BRITISH STANDARD

BS 5588-10:1991
Incorporating
Amendment No. 1

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

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

ISBN 0 580 19814 6

Amendments issued since publication

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

Contents

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.

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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

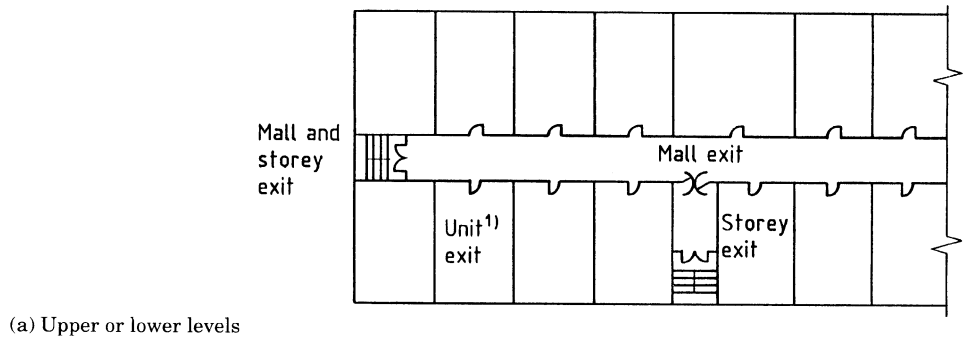
2.13
escape route
a route forming part of the means of escape from any point in a shopping complex to a final exit

2.14
final exit
the termination of an escape route from a ⟦A1⟩ shopping ⟨A1⟧ 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 ⟦A1⟩ shopping ⟨A1⟧ complex so that they are no longer in danger from fire and/or smoke (See Figure 1.)

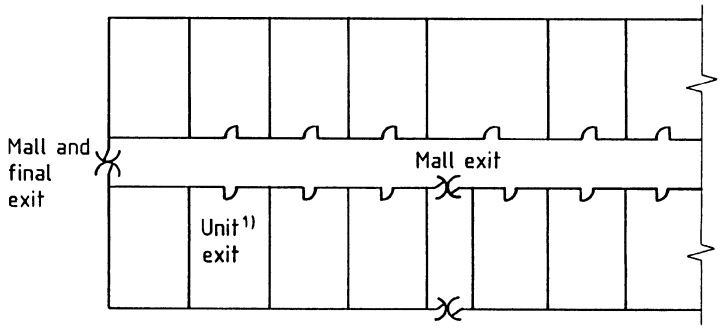
NOTE This might include a mall exit (see **2.25**), but not a unit exit (see **2.43**) delivering into a mall.

2.15
fire alarm/fire detection zone
a subdivision of the ⟦A1⟩ shopping ⟨A1⟧ 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.



(a) Upper or lower levels



(b) Ground level

1) Referred to as a final exit in BS 5588 : Part 2.

Figure 1 — Unit exits, small exits, storey exits and final exits (plan)

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/m^3 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.

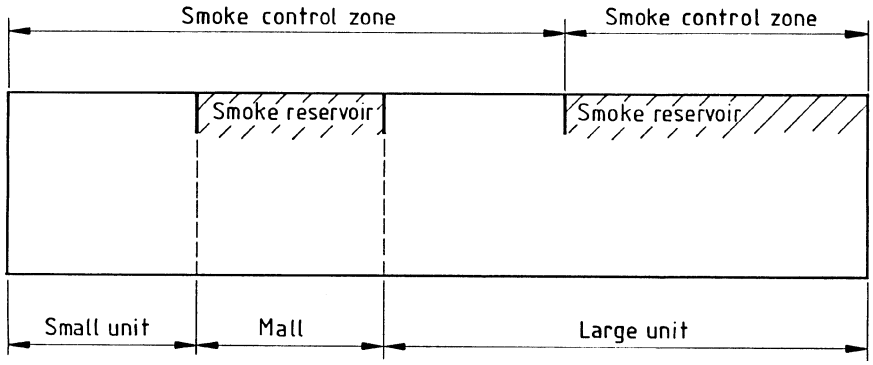


Figure 2 — Smoke control zones and smoke reservoirs (cross-section)

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 [A1] BS 5588-11 [A1].

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 [A1] shopping [A1] 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 within 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 [A1] shopping [A1] 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.

[A1] BS 5588-7[1)] [A1] deals with fire precautions in buildings containing atria, and should be referred to in appropriate cases.

4.5 Servicing and car parking

As [A1] shopping [A1] 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 [A1] shopping [A1] 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 [A1] shopping [A1] 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 [A1] shopping [A1] 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 [A1] shopping [A1] complex need consideration. Depending on the size of the [A1] shopping [A1] 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 [A1] shopping [A1] complex, the recommendations in those codes need to be varied because, for the [A1] shopping [A1] 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)] [A1] *Footnote deleted* [A1]

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 [A1] shopping [A1] 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 [A1] (see BS 5588-12) [A1].

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 [A1] shopping [A1] complex necessitate close control by management. Often these controls are extremely sophisticated. A fire safety strategy on how the [A1] shopping [A1] 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 [A1] BS 5588-12 [A1].

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 [A1] shopping [A1] 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 [A1] shopping [A1] 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 [A1] shopping [A1] 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 [A1] shopping [A1] complexes, this route may be long and involve travel to upper or lower levels. Even in single-storey [A1] shopping [A1] complexes, travel within the [A1] shopping [A1] 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 [A1] shopping [A1] complexes when personal contact between firefighting teams, and between them and the management of the [A1] shopping [A1] 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 [A1] shopping [A1] complex, but more effective command and control is possible from a fire control centre sited within the [A1] shopping [A1] complex from which control of communications and fire safety systems is possible and where there is contact with the management of the [A1] shopping [A1] 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 [A1] shopping [A1] complexes

7.2.1 *Commentary*

Single-storey [A1] shopping [A1] complexes pose less difficulties for firefighters than multi-storey [A1] shopping [A1] complexes. For example, there is no need to transport personnel and equipment from storey to storey. However, a single-storey [A1] shopping [A1] 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 [A1] shopping [A1] complex. Where the overall floor area of the [A1] shopping [A1] complex is particularly extensive, special consideration may need to be given to access requirements. However, the following recommendations will generally be applicable for those [A1] shopping [A1] complexes up to about 30 000 m^2 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 [A1] shopping [A1] 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.

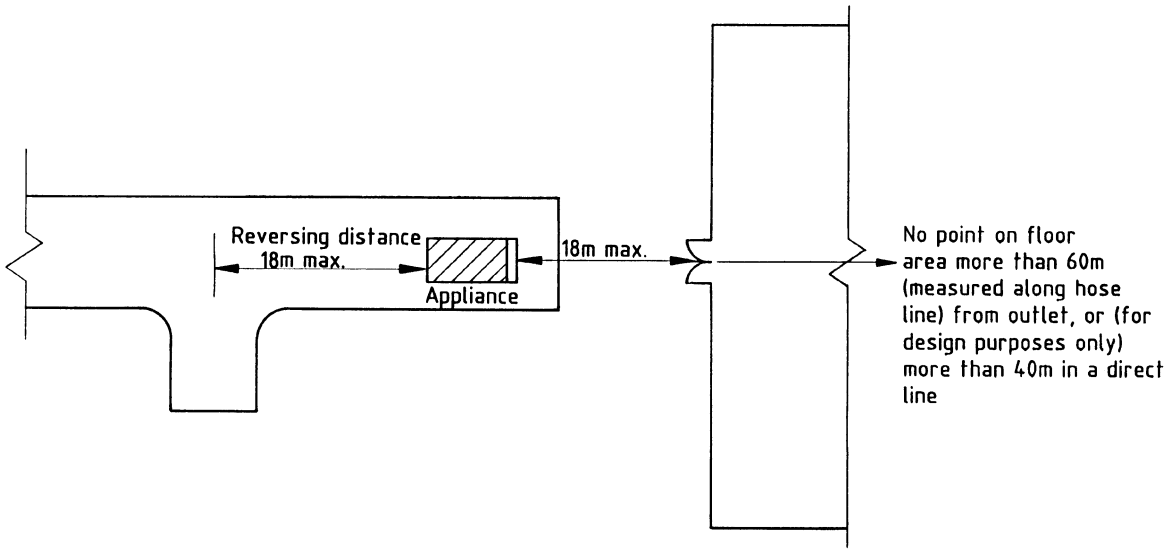


Figure 3 — Access to floor areas in single-storey [A1] shopping [A1] complexes with no fire main

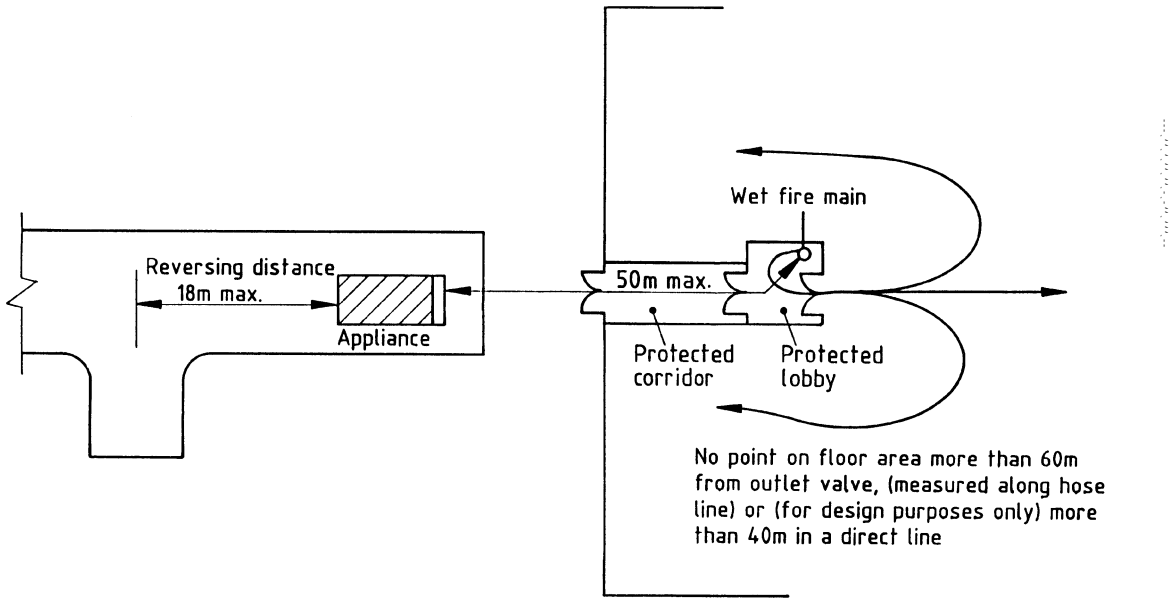


Figure 4 — Access to floor areas in single-storey [A1] shopping [A1] complexes with wet fire main

7.3 Fire appliance access roadways to multi-storey [A1] shopping [A1] complexes

7.3.1 *Commentary*

*Roadways of adequate width, loadbearing capacity and suitable gradient will enable fire appliances to reach the perimeter of the [A1] shopping [A1] complex and gain access to entry points into the [A1] shopping [A1] complex. These roadways may be public highways or, if within the boundaries of a large [A1] shopping [A1] 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 [A1] shopping [A1] 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 [A1] shopping [A1] 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 [A1] shopping [A1] 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 turnround 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) [A1] the distance specified in **7.6.2**b) if a wet fire main system is installed [A1];

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 [A1] shopping [A1] complex is not obstructed. These procedures should be agreed with the enforcing authorities [A1] (see BS 5588-12) [A1].

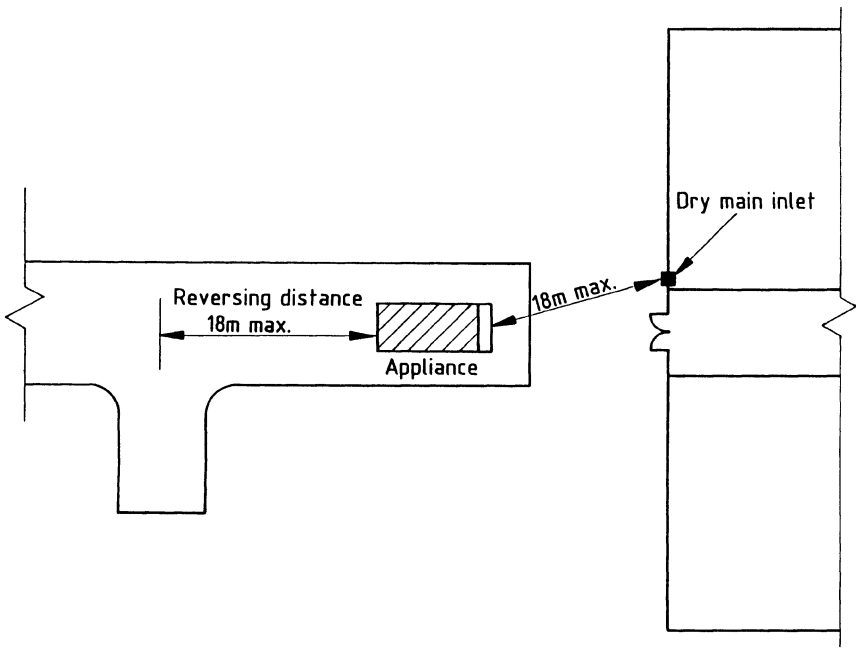


Figure 5 — Access to fire main inlets in multi-storey [A1] shopping [A1]complexes

[A1] Figure 6 — *Deleted* [A1]

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 [A1] *shopping* [A1] *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 [A1] *shopping* [A1] *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 [A1] *shopping* [A1] *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.

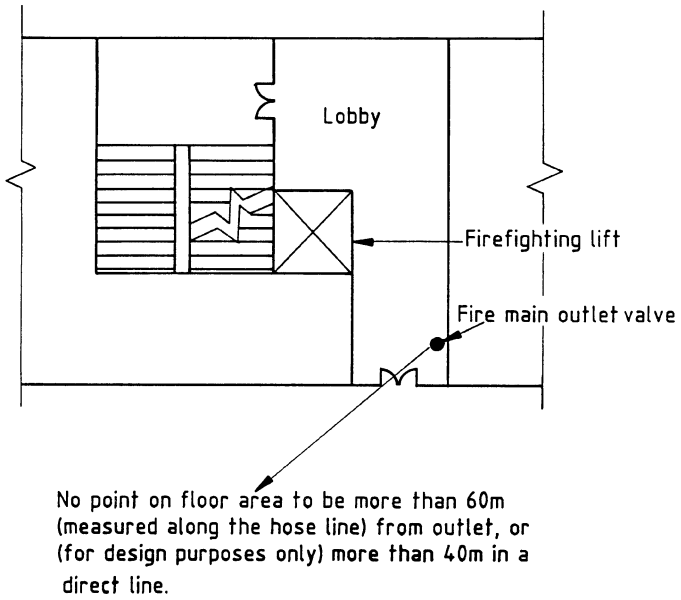


Figure 7 — Access to floor areas from firefighting shafts in multi-storey [A1] shopping [A1] complexes

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 **7.6.2**a)].

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 **7.4.2**a).

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.*

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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 m^2.

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.

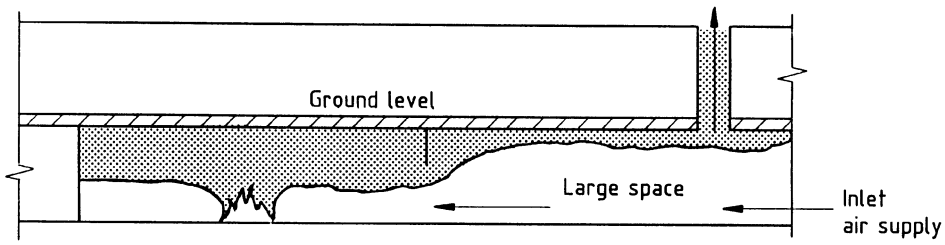
7.10.2 *Recommendations*

The following recommendations are applicable.

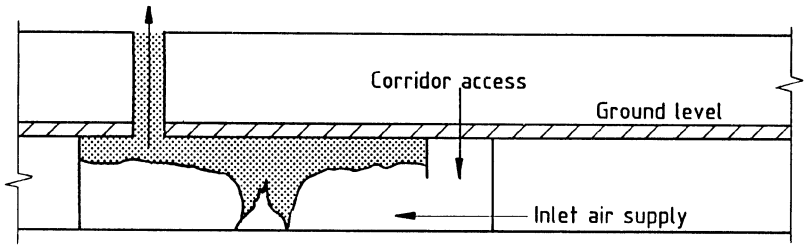
a) Access to occupancies in the ⟨A1⟩ shopping ⟨A1⟩ complex which do not comprise a unit should be designed in accordance with the principles, legislation or codes that are appropriate for the respective occupancies.

b) Access roadways common to both these other occupancies and the shopping complex should be available for emergency use at all times.

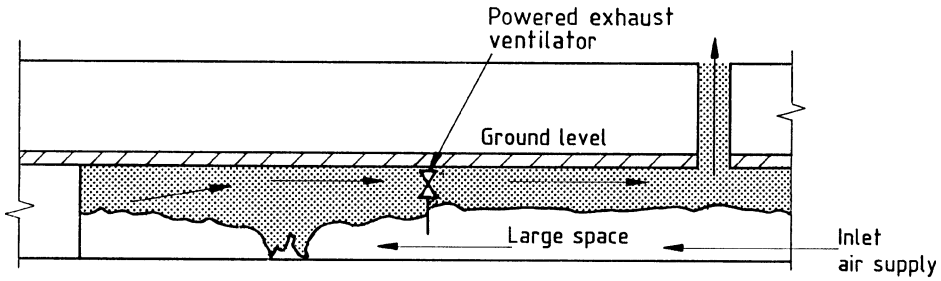
c) Firefighting shafts should not be common to the shopping complex and other occupancies.



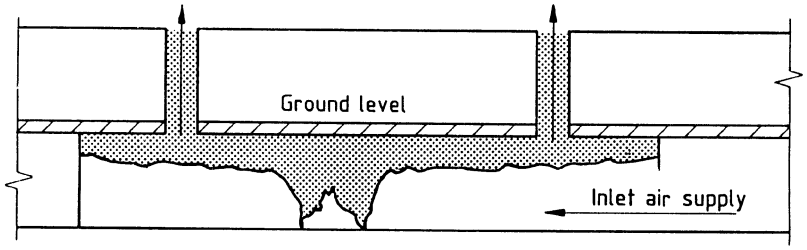
(a) Small room (≤ 450 m²) with access via a large space



(b) Small area (≤ 450 m²) with corridor access only



(c) Large basement area (> 450 m²) with no provision for an inlet air supply



(d) Large basement area (> 450 m²) provided with an inlet air supply

Key Smoke

Figure 8 — Ventilation provisions for basement rooms

18 December 2004

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 [A1] shopping [A1] 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.

blank

Section 4. Planning of escape

8 General

Malls can provide a safe means of evacuating the [A1] shopping [A1] complex in case of fire only if precautions are taken with the design, construction and management of a covered shopping complex.

There will be differences in how this can be achieved, depending upon whether a mall is covered or uncovered and other factors, e.g. the number of levels associated with the development and the siting of service areas, car parks and ancillary areas. These matters will affect the means of escape in case of fire, compartmentation, firefighting installations and the methods of smoke control needed within a particular [A1] shopping [A1] complex.

When designing the means of escape from a shopping complex in the event of fire, a full appreciation of the probable behaviour of fire is necessary. The overall design for a shopping complex needs, therefore, to be carefully assessed section by section to determine the danger that might arise both from a fire in that location and from a fire elsewhere in the [A1] shopping [A1] complex.

Fires do not normally start in two different places in a building (unless arson is involved). Initially a fire will create a hazard only in the part in which it starts and is unlikely to involve a large area. Subsequently, it may spread to other parts, usually along circulation routes.

The primary danger associated with fire in its early stages is not flame, but the smoke and noxious gases produced by the fire. Measures designed to provide safe means of escape should include provisions to limit the spread of smoke and gases.

The basic criteria which have been adopted in determining the design for the means of escape serving units comprising the [A1] shopping [A1] complex are as follows.

a) Wherever possible there should be alternative means of escape. [The only exception to the provision of alternative means of escape in case of fire in this code relates to small units, see **9.1.2**a)].

b) Where direct escape to a place of safety is not possible:

1) the travel distance in an unprotected escape route needs to be limited and to lead to a protected escape route; and

2) the protected escape route needs to lead to a place of safety.

The escape routes from the units in a shopping complex consist of the part of the route within the unit itself, and the part from the exit from the unit to the exit from the [A1] shopping [A1] complex.

In addition to avoidance of manipulative apparatus for means of escape (see **5.7**), the following facilities are not acceptable for use as means of escape in case of fire:

i) lifts (except suitably designed and installed firefighting lifts or evacuation lifts, for the use of disabled persons, see Clause **28**);

iii) passenger conveyors and escalators;

iv) portable ladders and throw-out ladders.

In the case of escalators, whilst it is recognized that in practice they will be used as stairs by persons escaping from one level to another, they are discounted when assessing protected stair capacity.

Clause **9** deals with means of escape from units and other occupancies to a final exit. The recommendations are mainly concerned with providing more than one escape route (except in severely restricted circumstances), limiting the distance to be travelled, and ensuring that the escape routes are wide enough.

Clause **10** deals with means of escape from other public facilities and with other precautions which are necessary in these areas.

Clause **11** deals with means of escape from non-public common areas and ancillary accommodation (including service installation rooms).

Clause **12** deals with vertical travel down or up a stair towards a final exit. The recommendations are mainly concerned with the provision of a sufficient number of protected stairways of adequate width.

Clause **13** deals with the problems of wayfinding and spatial orientation.

9 Escape routes serving units and other occupancies

9.1 Number of escape routes from units

9.1.1 *Commentary*

*The amount of smoke that is likely to be produced from a fire in a shop or other unit in a covered shopping complex could be so great as to put at risk people in other units facing onto the same mall. Alternative means of escape therefore need to be provided from these units, either at a different level or at the same level but leading to a different final exit, even if alternative means of escape are not recommended in the relevant Part of BS 5588. Except for large units, this alternative exit may lead through a service corridor (see **9.4**).*

In recent years the number of kiosks and small speciality shops provided in shopping complexes has increased and, subject to limitations on size, a single route of escape via the mall is considered acceptable from these small units.

9.1.2 *Recommendations*

The following recommendations are applicable (see also Figure 9).

a) Small units and kiosks which do not exceed 25 m^2 in total area and 5 m in depth (i.e. the distance from the mall frontage to the back of the unit, including any non-retail space) need not be provided with alternative means of escape.

b) ▌A1⟩ *Text deleted* ⟨A1▐

c) At least one alternative means of escape from any unit [other than a small unit or kiosk, see item a)] should deliver either:

1) at a different level from that at which the entrance to the unit is situated; or

2) at the same level, but leading to a different final exit(s).

d) Any exit from a unit that has an occupant capacity exceeding 300 persons should not discharge into a service corridor.

9.2 Distances of travel and number of escape routes in malls

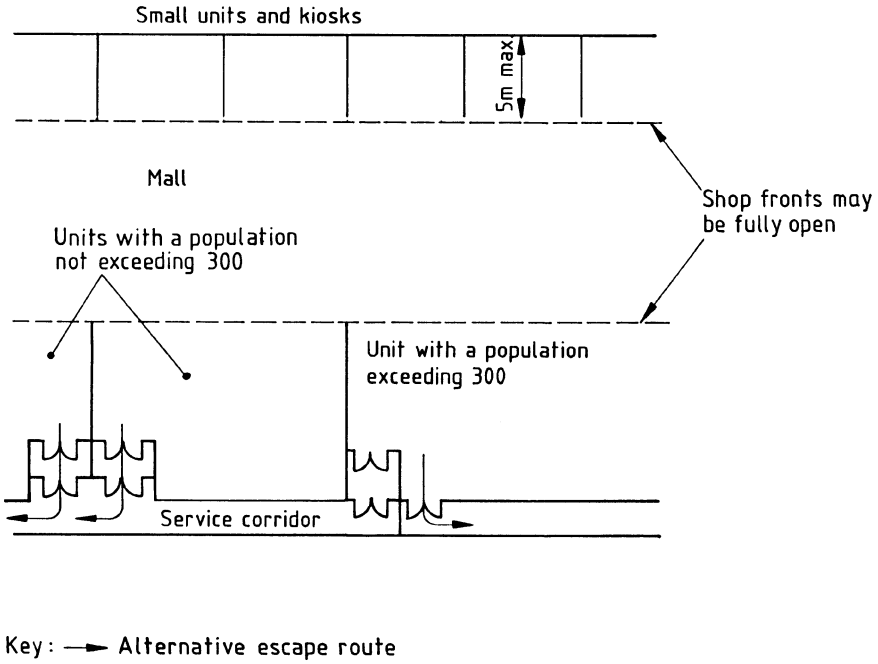
9.2.1 *Commentary*

Travel distance within units is determined by the relevant guidance on that type of occupancy. This code considers the escape route(s) from unit exits to the final exit(s) to a place of safety. The mall is likely to be a major element of this escape route.

The distance to the nearest mall exit should be limited. This mall exit need not be a final exit, but may be an exit into a protected corridor that itself leads to a final exit.

Escape routes from the mall ought to be so sited that a person confronted by fire on entering the mall from a unit can make a safe escape through an alternative mall exit. To achieve this, two exits ought to be available in substantially different directions. If the two directions diverge by less than 45° and are not separated by fire-resisting construction they are considered to provide escape in one direction only.

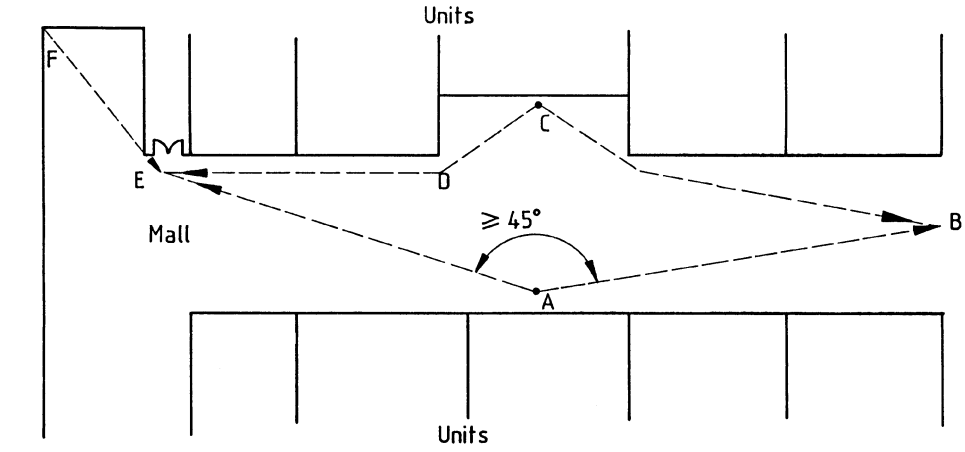
For reasons such as differences in hours of trading and insufficient staff to supervize evacuation of customers from other parts of the ▌A1⟩ shopping ⟨A1▐ complex, it is not considered acceptable for units to be used as an escape route from a mall.



Small units and kiosks should not exceed 25 m^2 in area and 5 m in depth.

NOTE. Lobbies need not be provided if the service corridor is provided with smoke control.

Figure 9 — Alternative escape routes from units



Key

– – – Indicates travel distance.
B is a final exit
E is a mall exit
AB, AE, CB and CE ≤ 45 m
CD and EF ≤ 9 m

Figure 10 — Travel distance in covered malls

9.2.2 *Recommendations*

The following recommendations are applicable (see also Figure 10).

a) Malls and walkways should have escape routes of such number and so situated that the travel distance from any point does not exceed the limitations given in Table 1.

Table 1 — Maximum travel distances in malls

Available direction of escape	Uncovered malls m	Covered malls m
a) In one direction		
1) mall at ground level	25	9
2) malls not at ground level	9	9
b) In more than direction		
1) mall at ground level	not limited	45
2) malls not at ground level	45	45

b) If travel is initially in one direction only then:

1) the travel distance to the point at which travel is possible in more than one direction should not exceed the appropriate limit given in item a) of Table 1; and

2) the total travel distance to the nearest mall exit or storey exit (including up to 9 m in one direction only) should not exceed the appropriate limit given in item b) of Table 1.

c) For travel to be considered to be in more than one direction, either:

1) the routes should be not less than 45° apart (see Figure 10); or

2) the routes should be separated from each other by fire-resisting construction.

d) Escape routes from malls and walkways should not be via units.

e) Persons should not need to enter a covered section of mall to reach a mall exit when escaping from a "dead-end" portion of an uncovered mall.

9.3 Width of malls and mall exits

9.3.1 *Commentary*

In many [A1] *shopping* [A1] *complexes units will face each other across a pedestrian mall, footpath or walkway. In such cases there is a risk of early fire spread across the mall from one unit to that facing it. This risk is related to the width of the mall and whether the mall is uncovered or covered. The danger of rapid fire spread across a covered mall is greater than in an uncovered mall, and the effect upon the means of escape is more serious in a covered mall because its roof will prevent smoke and hot gases from escaping unless provision is made for smoke venting.*

The minimum width of a mall is determined by the need to avoid fire spread across the mall by radiation and flame impingement, and the need to provide enough space for people to escape along the mall to a mall exit.

In some ways, malls are more akin to a public thoroughfare than a space within a building and the safety of people in a mall from fire is provided by a combination of features not normally found in other buildings; i.e. the limitation of fire spread by partial compartmentation and the provision of sprinklers, coupled with smoke control, as well as the provision of multiple exits.

These features make it possible to use malls as a means of escape. The width of the mall and of its exits needs to allow evacuation of the [A1] *shopping* [A1] *complex without delay, even though the smoke control system is designed to maintain the means of escape for an extended period. People at the back of a slow-moving crowd may feel threatened by smoke overhead and this could lead to problems if those people have to wait too long. It is not possible to set a precise time limit.*

Because evacuation will be progressive, with people in the mall(s) tending to precede those in the units (who will not be in immediate danger unless they are in the unit on fire), it will normally be sufficient to size the mall exits on the basis of the number of people the mall is assessed to be capable of holding, and not on the combined population of the malls and units. Although the mall population will normally exceed the aggregate population of the units served by the mall, if this is not the case it is essential that the mall exit capacity is adequate for the occupants of those units.

Large units facing each other across a mall of minimum width, or onto upper-level walkways, may pose difficulties were the number of persons within these units to exceed the capacity of the mall. However, if a fire occurred in a large store, the full width of the mall onto which the units front constitutes an initial "buffer zone" (which may be of several hundred square metres) from which the people escaping from the store can move to one or more mall exits. Large units also have other exits, independent of the mall, by which a proportion of the occupants escape. This arrangement is considered acceptable, but in these cases, consideration needs to be given to fire alarm and evacuation procedures within the ⟨A1⟩ *shopping* ⟨A1⟩ *complex to ensure that occupants are guided to alternative exits.*

NOTE 1 Capacities of exits from malls are based on the assumption that a unit width of 500 mm permits a flow of 40 persons/min. The time of 2.5 min implicit in the exit width calculations should not be regarded as the actual evacuation time.

An adequate discharge rate through a mall exit can be achieved by providing 5 mm of exit width per person to be evacuated, subject to a satisfactory minimum.

The minimum aggregate width of escape routes serving a mall section (see ***2.26****) may be calculated using the following equation:*

$$W = 5\left(\frac{xy}{0.75}\right) \text{ mm}$$

where

W is the required aggregate mall exit width (in mm);
x is the width of mall section (in m);
y is the length of mall section (in m);
5 *is the exit width per person (in mm);*
0.75 *is the space occupied per person (in* m^2*).*

In certain circumstances the width of malls may be affected by obstructions such as escalators, stairs, kiosks and features and these need to be taken into account in calculating the effective width of the mall.

Wider malls are often provided to reduce crowding, and it is unreasonable to assume that very wide malls will be occupied to a high density throughout. Therefore it is reasonable to modify the floor space factor in malls greater than 8 m in width, as it is not expected that malls exceeding this dimension will be occupied to the same density as narrower malls.

NOTE 2 Exit widths from units, including exits onto malls where appropriate, should be calculated in accordance with the appropriate codes.

9.3.2 *Recommendations for malls*

The following recommendations are applicable (see also Figure 11).

a) To provide adequate separation against fire spread, a mall should be not less than 6 m wide measured between the demise line or fascia of the units (whichever is the lesser) if covered, and not less than 5 m wide if uncovered.

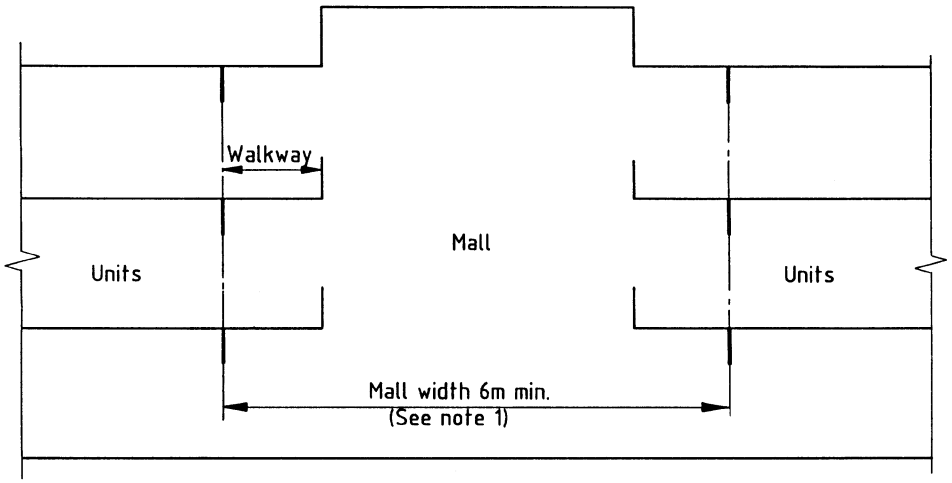
b) To provide adequate capacity for escape, a covered mall with units on both sides should have an effective width of not less than 6 m.

NOTE 1 Effective width is that part which is unobstructed by planters, seating, kiosks etc., and void openings. This effective width should be capable of sustaining the designed flow rate from the mall and units.

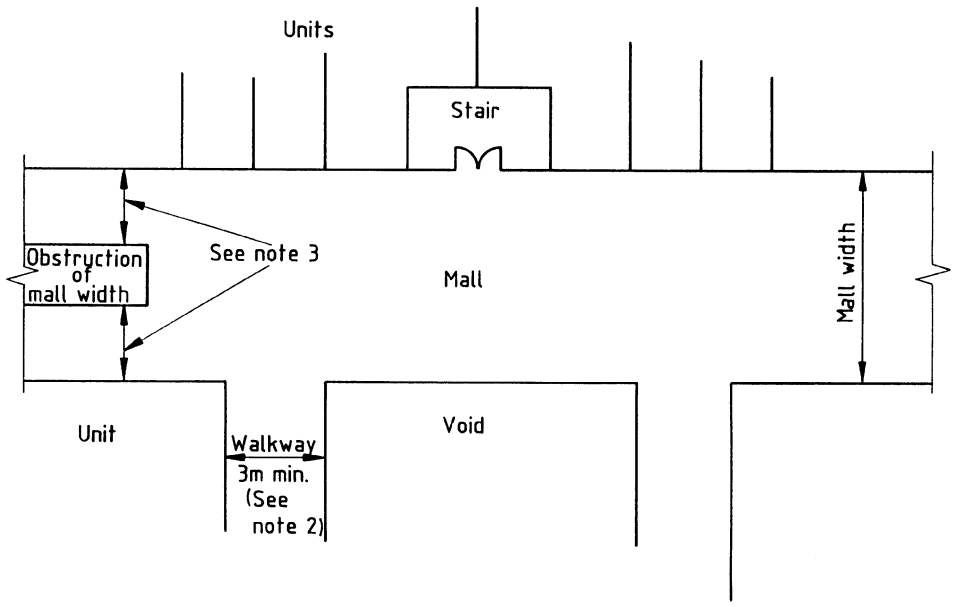
A mall with a void on one side, such as a galleried upper mall overlooking the level(s) below, or a mall with units on one side and an imperforate fire-resisting wall on the other, should have an effective width of not less than 3 m.

NOTE 2 Effective widths for galleried upper malls may be reduced, providing the unobstructed width is not less than 1.8 m, where it can be shown that the number of people using the mall for escape at that point can be safely accommodated. A similar approach should be adopted where the width of mall or galleried upper mall is reduced by an obstruction.

c) If doors are placed across a mall, their aggregate width should not be substantially less than that of the mall itself.



(a) Section



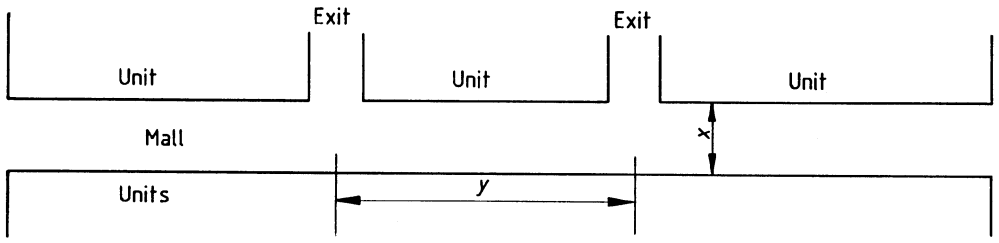
(b) Plan

NOTE 1. This width may be reduced to 5 m for open malls.

NOTE 2. A lesser width may be acceptable if shown by calculation to be sufficient but in no case should the effective width be less than 1.8 m.

NOTE 3. Where the mall width is obstructed, the reduced width should be substantiated by calculation.

Figure 11 — Mall widths



Minimum aggregate width of mall exits from central section of mall y metres in length and x metres wide is

$([X \times y]/0.75) \times 5$ mm

If the mall is 6 m wide and this section between mall exits is 90 m long then the combined width of those two exits should be not less than

$\{(6 \times 90)/0.75\} \times 5 = 3600$ mm

Figure 12 — Example of calculation of mall exit widths

9.3.3 ***Recommendations for mall exits***

The following recommendations are applicable (see also Figure 11).

a) The minimum aggregate capacity of escape routes from any mall section should be adequate for the total occupant capacity of the mall section, obtained by dividing the area of the mall section (in square metres) by a floor space factor of 0.75, unless:

1) an area of the mall section has fixed tables and associated seating, in which case a floor space factor of 1.0 should be used for that area; or

2) the width of the mall section exceeds 8 m, in which case a floor space factor of 2.0 should be used for that part of the mall section in excess of 8 m; or

3) the capacity of the unit exits served by the mall section exceeds the population calculated for the mall section, in which case the capacity of the mall exits should be not less than the capacity of the unit exits served by the mall section.

NOTE For calculation purposes, display areas and mall furniture (other than fixed seating for food courts) should not be deducted from the area of the mall; permanent display features (such as fountains) may be deducted.

b) The width of any particular escape route from a mall should be not less than the calculated minimum aggregate width divided by the number of escape routes, and in no case less than 1.8 m.

9.3.4 ***Examples of calculation of minimum aggregate width of mall exits*** (see Figure 12)

a) If the mall is 6 m wide and this section between mall exits is 90 m long, then the combined width of those two exits should be not less than:

$\{(6 \times 90)/0.75\} \times 5 = 3\,600$ mm

The minimum width of each mall exit is therefore 1.8 m [which is in accordance with **9.3.3**b)].

b) If the mall is 6 m wide and this section between mall exits is 80 m long, then the combined width of those two exits should be not less than:

$\{(6 \times 80)/0.75\} \times 5 = 3\,200$ mm

The calculated minimum width of each mall exit is therefore 1.6 m, but they need to be increased to 1.8 m to comply with **9.3.3**b).

c) If the mall is 12 m wide and this section between mall exits is 90 m long, then the combined width of those two exits should be not less than:

$\{(8 \times 90)/0.75\} \times 5 = 4\,800$ mm

$\{(4 \times 90)/2.00\} \times 5 = 900$ mm

Total width required = 5 700 mm

The minimum width of each mall exit is therefore not less than 2.85 m to be in accordance with **9.3.3**.

9.4 Escape routes using service corridors

9.4.1 *Commentary*

*As outlined in **9.1**, most units need alternative means of escape. In some cases it will be difficult to provide alternative means of escape (other than via the mall) which lead directly to a storey exit or to a different level and therefore it might be necessary to use service corridors.*

*Although service corridors are normally regarded as unsuitable for means of escape, they may be used (other than from units with an occupant capacity exceeding 300, see **9.1**) if restrictions are imposed regarding their use. Measures need to be incorporated to minimize smoke spread into and along the corridors, and there need to be restrictions on their length and width (which need to be able to accommodate the total number of persons escaping from the largest unit, after allowing 500 mm of clear width for any goods that may be in transit).*

Ways of ensuring that the corridor remains relatively smoke-free are either:

a) *by providing a protected lobby between the corridor and each unit, arranged so that the doors do not obstruct the corridor; or*

b) *where any service corridor links two or more storey exits, by subdividing the corridor with self-closing fire door(s) in accordance with **11.2**g).*

To reduce the danger of fire in a service corridor affecting any stair that serves it, any stair used for means of escape from a service corridor needs to be constructed as a protected stairway.

9.4.2 *Recommendations*

The following recommendations are applicable where any service corridor is to be used to provide alternative means of escape from units (see also Figure 9 and Figure 13).

a) Each unit served by the corridor should not have more than one exit onto the corridor.

b) Any such corridor should lead directly to a storey exit, and if the corridor exceeds 45 m in length it should have a storey exit at each end.

c) The corridor should be at least 2 m, but not more than 3 m, wide.

d) All such corridors should be regularly inspected and centrally monitored by colour closed-circuit television [see **17.2.2**f)].

e) To maintain the integrity of the corridor, it should be separated from any ancillary accommodation and any goods lifts by a protected lobby.

f) Any such lobby serving a goods lift should have a depth not exceeding 12 m, unless the lobby is provided with alternative means of escape.

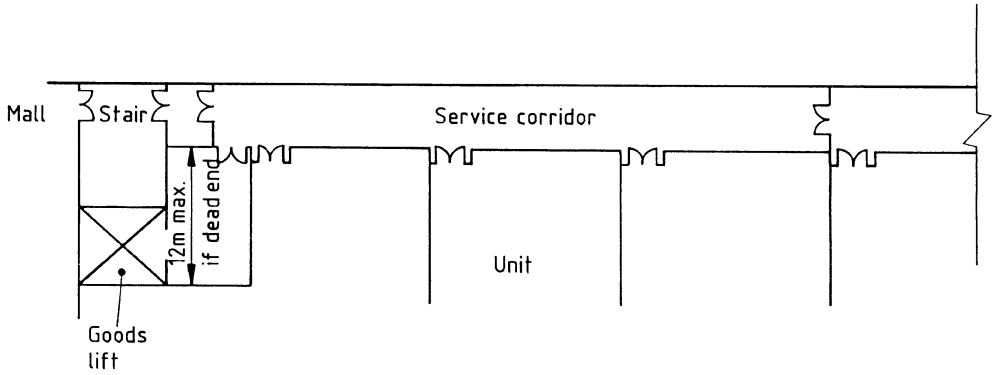
g) To ensure that the corridor remains relatively free of smoke:

1) each unit should be separated from the corridor by a protected lobby, arranged so that the doors do not obstruct the corridor (see Figure 9); or

2) if the corridor links two or more storey exits, it should be subdivided with self-closing fire door(s) in accordance with **11.2**g) (see Figure 13); or

3) a smoke control system design acceptable to the fire authority should be provided.

h) Any stair providing a means of escape from a service corridor should be constructed as a protected stairway.



The service corridor should discharge direct to a stair or exit.
Width of service corridor should be min. 2 m, max. 3 m.
Doors sub-dividing corridor is not necessary if access to units is via protected lobbies or the service corridor is provided with smoke control.

NOTE. Units with an occupancy greater than 300 persons should not have any fire exits onto a service corridor.

Figure 13 — Service corridors and goods lifts

9.5 Escape routes using unloading areas, service roads, vehicular roadways and car parks

9.5.1 *Commentary*

It is undesirable to use the unloading areas, service roads and vehicular roadways of a A1 *shopping* A1 *complex as escape routes from other parts of the* A1 *shopping* A1 *complex. If this is necessary in any particular case, suitable routes designated for pedestrians need to be provided and these routes need to be segregated from such areas to ensure that the pedestrian routes remain unobstructed and are available for people who may need to use them.*

In many schemes car parks are provided and positioned so that persons can escape into them without having to negotiate stairs. To be suitable for escape purpose, car parks need to be suitably separated from the remainder of the A1 *shopping* A1 *complex.*

9.5.2 *Recommendations*

The following recommendations are applicable (see also Figure 14).

a) Any escape route to an adjoining car park, or which passes through an unloading area, service road, or is situated in a vehicular roadway, should:

1) be clearly defined and, if necessary, guarded with protective barriers in accordance with BS 6180; and

2) be continuous and not less than 2 m in width.

b) Any such adjoining car park should:

1) be separated from the main A1 shopping A1 complex by fire-resisting construction; or

2) be in the open air; or

3) be a separate building/block reached by bridge(s) open to the air.

c) Mall exits should not discharge into car parks, service roads or basement areas.

9.6 Escape from occupancies other than units

9.6.1 *Commentary*

A1 *Shopping* A1 *complexes or developments may contain office blocks, hotels, residential accommodation and places of entertainment such as theatres and cinemas, dance halls, concert halls and assembly halls. Each of these other occupancies need to have their own internal means of escape arrangements set out in accordance with accepted principles. Alternative exits from these other occupancies should not discharge onto a mall even where they have an entry from a mall.*

9.6.2 *Recommendations*

The following recommendations are applicable.

a) The internal means of escape, in case of fire, from occupancies other than units may be covered by legislation and should be designed in accordance with the principles or codes that are appropriate for the respective occupancies.

b) Where these other occupancies have an entry from a mall, there should be sufficient means of escape from these occupancies that do not discharge into a mall.

c) Means of escape from these other occupancies should be separate from protected stairways serving the malls or units.

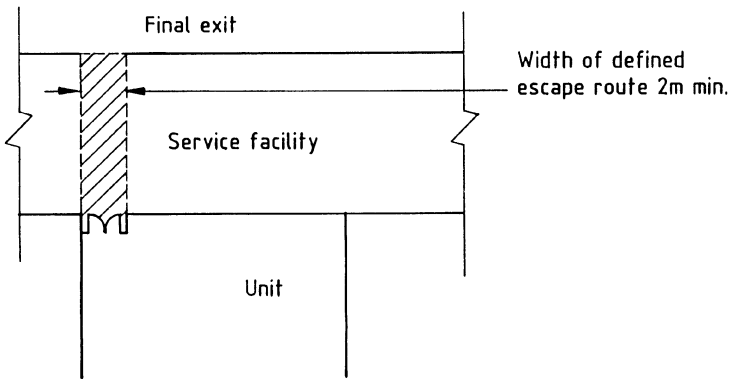


Figure 14 — Escape routes across service areas

10 Escape routes serving other public facilities

10.1 General

The scale and diversity of provisions made for the benefit and convenience of the public is increasing, particularly arrangements made to attract families to shopping complexes. Substantial areas may be devoted to public leisure and pleasure facilities, often under the direct control of the management of the ⟦A1⟩ shopping ⟨A1⟧ complex.

Whilst a relatively modest scale of accommodation provided for these purposes might be considered to be ancillary in nature to the units, and some even allowed to occupy sections of public areas, more ambitious projects should more properly be considered to be units of the ⟦A1⟩ shopping ⟨A1⟧ complex and be dealt with and accommodated as such.

It is not possible to anticipate the nature of facilities which might be provided. They will in every case require to be individually assessed and appropriate safety measures imposed for the protection of the public common areas, in addition to those recommended in this code as being applicable to units.

Special considerations are needed in the planning of facilities such as “left parcel” counters and rooms for the care and minding of children, and regard needs to be had to the effect which they are likely to have on crowd movement and emergency procedures. The smooth and efficient evacuation of sections of the malls can be jeopardized by contraflows of people with other priorities in mind than those which have been anticipated in planning escape routes. Access to accommodation which provides this kind of facility always needs to be positioned near to main exits from the ⟦A1⟩ shopping ⟨A1⟧ complex.

Other accommodation (such as plant rooms), not available to the public but to which access is usually required from public common areas, is dealt with in Clause **11**.

10.2 Recommendations for facilities available to the public (other than car parks and public transport facilities)

The following recommendations are applicable.

a) Facilities which are available to the public should be dealt with as a unit in respect of all fire safety provisions.

b) Facilities intended for the convenience of shoppers (including child minding facilities) should be positioned near to main exits from the ⟩A1⟨ shopping ⟩A1⟨ complex.

10.3 Car parks

10.3.1 *Commentary*

It is preferable if car parking facilities associated with a covered shopping complex comprise open air facilities. Often this will not be possible and therefore measures are necessary to ensure that car parking facilities do not prejudice safety in the ⟩A1⟨ shopping ⟩A1⟨ complex generally.

Preplanning of emergency procedures needs to take into account the likelihood that a high proportion of the users of the ⟩A1⟨ shopping ⟩A1⟨ complex would have arrived by car and would therefore tend to leave via the car park in an emergency. A further consideration is the problem which would be caused if all drivers were motivated simultaneously to remove their vehicles from a danger which threatened to include the car parking area.

Car parks within or adjoining a ⟩A1⟨ shopping ⟩A1⟨ complex may be required to be licensed under the Petroleum (Consolidation) Act 1928 by the Petroleum Licensing Authority for the area, which therefore needs to be consulted.

10.3.2 *Recommendations*

The following recommendations are applicable.

a) Any enclosed car park within or adjoining the ⟩A1⟨ shopping ⟩A1⟨ complex should:

1) have escape routes of such number and so situated that the travel distance to the nearest storey exit is in accordance with Table 2.

The capacities of these exits and escape routes should be calculated in accordance with Table 3. The aggregate capacity should be not less than the number calculated using a floor space factor of two persons per parking space, when in turn the capacity of each exit or escape route is discounted;

NOTE If these exits and escape routes also provide means of escape from any mall, their widths should comply with **9.3.3**.

2) have any external openings situated so as not to endanger any escape route or final exit from the ⟩A1⟨ shopping ⟩A1⟨ complex;

3) be provided with adequate means for venting smoke (see **20.6.4**);

4) be provided with suitable access for firefighting (see Clause **7**); and

5) be provided with sprinkler protection (see **18.2.2**).

b) Any car parking facilities provided within the ⟩A1⟨ shopping ⟩A1⟨ complex should be treated as a unit and be separated by fire-resisting construction from the remainder of the ⟩A1⟨ shopping ⟩A1⟨ complex (see **14.5**).

c) Any enclosed car park with access to a covered mall should be separated from the mall by a protected lobby.

10.4 Public transport facilities

10.4.1 *Commentary*

In many schemes there will be an interface between the ⟩A1⟨ shopping ⟩A1⟨ complex and public transport facilities, for example, bus and coach stations, railway stations, airports and heliports. In a large ⟩A1⟨ shopping ⟩A1⟨ complex there may be more than one public transport facility, e.g. an underground station and a bus/coach station, and (in coastal areas) perhaps even a ferry station. The facilities involved may be open or covered, above or below ground.

It is likely that one of the main access routes to a public transport facility attached to a ⟩A1⟨ shopping ⟩A1⟨ complex will be via the mall system of the ⟩A1⟨ shopping ⟩A1⟨ complex. Consequently, at peak travel times, the mall population will be considerably larger than the unit population.

It is necessary, therefore, to ensure that the means of escape routes from the transport facilities take account of peak period usage, and that the effect upon the means of escape routes serving the A1 *shopping* A1 *complex is considered when calculating mall widths and mall exit widths.*

Public transport facilities may also pose a problem of fire spread, should a fire occur in a vehicle, vessel or aircraft. The facilities need to be treated as a separate compartment for the purposes of fire separation, smoke control systems, and other relevant fire safety factors.

10.4.2 *Recommendations*

The following recommendations are applicable.

a) All public transport facilities should be provided with escape routes (independent of the escape routes serving the A1 shopping A1 complex) of such number and so situated that the travel distance to the nearest storey exit complies with Table 2.

The minimum capacity of any such exit and escape route should comply with **9.3.3**b).

b) Any public transport facility attached to or forming part of the A1 shopping A1 complex should be treated as a separate compartment, and where any facility is linked to the A1 shopping A1 complex by a tunnel, bridge or walkway, or by an uncovered link less than 6 m in length, arrangements should be made to prevent the spread of smoke and fire from one to the other.

NOTE Covered links with an uncovered section at least 6 m long between the covered section and the A1 shopping A1 complex or the facilities should be treated as an uncovered link.

c) Accommodation within public transport facilities (e.g. offices, shops, fast food areas) should be designed in accordance with the appropriate Part of BS 5588.

11 Escape routes serving non-public common areas and ancillary accommodation

11.1 Commentary

Many forms of ancillary accommodation are necessary in shopping complexes and it is desirable that, wherever possible, these are located in the non-public areas in order that public areas are effectively isolated from any hazard which the ancillary accommodation may impose.

In addition to rooms associated with common engineering services, ancillary accommodation includes stores and servicing areas.

Other accommodation, not normally available to the public but for which access from public common areas may be required, is that associated with the management of the A1 *shopping* A1 *complex for administrative purposes and may include offices, staff rooms and telephone exchanges. Whilst a management suite may be considered as a unit, any management areas remote from this suite are considered as ancillary accommodation.*

Corridors are commonly formed to provide access to ancillary accommodation. In view of the special risks associated with ancillary accommodation, such corridors need to be protected.

To prevent a corridor that connects alternative exits from becoming smoke-logged along its length, it is necessary to divide that corridor by a smoke control door and associated screen. Similarly, connecting corridors and dead-end corridors need to be separated so as to restrict the movement of smoke.

*Fire protection of areas of ancillary accommodation is dealt with in **14.5**.*

*Rooms in which engineering services are contained are dealt with in **21.3**.*

11.2 Recommendations

The following recommendations are applicable.

a) Non-public common areas and ancillary accommodation (including service installation rooms) should have escape routes of such number and be so situated that the travel distance from any point does not exceed the limitations given in Table 2. The capacities of the exits and escape routes should be calculated in accordance with Table 3.

If travel is initially in one direction only then:

1) the travel distance within the room or area to the point at which travel is possible in more than one direction should not exceed the appropriate limit given in Table 2; and

2) the total travel distance within the room or area (including that part in one direction only) should not exceed the appropriate limit given in Table 2.

For travel to be considered to be in more than one direction, either:

i) the routes should be not less than 45° apart; or

ii) the routes should be separated from each other by fire-resisting construction.

b) Alternative means of escape which do not involve entry into units should be provided from all common delivery and servicing areas.

c) Glazed areas separating escape routes from ancillary accommodation and from service installation rooms should be in accordance with **14.7.2**.

d) Ancillary accommodation (including service installation rooms) should be separated from any protected stairway by a protected lobby or protected corridor (see **12.6**) at the storey in which the accommodation is situated.

e) Ancillary accommodation (including service installation rooms) should be separated from any corridor available to the public by a protected lobby.

f) Corridors serving ancillary accommodation (including service installation rooms) should be enclosed by construction with a fire resistance of not less than 30 min and all doors within the enclosures should be fire-resisting and self-closing.

g) Corridors connecting alternative exits (other than corridors not exceeding 12 m in length) and corridors that comprise dead ends should be subdivided and separated as indicated in Figure 15.

12 Stairs and final exits

12.1 Number of protected stairways

12.1.1 *Commentary*

Accommodation stairs and escalators are provided in multi-level shopping complexes to connect the upper and lower malls. They are disregarded for escape purposes even though in practice they will be used if free from smoke and heat.

Because covered shopping complexes are provided with smoke control systems designed to ensure that all sections of the malls are usable for means of escape, all protected stairways serving malls may be expected to remain usable until any necessary evacuation is complete.

The safety of stairs serving other parts of the ⟦A1⟩ *shopping* ⟨A1⟧ *complex, for example car parks, cannot be ensured for an unlimited period of time. In these cases, all but the one nearest the fire may be expected to remain usable until any necessary evacuation is complete.*

12.1.2 *Recommendations*

The following recommendations are applicable.

a) There should be not less than two protected stairways available from each storey and car parking level.

b) Additional protected stairways should be provided as necessary to meet requirements for travel distance.

12.2 Siting of protected stairways

12.2.1 *Commentary*

In order to enable people to turn away from any fire to make their exit, protected stairways need to be located so that they are remote from each other.

12.2.2 *Recommendations*

The following recommendations are applicable.

a) The siting of protected stairways should be such that they afford effective alternative directions of travel from any relevant point in a storey.

b) Access to protected stairways should, so far as is reasonably practicable, be sited away from open connections between mall levels.

12.3 Width of protected stairways

12.3.1 *Commentary*

Protected stairways need to be of sufficient width to allow the full number of occupants who may need to use them for escape purposes to do so without risk of overcrowding or delay. In determining the number of persons on any mall level who may need to use a stair, the considerations of ***9.3.3****b) apply. It should be noted that, if one or more central handrails are provided, then each section of the stair so formed is treated as a separate stair.*

Table 2 — Maximum travel distances (other than in malls)

Accommodation	Maximum part of travel distance within room or area		Maximum travel distance to nearest storey exit	
	Escape in one direction only m	Escape in more than one direction m	Escape in one direction only m	Escape in more than one direction m
Accommodation other than the following list	18	45[a]	18	45[a]
Engineering services installation rooms Boiler rooms Fuel storage spaces Transformer, battery and switchgear rooms Rooms housing a fixed internal combustion engine	9	18	18	45[a]

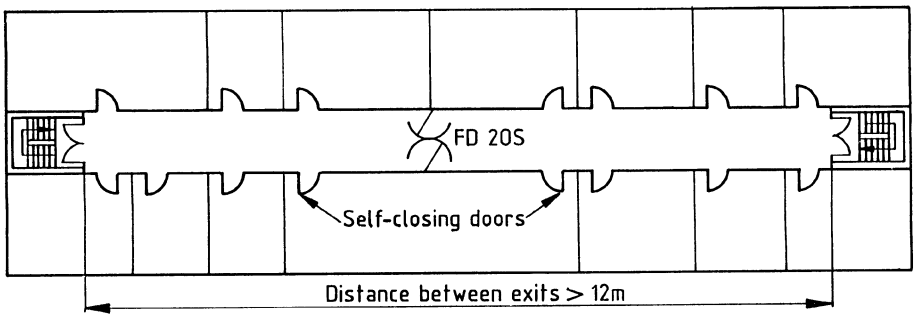
[a] This may include up to 18 m with escape in one direction only.

Table 3 — Capacities of exits (other than from malls)

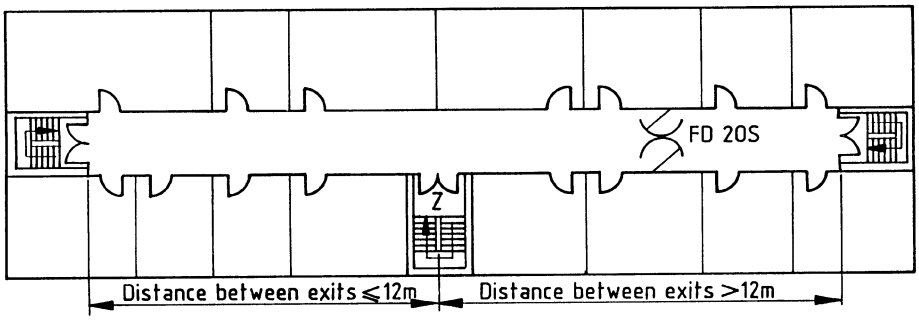
Maximum number of persons	Width mm
50	800
110	900
220	1 100
240	1 200
260	1 300
280	1 400
300	1 500
320	1 600
340	1 700
360	1 800

NOTE 1 Other values of width for a maximum number of persons greater than 220 may be obtained by linear interpolation or extrapolation.

NOTE 2 For the purposes of this table, the width of a doorway is that of the leaf or leaves, and the width of a passage is between the sides at shoulder level (that is about 1.5 m above finished floor level).

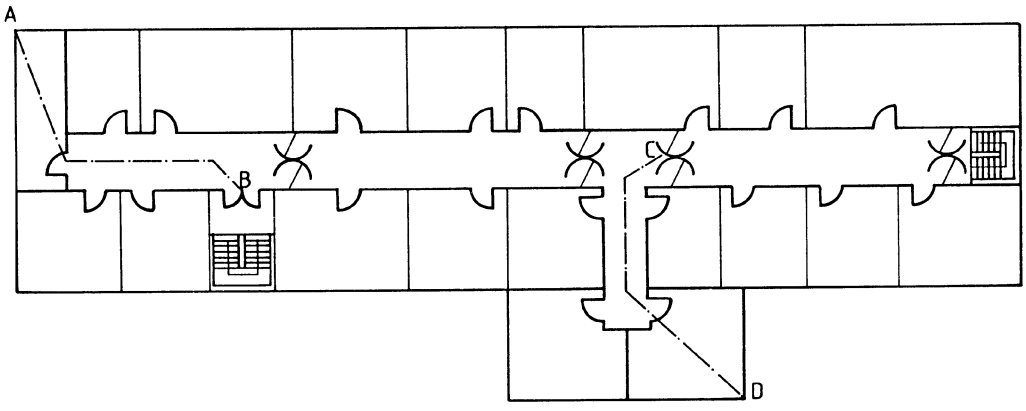


(a) Corridors connecting two exits



NOTE. Doors to central stair should be at position Z

(b) Corridors connecting three exits



AB and DC are dead ends

(c) Dead end corridors

Figure 15 — Corridors connecting alternative exits

12.3.2 *Recommendations*

The following recommendations are applicable.

a) The capacities of stairs and exits from them should be calculated in accordance with Table 4.

b) The width of the stair should not narrow in the direction of escape.

c) For the purposes of Table 4, the width of a stair is between the walls or balustrades and should be maintained clear for a vertical distance of 2 m, measured from the pitch line or landing floor level, with the following exceptions:

1) strings, each intruding into the stairway not more than 30 mm;

2) handrails, each intruding into the stairway not more than 100 mm.

NOTE If a handrail intrudes more than 100 mm into a stair, for the purposes of calculating the capacity of the stair, the stair width should be regarded as reduced by the amount that the intrusion exceeds 100 mm.

12.4 Enclosure of protected stairways

12.4.1 *Commentary*

The fire-resisting enclosure of a protected stairway is intended to prevent smoke and heat from entering the stair and rendering it impassable for escape purposes, and to restrict fire spreading from one storey to another. It is important to ensure that there are no fire risks within a protected stairway.

Some or all of these protected stairways may need to be designed as firefighting stairs (see ***7.4****).*

NOTE A protected stairway includes any passageway between the stair and a final exit (see ***2.33****).*

12.4.2 *Recommendations*

The following recommendations are applicable.

a) A protected stairway (other than a firefighting stair) should not incorporate any accommodation other than lift wells.

NOTE Engineering services such as gas and electricity should comply with the recommendations given in Section 7.

b) If a protected stairway projects beyond, or is recessed from, 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 stairway should be not less than 1.8 m[2)];

2) the enclosures within that distance and up to 9 m vertically below should be of fire-resisting construction that may have fixed fire-resisting glazed areas.

c) Where two protected stairways adjoin, they should be separated by imperforate construction, i.e. there should not be any openings, doors etc. in the separating elements common to both stair enclosures.

12.5 Basement stairs

12.5.1 *Commentary*

Areas below ground level are more likely to become completely filled with smoke and heat from a fire than are the ground and upper storeys. There is, therefore, a greater risk that a stair in a basement will become obstructed by smoke and heat, particularly in a fully developed fire. For this reason, it is preferable that all stairs to basements be entered at ground floor level from the open air, and only from such positions that smoke from any basement fire will not obstruct any exit serving the ground and upper storeys of the ▌A1⟩ *shopping* ⟨A1▌ *complex.*

However, if stairs are adequately protected from the ingress of smoke, e.g. by a system using pressure differentials or by the provision of ventilated lobbies at basement storeys, stairs serving upper storeys may be continued down to serve basement storeys.

Some shopping complexes are constructed on sloping sites such that a lower mall level may constitute a basement storey even though there may be a final exit from the ▌A1⟩ *shopping* ⟨A1▌ *complex at that level. If any lower mall level is provided with a smoke control system compatible with that provided at other levels, protected stairways may continue down to the lower level without any special precautions being taken.*

2) The Technical Standards to the Building Standards (Scotland) Regulations require a minimum separation of 2.0 m.

12.5.2 ***Recommendation***

A protected stairway connecting the basement storey(s) with the ground and upper storeys should be separated from each basement level by a protected lobby in accordance with **12.6.2**, unless:

a) the stairway is provided with a smoke control system using pressure differentials (see **20.6.3**); or

b) the basement comprises a lower mall level which is provided with smoke ventilation arrangements in accordance with **20.3**.

12.6 Access lobbies and corridors to protected stairways

12.6.1 ***Commentary***

Because of the smoke control provided in mall areas, direct access from malls into protected stairways without the need for lobby protection is considered acceptable.

Service corridors at the rear of units need to be protected corridors as they are not generally provided with smoke control.

Lobby protection to protected stairways is necessary to safeguard stairs connecting with enclosed car parks, boiler rooms and transformer chambers, etc.

*Still greater protection is necessary in connection with any corridor connecting a mall exit with a storey exit, and with any firefighting stairs (see **7.4**).*

Table 4 — Capacity of a stair

Number of floors served	Maximum number of persons accommodated on one stair of width:								
	1 000 mm	1 100 mm	1 200 mm	1 300 mm	1 400 mm	1 500 mm	1 600 mm	1 700 mm	1 800 mm
1	150	220	240	260	280	300	320	340	360
2	190	260	285	310	335	360	385	410	435
3	230	300	330	360	390	420	450	480	510
4	270	340	375	410	445	480	515	550	585
5	310	380	420	460	500	540	580	620	660
6	350	420	465	510	555	600	645	690	735
7	390	460	510	560	610	660	710	760	810
8	430	500	555	610	665	720	775	830	885
9	470	540	600	660	720	780	840	900	960
10	510	580	645	710	775	840	905	970	1 035

NOTE The capacity of stairs serving more than 10 floors may be obtained by linear extrapolation.

12.6.2 ***Recommendations***

The following recommendations are applicable.

a) If a protected stairway, other than an external stair, serves a storey or storeys in any of the following circumstances, it should be approached only by way of a protected lobby or protected corridor at the levels indicated.

1) If the stairway is in a building of height (see **2.23**) greater than 18 m, there should be a protected lobby or protected corridor at every level (excluding a top storey consisting exclusively of plant rooms).

2) If the stair provides access to any ancillary accommodation, there should be a protected lobby or protected corridor at the storey in which the ancillary accommodation is situated.

NOTE If the accommodation is a boiler room or transformer chamber, the lobby or corridor should be ventilated [see **20.6.2**b)].

3) If the stair connects the ground or upper storeys with a basement storey or storeys, or serves only basement storeys, there should be a ventilated protected lobby or ventilated protected corridor [see **20.6.2**a)] at every basement level, unless the stair is provided with a smoke control system using pressure differentials or the basement comprises a lower mall level which is provided with smoke ventilation arrangements (see **12.5.2**).

4) If the stair provides access to an enclosed car park, there should be a ventilated protected lobby or ventilated protected corridor [see **20.6.2**c)] at every car park access level.

5) If the stair serves a mall or walkway and a service corridor, the service corridor should be separated from the stair by a protected lobby.

b) Any corridor connecting an exit from a covered mall or walkway with a protected stairway or final exit should be a protected corridor which has no openings or doors to any adjacent accommodation.

12.7 External escape stairs

12.7.1 *Commentary*

Wherever possible, escape routes for the public in shopping complexes should not be by way of an external stair. This does not preclude, however, exits being by way of a raised walkway or podium which acts as a street.

However, occasionally the planning of the [A1] *shopping* [A1] *complex may be such that it may be necessary to consider access onto an external stair leading to a final exit.*

*External escape stairs provided for means of escape purposes (i.e. to meet the recommendations of **12.1.2** and **12.2.2**) are deemed to be protected stairways, and hence need to satisfy the recommendations given in **12.3.2**, **12.4.2**, **12.5.2** and **12.8.2** as well as those given in **12.7.2**.*

External escape stairs need to be protected from the effects of adverse weather conditions to avoid the stair being made slippery by rain or ice. It is also necessary to ensure that their use at the time of a fire cannot be prejudiced by smoke and flames from nearby doors and windows.

12.7.2 *Recommendations*

The following recommendations are applicable.

a) Any external escape stair used as a means of escape should:

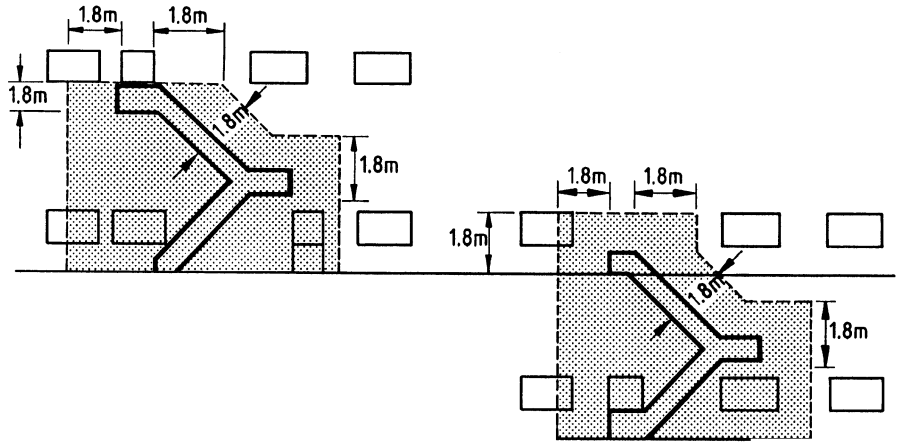
1) be roofed and at least partly covered in at the sides (depending upon the degree of exposure) so as to ensure freedom at all times from adverse weather conditions; and

2) be constructed of non-combustible material.

b) Any wall (or portion) (other than more than 1.1 m above the top floor level of a stair not being a basement stair) within 1.8 m of, or within 9 m vertically below, any external escape stair, should be of fire-resisting construction that may contain fire-resisting glazed areas. The doors to the stair (other than the door(s) at the top floor level of a stair serving storeys above ground level) should be fire-resisting and self-closing (see Figure 16).

c) Where the escape route from the stair is in one direction only, doors and windows that are not fire-resisting, ventilation outlets and extract systems, should not be sited within 3 m of the route.

d) Lobbies are not required to an external escape stair.



NOTE. The door at the top of the stair need not be fire-resisting and self-closing.

(c) Stair serving storeys above ground level (b) Stair serving a basement

Key Areas required to be of fire-resisting construction

Figure 16 — Fire resistance of areas adjacent to external stairs

12.8 Discharge from stairs and final exits

12.8.1 *Commentary*

The general principle to be followed is that all occupants of the [A1] *shopping* [A1] *complex using stairs to reach safety in the open air need to be assured of the same degree of protection from the effects of smoke and heat in this part of the escape route as that provided in other parts. The following considerations apply.*

a) *The safest arrangement is for the stair or final exit to discharge directly to the street at ground level. However, in large* [A1] *shopping* [A1] *complexes this may not be possible and consideration may be given to routes to final exits other than by way of the mall, e.g. via service yards, car parks or basement areas, where adequate provision is made for people to reach safety away from the* [A1] *shopping* [A1] *complex. (See* ***9.5****.)*

b) *In some circumstances, escape upwards rather than downwards, e.g. to service decks above the general level of the shopping malls, may be acceptable. The relationship between any upward escape routes and smoke reservoirs needs to be examined, to avoid leading people into a place where smoke might accumulate.*

c) *Any final exit needs to be immediately apparent to people using a stair that serves storeys both above and below the point of final exit. In order to prevent people who are escaping from passing the point of discharge, it is necessary to divide the landing at that level, although a door may be provided in the dividing structure for normal circulation between the upper and lower storeys.*

12.8.2 *Recommendations*

The following recommendations are applicable.

a) Where the exit passageways from two protected stairways adjoin, they should be separated by imperforate construction, i.e. there should not be any openings, doors, etc. in the separating element common to both passageways.

b) Final exits should have a width not less than that of the escape routes they serve and should give direct access to a street, passageway, walkway or open space sited so as to ensure the rapid dispersal of persons from the vicinity of the [A1] shopping [A1] complex so that they are no longer in danger from fire or smoke.

c) The upward and downward flights of any stair serving a basement and the ground and/or upper storeys should be separated at ground or access level by fire-resisting construction.

d) Any external portion of an escape route between a final exit and street level, for example across a concourse, service yard or pedestrian walkway, should be clearly defined and if necessary guarded with protective barriers in accordance with BS 6180.

e) Final exits should be so sited that they are clear of any risk from fire or smoke.

f) Transformer chambers, boiler rooms, refuse storage areas and similar risks should not have any openings that would prejudice the means of escape from the [A1] shopping [A1] complex.

13 Wayfinding and spatial orientation (architectural design, fire safety signs and messages)

13.1 Commentary

Research of the public's comprehension of the layout and ease of finding destinations in settings such as shopping complexes, car parking blocks and underground spaces has revealed significant spatial orientation and wayfinding problems. While spatial "complexity" can be alleviated by effective signs, wayfinding problems originate in the architectural design of a setting. Factors such as the lack of correspondence between the outside shape of a building complex and internal plan, access to the building at different levels, uniformity and symmetrical nature of malls and walkways on different levels, and lack of architectural reference points by which shoppers can readily establish where they are in relation to exits and destinations, cause confusions in the everyday use of a shopping complex. Such confusions jeopardize an emergency situation.

Careful attention is needed to the positioning, information content and presentation of signs and other visual displays such as electronic information boards, as well as decorative features which could obscure signs. To promote efficient crowd circulation in the everyday use of a shopping complex, and therefore in an emergency, the fire authority needs to be consulted with regard to the siting, positioning and information displayed through destination, escape route, fire exit signs and other visual displays (including "You-are-here" maps indicating the direction of exits, facilities and layout of the [A1] shopping [A1] complex).

Mention is made in [A1] BS 5588-12 [A1] of the value of public address systems in providing emergency information, but the effectiveness of verbal guidance can be seriously diminished if it is stated in terms of directional bearings, relative positions or the names given to the various entrances which are not readily apparent from within the malls. Appropriate signs can therefore complement public address announcements.

The fire authority also needs to be consulted with regard to the provision of fire safety signs (other than exit signs), e.g. to draw attention to the necessity to keep escape routes clear of obstructions and to identify those areas where smoking is not allowed.

*Consideration also needs to be given to the advantages of a photo-luminescent or other luminous wayfinding system of exit signs and directional markers on escape routes as a supplement to escape lighting (see **26.5**). A luminous system of directional lines (on walls near floor level and/or on floors), arrows, maps, exit signs, handrails and on the edge of steps, can improve wayfinding by the public, staff and fire service in unfamiliar surroundings.*

Guidance on the use of photo-luminescent markings for escape routes is given in BRE Information Paper IP 17/89.

13.2 Recommendations

The following recommendations are applicable.

a) Confusing spatial layouts should be avoided.

b) All exits in covered shopping complexes, including exits from the individual malls and the final exits from the [A1] shopping [A1] complex, should be marked and be readily visible to the occupants of the [A1] shopping [A1] complex.

c) Intermediate exit signs should be provided as necessary in public common areas so that no part of a public common area is more than 25 m from an exit sign or directional exit sign.

d) All fire safety signs and notices should comply with the relevant requirements of BS 5499.

e) Emergency announcements on the public address system and any electronic visual displays should be related to, and should augment, exit signs and directional signs.

f) The fire authority should be consulted about the siting and positioning of fire safety signs and other visual displays.

Section 5. Construction

14 Construction

14.1 General

Whilst this section deals with the construction of the ⟩A1⟨ shopping ⟩A1⟨ complex as a whole, the construction of individual units and other occupancies should comply with the recommendations of the Part of BS 5588 appropriate to their proposed use. The hazard posed by units and other occupancies to the common parts of the ⟩A1⟨ shopping ⟩A1⟨ complex in the event of fire in a unit or other occupancy is the prime consideration of this section.

The recommendations in Section 4 are made on the assumption that the provisions for structural fire protection of the ⟩A1⟨ shopping ⟩A1⟨ complex comply with the appropriate building regulations. Structural fire protection embraces the following matters, but the actual requirements of some of these depend on the size of the building(s) forming the ⟩A1⟨ shopping ⟩A1⟨ complex, and their relation to the site boundary:

a) fire resistance of structural elements;

b) subdivision of the ⟩A1⟨ shopping ⟩A1⟨ complex into compartments;

c) protection of all shafts connecting different compartments;

d) provision of cavity barriers and fire stops;

e) restriction of spread of flame on surfaces of walls and ceilings;

f) construction of roofs;

g) construction of external walls.

The provision of structural fire protection is intended to ensure that the ⟩A1⟨ shopping ⟩A1⟨ complex will not collapse prematurely in fire, and that the means of escape will remain unaffected by fire for long enough to ensure that the escape of the occupants can take place without undue risk. It will not, however, necessarily avoid the material loss of property.

It may therefore be desirable, in consideration of interests other than life safety, for designers to seek to provide a higher standard or a more comprehensive application of passive or active fire protection measures than is recommended here.

14.2 Internal linings

14.2.1 *Commentary*

The fire performance of internal linings of walls and ceilings of buildings, in respect of their surface spread of flame characteristics, is covered by building regulations. In a shopping complex, class 0 surfaces would be needed in circulation spaces, which would include most common areas, with surfaces elsewhere needing a surface spread of flame rating of class 1 in accordance with BS 476-7.

However, some variation on these standards may be appropriate, for example, shop signs and glazed areas at high level over malls (but not any glazing in shop fronts). Some glazing products may not be capable of testing in accordance with BS 476-7 and their performance in fire may need to be ascertained by other means.

If a shop front is provided it may incorporate combustible materials, including structural timber framing for the glazed areas, and stallboard risers, apart from the glazed part (which would need to have a minimum performance as for linings) and any part of the shop front which forms one side of a smoke reservoir. In such cases it is important that, in the event of fire, lateral spread from one unit to another is restricted. Separation between units, as for shop signs, is therefore needed. Depending on the amount of combustible material it may also be necessary to modify the smoke control system or to install sprinklers outside the shop front, although these additional measures are not likely to be needed where the only combustible materials are structural timbers supporting areas of glazing.

14.2.2 *Recommendation*

In circulation spaces all surfaces should be class 0 unless:

a) they are structural timbers supporting areas of glazing that form part of a unit front; or

b) they are unit signs with a surface spread of flame rating of class 1, 2 or 3 in accordance with BS 476-7, or are stallboard risers and are not within 1 m of any non-class 0 surfaces that form part of the front of an adjacent unit.

14.3 Compartmentation

14.3.1 *Commentary*

In order to reduce the possibility of a fire in one unit spreading uncontrolled throughout the [A1] *shopping* [A1] *complex, it is necessary to provide structural fire barriers between individual units, and to separate large units from malls. Similarly, parts of a* [A1] *shopping* [A1] *complex which fall into different main uses should be fully separated from one another.*

NOTE Where fire shutters are installed to form compartmentation between any unit and the mall, they need to be fitted with a controlled descent mechanism and to give an audible warning when operated.

14.3.2 *Recommendations*

The following recommendations are applicable.

a) Compartment walls and/or floors should be provided between parts of the [A1] shopping [A1] complex which have different main uses.

b) Compartmentation should be provided between the mall and:

1) any units with a floor area exceeding 3 700 m^2 at that level;

2) opposing units, where each has a floor area exceeding 2 000 m^2 at that level; and

3) any upper storey of a unit which has open connections with a lower storey in that unit which also has access from the mall.

c) The following walls and floors should also be constructed as compartment walls and compartment floors:

1) walls and floors between units;

2) walls between units and service corridors;

3) floors covering (or partially covering) roads; and

4) walls separating covered fire service access roads and covered servicing areas from the remainder of the [A1] shopping [A1] complex.

14.4 Fire resistance

14.4.1 *Commentary*

Elements of structure (see ***2.11****) may not inherently possess sufficient fire resistance. A variety of methods of additional fire protection is available in the form of protective coverings, casings or membranes, but designers should consider the risk of mechanical or other damage when selecting methods and materials. In some cases such damage can reduce or destroy the fire resistance of the element.*

For the purposes of complying with the recommendations for means of escape in case of fire, a 30 min period of fire resistance is generally considered adequate. However, increased periods of fire resistance for some elements may be necessary for structural fire protection, not only to comply with building regulations, but also to ensure adequate safety for firefighting. Higher periods of fire resistance may also be needed for insurance purposes and therefore the Insurers should be consulted at the design stage.

Satisfactory performance of fire resistance of structural elements is ascertained by compliance with one of the following:

a) *specifications tested, or assessed, in accordance with the appropriate part of BS 476*[3)]*;*

NOTE Requirements made in connection with statutory provisions may still refer to BS 476-8 although it has been superseded by BS 476-20, BS 476-21, BS 476-22 and BS 476-23, with the tests relevant to loadbearing elements published in Part 21, and those for non-loadbearing elements in Part 22. The criterion of "stability" has been replaced by the criterion of "loadbearing capacity". In line with international practice, non-loadbearing elements tested in accordance with BS 476-22 are assessed only for integrity and insulation. Brief details of these tests are given in PD 6520.

b) *appropriate British Standard specifications or codes of practice;*

c) *specifications referred to under building legislation.*

[3)] Although BS 476-8 was superseded in 1987, specifications tested to Part 8 before 1.1.1988 are acceptable for the purposes of this code.

14.4.2 ***Recommendations***

The following recommendations are applicable.

a) Fire resistance, where recommended in this code, should be taken (in the absence of any recommendation to the contrary) as being not less than 30 min, and implies the following:

1) for loadbearing walls, equal compliance for loadbearing capacity, integrity and insulation from either side;

2) for non-loadbearing walls and partitions, equal compliance for integrity and insulation from either side;

3) for floors, equal compliance for loadbearing capacity, integrity and insulation from the lower side;

4) for glazed elements, equal compliance for the appropriate criteria (see **14.7.2**) from either side;

5) for doors, compliance for integrity from either side, except in the case of doors to lift wells where performance is in respect of exposure of the landing side only.

b) The fire resistance of any element of structure should be not less than that required for any element which it supports, and in no case less than 120 min.

c) The following walls should have a fire resistance of not less than 120 min:

1) walls between units (or other occupancies), and between units (or other occupancies) and service corridors;

2) walls between parts of the ▌A1⟩ shopping ⟨A1▐ complex which have different main uses.

d) Any floor that covers (or partially covers) a fire service access roadway or a public roadway, and any wall separating a covered roadway from the remainder of the ▌A1⟩ shopping ⟨A1▐ complex, should have a fire resistance of not less than:

1) 240 min, if it is a floor over a basement, or a wall in a basement; or

2) 120 min, at any other level.

e) The walls listed in items c) and d) should be constructed from materials with a durability and resistance to impact damage not less than that given in Appendix B, and whose fire resistance, durability and resistance to damage is not significantly reduced by the absorption of water resulting from firefighting operations and/or the operation of sprinklers.

NOTE Materials such as brick and concrete are deemed to satisfy the recommendations of Appendix B.

The floors listed in item d) should be of solid non-combustible construction.

f) Floors and beams should achieve the appropriate standard of fire resistance without taking account of any additional protection afforded by any suspended ceiling beneath them.

14.5 Fire protection of certain facilities

14.5.1 ***Commentary***

Ancillary accommodation (including service installation rooms) generally tends to present a greater fire hazard than the units because the accommodation may only be occasionally visited and therefore is not under regular surveillance. Ancillary areas need to be adequately separated from the remainder of the ▌A1⟩ shopping ⟨A1▐ complex, with the degree of separation varying according to the risk.

Servicing areas provide common facilities for the reception of goods and supplies for the various units. These facilities comprise access for delivery vehicles and their unloading/handling equipment (which is usually power driven) and, possibly, storage rooms (although usual practice involves the direct transportation of delivered goods to the storage facilities of the various units). Servicing areas are often arranged as multiple unloading bays, some exclusive to the larger units of the ▌A1⟩ shopping ⟨A1▐ complex, but many offering a shared facility to coincide with the position occupied by the appropriate units and, in the case of servicing from levels which are either above or below mall level, goods lifts and hoists. In such cases, and particularly in the case where servicing is carried out from a lower level, the need for a fire-resisting enclosure of lift wells and service shafts is particularly critical.

Additional fire-resisting structural separation is needed in the case of lower-level common servicing arrangements, and indeed in the case of any covered vehicle delivery area, between those areas and other adjacent common servicing facilities. This separation may serve to provide means of escape which is alternative to that provided through the vehicle access roads.

14.5.2 ***Recommendation***

Enclosed car parks, covered servicing areas, the central control room/fire control centre, ancillary accommodation and service installation rooms (including those on the top of a flat roof) should be separated from other parts of the building in accordance with Table 5.

14.6 Vertical shafts for lifts, hoists, services, etc.

14.6.1 ***Commentary***

The penetration of fire-resisting floors by services and vertical shafts can prejudice the safety of occupants and create points of weakness in the compartmentation of the A1 *shopping* A1 *complex. There are provisions in building regulations for the penetration of compartment walls and compartment floors by service ducts and shafts.*

Wall-climber and other feature lifts within a mall could prejudice the safety of the occupants of the A1 *shopping* A1 *complex if they run through a smoke reservoir. Care is needed to maintain the integrity of the smoke reservoir and to protect the occupants of the lift.*

The use and installation of lifts are dealt with in Clause ***28****.*

14.6.2 ***Recommendations***

The following recommendations are applicable.

a) For lifts

1) Lift wells (except where situated wholly within mall areas, see item 3), or in a protected stairway, see **12.4.2**) should be enclosed throughout their height with fire-resisting construction.

Lifts serving accommodation over shopping complexes (other than car parks) should not discharge to a final exit via a mall.

2) Passenger lifts giving access to a mall and serving basement areas below a mall should be entered from each basement area by way of a protected lobby.

3) Where lifts not enclosed in shafts (e.g. feature lifts such as wall-climbers) pass through a smoke reservoir, they should be constructed/enclosed so as to prevent the escape of smoke through the opening provided for the lift in the reservoir boundary.

NOTE Lifts installed in units and other occupancies are covered by the relevant part of BS 5588 for the use of the unit.

b) Service shafts and other vertical ducts should be enclosed throughout their height with fire-resisting construction. Service ducts should comply with BS 8313 and ventilation and air conditioning ductwork should comply with BS 5588-9.

Table 5 — Structural fire protection of certain facilities

Facility	The facility should be separated from other parts of the [A1] shopping ⟨A1⟩ complex by:
1. Storage areas not greater than 450 m^2 (other than refuse storage areas) 2. Engineering services installation rooms (other than those covered by items 6, 7 and 8)	Robust construction having a minimum standard of fire resistance of 60 min (see Note)
3. Repair and maintenance workshops 4. Storage areas greater than 450 m^2 (other than refuse storage areas)	Robust solid non-combustible construction having a minimum standard of fire resistance of 120 min (see Note)
5. Refuse storage areas 6. Rooms housing fixed internal combustion engine(s) 7. Boiler rooms and fuel storage spaces 8. Transformer and switchgear rooms for equivalent above low voltage 9. Central control room, fire control centre, enclosed car parks and enclosed servicing areas	Robust solid non-combustible construction having a minimum standard of fire resistance equivalent to that required for the elements of construction of the [A1] shopping ⟨A1⟩ complex, and in no case less than 120 min (see Note)
NOTE Any openings in the required construction should be protected by doors having a similar standard of fire resistance.	

14.7 Glazed elements

NOTE The recommendations given in BS 6262 should also be followed. These recommendations may impose further restrictions on the position, size and composition of glazed elements.

14.7.1 *Commentary*

Partitions, doors and windows can be glazed with a variety of products, e.g. traditional annealed wired glass based on soda-lime-silica, or clear borosilicate glass. Although able to satisfy the integrity criterion of BS 476-22 for periods in excess of 90 min, these permit local heat transmission and radiation through the glass and so are unable to satisfy the insulation criterion for more than a limited period of time. Such heat transmission and radiation can constitute a hazard to people escaping nearby and could ignite adjacent combustible materials. Some laminated glasses (intumescent or gel-interlayer) can achieve in excess of 90 min for integrity and insulation in specific glazing constructions.

NOTE 1 PD 6512-3 gives advice and information on the fire performance of glazed elements in buildings.

The type of glazed element permitted in a fire-resisting construction depends on whether:

a) *the glazed element should afford the same protection as the remainder of the enclosure in which it is situated; or*

b) *it is only necessary for the glazed element to afford protection against the passage of flames and hot gases.*

NOTE 2 Additional restrictions may be imposed in connection with the construction of firefighting shafts (see BS 5588-5).

14.7.2 *Recommendations*

The following recommendations are applicable.

a) Glazed elements that are fire-resisting in terms of integrity and insulation to the required level may be used without restriction.

NOTE Glazing in service corridors needs to satisfy the recommendations on resistance to impact given in Appendix B.

b) Glazed elements that are fire-resisting in terms of integrity only should comply with the limitations given in Table 6 appropriate to their position.

14.8 Fire doors

NOTE The term "fire door" includes both the door frame and the door leaf or leaves.

Table 6 — Limitations on non-insulating fire-resisting glazed elements

Position of glazed element	Maximum total glazed area in:	
	fire-resisting walls[a]	any leaf of a fire door[b]
Between a protected stairway and a mall or walkway[c]	Unlimited above 1.1 m height	50 % of door area
Between a protected stairway and a unit, enclosed car park or covered public transport facility	Nil	50 % of door area
Between a protected stairway and a protected lobby or protected corridor	Unlimited above 0.1 m height	Unlimited above 0.1 m height
Between a protected lobby or protected corridor, and a common area; and between a unit and a protected lobby to a service corridor	Unlimited above 0.1 m height	Unlimited above 0.1 m height
Between any accommodation and a protected corridor connecting a covered mall or walkway with a protected stairway or final exit	Nil	Not applicable
Between a service corridor and a unit or a protected lobby to a unit	Nil	50 % of door area
Between any escape route and ancillary accommodation	Nil	0.1 m^2 max.
Subdividing corridors and malls	Unlimited above 0.1 m height	Unlimited above 0.1 m height

[a] The size of individual panes of glass making up the total glazed area should be limited to sizes that have been satisfactorily demonstrated to comply with the integrity criterion for an appropriate duration under test. Similarly, any mullions or transoms, especially between adjacent glazed elements, should also be proven.
[b] The suitability of any door with respect to incorporating fire-resisting glass should be established before glazing. Moreover, not all doors can be glazed without affecting the integrity of the door assembly.
[c] Measured vertically from the landing floor level or the stair pitch line.

14.8.1 ***Commentary***

Fire doors are one of the most important links in the chain of fire safety precautions, and care in their selection to ensure that they are adequate for their purpose cannot be over-emphasized.

The failure of doors under fire conditions usually occurs either at the gap between the door and the frame, or at one or more of the points where ironmongery is fixed (particularly at the hinges or lock positions) or, in the case of glazed doors, at the line of the junction between the glazed area and the rest of the door. For this and other reasons it is particularly important to ensure that doors delivered on site comply precisely, in dimensions and workmanship, with the manufacturer's specification for the appropriate fire resistance test report/assessment. Doors should be hung to ensure a good fit to the frame when closed.

The ability of fire doors to perform their designed function will depend upon their being fully closed at the time of fire; they are, therefore, normally required to be fitted with self-closing devices. However, closers should not have significantly more force than is necessary to close (and latch if appropriate) the door effectively; latches should be selected and fitted so as not to require an unreasonable closing force.

Where a closed door would cause problems to the normal usage and circulation of the A1 *shopping* A1 *complex, being perhaps in constant use by the public passing between areas on the same level and therefore vulnerable to damage or to being wedged or otherwise held open or to having the closer disconnected, electromagnetic (or similar) "hold open" systems may be considered for use.*

The performance of a fire door when tested in accordance with BS 476-22 is judged by its time to failure (in minutes) for each of the criteria of "integrity" and "insulation"; however, requirements made in connection with regulations and codes of practice do not normally specify any performance for "insulation".

For the purposes of this code, fire doors are designated by reference to their required performance (in minutes) for integrity only, e.g. a reference FD 20 implies that the door in that situation should achieve not less than 20 min integrity, and a reference FD 30 implies not less than 30 min integrity, when tested in accordance with BS 476-22. Where doors are also required to resist the passage of smoke at ambient temperature, the suffix "S" is added (see ***14.8.2****).*

NOTE 1 Methods for the evaluation of doors to control the movement of smoke will be published as Sections of BS 476-31. The methods take account of three different stages of a fire:

a) *ambient temperature;*

b) *medium temperature;*

c) *high-temperature conditions.*

NOTE 2 Further information on the performance and function of fire doors is given in PD 6512-1, and on the installation and maintenance of fire door assemblies in BS 8214.

Although the above-mentioned system of designation specifically excludes reference to any performance for insulation (because of the problems of radiation through traditional fire-resisting glass), Table 6 *recommends limits to the extent of the non-insulating glazed areas in fire doors in certain circumstances.*

Any reference to performance when tested in accordance with BS 476-22 is for the purposes of this code only. Depending upon circumstances, a higher performance may be necessary to satisfy building regulations or insurance requirements for structural fire protection.

14.8.2 *Recommendations*

The following recommendations are applicable.

a) A fire door should be provided to comply with the minimum performance recommended for any of the following circumstances;

1) a fire door forming part of the enclosures of:

i) a protected stairway, FD 30S;

ii) a protected lobby or protected corridor [see **9.4.2**f), **12.6.2** and **14.6.2**a)2)], unless the lobby or corridor is deemed to be a firefighting lobby (see **7.5.2**), FD 30S;

iii) the separation between upward and downward flights of basement stairs [see **12.8.2**c)], FD 30S;

iv) a protected lobby between an enclosed car park and a covered mall [see **10.3.2**c)], and to goods and service lifts [see **28.2**e)], FD 60S;

v) any accommodation listed in items 1 and 2 of Table 5, FD 60S;

vi) any accommodation listed in items 3 and 4 of Table 5, FD 120S;

vii) any accommodation listed in items 5 to 9 of Table 5, FD 120S;

viii) all lift wells enclosed with fire-resisting construction [see **14.6.2**a)], FD 30;

ix) building services ducts etc [see **14.6.2**b)], FD 30S, unless the duct is fire-stopped at each storey, in which case it should be FD 30.

NOTE 1 Any door situated in a compartment wall should have at least the fire resistance required for that wall.

2) a fire door subdividing:

i) protected corridors [see **9.4.2**g) and **11.2**g)], FD 20S;

ii) dead end portions of corridors from the remainder of such corridors [see **11.2**g)], FD 20S.

3) a fire door affording access onto an external stair, FD 20.

b) A fire door required to resist the passage of smoke at ambient temperature conditions [i.e. those having suffix "S" in item a)] should, when tested in accordance with BS 476-31.1 with the threshold taped, and subjected to a pressure of 25 Pa, have a leakage rate not exceeding 3 m^3/h per metre. When installed, the threshold gap should be sealed by a seal either with a leakage rate not exceeding 3 m^3/h per metre at 25 Pa or just contacting the floor. Where this is impracticable, the threshold gap should not exceed 3 mm at any point.

NOTE 2 If a smoke control system using pressure differentials is used to protect any of the spaces enclosed partly by such doors, then edge seals may be unnecessary, depending on the design of the system, and in particular the air flow path(s).

c) A fire door [except to a cupboard, refuse chamber or service duct, see item e)] should be fitted with a self-closing device (other than rising butt hinges) that:

1) should be of a type that cannot readily be disconnected or immobilized and does not embody a stand-open action; and

2) should override any latches fitted to the door(s); or

3) in the absence of a suitable latch or other positive device for holding the door shut in its frame, should be of a type that has been shown by test in accordance with BS 476-22 to be capable of holding the door closed in the frame for:

i) a sufficient period of time for the closing role to be taken over by a thermally activated sealing device (such as an intumescent seal); or

ii) the full period of exposure if such seals are not incorporated.

d) Unless shown to be satisfactory when tested in accordance with BS 476-22, no part of a hinge on which any fire door is hung, and that provides the sole means of support at the hanging edge, should be made either of combustible material, or of non-combustible material having a melting point of less than 800 °C.

e) A fire door to a cupboard or refuse chamber or service duct, in lieu of being self-closing, should have means to enable it to be kept locked shut when not in use and be so marked on the outside with the appropriate sign complying with BS 5499-1.

f) Hold-open systems complying with **14.9** may be provided for holding open fire doors, or for overriding their self-closing devices. Such doors should be suitably marked on both sides, at about eye level, with the appropriate sign complying with BS 5499-1.

g) All fire doors, except doors to cupboards or service ducts [see item e)], or doors held open by a hold-open device [see item f)], should be marked on both sides, at about eye level, with the appropriate sign complying with BS 5499-1 to the effect that they should be kept closed when not in use.

NOTE 3 Advice on the selection of door furniture for fire doors is given in "Code of practice for hardware essential to the optimum performance of fire-resisting timber doorsets" (1983), prepared by and available from the Association of Builders' Hardware Manufacturers, Heath Street, Tamworth, Staffs, B77 7JH.

14.9 Hold-open systems

14.9.1 *Commentary*

Hold-open systems are used to hold a fire door in the open position, against the action of a door closer, automatically releasing the door in a fire situation. There are two main types of hold-open system available.

a) *Automatic-release mechanisms that are not part of the door closing device, usually consisting of two separate components, one attached to the door and the other to the building structure.*

b) *Door closing devices that incorporate a hold-open mechanism.*

NOTE Some door closing devices may be set to allow the door to swing freely, with the door closer operating only in a fire situation.

A specification has been published only for the automatic-release mechanisms described in item a).

14.9.2 *Recommendations*

The following recommendations are applicable.

a) Automatic-release mechanisms should comply with BS 5839-3.

b) The hold-open system should release the door to close automatically in the event of each or any one of the following:

1) detection of smoke by suitable automatic apparatus;

2) failure of the power supply;

3) operation of the fire alarm system;

4) local manual operation;

5) a manual operation at a central control point.

14.10 Recommendations for doors on escape routes

The following recommendations are applicable.

a) Doors affording means of escape from, and within, the common areas of the ▌A1⟩ shopping ⟨A1▐ complex should:

1) be hung to open in the direction of escape;

2) be hung so that any change of floor level occurs beyond the edge of the door when open at an angle of 90 ° to the closed position;

3) be hung so that they do not reduce the effective width of any escape route across a landing;

4) if opening towards a corridor or a mall, be recessed to the full width of the door;

5) where hung to swing both ways, and on all doors subdividing corridors or malls, be provided with at least an adequate vision panel in each leaf;

6) open not less than 90°.

b) Fire doors on common escape routes should not be fitted with threshold upstands.

c) Automatic doors and revolving doors should not be provided across escape routes unless:

1) they are to the required width and are automatic doors complying with BS 7036 and either:

i) they are arranged to fail safely to outward opening from any position of opening; or

ii) they are provided with a monitored fail-safe system for opening the doors if the mains supply fails; or

2) swing doors to the required width are provided immediately adjacent.

d) Security grilles and shutters (roller, folding or sliding) to units should be capable of being easily and quickly opened manually (even if normally power operated) unless an alternative power supply is provided.

14.11 Recommendations for fastenings of doors on escape routes

NOTE 1 Consultation with insurers with respect to any security implications is recommended.

The following recommendations are applicable.

a) Final exit doors on escape routes from public common areas and mall exit doors should either be free from fastenings or be fitted with panic bolts complying with BS 5725-1.

b) Final exit doors on escape routes from non-public common areas should be fitted only with simple fastenings that can be operated from the escape side of the door without the use of a key.

c) Doors on escape routes from common areas, other than those covered by items a) and b), should be free from fastenings.

NOTE 2 If security grilles and/or shutters need to be provided across malls when staff may be present in the ▌A1⟩ shopping ⟨A1▐ complex, any necessary fastening arrangements should be agreed with the enforcing authority.

d) Security devices, additional to those mentioned in items a) and b), should be fitted only subject to the agreement of the enforcing authority.

14.12 Recommendations for construction of escape routes

The following recommendations are applicable.

a) All floorings and floor coverings of escape routes, including malls, the treads of any stair and the floor of any landing, should be chosen so as to minimize slipperiness when wet.

b) No escape route should be provided with a clear headroom of less than 2 m and there should be no projection from any wall (except normal handrails), ceilings (except door frames), or false ceilings, below this height which would impede the free flow of persons using it.

c) Ramps should have an easy gradient, in no case steeper than 1 in 12.

d) Clear gangways should be provided from all parts of common areas up to and between stairs, the doors to stairways and other exits from the common areas.

14.13 Recommendations for stairs

The following recommendations are applicable.

a) Stairs should be designed and constructed in accordance with the appropriate part of BS 5395.

b) If an escape route is used by members of the public, the stair should comply with BS 5395-1, or should be a type E (public) stair complying with BS 5395-2.

c) Every escape stair and its associated landings should be constructed of materials of limited combustibility if it is:

1) the only stair serving the building (or part of the building);

2) within a basement;

3) serving any storey having a floor level more than 18 m above ground or access level; or

4) an external escape stair [see **12.7.2**a)].

14.14 Ladders

14.14.1 *Commentary*

Portable ladders and throw-out type ladders are not considered suitable means of escape. Fixed vertical or raking ladders will be suitable only in exceptional circumstances, e.g. for plant rooms that are not normally manned.

14.14.2 *Recommendations*

The following recommendations are applicable.

a) Ladders should not be provided as means of escape for members of the public.

b) Ladders should be provided only as means of escape for not more than 10 able-bodied and active members of staff in exceptional circumstances where it is impractical to provide a more satisfactory escape route.

c) Ladders provided as means of escape should be constructed of non-combustible materials, and should comply with BS 5395-3.

Section 6. Fire protection facilities

15 General

Section 4 and Section 5 of this code cover those passive aspects of fire protection in which the fixed and permanent features of the design and construction of the [A1] shopping [A1] complex are so selected and disposed as to provide either control of the progress of a fire or protection of the occupants of the [A1] shopping [A1] complex in the event of fire, or both. This Section [A1] covers [A1] active measures of fire protection such as detecting a fire, giving the alarm, checking the development of a fire, extinguishing a fire, and securing the safe escape of the occupants. These elements are closely related and some introduction to the procedures which should be adopted in case of fire are necessary in order that guidance on active fire protection facilities may be given proper perspective. Access and facilities for the fire service are dealt with in Section 3.

Active fire protection is divided into mechanical and electrical equipment and systems covered in this Section, and organizational and managerial activities and responsibilities covered in [A1] BS 5588-12 [A1]. It will be noted, however, that although much of [A1] BS 5588-12 [A1] is concerned with the correct action to be taken by managements of shopping complexes and individual units, either to avoid the occurrence of fire altogether, or to ensure appropriate action in the event of fire, significant responsibilities are also specified for the servicing and maintenance of those provisions which are described in this Section.

Some of the recommendations of this Section arise from legal requirements relating to life safety, whereas the remainder refer to installations or equipment that a wise owner will prescribe in the [A1] shopping [A1] complex for reducing risk of property loss. Many of the recommendations are consequent upon the requirement for occupied buildings in designated use categories under the Fire Precautions Act 1971, in which shops are included, to be provided with a fire certificate from the fire authority. Because of this requirement, and because the facilities required for use by the fire service may vary from one area to another, consultation at an early stage with the fire authority is desirable. (See also **3.5** in connection with protection of property.)

16 Fire detection and alarm systems

16.1 Fire alarm systems

16.1.1 *Commentary*

Irrespective of any other devices that may be installed in a shopping complex to detect and give warning of a fire outbreak (such as automatic fire detection or extinguishing systems) most units are required by law to have some means whereby the alarm of fire may be given by a person discovering an outbreak of fire. This will consist of either:

a) *a manually operated fire alarm (or more than one), i.e. a manually operated device that makes a distinctive sound; or*

b) *a fire alarm system, i.e. an electrical system in which the alarm is initiated manually from one of a series of manual call points with frangible covers, the warning being produced by the electrical operation of suitable warning devices.*

Where premises form part of a covered shopping complex, it is essential that a fire alarm system be provided to all units irrespective of their use.

Mandatory requirements for the provision of fire warning systems are contained in the Fire Precautions Act 1971, and the appropriate fire authority needs to be consulted.

To ensure safety throughout a covered shopping complex a comprehensive and sophisticated fire alarm system is needed which can be zoned to arrange for fire warning signals and, if necessary, different kinds of warning signals, to be given in selected units and areas depending on the location of the manual fire alarm call point which is actuated.

BS 5839-1 gives recommendations on general design, control and indicating equipment, zoning, power supplies, and call points etc., and contains advice relevant to buildings in multiple occupancy which is particularly relevant to covered shopping complexes.

Devices incorporating a visual and audio signal (e.g. pulsing light and buzzer unit) may be used in areas other than the fire zone where it is intended to alert only members of staff.

16.1.2 ***Recommendations***

The following recommendations are applicable.

a) Each unit within the [A1] shopping [A1] complex should have a fire alarm system that complies with BS 5839-1. The control and indicating equipment of each such system should be capable of "stand alone" operation and be suitably equipped to interface with the central fire alarm system as follows:

1) to transmit to the central control room a signal that an alarm has been initiated within that unit;

2) to transmit to the central control room a signal that a fault has occurred in the fire alarm system of that unit;

3) to receive from the central fire alarm system a signal for the operation of the audible/visual alarm warning devices within that unit in accordance with the fire routine [A1] (see BS 5588-12) [A1].

b) The central fire alarm system should comply with BS 5839-1 in respect of all common areas of the [A1] shopping [A1] complex. It should be capable of interfacing with the fire alarm system in each unit for the transmission of signals as recommended in item a), so as to comprise an integrated system governing the operation and monitoring of all fire alarm equipment within the [A1] shopping [A1] complex.

c) The interface between the central fire alarm system and the fire alarm systems within units should be by means of equipment designated to prevent any incompatible voltage or other fault within the fire equipment in a manner that could damage or adversely affect the operation of the central fire alarm system. The relays and other equipment associated with each individual unit interface should be housed in a separate box (or a separate compartment of a panel) controlled and maintained by the owner of the [A1] shopping [A1] complex. All wiring connections within the interface box/panel should be carried out by the installer of the central fire alarm system.

d) It is acceptable for signals related to the operation of, or faults within, fire extinguishing equipment in units (e.g. sprinklers, gaseous systems) to be transmitted via the same interface as is used for fire alarm signals from that unit.

e) Manual call points should be provided throughout the [A1] shopping [A1] complex, other than in the mall(s). In addition, automatic detectors should be provided to detect the occurrence of fire in non-public common areas, in relevant locations and elsewhere as required for the operation of other automatic fire protection equipment, e.g. smoke ventilators.

f) The [A1] shopping [A1] complex should be divided into fire alarm. zones (see **2.15**) for the purpose of identifying the location of the origin of a fire alarm signal. Each unit should be designated as one or more zones at the central fire alarm indicating equipment (larger units may comprise several zones). The central fire alarm indicating equipment should be located in the central control room from which the emergency procedure will be supervised. In the event that the control room is of necessity located remote from the initial point of arrival of the fire service, or there are two or more fire service access points, repeater panels should be provided at the fire service access points.

In spaces where smoke control arrangements are used, the fire alarm system should be zoned in accordance with the smoke control system zoning arrangements.

Fire alarm systems in covered non-public common areas which are totally fire and smoke separated (including fire shutters operated only by automatic smoke detection) may be zoned independently from units and public common areas.

g) The [A1] shopping [A1] complex should be divided into fire alarm sectors for the purpose of giving audible/visual warning simultaneously in all parts of the [A1] shopping [A1] complex that would be similarly threatened by a fire in any one location. The divisions between sectors should be determined in relation to fire compartmentation, smoke reservoirs, designated escape routes, common access from units to malls, service corridors, etc., and the fire routine [A1] (see BS 5588-12) [A1]. A sector should comprise one or more of the fire alarm zones which may need to be evacuated simultaneously. It may be necessary to give audible warning in two or more sectors simultaneously, depending on the location of the fire.

h) The operation of the fire alarm system in any fire alarm zone should be indicated at the central control room of the shopping complex.

i) Provision should be made for the operation of the evacuation signal throughout all fire alarm zones in any fire alarm sector or the complete [A1] shopping [A1] complex from the central control room.

j) The installation, servicing, testing and maintenance of all fire alarm systems should be in accordance with the provisions of BS 5839-1.

k) The central fire alarm control and indicating equipment, including power supplies and monitoring facilities, should be under the immediate control of the management of the shopping complex.

16.2 Fire detection systems

16.2.1 *Commentary*

A manual fire alarm system may often be satisfactory in shops. However, in shopping complexes, and particularly in larger ones, an arrangement for phased evacuation is likely to be needed. Then, the rapid detection of fire will be essential in order to avoid delay in the management being notified. There will therefore arise a hierarchy of detection levels, commensurate with the complexity of the building and required evacuation procedures.

A fire detection system can initiate a variety of functions. These include closing down ventilating and air conditioning plant, bringing fire control systems into operation, opening ventilators or starting fans for the control of smoke in or above escape routes, opening doors or ventilators in adjacent areas to provide replacement air for the smoke control system, operating door release mechanisms, etc. Where an automatic fire detection system is installed solely to actuate fire protection devices, then a distinct signal should be provided at the central control room to indicate fire, and that systems have been activated.

In shopping complexes, because of problems associated with deliberate false alarms, vandalism and the proper management of escape, it is not considered to be appropriate that the operation of a ⟩A1⟨ *manual call point* ⟩A1⟨ *should have any effect other than the giving of a warning that fire has occurred* ⟩A1⟨ *(see BS 5588-12)* ⟩A1⟨*. However, it is essential that the operation of a manual call point anywhere in the* ⟩A1⟨ *shopping* ⟩A1⟨ *complex should be indicated at the central control room (see* ***17.2****).*

Fire may be detected automatically in a variety of ways and apparatus designed for the purpose needs to be sensitive to at least one of the particular phenomena that are associated with fire, e.g. the presence of heat, smoke, flame, or the rate or pattern by which the most relevant conditions change in these respects. Several detection methods may be incorporated into the same automatic system so that the most suitable detection method can be chosen for any location where the fire characteristics can be anticipated or present a particularly significant hazard. More detailed guidance on the choice of detectors is given in BS 5839-1, and it is desirable that advice is sought from specialist firms of consultants as to the correct type of system for given circumstances.

Non-public common areas, particularly servicing areas, are sometimes unoccupied for periods when substantial amounts of merchandise are present and are either stacked in a temporary manner or partially unloaded from transport, and hence automatic fire detection is particularly suitable for these areas.

16.2.2 *Recommendations*

The following recommendations are applicable.

a) All covered non-public common areas and stockrooms of shopping complexes should be protected by an automatic fire detection system, in addition to whatever provision is made in those areas for automatic fire control.

b) Where automatic fire control systems are designed to be actuated by automatic fire detectors, the systems will be combined and should therefore be commissioned and tested together ⟩A1⟨ (see BS 5588-12) ⟩A1⟨.

c) Covered non-public common areas which are totally fire and smoke separated (including fire shutters only operated by smoke detectors) may be zoned independently from units and public common areas.

d) Public common areas/malls provided with a smoke control system should be protected by an automatic fire detection system using smoke-sensitive detectors.

e) Public common areas/malls on multiple levels provided with a smoke control system should be protected by an automatic smoke detection system on each level (e.g. ground floor malls will require automatic smoke detectors to be fitted to the underside of the balconies above). Where the fronts of units extend to the edges of any balcony/walkway above, automatic smoke detectors should be provided in these units.

f) Units (or parts thereof) employing a self-contained independent smoke control system (see **20.4**) should be provided with a type L3 automatic fire detection system in accordance with BS 5839-1:1988.

g) In spaces where smoke control and/or other automatic fire protection devices are employed, the automatic fire detection system(s) should be zoned in accordance with the zoning arrangements for those facilities.

h) Where automatic fire detection systems are employed to initiate other active fire protection measures, care should be taken to ensure that the accidental operation of a detector other than in the fire zone cannot prejudice the operation of the active fire protection devices.

i) Where active fire protection measures can (or need to) be activated from one or more zones e.g. from a unit or a mall, care should be taken to ensure that the activation signals from each system are compatible and complementary.

j) The performance of all automatic fire detection equipment in shopping complexes designed for life safety or property protection should comply at least with the recommendations of BS 5839-1 for that purpose.

k) The installation, servicing, testing and maintenance of all automatic fire detection equipment in a shopping complex should comply with the relevant recommendations of BS 5839-1.

16.3 Communications with the fire service

16.3.1 *Commentary*

In order to ensure that the fire service is alerted in every emergency, it is essential that fire alarms are automatically relayed to the fire service control room (see BS 5839-1). It is acceptable for such message to be combined with provisions for the relaying of security alarms to a remote manned centre, provided that separately identifiable signals are used for each type of emergency.

In shopping complexes in which the public common areas comprise permanent public thoroughfares, arrangements should be made for public telephone facilities to be available.

16.3.2 *Recommendations*

The following recommendations are applicable.

a) All alarms of fire should be transmitted automatically to a remote manned centre or to the control room of the fire service.

b) Public telephone call box facilities should be provided in all covered shopping complexes with permanently open public thoroughfares.

c) In all shopping complexes provisions should be made for telephone communication with all the public emergency services from the central control room of the ⟦A1⟧ shopping ⟦A1⟧ complex to be independent of other telephone traffic.

17 Control of evacuation in a fire

17.1 Single- and two-stage alarm arrangements

17.1.1 *Commentary*

Fire alarms in smaller shopping complexes are best operated in a "single stage" mode in which the actuation of any call point within the ⟦A1⟧ shopping ⟦A1⟧ complex will give an instantaneous warning from all the sounders for an immediate evacuation.

*In larger ⟦A1⟧ shopping ⟦A1⟧ complexes, two-stage alarm arrangements may be preferable in which the initial alarm of fire warns management, and simultaneously an evacuation signal is given in the alarm-originating unit and possibly a number of units in the same smoke control zone (see **2.37** and **20.2**), with the remainder of the ⟦A1⟧ shopping ⟦A1⟧ complex being given an alert signal. In these circumstances, provision is made for the evacuation of other areas/zones by the appropriate signal at a later stage according to the needs of the situation (phased evacuation).*

NOTE 1 Phased evacuation is a system of evacuation in which different parts of the ⟦A1⟧ shopping ⟦A1⟧ complex are evacuated in a controlled sequence of phases, those parts of the ⟦A1⟧ shopping ⟦A1⟧ complex expected to be at greatest risk being evacuated first. A phased evacuation will normally require at least a two-stage alarm system.

NOTE 2 A staged alarm system enables two or more stages of alarm to be given within a given area, e.g. a two-stage alarm system capable of giving "alert" or "evacuate" signals, and a three-stage alarm system capable of giving "staff alarm", "alert" or "evacuate" signals.

The sophistication of the fire alarm system and public address arrangements are major factors in considering evacuation procedures in shopping complexes and, based on these factors, the following matters need to be addressed.

a) *Immediate evacuation in an alarm situation is needed normally from at least the unit of origin of the alarm. Larger units need special arrangements* ▌A1⟩ *(see BS 5588-11)* ⟨A1▐.

b) *Arrangements are needed to alert units in the same smoke control zone of a potential fire situation and make management aware that there may be the need to extend evacuation to adjacent smoke zones or the whole* ▌A1⟩ *shopping* ⟨A1▐ *complex.*

c) *Based on a predetermined time scale, an alert signal needs to automatically default to an evacuate signal.*

d) *Live directive public address announcements from control room operators using colour closed-circuit television (CCCTV) surveillance of public areas should be used to evacuate areas such as the malls where many people are present and at potential risk. Directive messages are those which provide the public with the clear, prompt and accurate information they need about potential fire risk if they are to be motivated without undue delay to start to move in the safest direction. The public address system should not be restricted to codified messages to staff who are expected to coordinate the evacuation. As full use as possible needs to be made of the control room to continuously coordinate and disseminate evacuation messages to different areas of the shopping complex at all stages of an evacuation.*

Prerecorded verbal messages need to come into operation as a back-up after a predetermined time scale, should "live" announcements not have been given. An "active" public address system needs also to be used regularly, and can help to reduce crowd congestion at peak times.

17.1.2 *Recommendations*

The following recommendations are applicable.

a) Where necessary to facilitate the agreed evacuation procedure, the fire alarm system should be capable of giving two distinctive forms of audible warning to signify "evacuate" or "alert". The distinction between these two stages of alarm should be consistent throughout the ▌A1⟩ shopping ⟨A1▐ complex.

b) The central control room should have overriding control of audible warning devices in public common areas to permit the use of the public address system in giving verbal directions for evacuation. Public address systems intended for use as fire warning devices should comply with BS 5839-1 (see also **17.3**).

c) Where the agreed emergency procedure requires manual control of audible warning devices by the central control room, provision should be included for their automatic operation in accordance with the agreed procedure if manual control of the system has not been put into effect within 1 min of the initiation of the first alarm of fire. This should include the operation of prerecorded messages where appropriate.

d) On the initiation of a fire alarm, the operation of any other public address messages, music etc., (including the power supplies to any temporary advertising/promotional systems within public common areas and units) should be automatically discontinued. The public address system of the ▌A1⟩ shopping ⟨A1▐ complex should automatically reset to the predetermined emergency status in respect of volume, sector divisions, etc.

17.2 Central control room

17.2.1 *Commentary*

In any shopping complex there needs to be a central control room that is closely associated with the accommodation for the day-to-day management of the ▌A1⟩ *shopping* ⟨A1▐ *complex. The central control room needs to be away from the points of discharge of the public as it may also need to serve as the fire control centre (see* ***7.9****). Because the central control room also functions as a fire control centre (see* ***7.9****) at times of emergency, it needs to be adequately and efficiently manned at all times appropriate to the public use of the* ▌A1⟩ *shopping* ⟨A1▐ *complex, and as circumstances dictate for the non-public operation of the* ▌A1⟩ *shopping complex* ⟨A1▐*. To ensure that the management can maintain control in a developing situation, a reliable means of communication is necessary.*

Due to the many managerial functions performed within the control room (other than those associated with fire or other emergencies) consideration needs to be given to enabling the [A1] *shopping* [A1] *complex to continue to trade in the event of an emergency occurring within the control room or its associated equipment. This may be achieved by providing duplicate essential equipment at a remote location, or by operating a simplified form of management using portable equipment. In the event of evacuation of the control room it is unlikely that an evacuation of the* [A1] *shopping* [A1] *complex would be necessary, provided it is suitably constructed and sited. For a fire confined to the control room, the communications carried by the firefighters attending the incident should normally be sufficient without the enhanced facilities recommended in this code for use in the event of a major fire within the other parts of the* [A1] *shopping* [A1] *complex.*

A number of forward control positions need to be planned in consultation with the fire service. They act as storage points for emergency equipment for use by the staff of the [A1] *shopping* [A1] *complex and need to be equipped with at least the following items:*

a) *torches:*

b) *luminous waistcoats;*

c) *loud hailer;*

d) *portable firefighting equipment;*

e) *portable barriers.*

17.2.2 *Recommendations*

The following recommendations are applicable.

a) Arrangements should be made for the provision of a central control room from which the supervision of all matters relating to the fire and safety of the [A1] shopping [A1] complex may be efficiently carried out. Provision of facilities to the control room should be provided such that intervention to ensure life safety from fire in emergency conditions can be achieved.

NOTE 1 Responsibilities of the management of shopping complexes in respect of the general efficiency, staffing and organization of a central control room are outlined in [A1] BS 5588-12 [A1].

b) The control room should:

1) be manned by a competent person, familiar with the use and operation of the equipment contained therein, whilst the [A1] shopping [A1] complex is occupied;

2) be located in a room or area of low fire risk;

NOTE 2 The fire compartmentation, smoke separation and alternative means of escape from the control room should be such that the central control staff should be able to remain within the control room safely during any emergency situation elsewhere in the [A1] shopping [A1] complex. (See also Table 5.)

3) if also serving as a fire control centre, be adjacent to a fire service access point and be accessible direct from open air;

4) be provided with a 3-h non-maintained system of lighting supplied from a source independent of the normal lighting to enable the control room to operate satisfactorily in the absence of the normal lighting supply.

c) A reliable means of communication with the central control room should be provided throughout the [A1] shopping [A1] complex.

d) Fire telephones should be installed:

1) for use by the management of the [A1] shopping [A1] complex in conjunction with the fire control system [A1] (see BS 5588-12) [A1]; and

2) for communications between fire service personnel.

Handsets should be provided in all strategic points, at each entrance, and in the central control room.

e) The fire telephone system should:

1) have a wiring system complying with **25.3.2**;

2) be provided with a battery back-up, capable of powering the system for at least 24 h, after which sufficient capacity should remain in the batteries to operate the system for 3 h.

f) The control room should contain the following;

1) indicator panels showing the status of all automatic fire protection installations and facilities (see Table 7);

2) manual override switches associated with all automatic fire protection installations and facilities (other than those which are required to be located either adjacent to their equipment or elsewhere, e.g. overrides for gaseous fire extinguishing systems or sprinkler system main or floor isolating valves);

3) manual overrides for air conditioning systems or ventilation systems involving recirculation;

4) a fire telephone providing a direct link between the control room and all firefighting lobbies and fire service access points;

5) an exchange telephone with direct dialling for external calls;

6) a public address system as described in **17.3.2**;

7) controls and monitor screens for colour closed-circuit television (CCCTV);

NOTE 3 Clear verbal guidance in any emergency should be given when there are a number of options available for the public to take. A CCCTV surveillance system is needed because, in addition to indications on fire alarm panels, the only information available from the malls is from security staff, who may not have an overall picture of crowd movement. The cameras should be sited to cover all public areas and escape routes (including service corridors where these are used for escape routes) and should be mounted below the smoke reservoir base.

8) the fire routine for the ⟦A1⟩ shopping ⟨A1⟧ complex ⟦A1⟩ (see BS 5588-12) ⟨A1⟧;

9) floor plans of the ⟦A1⟩ shopping ⟨A1⟧ complex as described in **7.12.2**;

10) the telephone numbers of principal staff/building engineers.

17.3 Communications with public common areas

17.3.1 *Commentary*

*The need for verbal guidance in an emergency has already been mentioned in **17.1**. There may well be a confusing number of options apparent to the public under these circumstances and alarms other than public address systems on the malls would not be helpful.*

17.3.2 *Recommendations*

The following recommendations are applicable.

a) A public address system complying with BS 5839-1 should be provided in all covered malls of a shopping complex.

b) Emergency announcements should be preceded by a distinctive intrusive sound unique to all emergency conditions.

c) The facilities for public address in the central control room should include arrangements for making separate announcements in each covered mall area if required, or for addressing certain preselected areas simultaneously.

d) The volume of emergency announcements made from the central control room to all covered malls should be at least 5 dB(A) above the ambient background noise level in an emergency in every part of the ⟦A1⟩ shopping ⟨A1⟧ complex.

NOTE 1 If a powered smoke ventilation system is provided in a shopping complex, the ambient background noise level needs to include any noise generated by that ventilation system.

NOTE 2 On the initiation of any public address emergency announcement by the fire alarm, the system should be capable of overriding all extraneous audible signals [see **17.1.2**b)].

Table 7 — Control room indications of status of fire protection equipment

Source of signal	Status indications
Public areas	Fire detection and alarm system Smoke control system(s)
Units generally	Fire detection and alarm system Sprinkler system(s)
Units with dedicated smoke control systems	Fire detection and alarm system Sprinkler system(s) Smoke control system(s)
Non-public areas	Fire detection and alarm system Sprinkler system(s) Smoke control system(s)
⟩A1⟨ Shopping complex ⟩A1⟨ generally (including plant rooms)	Fire safety systems and power supplies

18 Automatic fire protection systems and special risk protection

18.1 General

Several forms of automatic fire protection systems may be required to provide effective protection for life safety, or property, or both, throughout shopping complexes. Guidance on the selection of automatic fire extinguishing systems is given in BS 5306-0. For automatic fire protection systems to be effective and provide the necessary control, all parts of the ⟩A1⟨ shopping ⟩A1⟨ complex need to be suitably protected.

A distinction has to be made between "space protection" i.e. covering the bulk of the building space likely to contain predominantly carbonaceous materials for which water is a suitable extinguishing medium, and protection covering a special risk, which may need a particular extinguishing medium.

18.2 Sprinkler systems

18.2.1 *Commentary*

Automatic water sprinkler systems will provide efficient means of fire control throughout most parts of shopping complexes, ensuring:

a) *detection of a fire at an early stage;*

b) *control of fire growth, fire spread, heat and smoke generation, by delivering water to the seat of the fire;*

c) *the provision of a local alarm of system operation, and confirmation of the alarm of fire at the central control room; and*

d) *if appropriately arranged, the transmission of an alarm to the fire service.*

Care needs to be taken when deciding whether or not a mall should be sprinklered. It is common practice not to sprinkler malls when there are no combustibles likely to be present. However, if the mall is to be used for other purposes, such as kiosk sales, displays, food courts, etc., it will be necessary to provide sprinkler protection. In these situations the position and height of the sprinkler heads need careful consideration to ensure that they provide the desired protection.

Any fires which originate in any unsprinklered portions of a shopping complex may seriously jeopardize the efficacy of fire protection in any adjacent sprinklered zone. Consequently, careful consideration needs to be given to any potential fire load before omitting sprinklers from any part of the shopping complex.

The appropriate authorities need to be consulted with respect to whether or not sprinkler systems are necessary in malls.

18.2.2 ***Recommendations***

The following recommendations are applicable.

a) Sprinkler protection should be provided throughout any covered shopping complex, except in:

1) any mall where sprinkler protection is not required by the enforcing authorities;

2) any part provided with a fire extinguishing system complying with **18.3**;

3) any part which comprises a separate occupancy and that is used for a purpose for which an automatic sprinkler system is inappropriate (in which case it should be provided with an appropriate automatic system complying with **18.3**);

4) open-sided car parks; and

5) other occupancies/main uses which are part of the ▌A1⟩ shopping ⟨A1▌ complex as a whole but which are totally fire separated, do not share the means of escape, and are subject to their own standards and codes of practice. (See also **9.6**, **14.3** and **14.4**.)

b) The design, installation, maintenance and user responsibilities of sprinkler systems, and the operating temperatures of the sprinkler heads, should be in accordance with BS 5306-2.

c) To ensure their efficiency, sprinkler systems should be:

1) designed and installed in accordance with the appropriate hazard class, but at least to "Ordinary Hazard Group 3". Sprinkler systems installed in units and in all public common areas should, in addition, meet the life safety recommendations of BS 5306-2;

2) correctly maintained, ensuring that any changes to occupancy, goods stored, building interior designs and extensions, etc. are appropriately protected;

3) connected to duplicate water supplies complying with BS 5306-2.

NOTE For life safety sprinkler systems, one of the water supplies should be a superior supply and accord with the provisions of Tables 6 and 7 of BS 5306-2:1990.

d) If an area (e.g. a covered loading bay) is protected by sprinklers, any fusible link or other heat-sensitive device designed to close a fire door or shutter within its surrounding walls either:

1) should operate before the sprinklers; or

2) should be so located that the cooling effect on the device of the water from the sprinklers cannot jeopardize the effective operation of the door or shutter.

18.3 Special risk protection

18.3.1 ***Commentary***

Automatic fixed gas, powder, water spray deluge systems or other purpose designed extinguishing systems may be necessary in certain locations such as machine rooms or transformer and electrical switchgear rooms. In some instances, they may be required as an adjunct to sprinkler systems to protect equipment in service areas or hot processes (such as bakers' ovens and deep fat fryers).

In general, systems for the protection of special risks require to be designed to suit the specific circumstances, and specialized designers and manufacturers should be consulted. Guidance on the selection of automatic fire extinguishing systems is given in BS 5306-0. Carbon dioxide systems are covered in BS 5306-4, halon systems in BS 5306-5, foam systems in BS 5306-6 and powder systems in BS 5306-7. The protection of data processing equipment is covered in BS 6266.

NOTE For environmental reasons halon systems should be used only where there is no other practicable alternative extinguishing agent.

If the application of foam by the fire service is considered, it needs to be discussed with the fire service first, as many fire appliances are no longer fitted with the necessary foam-generating equipment. Where automatic foam systems are to be installed, it should be noted that it is difficult to flood large areas and that it constitutes a hazard to life.

Fire risks such as oil storage tank chambers and oil-fired boiler rooms, for which foam is used as the extinguishing medium, may be situated where the fire service cannot obtain access to the space for the purpose of applying foam. The most common situation is where such fire risks are below ground. If it is not possible to apply foam through windows, louvres, etc. then foam inlets complying with BS 5306-1 are required. These consist of an inlet or inlets to which fire service equipment can be connected, piping from that external point to inside the space, and a fitting or fittings at the delivery end of the pipe placed suitably for the protection of the risk.

18.3.2 *Recommendations*

The following recommendations are applicable.

a) Rooms containing oil-filled electrical gear should be protected by automatic high-velocity waterspray systems complying with BS 5306-2.

b) Rooms containing machinery and non-oil-filled electrical gear should be protected by gaseous extinguishing systems complying with BS 5306-4 or BS 5306-5.

c) Rooms containing oil-fired boilers and oil fuel stores should be protected by automatic high-velocity waterspray systems complying with BS 5306-2 over the oil tanks and the oil-firing ends of boilers, or (where considered appropriate) by automatic foam systems or foam inlets for fire service use.

NOTE Standard automatic sprinkler protection should be used in the remaining areas of these rooms.

d) Any part of a covered shopping complex referred to in **18.2.2**a)3) should be protected by an appropriate automatic fire extinguishing system.

e) Automatic fire extinguishing systems, foam inlets and equipment on premises should be installed, in consultation with the fire authority, in accordance with the appropriate Parts of BS 5306, or for data processing equipment, in accordance with BS 6266.

19 Manual firefighting equipment

19.1 Commentary

Whether or not any other fire protection facilities are installed in a shopping complex (e.g. sprinklers), there is a legal requirement under the Fire Precautions Act 1971 to provide equipment for firefighting purposes for use by persons in the building. Hose reels and/or portable extinguishers are needed so that the staff can try to fight or contain a fire in its early stages (if this is consistent with personal safety) while the fire service is on its way.

Manually operated firefighting equipment can often be deployed long before automatic systems operate, greatly reducing the likelihood of the fire growing and in so doing reducing the consequent life hazard, financial loss and disruption to business. Hose reels provide the best means whereby a fire can be fought with water by persons who have not received much training; the apparatus is light and simple to operate, the water flow is continuous and maintenance is minimal. The additional provision of hose reels, or portable firefighting appliances, may (subject to the approval of the appropriate authority) provide a measure of cover during any down time of the automatic systems for maintenance or repair.

Areas not covered by an automatic system will require to be adequately covered by such portable equipment. It may be possible to protect some areas, such as service areas, by portable equipment provided within units, providing it is suitable and appropriately sited. It should be appreciated that portable equipment installed in common areas will not be subject to the same degree of security and may be more prone to damage than if it were to be located within occupied spaces. However, the risk to be covered needs to be carefully evaluated. Portable equipment selected for general use within the unit may not be suitable for the risk of fire to be found in the common areas. Fire extinguishers located outside units should, where necessary, be protected against accidental damage and the effects of frost. It is essential that the fire authority is consulted as regards the provision, siting, etc. of all manual firefighting equipment.

19.2 Recommendations

The following recommendations are applicable.

a) Adequate and suitable means for manually fighting fire should be provided throughout the [A1] shopping [A1] complex. Hose reels should be provided where water is the appropriate extinguishing medium. Portable appliances should be provided for special applications where water is not appropriate.

b) Portable fire extinguishers should comply with BS 5423 and should be installed and maintained in accordance with BS 5306-3.

c) Hydraulic hose reels should comply with BS 5274 and should be installed in accordance with BS 5306-1.

d) Equipment should be so sited as to be readily available in areas not likely to be involved in the early stages of a fire and should, if possible, be grouped at fire points (preferably adjacent to exits or by fire alarm call points).

20 Smoke control provisions

NOTE Smoke control arrangements to assist firefighting are covered in **7.7**.

20.1 General

In an open-air street a fire in a shop will usually only threaten the occupants of that shop, and once they have escaped onto the street, they would generally be safe. However, a covered shopping complex has individual units opening onto a covered mall and smoke from a fire in any unit would spread rapidly via the mall system, leading to the malls becoming smoke logged in a very short time, perhaps just one or two minutes. Therefore a fire in a unit does not just threaten the occupants of that unit, but also the occupants of the entire [A1] shopping [A1] complex.

At peak times a shopping complex can be very densely populated and in practice the time needed for evacuation can be considerably longer than the time taken for hazardous conditions to develop in the malls. Statistics of fire deaths show that most fire fatalities are due to the effects of smoke, and hence it is essential that covered shopping complexes have adequate automatic smoke control to ensure that escape is unhindered by smoke.

Although the role of a smoke ventilation system is principally one of life safety, it should also be remembered that firefighting becomes both difficult and dangerous in a smoke logged building.

Other clauses of this code are concerned with detection and alarm systems to give early warning of a fire, sprinklers to control the spread of fire, and planning of escape from public and non-public common areas. Clearly there is an interaction between the smoke control system and these other arrangements which should be considered at the design stage.

The provisions for automatic smoke control in this Section are for public common areas, individual units, other occupancies and non-public common areas. The methods of smoke control used are smoke ventilation (both natural and powered) and pressurization.

20.2 Design principles for smoke ventilation

NOTE More detailed guidance is given in [A1] BS 7346-4 [A1].

Smoke from a fire in a unit rises in a plume to the ceiling. As it rises, air mixes into the plume increasing the volume of smoke. The smoke particles produced depend strongly on the nature of the burning material, but the quantity of smoke-bearing gases is determined largely by the quantity of air that mixes into it.

If the smoke is not contained in, and directly exhausted from, the unit or other occupancy, the smoke will flow into the mall and the turbulence produced will cause further mixing with the surrounding air, which in turn will increase the mass flow rate of smoke. In a single storey mall, the smoke will form a layer and effectively there will be no further mixing. If the unit fronts onto a multi-level mall, then there will be further mixing as the smoke rises as a plume through the upper levels.

Fire growth within a unit can be very rapid, and sprinklers are essential to control a fire to a size for which it is practical to design a smoke ventilation system capable of maintaining the malls clear of smoke at low level.

Smoke ventilation systems in covered shopping complexes are generally designed for a sprinkler controlled fire of 12 m perimeter and 5 MW convective heat flow, and can be designed to allow the smoke and heat from a fire in a unit or other occupancy to either:

a) flow into the mall, where it is then contained and subsequently removed (see **20.3**); or

b) be contained in, and removed directly from, the unit or other occupancy affected (see **20.4**).

A smoke ventilation system comprises the following.

1) *Smoke control zones.* It is necessary to sub-divide the [A1⟩ shopping ⟨A1] complex into zones for smoke control purposes. The boundaries of each zone will be determined by the physical geometry of the [A1⟩ shopping ⟨A1] complex, and in particular by the arrangement of malls and units, as the zones define the unit(s) and/or malls through which smoke may travel (before flowing into, and then being removed from, smoke reservoirs).

NOTE 1 A smoke control zone may encompass one or more smoke reservoirs.

2) *Smoke Reservoirs.* Within each smoke control zone it is necessary to create one or more smoke reservoirs in order to collect smoke and from which to remove the smoke. Smoke reservoirs can often be formed by the downstand smoke fascias of units, combined with smoke curtains.

The fascias are necessary, not to prevent smoke flowing into the mall from a fire in a unit, but to prevent smoke flowing into other units adjoining the mall. They need to be at least as deep as the design smoke layer base and constructed from materials that can withstand smoke temperatures.

The structural elements and/or curtains which form the smoke reservoir need to be arranged such that smoke from a fire in any unit can only flow into one smoke control zone. Additional measures within some units may be required to ensure that smoke cannot flow from a unit into more than one smoke control zone.

In some circumstances it may be possible for a reservoir to serve more than one smoke control zone (see Figure 17), as long as there is no risk of smoke flowing from one zone to another.

The clear height established beneath a smoke layer needs to be safely above head height. Increases in this dimension above the recommended value will improve the level of safety within that smoke control zone, but will also require increasing quantities of smoke to be removed as a consequence.

3) *Ventilation system.* A natural ventilation system uses the buoyancy of the smoke to provide the driving force for smoke exhaust and the rate of smoke exhaust is largely dependent upon the depth and temperature of smoke. An advantage of a natural ventilation system is that it can cope with a wide range of fire conditions and, if for any reason the fire grows larger than the design fire size, the greater depth and temperature of smoke leads to an increased exhaust rate. Thus a natural ventilation system has a self compensating mechanism. The equipment needs to be designed to fail safe in the open position, making a natural ventilation system very simple and reliable.

Care needs to be taken to ensure that natural exhaust ventilators are not installed in a position subject to positive wind pressures. A ventilator installed on a roof with a pitch of 30° or less, and not close to taller buildings, would not usually be adversely affected by windy conditions as wind blowing over the roof would produce a suction pressure at the ventilator, and the exhaust rate through the ventilators would increase. If it is impractical to position the ventilators in an area not subject to positive wind pressures, then powered extraction is necessary.

A powered ventilation system can be designed to overcome wind pressures and is often the most practical system to use where smoke is being extracted through an extensive ductwork system. The equipment needs to be capable of continued operation for a suitable period of time at the anticipated temperatures.

The controls and wiring need to be protected to ensure a maintained electrical supply to the fans in a fire.

NOTE 2 Natural exhaust ventilators and powered exhaust ventilators ought never to be provided together in the same smoke control zone.

4) *Inlet air supply.* As the exhaust gases consist almost entirely of air that has mixed with the smoke from the fire, fresh air needs to enter the smoke control zone at a rate equivalent to the smoke exhaust rate, and at a height low enough not to mix prematurely with the smoke.

20.3 Smoke ventilation arrangements in malls

20.3.1 *Commentary*

Ideally smoke from a unit on fire ought to be prevented from entering the malls. However, it can be extremely expensive to provide each unit, however small, with its own smoke ventilation system, and hence it is usually necessary to allow smoke to enter the mall.

If smoke from a unit on fire enters a mall it is essential that it remains well above head height if the mall is to continue to act as a safe escape route. Therefore the area of the mall affected by smoke needs to be limited to prevent excessive smoke cooling, and the length of mall in a single smoke zone needs to be limited to prevent excessive travel distances within smoke-affected areas.

*The smoke from a fire in a large unit could become extremely cool prior to flowing into the mall area. Large units therefore need to have some form of smoke control to prevent smoke entering the mall. For example, the unit could have its own smoke ventilation system (see **20.4**), or an appropriately designed slot extraction system can be installed above the doors or openings to the mall system to prevent the entry of cool smoke into the mall.*

NOTE Any hot smoke that enters the mall will be sufficiently buoyant to flow into a mall smoke reservoir.

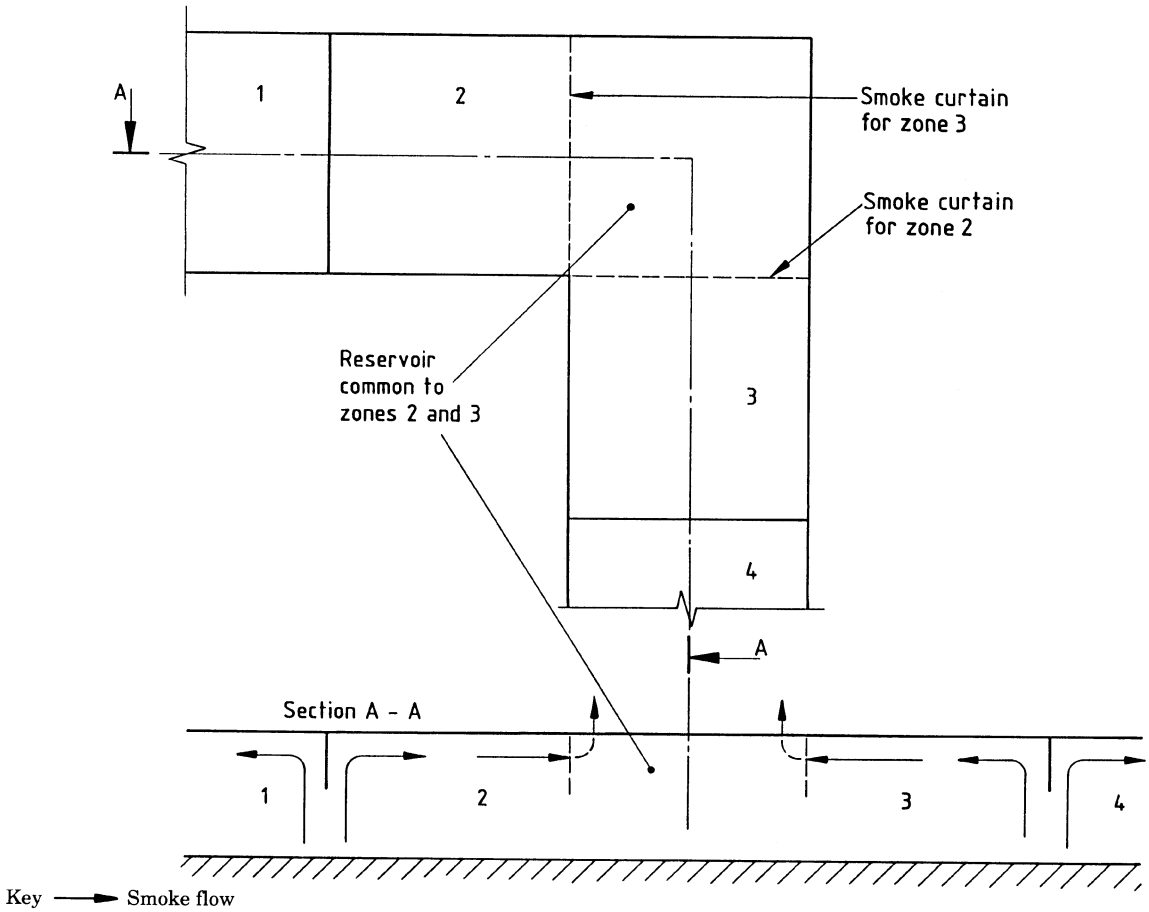


Figure 17 — Smoke reservoir common to several smoke control zones

Parts of large units may vent into the mall provided that:

a) *the area of such parts of the unit does not exceed that allowed for a single unit; and*

b) *such parts of the unit are adjacent to the mall.*

Shopping complexes are becoming increasingly multi-use developments. It is important therefore to consider the potential fire risk in occupancies other than units, as if they adjoin the mall there is the potential for smoke and heat to pass into the mall and affect the shopping complex. The likely fire size in any of these occupancies needs to be assessed and a check made as to whether a system designed on the basis of a fire that is 12 m in perimeter, with a convective heat flow of 5 MW, will be adequate to deal with the fire from any other occupancy opening onto that section of the mall. The smoke ventilation system in the malls would then need to be designed to cope with any of the selected fire sizes in any of these occupancies.

Additional guidance on the design of mall smoke ventilation systems is given in ⟩A1⟨ *BS 7346-4* ⟩A1⟨.

20.3.2 *Recommendations*

The following recommendations are applicable.

a) In every covered mall section of a shopping complex, effective smoke control measures should be taken which will ensure that the smoke from the largest design fire which occurs in any unit or other occupancy, or in any common area, will not endanger the use of any mall or walkway as an escape route.

NOTE 1 The design fire for a retail unit is taken to be 12 m in perimeter, with a convective heat flow of 5 MW. For occupancies other than retail units, the likely maximum fire size and convective heat flow for that occupancy needs to be assessed. Subsequent smoke control calculations need to be based upon the most demanding design fire.

b) Smoke control zones should be so designed and arranged that:

1) the base of the smoke layer in a zone will be not less than 3 m above the level of the mall or walkway;

2) zone boundaries are formed by structural elements of the building and/or smoke curtains;

3) the area of mall within the smoke control zone does not exceed 1 000 m^2 (1 300 m^2 if powered ventilation is used), and the length of each zone, measured along the centre line of the mall, does not exceed 60 m;

4) units discharging smoke into mall zones either:

i) have a plan area not exceeding 1 000 m^2 (1 300 m^2 if powered ventilation is used); or

ii) are subdivided such that smoke is vented to the mall only from parts of the unit with a plan area not exceeding 1 000 m^2 (1 300 m^2 if the mall is provided with a powered ventilation system) that are adjacent to the mall;

NOTE 2 The remainder of the unit needs to be provided with an independent smoke ventilation system (see **20.4**).

5) smoke which is discharged from any unit within the smoke control zone cannot pass into another smoke control zone;

6) smoke curtains, unless permanently fixed in position, are brought into position automatically, provide effective depth, and are adequately smoke-tight.

c) Adequate arrangement(s) should be made in each smoke reservoir for the removal of smoke in a way that will prevent the formation of stagnant regions.

d) All smoke control equipment (including smoke curtains) should be supplied and installed in accordance with the appropriate Part of BS 7346, and powered systems should comply with **20.8**.

e) All automatic provisions and powered operations connected with the control of smoke in malls should:

1) be regularly and effectively maintained and serviced;

2) be tested as a complete entity (rather than individually) if they depend upon other system devices for their successful operation.

f) Any air-conditioning ventilation ductwork used in conjunction with the smoke ventilation system should comply with **20.7**.

20.4 Smoke ventilation arrangements in individual units and other occupancies

20.4.1 *Commentary*

The removal of smoke directly from a unit or other occupancy on fire has the advantage of preventing smoke from entering the common areas and, where this is the objective, all relevant planning and design considerations need to be applied to that end, with appropriate responsibilities formally allocated ▌A1⟩ *(see BS 5588-12)* ⟨A1▐*. Unless all units have a similar system and the possibility of a fire in the common areas is eliminated, a smoke ventilation system in the common areas will still be necessary, as well as smoke detection in each unit.*

Any suspended ceilings within the unit need to be permeable to smoke if located below or within a smoke reservoir. It is essential that provision is also made for low-level openings to allow replacement air into the unit.

NOTE Reference should be made to BS 5306-2 to ensure that the suspended ceiling design does not impede the efficiency of the sprinkler system.

The application of smoke ventilation systems to individual units in a covered shopping complex is recommended by this code only in circumstances where such provisions are essential to maintain adequate safety standards in the malls and where the management of the ▌A1⟩ *shopping* ⟨A1▐ *complex can retain supervisory responsibilities. This is because responsibilities for maintenance of safety provisions affecting a* ▌A1⟩ *shopping* ⟨A1▐ *complex as a whole might be delegated to the tenants of individual units, and as tenants may change frequently they might not fully understand the smoke control measures or the importance of them. In addition, the cost and complexity of such arrangements (particularly in multi-storey developments comprising many small units) could be prohibitive.*

Large units which are subdivided internally into smoke control zones will need to have a smoke control system for each zone, other than the parts allowed to discharge into the mall. The zones need to be separated at high level in such a way, and with sufficient depth, to prevent the spread of smoke to adjacent smoke control zones.

Additional guidance on the design of smoke ventilation arrangements in units is made in ▌A1⟩ *BS 7346-4* ⟨A1▐*. For occupancies other than units, consideration needs to be given to the maximum fire size and convective heat flow for that occupancy.*

20.4.2 *Recommendations*

The following recommendations are applicable.

a) Units and other occupancies with a plan area greater than 1 000 m^2 (1 300 m^2 if using powered ventilation in the mall) should either:

1) be subdivided into smoke control zones not exceeding 2 000 m^2 plan area (2 600 m^2 if using powered ventilation); and

2) have structural elements and/or smoke curtains positioned in such a way and of sufficient depth (taking into account the required exhaust rate) to prevent the passage of smoke into adjacent (and otherwise unaffected) smoke control zones; and

3) be provided with a smoke ventilation system capable of serving only the smoke control zone(s) containing the smoke during the fire condition, and which is actuated by the smoke detection system; and

4) have sufficient inlet (replacement) air supplies to enable the smoke ventilation system to operate efficiently;

or, if undivided internally, should have a slot extraction system above all doors/openings (including glazed areas) onto the mall system capable of extracting all the cool smoke flowing through those openings and operated automatically by the fire detection system of the unit or other occupancy.

NOTE 1 Parts of the unit adjacent to the mall with a plan area not exceeding 1 000 m^2 (1 300 m^2 if the mall is provided with a powered ventilation system) may discharge into the mall.

NOTE 2 Each smoke control zone needs to be a separate fire detection zone.

NOTE 3 Where the unit has an air conditioning/ventilation system independent of the ▌A1⟩ shopping ⟨A1▐ complex that will prevent smoke flowing into the mall, this may be used during the fire and will reduce the volume of smoke extracted above doors/openings into the mall.

b) Adequate arrangement(s) should be made in each smoke reservoir for the removal of smoke in a way that will prevent the formation of stagnant regions.

c) All smoke control equipment (including smoke curtains) should be supplied and installed in accordance with the appropriate Part of BS 7346, and powered systems should comply with **20.8**.

d) The servicing, maintenance and testing of smoke control provisions in individual units and other occupancies should remain the responsibility of the management of the ▌A1⟩ shopping ⟨A1▐ complex and should be carried out on the same basis as for smoke control arrangements in common areas [see **20.3.2**e)].

e) Any air conditioning/ventilation ductwork used in conjunction with the smoke control system should comply with **20.7**.

20.5 Control of automatic smoke ventilation

20.5.1 *Commentary*

It is important for life safety purposes that the arrangements for the control of smoke in shopping complexes come into effect without delay once the presence of smoke is detected. The automatic detection of smoke and the automatic operation of the smoke ventilation equipment needs to take precedence over the provision of any manual controls that may appear to be desirable. A fire service override needs to be provided at a location to be agreed with the fire authority.

Such arrangements include the automatic shutting down of mechanical ventilation and air-conditioning plant, including air curtain systems at unit doorways and circulatory systems connected with refrigerated display cabinets in shop units, the opening of smoke ventilators, the release of smoke curtains and the energizing of powered smoke ventilation plant. The sequencing and extent of the replacement air arrangements for the smoke ventilation system are very important, depend on the location at which smoke is detected, and require detailed consultation with the fire authority.

Where the removal of smoke from the common areas is the objective, arrangements are necessary for the automatic detection of smoke within the relevant smoke control zone. These arrangements are always needed at the mall ceiling and, additionally, below an upper-level balcony/canopy where this is appropriate.

20.5.2 *Recommendations*

The following recommendations are applicable.

a) All arrangements for the control of smoke in covered shopping complexes should be either permanently fixed in position or automatic in operation and, where possible, fail-safe.

b) The control system for a powered smoke ventilation system should be designed so that in the event of any failure in the control circuit, whether caused by fire or not, the system will be actuated.

c) Automatic fire detection equipment used in connection with the control of smoke should operate on the principle of smoke detection and should be installed in accordance with BS 5839-1.

d) Where the removal of smoke from within a unit is the chosen objective of smoke control, a type L1 smoke detection system, as described in BS 5839-1:1988, should be provided within the unit.

e) Automatic electrical connections by means of relays or similar devices to shut down or operate circuitry for the purpose of the control of smoke should be initiated immediately a fire is detected.

f) The extent and nature of the arrangements controlled by, or brought into operation by, the automatic detection of smoke, should be adequate for the control of smoke resulting from a fire at the location where smoke has been detected. Zoning arrangements should be appropriate for this purpose.

g) All equipment for the control of automatic operations should be the direct responsibility of the management of the shopping complex and should be under the control of that management.

20.6 Smoke control arrangements in common areas (other than in malls)

20.6.1 *General*

Non-public areas incorporating servicing facilities are often shared by many different units and can comprise accommodation at all levels, including basement levels and roof areas. Stair traffic between these areas will invariably involve upward movement when the stairs are used as escape routes, necessitating their enclosure and their protection by ventilated lobbies.

If public stairs are to be safely used by occupants of a shopping complex to escape from fire, it is essential that they remain free from smoke and heat for sufficient time for evacuation of the building. This need is considered to be met under normal circumstances by the provision of fire-resisting enclosures and fire-resisting self-closing doors. However, additional precautions are necessary in the case of stairs serving basements or areas of high fire risk.

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

20.6.2 *Recommendation for smoke control for protected lobbies and protected corridors*

Protected lobbies and protected corridors should be provided with an area of permanent ventilation of not less than 0.4 m^2 where separating a protected stairway from:

a) a basement storey;

b) a boiler room or transformer chamber;

c) an enclosed car park.

20.6.3 *Recommendations for smoke control by pressure differentials*

The following recommendations are applicable.

a) Any scheme for smoke control using a powered pressure differential system should be designed and installed in accordance with BS 5588-4.

NOTE Any firefighting stairs will also need to be pressurized.

b) According to the details of the scheme, the recommendations of **20.6.2** may not need to be implemented.

20.6.4 *Recommendation for smoke control in enclosed car parks*

Enclosed car parks should be provided with one of the following means of venting smoke.

a) Permanent vents with an area not less than 2.5 % of the floor area, uniformly distributed on at least three sides of the car park.

b) A powered smoke ⟦A1⟩ and heat exhaust ventilation system as described in BS 7346-4 ⟨A1⟧.

20.6.5 *Recommendations for smoke shafts*

The following recommendations are applicable.

a) If smoke shafts are led up through the building to discharge direct to open air, the outlets should be maintained unobstructed, or be covered only with:

1) non-conbustible grilles and/or louvres; or

2) smoke outlet terminals complying with BS 7346-1 or BS 7346-2.

b) 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.

20.7 Air-conditioning/ventilation ductwork used for smoke ventilation

20.7.1 *Commentary*

Air-conditioning/ventilation ductwork used in conjunction with smoke ventilation systems presents a risk of the spread of smoke and fire within the ⟨A1⟩ *shopping* ⟨A1⟩ *complex. Careful consideration therefore needs to be given to fire protection, integrity, construction and routing of air-conditioning/ventilation ductwork used for smoke ventilation.*

20.7.2 *Recommendations*

The following recommendations are applicable.

a) Air-conditioning/ventilation ductwork used for smoke ventilation should be adequately protected against fire penetration where it is routed beyond a fire-resisting barrier. If the ductwork requires fire protection to be installed external to the ductwork, the fire protection should be adequately supported such that it will remain in place and retain its effectiveness when subjected to fire from either side of the ductwork. Additional insulation should be supported from the building structure unless the ductwork supports are designed to bear the additional load.

b) Fusible link type fire dampers should not be fitted in the ductwork.

c) The construction of the ductwork should be adequately braced to maintain the integrity of the ductwork at the high temperatures and pressures that may exist, and should be designed to accommodate thermal expansion without distortion or damage.

d) All the materials associated with air-conditioning/ventilation systems used for smoke ventilation should be designed to ensure that the system will continue to operate when any part is exposed to fire.

e) Unless the design of the smoke ventilation system specifically does not allow the possibility, fire/smoke dampers which are operated by smoke detectors associated with the air-conditioning/ventilation system(s) should all fail-safe to the correct position for the system(s) to work satisfactorily in the smoke ventilation mode. Where there is no fail-safe position possible (e.g. where one fan or one set of fans are intended to serve one of several smoke control zones, selectable by controllable dampers), the reliability of the dampers should be acceptable to the approving authority.

20.8 Powered smoke ventilation systems

20.8.1 *Commentary*

It is essential that powered smoke ventilation systems provided for life safety purposes remain operational at all times. Because of the risk that one of the extract fans might be unserviceable, it is essential that the capacity of the system is oversized, or that standby fans are provided. Fans may be located within the smoke control zone or in a plant room remote from, and connected by ductwork to, the smoke control zone(s). Fans may be mounted in plant rooms within the building, or on the exterior of the building, usually in groups serving one or more smoke control zones.

20.8.2 *Recommendations*

The following recommendations are applicable.

a) Components of powered smoke ventilation systems should have a minimum temperature classification of class C in accordance with BS 7346-2:1990.

b) Each smoke control zone should be provided with sufficient fans to enable smoke to be extracted in such a way as to maintain the base of the smoke layer at or above its design height.

c) If the smoke ventilation is achieved by the provision of powered exhaust ventilators, then at least two ventilators should be provided for each smoke reservoir, and the aggregate capacity of the ventilators serving the smoke control zone should be such that recommendation b) will be met when, in turn, the largest capacity ventilator in each reservoir is discounted.

NOTE 1 This recommendation may be met by either:

1) providing an additional powered exhaust ventilator; or

2) providing ventilators with excess capacity.

d) There should be no fewer than two fans in each plant room or group of fans serving a single smoke control zone, and the aggregate capacity of the fans serving the smoke control zone should be such that recommendation b) will be met when, in every plant room or group of fans serving the zone, the largest capacity fan is discounted.

NOTE 2 This recommendation may be met by either:

1) providing an additional fan; or

2) providing fans with excess capacity.

e) In each plant room or group of fans serving two or more smoke control zones there should be:

1) no fewer than two fans, and the aggregate capacity of the fans should be such that recommendation b) will be met for each smoke control zone served by the plant room or group of fans; and

2) an additional fan with a capacity of not less than that of the largest fan in the plant room or group of fans.

f) An additional fan provided to meet recommendation d) or [e)2)] should be automatically activated in the event of failure of a fan in the plant room or group of fans.

NOTE 3 Detection of failure of a fan may be achieved by either:

1) monitoring the fan power circuit; or

2) monitoring the air flow produced by the fans in the plant room or group of fans.

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Section 7. Engineering services

21 General

21.1 Engineering services

In this code engineering services are those providing comfort, convenience and safety elsewhere than in the units and other occupancies, and comprise the following:

a) gas services;

b) electrical services and wiring;

c) lighting;

d) heating systems;

e) mechanical ventilation and air conditioning systems;

f) lifts and escalators;

g) incinerators.

Engineering services provided for the units and other occupancies are covered in the respective parts of BS 5588.

21.2 Enclosure of engineering services

21.2.1 *Commentary*

Some engineering services are known potential sources of fire, and it is essential that the equipment associated with them in shopping complexes is installed and maintained in accordance with the relevant codes of practice and safety regulations.

The importance of correct installation in the first place is emphasized, because electrical, lighting, heating and ventilation systems are often concealed above suspended ceilings and/or within service ducts. Electrical control gear is also often located behind ceiling and wall panels. Installation faults that might lead to fire are particularly dangerous because the fire is likely to remain undiscovered for a time.

21.2.2 *Recommendations*

The following recommendations are applicable.

a) Ducts for engineering and building services should comply with BS 8313; ductwork for ventilation and air conditioning should comply with BS 5588-9.

b) Platform floor and ceiling voids should incorporate cavity barriers at spacings to satisfy building regulations. Any penetration of cavity barriers or floor panels by services should be fire-stopped. Where partitions above the platform floor are required to have specified fire resistance, they should be carried down to the structural floor.

21.3 Engineering services installation rooms

21.3.1 *Commentary*

Engineering services installation rooms include workshops, electrical switchgear rooms, boiler rooms, fuel storage spaces, mechanical ventilation and air conditioning plant rooms, lift machine rooms, rooms housing fixed internal combustion engines and battery charging rooms.

If there is cause to store or use highly flammable substances, the attention of building designers and management is drawn to the relevant legislation.

*Means of escape from engineering services installation rooms is dealt with in Clause **11**.*

*Fire protection of engineering services installation rooms is covered in **14.5** and the enclosure of lift shafts in **14.6**.*

21.3.2 *Recommendations*

The following recommendations are applicable.

a) Service installation rooms should be sited so that escape from other exits is not prejudiced by the risk of an outbreak of fire in such a room.

b) Service installation rooms in which flammable liquids or gases are used or stored should have imperforate cills to doorways and any necessary drainage should be provided with interceptors.

c) Service installation rooms should, where necessary for the safe operation of the equipment and to avoid undue build-up of heat, be ventilated (either directly or indirectly) to the outside air. The provision of such ventilation should not impair any fire resistance requirements for the structure.

22 Boiler rooms, fuel storage areas, transformer, battery and switchgear rooms, and rooms housing fixed internal combustion engines

22.1 Boiler rooms

22.1.1 *Commentary*

In the design of a boiler room and ancillary spaces the possibility of a future change to other fuels may require consideration.

22.1.2 *Recommendations*

The following recommendations are applicable.

a) Oil-fired installations should be in accordance with BS 5410-1 and BS 5410-2.

b) Town, natural and liquefied gas boiler installations should be in accordance with BS 6798 or BS 6644.

c) Boiler rooms (other than those covered by BS 5410-2) should have adequate provision for smoke venting.

22.2 Recommendations for fuel storage areas

The following recommendations are applicable.

a) Oil should be stored in accordance with BS 5410-1, BS 5410-2 and BS 799-5.

b) Solid fuel should be stored in bunkers protected by non-combustible walls of sufficient thickness to prevent heating of the fuel by boilers or steam pipes.

c) Fuel storage areas (other than those covered by BS 5410-2) should:

1) have adequate provision for smoke venting;

2) if used for the bulk storage of liquefied petroleum gas, be in accordance with the Health and Safety Executive Guidance Booklet HS(G)34 and Guidance Note CS4.

22.3 Recommendations for transformer, battery and switchgear rooms

The following recommendations are applicable.

a) A transformer, battery or switchgear room, unless situated on the roof or in a separate enclosure, where possible should be sited adjacent to an external wall and entered only from the open air.

b) A transformer, battery or switchgear room should have adequate provision for ventilation.

22.4 Recommendation for rooms housing fixed internal combustion engines

Liquefied petroleum gas fired engines should be surrounded by a bund wall not less than 600 mm in height above floor level [for storage of liquified petroleum gas see **22.2**c)].

23 Waste storage and treatment

23.1 Commentary

Waste retained in premises constitutes a fire risk, particularly if it is bulky. BS 5906 gives advice on the collection, storage and disposal of waste, together with information about on-site treatment systems such as compactors, balers and incinerators which reduce the volume of waste and its fire risk.

23.2 Recommendation

Waste storage chambers, waste chutes and waste hoppers should be sited and constructed in accordance with BS 5906.

24 Gas services

24.1 Natural gas installations

24.1.1 *Commentary*

The installation of gas fittings, including installation pipework, meters and appliances, is controlled by the Gas Safety (Installation and Use) Regulations 1984. Service pipes are subject to the provisions of the Gas Safety Regulations 1972. Both Regulations should be referred to for specific details.

Further guidance may be found in the following publications:

a) *"Manual valves — A guide to selection for industrial and commercial gas installations": British Gas IM/15.*

b) *"Guidance notes on the installation of gas pipework, boosters and compressors in customers premises": British Gas IM/16.*

c) *"Guide for gas suppliers requiring authorisation under Section 8 of the Gas Act 1986": Ofgas — Office of Gas Supply.*

24.1.2 *Recommendations for service and installation pipework*

The following recommendations are applicable.

a) Installation and service pipes should not be run in malls and escape routes serving malls, unless this cannot be avoided.

b) All gas services and installation pipes should be installed such that the fire resistance of the ▌A1⟩ shopping ⟨A1▌ complex is unimpaired.

c) Emergency control valves should be located external to the ▌A1⟩ shopping ⟨A1▌ complex.

24.1.3 *Recommendation for meter installations*

The meter installation should comply with the Institution of Gas Engineers publication IGE/GM/1. "Gas meter installations for pressures not exceeding 100 bar".

24.2 Liquefied petroleum gas (LPG) installations

In the absence of any published authoritative guidance regarding fire safety aspects of LPG installations, discussions should be held with the appropriate authority.

25 Electrical services

25.1 Recommendation for electrical installations

All electrical services should be installed, and periodically inspected and tested (with any necessary maintenance carried out), by suitably qualified engineers in accordance with the IEE Wiring Regulations.

25.2 Electrical power supplies

25.2.1 *Commentary*

All electrical supplies to life safety and fire protection installations need to be derived from the point at which the electrical supply enters the [A1] *shopping* [A1] *complex, so that the failure of other equipment does not render the installations inoperative. Since it is not possible to determine where a fire may start, all power supplies and their associated control equipment back to the supply intake position should be regarded as being within the hazard/risk area. Therefore great care needs to be taken in the design to ensure power is available at all times.*

Consideration also needs to be given, not only to routing of cables, but to positions of terminations, circuit protection facilities and control panels, to ensure that these are also provided with adequate protection from the effects of fire.

25.2.2 *Recommendations*

The following recommendations are applicable.

a) The electrical power supply to life safety and fire protection equipment should be separate from all other circuits in the [A1] shopping [A1] complex.

b) Each connection to the power supply should be via an isolating protective device reserved solely for the life safety and fire protection equipment and independent of any other main or sub-main circuit. Such isolating protective devices (with high rupturing safety devices) should be clearly labelled and identified as to their purpose. They should be secured against unauthorized operation and should, except for maintenance, be kept locked-on.

c) The supply to these isolating protective devices should be independent of the main switch for the [A1] shopping [A1] complex.

d) Monitoring facilities should be provided at the central control room to show, as far as is reasonably practical, that power is available up to the final control point, e.g. motor contactor, to all fire safety systems.

25.3 Protected circuits for the operation of equipment in the event of fire

25.3.1 *Commentary*

Wiring systems for the supply of electrical equipment required to operate in the event of fire need to be of a type or installed in a manner such that, in the event of fire anywhere in the [A1] *shopping* [A1] *complex, the circuits will continue to operate and the cables will maintain circuit integrity.*

25.3.2 *Recommendations*

The following recommendations are applicable.

a) The wiring systems should either

1) consist of mineral-insulated, copper-sheathed cables complying with BS 6207, or consist of cables complying with the requirements for classification as CWZ in accordance with BS 6387; or

2) be protected against exposure to the fire by separation from any significant fire risk by a wall, partition or floor having at least 1 h fire resistance.

NOTE 1 Where appropriate, compliance is for integrity and insulation from the side of the construction remote from the cable.

NOTE 2 The mechanical protection of cables by conduit, ducting or trunking should not be considered to give protection against fire.

b) The wiring systems should be separate from any circuit provided for any other purpose.

c) The wiring systems should be such that they cannot be affected by fire at any position where cable connections are made.

d) The wiring systems should be adequately protected from any mechanical damage.

NOTE 3 To achieve greater integrity of the system, separate or independent sources of electrical supply are necessary (see **25.4**).

25.4 Primary and secondary power supplies

25.4.1 *Commentary*

To reduce the risk of the loss of electrical supply in a fire, a secondary power supply is considered essential. A supply is required from a generator, or a separate substation, which is of sufficient capacity to maintain supplies to the life safety and fire protection installations, including smoke control systems in malls, systems using pressure differentials and ancillary equipment. The secondary power system needs to be designed to operate safely in fire conditions. Consideration of the means for the provision of a secondary supply ought to include the overall electrical distribution system within the A1 *shopping* A1 *complex, and also the power needs for other equipment requiring a secondary power supply.*

It should be noted that a power supply from a second substation would not offer protection against the occurrence of a fault (unconnected with a fire in the A1 *shopping* A1 *complex) on the high-voltage distribution network (such as the severing of a high-voltage cable during construction work) as this could affect both substations. If protection against such faults is required, then either a generator needs to be provided, or a power supply needs to be taken from a high-voltage distribution network different to that normally supplying the* A1 *shopping* A1 *complex.*

The change-over from the primary to the secondary power supply needs to be automatic so that the life safety and fire protection installations continue operation. Both the primary and secondary supplies to the life safety and fire protection installations need to be sufficiently protected against fire and water damage, and also separated from each other, so that the failure of cables or equipment, either by mechanical breakdown or damage by fire, in any one system, does not affect the other supply. Protection against fire may be achieved by choice of cable, choice of route (for example, through protected areas, or external to the A1 *shopping* A1 *complex) or by the provision of additional fire protection.*

It is essential that the fire procedures of the A1 *shopping* A1 *complex do not include the isolation of circuits supplying power to the above mentioned equipment.*

25.4.2 *Recommendations*

The following recommendations are applicable.

a) A secondary power supply independent of the primary power supply to the A1 shopping A1 complex, e.g. an automatically started generator or a supply from another substation, should be provided which will, independently of the primary supply, be of sufficient capacity to maintain in operation for at least 3 h the following:

1) the shopping mall smoke control system and other powered smoke control systems (including systems using pressure differentials);

2) the fire service communication systems; and

3) any other fire protection or firefighting equipment.

The secondary power supply should be capable of providing the power supply for items 1), 2) and 3) within 15 s of the failure of the primary electrical supply. Where the alternative power source is a generator, it should be capable of providing the power necessary for at least 3 h without replenishment of fuel. A supply from another substation should be from a substation which does not normally provide the incoming supply to the A1 shopping A1 complex.

b) Whichever secondary source is provided, the distribution should be organized such that the secondary supply remains live when the remainder of the supplies in the A1 shopping A1 complex are isolated in an emergency.

c) Cables supplying current to the life safety and fire protection installations should be installed in accordance with the IEE Wiring Regulations and manufacturer's instructions. The cables should have an inherently high resistance to fire and be protected where necessary against mechanical damage. Cables, switchgear and other equipment transmitting the secondary power supply should be separate from those of the primary supply, or be physically protected so that a breakdown, or any cause of breakdown, on one supply would not lead to a simultaneous failure of the other supply.

d) The primary and secondary power supply cables should be terminated in a change-over device located within the plant room(s) housing the life safety and fire protection equipment. The change-over device should automatically effect the transition from primary to the secondary power supply if the primary supply to the particular plant fails.

e) Any electrical substation or enclosures containing any distribution board, generator, powered smoke control plant, pressurization plant, communication equipment, and any other equipment associated with life safety and fire protection systems, should be separated from the ⟨A1⟩ shopping ⟨A1⟩ complex by construction with a fire resistance of not less than 2 h.

25.5 Firemen's emergency switches for discharge lighting installations

25.5.1 *Commentary*

Discharge lighting installations, such as floodlights and neon advertising signs, may operate at voltages that are a hazard to firefighters.

25.5.2 *Recommendation*

An exterior discharge lighting installation, or an interior discharge lighting installation operating unattended, and operating at a voltage exceeding low voltage, should be controlled by a firemen's emergency switch, installed and situated in accordance with the IEE Wiring Regulations and. the requirements of the fire authority.

26 Lighting

26.1 Types of luminaire

26.1.1 *Commentary*

Luminaires range from tubular fluorescent to filament and high-pressure lamps. Fluorescent luminaires operate at relatively low temperatures and the tubes themselves are not likely to be a source of fire. Electrical breakdown of associated gear and wiring in the luminaire, however, may lead to ignition of adjacent combustible materials. Correct installation is therefore essential.

All incandescent filament lamps and high-pressure discharge lamps operate at elevated temperatures, and where such lamps are used they should not be close to or fixed to materials that are readily ignited. Care should be taken in the selection of plastics materials or finishes, some of which can be highly flammable.

Methods of lighting can be subdivided broadly into three groups:

a) *recessed luminaires;*

b) *illuminated ceilings;*

c) *luminaires at or below ceiling level.*

26.1.2 *Recommendation*

Luminaires should comply with BS 4533.

26.2 Recessed luminaires

When recessed luminaires are within suspended ceilings they can overheat, resulting in failure of the insulation of electric wiring and apparatus. The control gear of fluorescent luminaires is particularly likely to cause overheating, as is the use of incandescent lamps of a wattage in excess of the design standard.

Such overheating may result in fire within a concealed space, with consequential problems of detection and extinguishment.

26.3 Illuminated ceilings

The most common illuminated ceilings are the perforated types, e.g. louvre, egg crate diffusers. By the nature of their function and the construction and materials used, these ceilings contribute nothing to the fire resistance of the structure. The materials might be combustible and care in their selection is important in order to reduce to a minimum their contribution to any fire that may occur.

26.4 Luminaires at or below ceiling level

Luminaires at or below ceiling level, if properly fitted and maintained, usually present a negligible fire risk, but care is necessary in siting to avoid interference with the water distribution pattern of sprinkler heads. Care is also necessary to prevent accidental operation of sprinklers and fire detectors by heat from luminaires. Where spot and other low-level luminaires are used, care needs to be taken to avoid close proximity with combustible goods and materials and to ensure that there is no heat built up within a confined area. In service corridors, loading bays and engineering services rooms the use of pendant-type luminaires should be avoided; bulkhead type luminaires are preferable.

26.5 Lighting of escape routes

26.5.1 *Commentary*

Staff working within a shopping complex can be expected to be familiar with the normal circulation areas, stairs, corridors etc., which could also be the escape routes. Members of the public will generally know only the principal mall circulation routes. In order to clearly delineate internal circulatory routes, adequate lighting needs to be provided and maintained in all common areas of covered shopping complexes.

Special provisions should also be made for the lighting of all public and staff escape routes in the ⟩A1⟨ *shopping* ⟩A1⟨ *complex to ensure good visibility should the main or local electricity supply fail for any reason. It should also be possible to see any directional or warning signs associated with escape routes, changes in floor level the location of fire alarm call points and firefighting equipment.*

Escape lighting is also necessary in all units, notwithstanding that such lighting may not be required under the appropriate Part of BS 5588.

All parts of the common areas need to be considered separately to determine the need and type of system for providing escape lighting. Consultation is necessary with the appropriate enforcing authority.

The essential feature of escape lighting is that it is designed to illuminate when part or all of the normal lighting has failed. There are various types of escape lighting, e.g. maintained alight continuously; not alight until the local circuit has failed, then lighting automatically; single, independent self-contained, battery-powered luminaires or systems powered by a central battery or generator.

26.5.2 *Recommendations*

The following recommendations are applicable.

a) Adequate artificial lighting should be provided in all common areas and escape routes, and should be of a sufficient standard to enable persons to see to escape.

b) In addition to the system of artificial lighting, escape lighting should be provided within:

1) all common areas;

2) underground or windowless accommodation;

3) all escape routes;

4) all units (other than kiosks).

NOTE 1 In malls, consideration should be given to siting escape lighting luminaires below the design base of the smoke layer.

NOTE 2 Additional escape lighting luminaires may be required in a densely occupied mall.

c) Escape lighting systems should comply with the appropriate recommendations of BS 5266-1.

27 Heating, mechanical ventilation and air conditioning systems

27.1 Heating systems

27.1.1 *Commentary*

Experience has shown that, in buildings of all sizes, few fires are caused by central heating systems, i.e. those in which energy conversion takes place at one point in the building. Most fires from heating appliances are produced by local heating units, particularly those that are not fixed ⟩A1⟨ *(see BS 5588-12)* ⟩A1⟨.

NOTE The installation of heating appliances and systems is controlled by building regulations and by regulations applicable to the fuel(s) used.

a) **Central heating (water).** *These systems, whether high or low pressure, and whether fired by solid fuel, gas, oil or with a facility to burn alternative fuels, should give rise to little fire risk if installed in accordance with building regulations and relevant standards.*

b) **Warm air heating.** *Considerations similar to item a) apply. With this form of heating, rigorous precautions are necessary to avoid any risk either that the system will permit the products of combustion to be distributed through the ductwork or that a fire starting in one part of the* [A1] *shopping* [A1] *complex will be transferred to another part; further details are given in BS 5588-9.*

c) **Electric and gas heaters.** *These need to be of the convector rather than the radiant open-element type and, if so, should present little fire risk. Although gas convector heaters are available in flued and flueless versions, the former are preferable. Gas fires have to be flued.*

d) **Electric thermal storage.** *An electrical thermal storage system, whether used as underfloor heating or as individual heaters, depends for its safety on being installed in such a manner or in such positions that the risk of overheating and ignition of adjacent materials is eliminated.*

27.1.2 ***Recommendation***

All heating appliances and systems should comply with appropriate standards and should be installed in accordance with relevant standards and codes of practice.

27.2 Mechanical ventilation and air conditioning systems

27.2.1 ***Commentary***

These systems in large buildings such as shopping complexes are likely to involve extensive ductwork throughout the [A1] *shopping* [A1] *complex. An understanding of the principles of passive fire protection in such systems is essential to avoid fire hazards, of which the main ones are as follows.*

a) *Flames and hot gases (smoke), by breaking into and out of horizontal or vertical ductwork, can spread a fire from one part of the* [A1] *shopping* [A1] *complex to another. If the ductwork insulation is flammable, this hazard is greater.*

b) *Flames may spread to another part of the* [A1] *shopping* [A1] *complex because of the lack of fire-stopping around ductwork where it penetrates fire-resisting separation.*

c) *In the event of a fire, a ventilating or air conditioning system using a proportion of recirculated air may distribute smoke and hot gases throughout the* [A1] *shopping* [A1] *complex.*

d) *In higher buildings with sealed windows, the smashing of glass to facilitate smoke removal could result in a hazard to people from falling glass or flying shards. This situation may be avoided if smoke venting facilities are provided in accordance with the recommendations of* ***7.7.2****e).*

Although environmental air movement may have ceased, the buoyancy inherent in fire gases can cause smoke to enter ductwork through any grilles or openings, to move along the ductwork and to exit via other grilles or openings.

It is also important to ensure that the movement of air is away from escape routes so as to prevent, as far as possible, smoke-laden air being carried into protected escape routes and exits.

Mechanical ventilation and air conditioning plant rooms are most likely to be situated in a basement, on the roof or possibly both. The main risk of fire in such areas, provided the enclosures are adequate, is from the nature of the installation itself, unless there is provision for an automatic fire detection system to close down the plant, and unless adequate fire dampers are included in the ductwork system.

Smoke control systems employing pressure differentials are covered in ***20.6.3****. However, if such a system is to be provided for the protection of escape routes against the ingress of smoke and toxic gases, the accepted practice in the design of ventilation and air conditioning systems should be modified so as to achieve compatibility between the two systems.*

BS 5839-1 gives guidance on the siting of smoke detectors.

27.2.2 *Recommendations*

The following recommendations are applicable.

a) Mechanical ventilation and air conditioning plant should be installed in accordance with BS 5720.

b) Service ducts should be installed in accordance with BS 8313, and ventilation and air conditioning ductwork should be installed in accordance with BS 5588-9.

NOTE 1 See also **20.7** if the system is also used for smoke ventilation arrangements.

c) Except for smoke control ventilation systems, effective smoke detection arrangements should be made to cause the automatic shut down of any ventilation or air conditioning system in the event of smoke being present in the system. Measures should be taken to prevent smoke spreading from one smoke zone to another in ductwork common to more than one smoke zone.

d) Except for smoke control ventilation systems, any mechanical ventilation or air conditioning system should be automatically shut down on the operation of any fire detection system in the area in which it operates.

e) The operation of the normal mechanical ventilation system should not jeopardize the operational efficiency of any life safety system within the ⟦A1⟩ shopping ⟨A1⟧ complex.

NOTE 2 Where the normal mechanical ventilation system is also used for the smoke control ventilation arrangements, the whole of the system (including fans, ductwork, controls and wiring) should be of a standard suitable for the smoke temperatures and pressures developed. (See **20.7**.)

f) Any system of mechanical ventilation should be designed to ensure that in the event of fire the airflow pattern is away from protected escape routes and exits. This pattern may be achieved by the use of automatic change-over devices operated by the fire detection and alarm system, which should also be capable of manual operation.

g) Ventilation and air conditioning systems should be compatible with any smoke control system installed employing pressure differentials.

28 Lifts and escalators

28.1 Commentary

Experience in fires has shown that misuse or malfunctioning of lifts has caused a number of deaths, attributed amongst other things to failure of the power supply or lifts being called to or held at the fire floor. Once the car and landing doors open in a fire area their design is normally such that they remain open, exposing the occupants to fire. For these reasons it is not appropriate to use passenger lifts (other than evacuation lifts for disabled persons) for means of escape. For the same reasons, it is not appropriate to use goods and service lifts in the event of fire.

Goods and service lifts pose a particular fire hazard and means of escape problem in shopping complexes. To minimize any undue fire or smoke spread, they need to be separated from other parts of the ⟦A1⟩ shopping ⟨A1⟧ complex by protected lobbies.

Special arrangements may be needed where any lift connects a common area (e.g. car park) to the interior of a unit or other occupancy.

If a lift well is located within a common escape route, the preferred location of the lift machine room is either above or outside the common escape route. Where they have to be at the foot of the well, the fire separation from the well is crucial.

Firefighting lifts are covered in Section 3.

*The enclosure of lift wells is covered in **14.6.2**.*

*Although escalators cannot be considered as escape stairs (see Clause **8**), measures need to be taken to safeguard any persons using them at the time of the fire.*

28.2 Recommendations

The following recommendations are applicable.

a) Lifts for passengers and goods, goods hoists, passenger conveyors and escalators, should be installed in accordance with the relevant part(s) of BS 5655;

b) Evacuation lifts should be in accordance with BS 5588-8.

c) Lift machine rooms should comply with the appropriate Part of BS 5655.

d) Escalators and lift doors discharging into malls and walkways should be situated at least 6 m from any kiosk or display area, and from any opening to adjacent units or other occupancies.

e) Goods and service lifts should be entered from protected lobbies on all levels above and below the loading dock/servicing area.

f) On operation of the fire alarm system, suitable arrangements should be made to bring escalators gradually to a halt in that mall fire detection zone/smoke control zone, and lifts in the malls should automatically return to the ground storey/fire service access level.

29 Incinerators

29.1 Commentary

There are two main types of incinerators:

a) *for the disposal of bulk waste;*

b) *sanitary incinerators for toilets.*

Incinerators may be fired by gas or electricity, but irrespective of the source of heating, the fire risk arises from the nature and bulk of the waste to be consumed.

All types of incinerators, except those fired by electricity, are controlled (as fittings) by building regulations. The means of flueing incinerators, including those fired by electricity, are also controlled by building regulations with regard to the discharge of products of combustion and the risk of fire spread.

29.2 Recommendation

Incinerators with a capacity larger than 0.08 m^3 require special consideration, and preferably should be isolated in a separate building.

Section 8. Management

[A1] Management is now dealt with in BS 5588-12.[4)] [A1]

[4)] [A1] *Footnote deleted* [A1]

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Appendix A
Uncovered shopping complexes, small shopping developments, refurbished and existing premises incorporated into shopping complexes

A.1 General

The recommendations in this code have, in the main, been drafted in the context of new medium to large shopping complexes with fully or partially covered malls.

Although these recommendations are capable of being applied to [A1] shopping [A1] complexes of all forms and sizes, it might nevertheless be appropriate to consider some variation in the case of uncovered [A1] shopping [A1] complexes, small shopping developments, refurbishment of existing shopping complexes and covering existing streets. However, except where otherwise set out in this code, it is not possible to give firm recommendations for these forms of development because of the wide variation in form and other factors. Much will depend on the particular circumstances and a flexible application of the recommendations is therefore needed. Such an approach is particularly relevant where developments constitute, or are to be incorporated in, a building of architectural/historical interest. A sensitive handling of the fire protection facilities is necessary if the architectural/historic features are not to be prejudiced.

Any variations made in accordance with this appendix should be agreed with the enforcing authorities.

NOTE Any extensions to an existing [A1] shopping [A1] complex should comply with the appropriate recommendations in this code.

A.2 Uncovered shopping complexes

Some of the recommendations of this code are specially directed at those parts of new [A1] shopping [A1] complexes having uncovered malls, for example, those on escape distances in Clause **9**. Others may not be relevant, for example those on smoke ventilation in Clause **20**. However, although most of the recommendations could be applied whether or not the malls are covered, uncovered shopping complexes tend to display fewer fire safety problems than covered ones. Some uncovered developments might be little different, in fire safety terms, to a conventional group of "High Street" shops.

In general, uncovered shopping complexes do not need to be sprinklered. However, an uncovered [A1] shopping [A1] complex might still have features that lead to the need to consider the provision of sprinklers. For example, there may be communal features that could affect the overall safety of the development, such as communal basement servicing arrangements.

When designing uncovered shopping complexes, consideration should be given to the possibility of the development becoming covered at a later date, possibly as part of a refurbishment scheme. In particular, malls with an effective width of less than 6 m, and unsprinklered units, will pose problems (see also **A.4**).

A.3 Small shopping developments

At their simplest these developments are typified by the traditional shopping arcade. These often grew out of existing narrow lanes where the space between opposing buildings was subsequently glazed over to provide weather protection and a more pleasant environment. These small developments, whether in a new building or formed by the subdivision of an existing building, should be of no greater size overall than would be acceptable under building regulations as a single uncompartmented shop. Owing to the smallness of the development it might be difficult to provide the minimum width of mall recommended for [A1] shopping [A1] complexes generally. Similarly it might only be possible to service the units from the mall, and it might not always be possible to obtain secondary escape from units.

In assessing the fire safety standards of these small developments it may sometimes be appropriate to consider cases by comparison with the fire safety needs of a single shop of similar size taking into account the multi-occupancy factor. Where there is simple and direct means of escape, short distances of travel, a good standard of automatic fire detection and alarm, and arrangements for total evacuation in an emergency, then a lesser standard of provision in some other areas might be appropriate but each case would need to be considered on its merits.

A.4 Refurbishment of existing shopping complexes

The demands of the public in respect of their shopping environment have changed dramatically in recent years. High standards in respect of weather protection and comfort are expected. Many early shopping complexes were often no more than pedestrianized precincts with the public common areas largely open to the elements. Commercial competition from newer and more environmentally pleasing developments has led to widespread refurbishment of older ▮A1⟩ shopping ⟨A1▮ complexes.

Particular problems arise in the refurbishment and/or enclosure of uncovered shopping complexes to meet, as far as practicable, current standards. Where previously open malls are to be covered a number of problems arise. Malls that are of a width that was satisfactory when they were substantially open may be less satisfactory when covered, and it may be difficult to widen them without severe disruption to trading.

Fire separation between adjoining units may not be a significant problem, and with sufficient roof height it should not generally be difficult to provide smoke venting that meets the recommendations of Clause **20** in the new roof structure. The provision of full sprinkler protection might be difficult to arrange in some cases mainly due to legal problems. In the event of any units remaining unsprinklered, fire precautions should be based on the assumption of a fully involved fire in any one of those units. There may be practical difficulties in providing the appropriate standard of means of escape, and the constraints of the existing building might make it difficult to incorporate some other fire safety features.

For example, where malls are narrow and cannot be widened, and space for the necessary ducting and equipment exists within the units, sprinklered units could be provided with individual smoke extraction systems. Similarly such an arrangement would be needed where mall heights are low. If smoke is allowed to discharge into a mall with a low ceiling there could be insufficient height to maintain a clear distance to the base of any smoke layer, above the heads of persons escaping. The recommendation in **20.3.2** is of paramount importance in any situation where smoke is extracted from malls. In these cases, management arrangements to ensure continued effectiveness of the individual extraction systems would be essential.

Any refurbishment offers an opportunity to upgrade fire safety standards, and the starting point should be the full recommendations of this code. Where this is not possible, then any alternative package would need to be carefully considered, but always bearing in mind that in some cases any upgrading might be preferable to no improvement at all.

Similar problems to the above can occur when refurbishing existing covered ▮A1⟩ shopping ⟨A1▮ complexes, especially those not designed to Fire Prevention Guide No. 1 or this code. Therefore similar flexible solutions will be appropriate.

A.5 Existing premises incorporated into shopping complexes

When existing premises are incorporated into shopping complexes, often as part of a town centre development, similar problems to those discussed in **A.3** and **A.4** will arise and therefore similar flexible solutions will be appropriate.

Appendix B
Impact resistance of partitions

NOTE 1 This appendix applies to those walls referred to in **14.4.2**e).

Unless constructed of materials such as brick or concrete, partitioning should satisfy the criteria for compliance given in Table 8 when tested in accordance with BS 5234-2[5)].

NOTE 2 The tests are carried out on a test specimen between 4.5 m and 6.0 m in length incorporating an 1 100 mm wide doorset 650 ± 50 mm from one end with a 900 mm wide partition fixed at right angles to the other end. The way in which the components are fixed to each other should be in accordance with the supplier's recommendations with regard to their nature, type, position and spacing.

The test specimen should be mounted in a rigid rig (such that the application of a load of 2 kN at any point, in addition to any load imposed by the test specimen, does not result in a deflection or lateral residual movement exceeding 0.1 mm) and subjected to the tests given in Table 8 in the order in which they are listed.

5) In preparation.

Appendix C
Commissioning and hand-over of smoke control systems

NOTE Where various functions interface, e.g. smoke detection and smoke control, these systems should be commissioned together to ensure that the prescribed fire safety procedure is implemented.

C.1 Smoke ventilation systems

C.1.1 *General*

On completion of the smoke ventilation system, the complete installation should be checked for compliance with the approved drawings and system design. Adequate instruction on its use, planned maintenance and testing should be supplied to the owner of the premises.

The hand-over procedure should include operation of the system by actuating smoke detectors in each smoke control zone. All elements of the system and control interfaces for ventilators or extract fans, curtains and air inlets should then operate automatically.

Table 8 — Impact resistance tests for partitions

Test	Severity	Criteria for compliance
a) Stiffness (see Note 1)	500 N	No significant damage, max. deflection 10 mm
b) Small hard body impact (see Note 2)		(see Note 4)
1) surface damage	10 N·m	No significant damage
2) perforation	30 N·m	No significant damage
c) Large soft body impact (see Note 3);	120 N·m	No significant damage

NOTE 1 Force applied via a 150 mm diameter plate.

NOTE 2 Body is a 50 mm steel sphere.

NOTE 3 Body is a spheroconical bag 600 mm × 400 mm filled with hardened glass beads.

NOTE 4 Deflection of the partition from the vertical.

C.1.2 *Powered smoke exhaust systems*

The volume exhaust rate should be measured for the design fire. This should be obtained at ambient temperature equivalent to the required volume exhaust rate at the calculated gas temperature, or class C temperature (in accordance with BS 7346-2), whichever is appropriate.

NOTE 1 The volume extract (or supply) airflow readings should be taken by either using a vane anenometer at each extract grille, then totalling the readings; or by taking a Pitot traverse in an appropriate straight section of ductwork (approximately 4 m from any obstruction or outlet, etc.) for each fan, then totalling the results.

Further information can be found in the CIBSE Commissioning Code A.

If standby generators are installed to provide emergency electrical power, these should be checked.

NOTE 2 If the standby generator(s) are common to other emergency systems, these other systems should be powered by the generator(s) to ensure that an adequate and reliable power supply is provided.

C.1.3 *Natural smoke ventilation systems*

The areas of the ventilators should be measured, and along with test certificates for ventilator aerodynamic coefficients, these should be compared with the figures required by the approved design.

NOTE This can be done by measuring a sample of each ventilator size and calculating the measured area by totalling the numbers of vents.

C.2 Smoke control systems employing pressure differentials

The following check tests should be carried out when accepting a smoke control system employing pressure differentials.

a) All detection devices operate correctly and initiate operation of the system.

b) The air relieving systems operate.

c) A measurement should be taken of the air velocity, across all open doors that, when normally closed, separate the pressurized space and adjacent spaces.

d) Measurements should be taken of the pressure differential between each pressurized space and its adjacent unpressurized space, with all doors being closed.

e) Operation of standby fans/motors should be checked for correct changeover, etc.

〈A1〉 *Appendix deleted* 〈A1〉

Publication(s) referred to

BS 476-4, *Fire tests on building materials and structures — Part 4: Non-combustibility test for materials.*

BS 476-6, *Fire tests on building materials and structures — Part 6: Method of test for fire propagation for products.*

BS 476-7, *Fire tests on building materials and structures — Part 7: Method for classification of the surface spread of flame of products.*

BS 476-8, *Fire tests on building materials and structures — Part 8: Test methods and criteria for the fire resistance of elements of building construction.*

BS 476-11, *Fire tests on building materials and structures — Part 11: Method for assessing the heat emission from building materials.*

BS 476-20, *Fire tests on building materials and structures — Part 20: Method for determination of the fire resistance of elements of construction (general principles).*

BS 476-21, *Fire tests on building materials and structures — Part 21: Methods for determination of the fire resistance of loadbearing elements of construction.*

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

BS 476-23, *Fire tests on building materials and structures — Part 23: Methods for determination of the contribution of components to the fire resistance of a structure.*

BS 476-31.1, *Fire tests on building materials and structures — Part 31: Methods for measuring smoke penetration through doorsets and shutter assemblies — Section 31.1: Method of measurement under ambient temperature conditions.*

BS 750, *Specification for underground fire hydrants and surface box frames and covers.*

BS 799-5, *Oil burning equipment — Part 5: Specification for oil storage tanks.*

〈A1〉 *Text deleted* 〈A1〉

BS 4533, *Luminaires.*

BS 5234-2, *Partitions (including matching linings) — Part 2: Specification for performance requirements for strength and robustness including methods of test.*[6)]

BS 5266-1, *Emergency lighting — Part 1: Code of practice for the emergency lighting of premises other than cinemas and certain other specified premises used for entertainment.*

BS 5274, *Specification for fire hose reels (water) for fixed installations.*

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BS 5306-1, *Fire extinguishing installations and equipment on premises — Part 1: Hydrant systems, hose reels and foam inlets.*

BS 5306-2, *Fire extinguishing installations and equipment on premises — Part 2: Specification for sprinkler systems.*

BS 5306-3, *Fire extinguishing installations and equipment on premises — Part 3: Code of practice for selection, installation and maintenance of portable fire extinguishers.*

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BS 5306-5, *Fire extinguishing installations and equipment on premises — Part 5: Halon systems.*

BS 5306-6, *Fire extinguishing installations and equipment on premises — Part 6: Foam systems.*

BS 5306-7, *Fire extinguishing installations and equipment on premises — Part 7: Specification for powder systems.*

BS 5395-1, *Stairs, ladders and walkways — Part 1: Code of practice for the design of straight stairs.*

BS 5395-2, *Stairs, ladders and walkways — Part 2: Code of practice for the design of helical and spiral stairs.*

BS 5395-3, *Stairs, ladders and walkways — Part 3: Code of practice for the design of industrial type stairs, permanent ladders and walkways.*

[6)] In preparation.

BS 5410-1, *Code of practice for oil firing — Part 1: Installations up to 44 kW output capacity for space heating and hot water supply purposes.*

BS 5410-2, *Code of practice for oil firing — Part 2: Installations of 44 kW and above output capacity for space heating, hot water and steam supply purposes.*

BS 5423, *Specification for portable fire extinguishers.*

BS 5499-1, *Fire safety signs, notices and graphic symbols — Part 1: Specification for fire safety signs.*

[A1] *Text deleted* [A1]

[A1] BS 5588-4, *Fire precautions in the design, construction and use of buildings — Part 4: Code of practice for smoke control using pressure differentials.* [A1]

BS 5588-5, *Fire precautions in the design, construction and use of buildings — Part 5: Code of practice for firefighting stairs and lifts.*

[A1] *Text deleted*[7] [A1]

BS 5588-7, *Fire precautions in the design, construction and use of buildings — Part 7: Code of practice for* [A1] *the incorporation of atria in buildings*[8] [A1].

BS 5588-8, *Fire precautions in the design, construction and use of buildings — Part 8: Code of practice for means of escape for disabled people.*

BS 5588-9, *Fire precautions in the design, construction and use of buildings — Part 9: Code of practice for ventilation and air conditioning ductwork.*

[A1] BS 5588-12, *Fire precautions in the design, construction and use of buildings — Part 12: Managing fire safety.* [A1]

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BS 5725-1, *Emergency exit devices — Part 1: Specification for panic bolts and panic latches mechanically operated by a horizontal push-bar.*

BS 5810, *Code of practice for access for the disabled to buildings.*

BS 5839-1, *Fire detection and alarm systems for buildings — Part 1: Code of practice for system design, installation and servicing.*

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

BS 5906, *Code of practice for storage and on-site treatment of solid waste from buildings.*

BS 6180, *Code of practice for protective barriers in and about buildings.*

BS 6207, *Specification for mineral-insulated copper-sheathed cables with copper conductors.*

BS 6262, *Code of practice for glazing for buildings.*

[A1] *Text deleted* [A1]

BS 6266, *Code of practice for fire protection for electronic data processing installations.*

BS 6387, *Specification for performance requirements for cables required to maintain circuit integrity under fire conditions.*

BS 6644, *Specification for installation of gas-fired hot water boilers of rated inputs between 60 kW and 2 MW (2nd and 3rd family gases).*

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BS 7346-1, *Components for smoke and heat control systems — Part 1: Specification for natural smoke and heat exhaust ventilators.*

BS 7346-2, *Components for smoke and heat control systems — Part 2: Specification for powered smoke and heat exhaust ventilators.*

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[7] [A1] *Footnote deleted* [A1]
[8] [A1] *Footnote deleted* [A1]

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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 6512-1, *Use of elements of structural fire protection with particular reference to the recommendations given in BS 5588 "Fire precautions in the design and construction of buildings" — Part 1: Guide to fire doors.*

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