptable in small developments where full compliance with the recommendations could be difficult, and in uncovered shopping complexes where some recommendations might be inappropriate. It is also necessary to consider problems associated with refurbishment of existing **[A]** shopping **[A]** complexes of all sizes. Constraints imposed by the existing building may necessitate considerable flexibility in applying the recommendations.

These forms of development are dealt with in Appendix A.

Section 3. Facilities for the fire service

7 Facilities for the fire service

7.1 General

In order for firefighters to successfully deal with a fire in a shopping complex, it is first necessary for them to drive their fire appliances to entrances giving them access to the interior of the building. They need to then transport themselves and their equipment from this point to the scene of the fire. In extensive multi-storey **[A]** shopping **[A]** complexes, this route may be long and involve travel to upper or lower levels. Even in single-storey **[A]** shopping **[A]** complexes, travel within the **[A]** shopping **[A]** complex may be extensive. Having reached the scene of the fire they will need, amongst other things, an adequate supply of water at sufficient pressure to enable them to deal with the fire.

The presence of smoke and heat may also seriously hamper and delay firefighters' efforts to effect rescues and carry out firefighting operations. The provision of smoke control measures required to assist means of escape will also aid firefighting, and it will be necessary to provide some form of smoke control to assist firefighting in some areas such as enclosed car parks and covered service areas where it is not required for means of escape.

Good communications between firefighters at the scene of an incident are vital to successful firefighting, particularly in **[A]** shopping **[A]** complexes when personal contact between firefighting teams, and between them and the management of the **[A]** shopping **[A]** complex, is likely to be inherently difficult.

Effective command and control of firefighting operations is essential in shopping complexes, preferably carried out from an agreed location. Many fire services have their own vehicular mobile command centres which need to be located outside the **[A]** shopping **[A]** complex, but more effective command and control is possible from a fire control centre sited within the **[A]** shopping **[A]** complex from which control of communications and fire safety systems is possible and where there is contact with the management of the **[A]** shopping **[A]** complex.

It is important that the time taken to reach the actual scene of a fire, by a sufficient number of firefighters provided with adequate resources to effect any necessary rescues and commence firefighting operations, is kept to an absolute minimum. Early consultation with the fire and local authorities is advised to identify remedy potential difficulties in providing facilities to assist the fire service.

Guidance on access and facilities for the fire service can be found in the building regulations. However, as fire appliances are not standardized it is essential that the fire authority is consulted at an early stage regarding its requirements for access roadways.

7.2 Single-storey **[A]** shopping **[A]** complexes

7.2.1 Commentary

*Single-storey **[A]** shopping **[A]** complexes pose less difficulties for firefighters than multi-storey **[A]** shopping **[A]** complexes. For example, there is no need to transport personnel and equipment from storey to storey. However, a single-storey **[A]** shopping **[A]** complex may cover an extensive area and therefore access roadways are still necessary to enable fire appliances to drive near to selected entry points to the **[A]** shopping **[A]** complex. Where the overall floor area of the **[A]** shopping **[A]** complex is particularly extensive, special consideration may need to be given to access requirements. However, the following recommendations will generally be applicable for those **[A]** shopping **[A]** complexes up to about 30 000 m² and/or having one dimension not greater than 190 m.*

*Firefighters will still have to lay out hose between the fire appliance and the fire, and therefore it is desirable that this distance be kept to a minimum. The provision of a wet fire main system will enable an increased distance between the fire appliance parking position and the wet main outlet valves. The route within the **[A]** shopping **[A]** complex taken by firefighters to reach the outlet valve will need to be a protected route.*

7.2.2 Recommendations

The following recommendations are applicable.

a) Access roadways should be constructed to meet the requirements of the fire authority.

b) Entry points to the **[A₁]** shopping **[A₁]** complex should be readily identifiable to the fire service.

NOTE 1 An entry point is a door allowing access to the **[A₁]** shopping **[A₁]** complex from the outside and is not necessarily be a door giving access to a mall. An entrance dedicated to fire service access is preferable.

c) Unless a wet fire main system is installed [see item d)], fire appliance access should be provided to within 18 m of each of a sufficient number of entry points so that no point in the building is more than 60 m from an entry point, measured along a route suitable for laying hose (see Figure 3).

NOTE 2 If the internal layout is not known at the planning stage, a direct line measurement of 40 m may be used for design purposes, provided that the layout of the building when occupied satisfies the 60 m criterion.

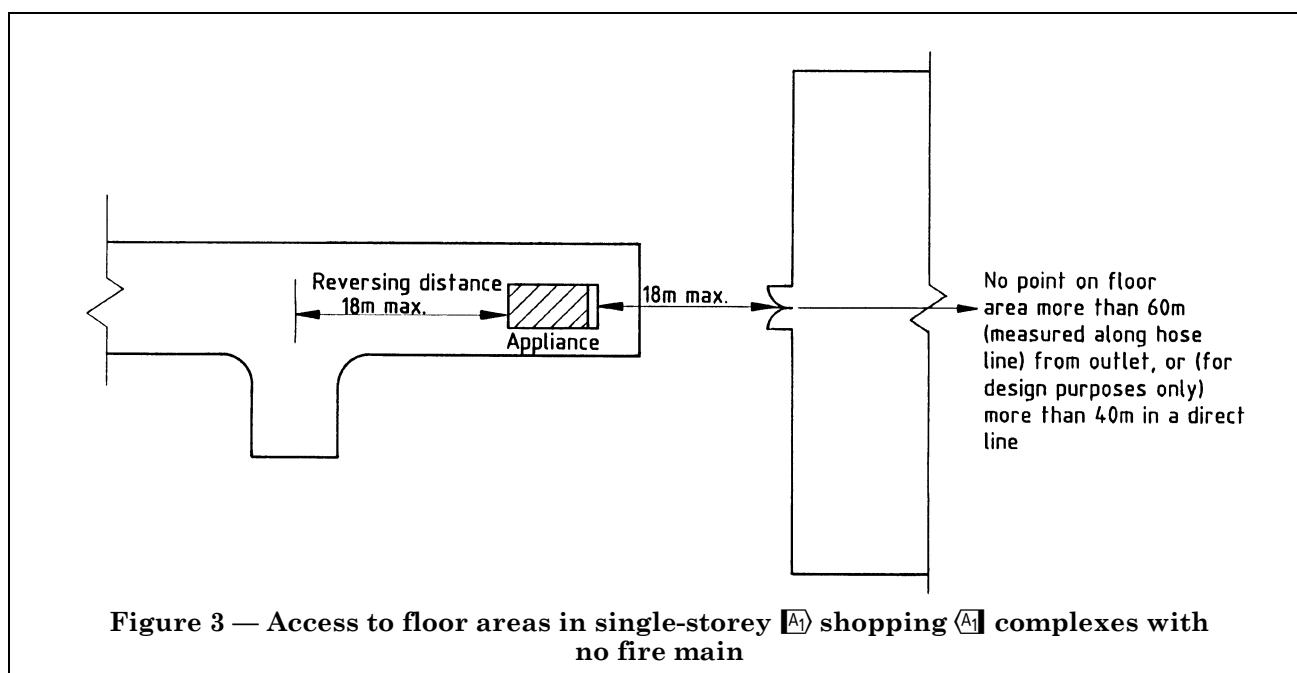
d) If a wet fire main system complying with BS 5306-1 is installed, fire appliance access should be provided to within 50 m of each of a sufficient number of outlet valves such that no point in the **[A₁]** shopping **[A₁]** complex is more than 60 m from an outlet valve, measured along a route suitable for laying hose (see Figure 4).

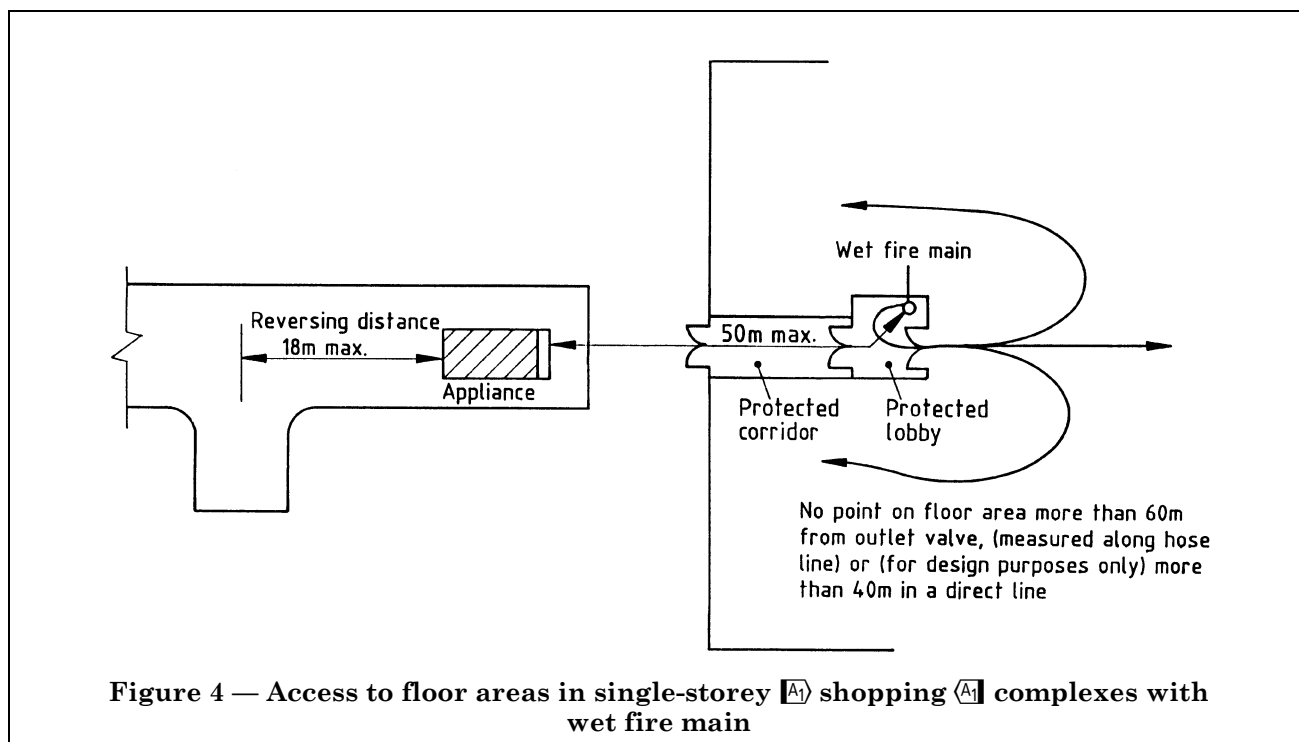
NOTE 3 If the internal layout is not known at the planning stage, a direct line measurement of 40 m may be used for design purposes, provided that the layout of the building when occupied satisfies the 60 m criterion.

A wet main outlet valve should be located in a protected lobby where there is sufficient room for firefighters to lay out equipment and the route taken by firefighters from the entry point to the **[A₁]** shopping **[A₁]** complex to the lobby containing the wet main outlet should be a protected route.

e) Turnround facilities should be provided so that fire appliances do not have to reverse more than 18 m (see Figure 3 and Figure 4).

f) The relevant recommendations in 7.7 to 7.12 should be followed.





7.3 Fire appliance access roadways to multi-storey A_1 shopping A_1 complexes

7.3.1 Commentary

Roadways of adequate width, loadbearing capacity and suitable gradient will enable fire appliances to reach the perimeter of the A_1 shopping A_1 complex and gain access to entry points into the A_1 shopping A_1 complex. These roadways may be public highways or, if within the boundaries of a large A_1 shopping A_1 complex, they may be service roadways used by vehicles delivering goods. These access roads may be covered and at any level. If they are covered, or are at low level, and are to be used by fire appliances to gain access into the A_1 shopping A_1 complex, then special provisions will be needed to make this possible. The fire resistance of any floors over an access roadway should be such that possibility of collapse onto fire appliances at work during a fire is remote [see 14.4.2 d)]. If access roads are enclosed at any level, then venting of exhaust fumes will be necessary. Emergency lighting and communications facilities will also need to be considered.

Consideration should also be given to whether access can be made available to upper levels or podium decks by way of ramps where there may be access across the open or top deck to other structures within the A_1 shopping A_1 complex. Any such ramps should also be of suitable gradient, loadbearing capacity and width for fire appliance use.

Access roads may, because of road planning and varying ground levels around the A_1 shopping A_1 complex, be above surrounding ground level; in this case, access into a building from the roadway may be possible in both upward and downward directions.

Management procedures should ensure that control is exercised over the movement and parking of commercial vehicles on service roadways also used for fire service access, so that fire appliances are not obstructed in an emergency and are able to proceed to within the required distance of any fire main, foam or other inlets. In the interests of security, it may also be considered necessary to restrict unauthorized entry via such roadways, and any proposals for restrictions should form part of the consultation mentioned in 7.1. Similarly, the provision of turnaround facilities or hammer-heads should be considered so that fire appliances do not have to reverse over extended distances.

7.3.2 Recommendations

The following recommendations are applicable.

- a) Access roadways should:
 - 1) be constructed to meet the requirements of the fire authority;
 - 2) be positioned such as to allow pumping appliances to proceed to within either:
 - i) 18 m of, and in sight of, each dry fire main inlet connection point (see Figure 5); or
 - ii) A_1 the distance specified in 7.6.2b) if a wet fire main system is installed A_1 ;
 - 3) be positioned such as to allow pumping appliances to proceed within 18 m of, and in sight of, any other inlet points, e.g. foam inlet, or infill points to sprinkler or wet main storage tanks;
 - 4) be provided with turnround facilities so that fire appliances do not have to reverse more than 18 m (see Figure 5); and
 - 5) be of a gradient not exceeding 1 in 12.
- b) Enclosed or covered access roadways at any level should, in addition to item a), be provided with:
 - 1) ventilation adequate to remove exhaust fumes from a pumping appliance in operation;
 - 2) fire telephones in accordance with 7.8.2; and
 - 3) a 3-h maintained emergency lighting system in accordance with BS 5266-1.
- c) Management procedures should be implemented to ensure that fire appliance access to required positions within the A_1 shopping A_1 complex is not obstructed. These procedures should be agreed with the enforcing authorities A_1 (see BS 5588-12) A_1 .

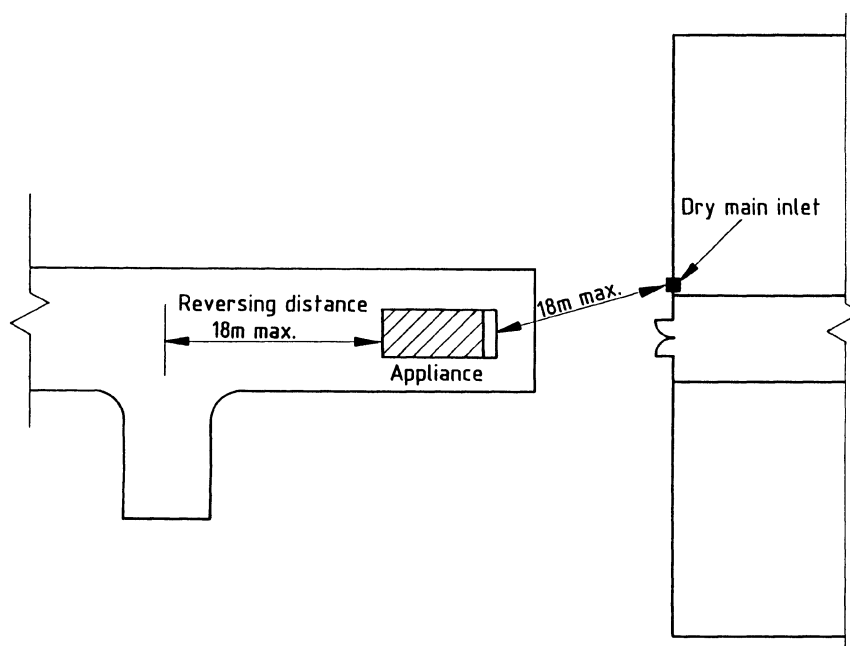


Figure 5 — Access to fire main inlets in multi-storey A_1 shopping A_1 complexes

A_1 Figure 6 — Deleted A_1

7.4 Access for firefighters to the interior of multi-storey complexes

7.4.1 Commentary

Access roadways will enable fire appliances to reach entry points into the building. Generally these entry points will be the normal means of ingress/egress used by members of the public, unless they are located in non-public areas such as service areas.

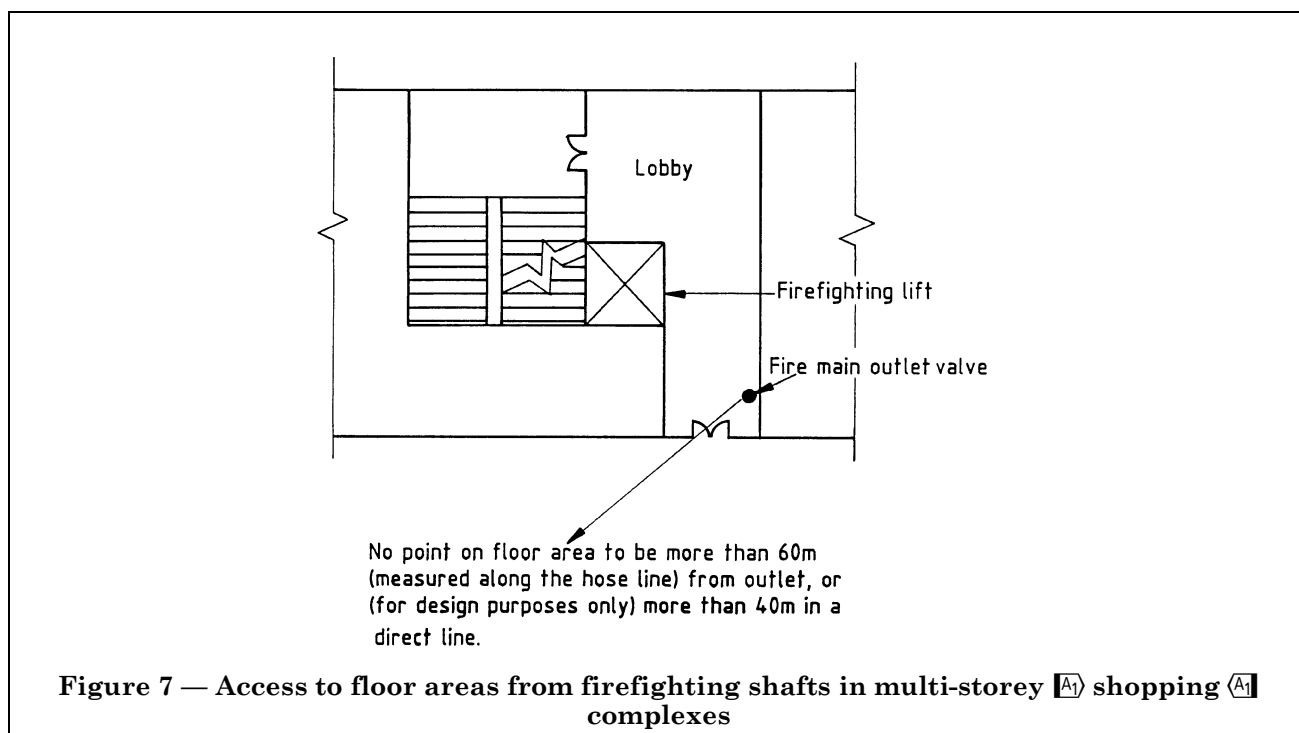
In extensive **[A]** shopping **[A]** complexes it is important that fire service access points are identified in some way to assist arriving firefighters to locate them quickly in an emergency. This may be achieved by some visual indication such as a sign or by a flashing beacon.

From these entry points facilities are needed to enable firefighters to reach any point on upper or lower levels, such as retail floors, car parks or service areas, and to take with them conveniently and quickly such items of equipment as they require for an immediate attack on the fire. These facilities take the form of firefighting stairs with firefighting lobbies, which enable firefighters to establish a bridgehead from which to tackle the fire. In order that firefighters do not have to carry heavy equipment up or down numerous flights of stairs, it will be appropriate in certain instances to include a firefighting lift which will enable the speedy transport of personnel and equipment to upper or lower storeys.

The advantages gained by providing stairs and lifts will be lost if firefighters then need to lay out hose from the appliance via the stairway to the scene of the fire. Therefore a fire main with landing valves in each lobby associated with the firefighting stair is needed. The fire main will generally be dry, but in high-rise or deep-plan **[A]** shopping **[A]** complexes it may be necessary for it to be a wet main system, i.e. permanently charged with water.

These facilities, namely the firefighting stair, firefighting lobbies, dry or wet fire main, and where appropriate the firefighting lift, combine together to form a firefighting shaft. The number of firefighting shafts required will generally depend on the area covered by the **[A]** shopping **[A]** complex. However, that number and location should be such that firefighters do not have to cover extensive areas from any one shaft.

There is no restriction on the use of firefighting stairs for the normal movement of people between storeys or their use as means of escape stairs in an emergency.



7.4.2 Recommendations

The following recommendations are applicable to multi-storey **[A1]** shopping **[A1]** complexes.

- a) All **[A1]** shopping **[A1]** complexes should be provided with sufficient firefighting shafts complying with BS 5588-5 (other than the recommendations relating to the size of firefighting lobbies, see 7.5.2) such that every part of every storey is not more than 60 m from a fire main outlet valve, measured along a route suitable for laying hose (see Figure 7).

NOTE 1 If the internal layout is not known at the planning stage, a direct line measurement of 40 m may be used for design purposes, provided that the layout of the building when occupied satisfies the 60 m criterion.

NOTE 2 Each firefighting shaft should also contain a fire main [see 7.6.2a)].

- b) Firefighting lifts should be provided in **[A1]** shopping **[A1]** complexes with one or more storeys at a height greater than 18 m above, or depth more than 9 m below, fire service access level.
- c) Entry points to firefighting shafts should be readily identifiable to the fire service.
- d) Car parks or service areas located above or below retail floors should generally be serviced by the firefighting shafts servicing the retail floors.

7.5 Firefighting lobbies

7.5.1 Commentary

Some relaxation on the recommendations for firefighting lobbies in BS 5588-5 may be appropriate in some circumstances, for example, where a mall is accessed from a stairway via a protected corridor which does not meet the required dimensions for a firefighting lobby. In this situation, provided that the corridor is itself separated from the mall, and there is adequate space for firefighters to lay out equipment in the corridor, it may still be considered as a firefighting lobby. This has the advantage that fire main outlet valves in the corridor/lobby can be brought near to the doors leading on to the mall, thus reducing the length of hose runs.

7.5.2 Recommendation

Protected lobbies or protected corridors connecting firefighting stairs to malls or other accommodation should be deemed to be firefighting lobbies if:

- a) there is adequate space for firefighters to lay out their hose and connect it to the fire main outlet valve; and
- b) in all other respects they satisfy the recommendations of BS 5588-5.

7.6 Fire mains

7.6.1 Commentary

*The importance of keeping to a minimum the time taken by firefighters to reach the scene of a fire and commence firefighting operations has been stated in 7.4. In considering this factor, the most important element is the overall distance (both horizontal and vertical) that firefighters need to travel between the appliance parking position and the point where a firefighting bridgehead can be established within the **[A1]** shopping **[A1]** complex (usually a firefighting lobby on the affected floor). Account needs also to be taken of the amount of heavy equipment that needs to be carried to this point. Once there, firefighters then need to charge their hoses to tackle the fire. It is therefore important that a maximum distance between those two points be imposed. The time taken to travel that distance and begin firefighting operations, and the relative positions of the fire appliance and the firefighting bridgehead, can however be influenced by two important factors:*

- a) *whether water for firefighting is readily available from a charged wet fire main (a dry fire main first needs to be charged from a street hydrant via the appliance pump); and*
- b) *whether a firefighting lift is available to transport personnel and equipment to eliminate the more physically arduous and time-consuming vertical travel via stairs.*

A fire main system, whether wet or dry, removes the need for firefighters to drag charged hose upstairs, which is both arduous and time-consuming, and also obstructs the stairs in an emergency.

The time- and energy-saving benefits of a firefighting lift are recognized by discounting any vertical travel by lift when assessing the overall distance between appliance and outlet valve. Conversely, the additional time and physical effort required due to the lack of a firefighting lift is reflected by using 150 % of the actual vertical travel necessary via stairs when calculating the overall distance between the appliance and the outlet valve.

*Thus, if a wet main system and a firefighting lift are provided, the appliance does not need to be within a certain distance of the access point into the **[A1]** shopping **[A1]** complex, provided the recommended overall distance for firefighters can be met.*

If a dry main system is installed together with a firefighting lift, then the appliance needs to be able to proceed to within a reasonable distance of the inlet so that the minimum of fire hose is needed to connect the appliance to the inlet and to afford better supervision for the appliance pump operator. Connecting the fire appliance to a street hydrant and to the fire main inlet and charging the riser with water is time-consuming and therefore the overall distance which firefighters need to travel needs to be reduced to compensate for the additional time taken to supply water for firefighting.

*It can be seen that if a wet main system and firefighting lift is installed, the location of appliance parking points and siting of firefighting shafts within the **[A1]** shopping **[A1]** complex is more flexible.*

*However, it should be remembered that, if the firefighting shafts are sited some way within the **[A1]** shopping **[A1]** complex, then the route taken by firefighters from the access point to the shaft needs to be a protected route.*

7.6.2 Recommendations

The following recommendations are applicable.

- a) All **[A1]** shopping **[A1]** complexes of more than one storey should be provided with wet or dry rising (or falling) fire mains in accordance with BS 5306-1 and BS 5588-5 serving the firefighting shafts recommended in 7.4.2a).

NOTE 1 The recommendations of BS 5306-1 and BS 5588-5, stating that rising mains need only be installed in buildings where a floor is higher than 18 m, are not applicable in this instance.

- b) **[A1]** If a wet main system is provided, then the maximum distance between the fire appliance parking position and the outlet valve in the highest firefighting lobby should be not more than 50 m.

- c) If a dry main system is provided, then the maximum distance between the fire appliance parking position and the outlet valve to the highest firefighting lobby should be not more than 30 m. **[A1]**

NOTE 2 The fire appliance parking position should be within 18 m of, and in sight of, the dry riser inlet.

- d) In calculating the distance referred to in items b) and c):

- 1) if a firefighting lift is provided, only horizontal travel need be taken into account;
- 2) if a firefighting lift is not provided, both horizontal and vertical distances of travel should be taken into account, and the distance of any travel necessary via stairs should be taken to be 150 % of the vertical distance travelled.

NOTE 3 Firefighting lifts should be provided in **[A1]** shopping **[A1]** complexes with a storey or storeys at a height greater than 18 m above, or depth more than 9 m below, fire service access level.

7.7 Smoke control provisions to assist firefighting

7.7.1 Commentary

The build-up of smoke and heat as a result of a fire can seriously inhibit the ability of the fire service to carry out rescue and firefighting operations in a shopping complex. The provision of smoke control measures for means of escape together with those associated with firefighting shafts will assist firefighters in their tasks.

*In some areas of a shopping complex, such as enclosed car parks and covered service areas, smoke control measures for means of escape are not usually required. Firefighting in such spaces is more difficult and therefore provision needs to be made for smoke control to assist firefighting operations. Such provisions will also benefit salvage operations following a fire, facilitating a speedier return to normal operation of the **[A1]** shopping **[A1]** complex.*

It is not necessary for smoke control measures for firefighting to be as comprehensive as those required for means of escape. The objective is to prevent a build-up of smoke and heat and to make conditions tenable for firefighters wearing appropriate equipment (including breathing apparatus) to enter and deal with the fire and carry out any necessary rescues. For this reason a system for diluting the smoke from a fire in that area to a level compatible with the fire service operations based on straightforward air changes is also acceptable (as opposed to one designed to maintain a region of clear air below a buoyant smoke layer).

The vehicle exhaust fume extraction systems in all enclosed loading docks and covered roadways should remain running during the fire in order to cater for the fumes generated by pumping appliances, unless a fire occurs within one of these areas, in which case the vehicle exhaust fume extraction system in that area should cease to operate in preference to the smoke exhaust system. All exhaust fume extraction systems in remaining unaffected areas should continue to operate as normal.

Provision is also necessary for the release of smoke and heat from stairs.

Smoke control for firefighting shafts is covered in BS 5588-5.

7.7.2 Recommendations

The following recommendations are applicable.

a) All enclosed loading docks and covered service roadways should be provided with:

1) a smoke control system capable of either:

i) maintaining a clear air layer below the smoke for not less than 1.75 m above any point on the loading dock floor or roadway when a fire of 15 m perimeter with a convective heat output of 7 MW occurs in that area; or

NOTE 1 Where members of the public may be present, consideration should be given to a clear height compatible with safe evacuation, within the constraints imposed by the structure. Providing the means of escape from the area comply with all the recommendations of Section 4, then the minimum clear height requirement should be 3 m above any surface used as a public escape route.

ii) exhausting smoke at a minimum rate equivalent to 10 air changes per hour in the affected area; or

2) a smoke control system design acceptable to the fire authority.

NOTE 2 In some circumstances the design of the building will dictate the eventual smoke movement, and may require no additional smoke control provisions.

b) The design of smoke control systems permitted under item a) should take into account the circumstances relevant to each affected area, and should be accompanied by a clear statement of justification by the designer.

c) All basement storeys [except for malls, units, other occupancies and those areas covered in item a)] should:

1) be provided with openable vents with an area of not less than 2.5 % of the floor area and arranged to induce cross-ventilation; or

2) be provided with smoke outlets that:

i) are situated at high level in well-distributed positions along street frontages or adjacent to external walls easily accessible to the fire service;

ii) aggregate not less than 2.5 % of the floor area they serve;

iii) if covered, have breakable covers;

iv) are sited away from exits; or

3) be provided with a smoke exhaust system capable of providing at least 10 air changes per hour in the fire-affected area; or

4) be provided with a smoke control system design acceptable to the fire authority.

NOTE 3 *Rooms not more than 450 m².* Where there is a large common space adjacent [see Figure 8(a)], the room may not need to be provided with its own ventilation arrangements. Smoke and heat issuing from the room may (if necessary) be vented from the adjacent larger space, using the smoke control system in that space.

Where the room has only corridor access [see Figure 8(b)], then the room should be vented by the provision of:

- i) 2.5 % ventilation arranged around the room [see items c)1) and 2)]; or
- ii) at least 10 air changes per hour [see item c)3)]; or
- iii) other means acceptable to the fire authority [see item c)4)].

NOTE 4 *Rooms greater than 450 m².* Where there is a larger common space adjacent [see Figure 8(c)], the room may have the smoke and heat vented into the common space by ducting and fans designed to remove the smoke and heat at a rate of at least 10 air changes per hour of the room [see item c)3)]. The smoke control system in the common space should operate simultaneously with that in the room.

Where the room has a corridor access or common space adjacent which can provide an inlet air supply to the room [see Figure 8(d)], then the room should be vented in accordance with items c)2), 3) or 4).

d) A protected stairway which is not provided with a smoke control system using pressure differentials (other than a firefighting stair) should be provided with:

- 1) openable windows at each upper storey or landing level; or
- 2) a window or vent at the top having a clear openable area of not less than 1 m².

e) All openable windows and vents provided for smoke control should be clearly identifiable and should be fitted with:

- 1) simple lever handles; or
- 2) locks that can be operated by the fire service with a square-ended key.

NOTE 5 If openable windows and vent openings are not easily accessible, provision should be made for their operation by a remote control mechanism that, in the case of any vent provided in accordance with item d)2), should be located adjacent to the entrance doorway in the ground/access storey and be clearly marked as to its function and means of operation. Vents provided in accordance with item d)2) should also be provided with local control at the topmost storey served by the stair.

f) If it is not possible or convenient for a smoke outlet to terminate at a level accessible to the fire service, the shafts may be led up through the building to discharge direct to the open air at a suitable point, and the outlets should be maintained unobstructed, or be covered only with:

- 1) non-combustible grilles and/or louvres; or
- 2) smoke outlet terminals complying with BS 7346-1 or BS 7346-2.

g) Shafts serving smoke outlets should:

- 1) be provided separately from different basement levels and from such accommodation as boiler rooms, rooms containing oil-filled switchgear, storage spaces and car parks;
- 2) for natural (buoyancy driven) systems, have throughout their length a cross-sectional area not less than that of the smoke outlets they serve, or have their size (area) supported by appropriate hydraulic calculations;
- 3) be enclosed with solid non-combustible material having a fire resistance not less than that required for the storey served, or through which they pass, whichever is the higher.

7.8 Communications for fire service use

7.8.1 Commentary

Firefighters at a shopping complex use personal radio sets for communicating with each other and with their own command points. However, personal radio sets have disadvantages such as occasional poor reception due to local screening and limited battery life. It is therefore desirable that mobile communications should be supplemented by some form of fixed communications system enabling contact between individual teams of firefighters and also with the fire control centre (see 7.9).

7.8.2 Recommendation

Fire telephones should be provided in accordance with the recommendations of 17.2.2.

7.9 Fire control centre

7.9.1 Commentary

A fire control centre is necessary to enable the fire service to assume control of an incident immediately on arrival. The fire control centre should be readily accessible with direct access from the open air, and because of the possible need for it to be operational over an extended period of time, it should be located in a room provided with structural fire separation (see 14.5) and should incorporate facilities to enable it to function as normal during an emergency. It should contain all control and indicating equipment for the fire alarm and other fire safety systems for the [A1] shopping [A1] complex.

NOTE The fire control centre may form part of the general management offices for the [A1] shopping [A1] complex.

7.9.2 Recommendations

The following recommendations are applicable.

- a) A fire control centre should be provided within the [A1] shopping [A1] complex, and should be either:
 - 1) a room dedicated solely as a fire control centre; or
 - 2) combined with the management central control room.

NOTE Any console layout within a combined fire control centre/central control room should clearly differentiate between the fire and security systems.

- b) The fire control centre should comply with the recommendations given in 17.2.2 for the central control room.

7.10 Occupancies (other than units) associated with shopping complexes

7.10.1 Commentary

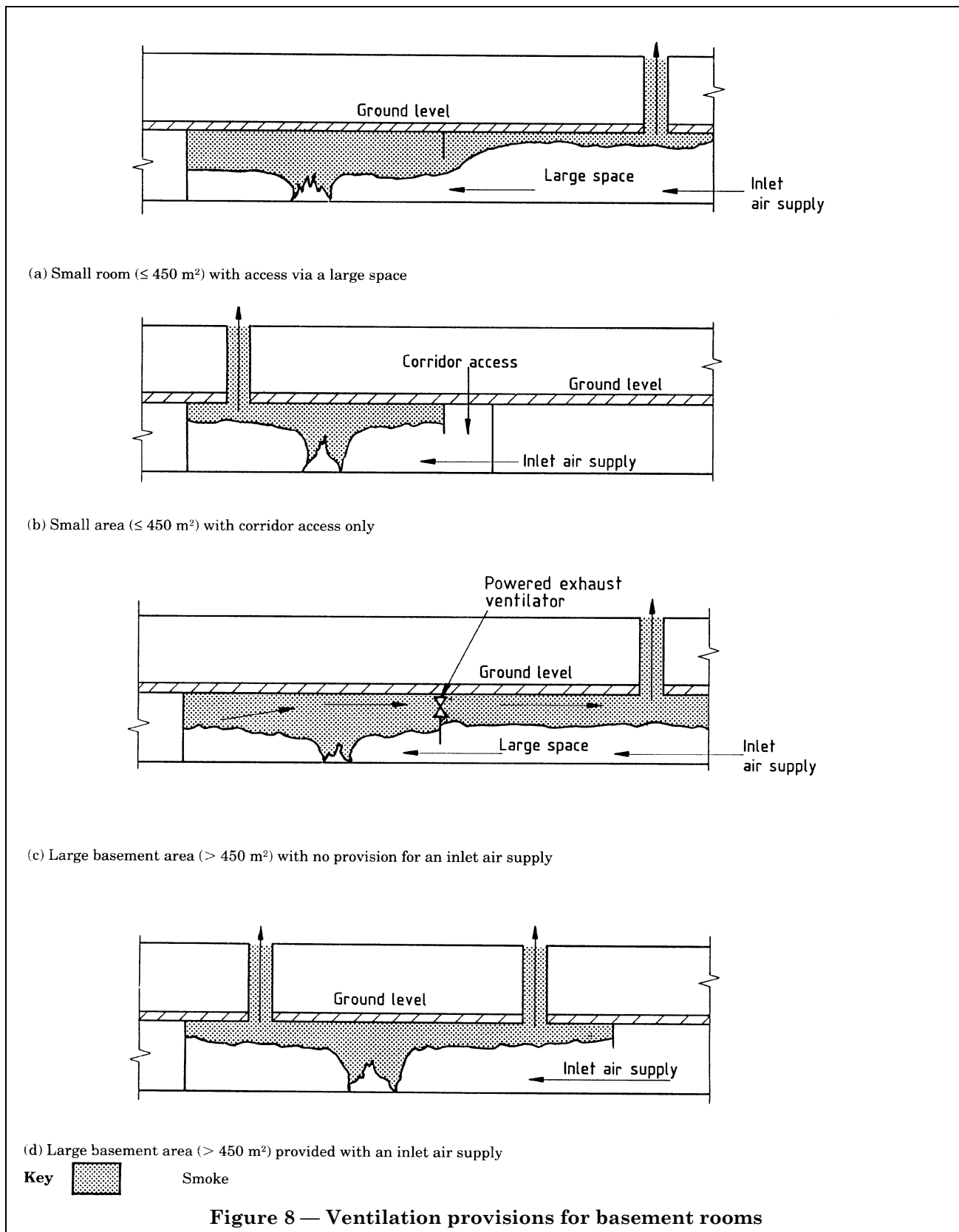
Where accommodation for other uses, e.g. office blocks, places of entertainment, is sited above or within a shopping complex, it will generally be necessary to provide fire service access to those occupancies that is completely independent of the shopping complex. It may be possible to use the shopping complex perimeter access roadways to reach them, provided it can be guaranteed that such roadways will be available 24 h per day/365 days per year.

Any firefighting shafts required for these other occupancies need to be completely independent of the shopping complex.

7.10.2 Recommendations

The following recommendations are applicable.

- a) Access to occupancies in the [A1] shopping [A1] complex which do not comprise a unit should be designed in accordance with the principles, legislation or codes that are appropriate for the respective occupancies.
- b) Access roadways common to both these other occupancies and the shopping complex should be available for emergency use at all times.
- c) Firefighting shafts should not be common to the shopping complex and other occupancies.



7.11 Water supplies for fire service use

7.11.1 Commentary

Water supplies for manual firefighting by the fire service are normally provided from hydrants, either those of the water authority on street mains or private hydrants installed by the building owner or developer.

Hydrant systems include internal fire mains, whether wet or dry, fitted with landing valves, and private hydrants on water mains external to the building.

It is necessary that these mains and hydrants are able to deliver an adequate supply of water at suitable pressures to enable effective firefighting to be carried out. For the same reason, hydrants also need to be located in positions which are both near to building entry points (which may also be entry points to firefighting shafts containing fire mains) and to fire appliance parking positions. These requirements for siting apply whether fire appliance access is at ground level, at upper deck level or below ground level. Water supplies for a [A1] shopping [A1] complex should be discussed with the enforcing authorities and local water authority at an early stage.

In areas without available mains, a bulk or static supply should be arranged. If this takes the form of a static tank or dam, the capacity needs to be related to the size of the [A1] shopping [A1] complex and the risk involved. The capacity should be agreed with the fire authority.

An unlimited and guaranteed natural water source may be acceptable to the fire authority subject to adequate access and hard standing for appliances being provided. The natural water supply and position of fire appliance access points should be agreed with the enforcing authorities.

7.11.2 Recommendation

All [A1] shopping [A1] complexes should be provided with an adequate supply of water for firefighting by one, or a combination of, the following means:

- a) hydrants designed and installed in accordance with BS 750 and sited such that no hydrant is more than 90 m from another, nor more than 45 m from a fire appliance parking position; and delivering not less than a total volume of 4 500 L/min when any four hydrants are open at the same time; and
- b) a static or natural water supply providing the same level of supply as above for a period of not less than 2 h and satisfactory to the enforcing authorities.

NOTE Attention is drawn to any relevant water legislation for the area.

7.12 Plans for fire service use

7.12.1 Commentary

In large [A1] shopping [A1] complexes and those having extensive accommodation below ground level, it is of assistance to the fire service if plans of the building showing fire protection and escape facilities are made available. Such plans should be drawn to a scale agreed with the enforcing authorities. The plans need to be displayed where they can be readily referred to in an emergency. Normally this would be near the fire service access. If there is basement accommodation, plans of such accommodation need to be displayed at the fire service access storey in any stairway (or lobby) leading to a basement. It is desirable that additional copies of the plans be furnished to the fire service so that it can preplan for an emergency.

7.12.2 Recommendations

The following recommendations are applicable.

- a) Scale plans of the  shopping  complex for the guidance and use of the fire service should be prepared in consultation with the enforcing authorities.
 - b) The plans should clearly indicate the location of (for example):
 - 1) surrounding streets;
 - 2) malls, exits, stairs, corridors and any refuges for disabled persons;
 - 3) fuel storage areas, gas and oil main controls;
 - 4) electrical main and submain controls;
 - 5) ventilation plant and control switches, including controls for any smoke control system using pressure differentials;
 - 6) sprinkler valves;
 - 7) hose reels;
 - 8) hydrants and rising/falling mains;
 - 9) shutters and doors released automatically in the event of fire, and any central control point for release;
 - 10) smoke outlets and smoke control system types and zones;
 - 11) openable windows in sealed buildings;
 - 12) main and any secondary fire alarm panels, and zoning of fire alarm systems;
 - 13) pump rooms supplying fire protection systems;
 - 14) firefighting stairs and lifts;
 - 15) automatic fire extinguishing systems;
 - 16) foam inlets;
 - 17) telephone communication points and fire control centre.
- The direction of north, a linear scale bar and a “You are here” indicator should be included.
- c) The plans should be mounted on a rigid surface and should be displayed in the fire control centre and other locations agreed with the fire service.