BRITISH STANDARD

BS 5588-5:2004

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

## Part 5: Access and facilities for fire-fighting

ICS 13.220.01; 91.040.01

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee FSH/14, Fire precautions in buildings, upon which the following bodies were represented:

Association of British Fire Trades
Association of British Theatre Technicians
Association of Building Engineers
Association of Corporate Approved Inspectors
Association of Specialist Fire Protection
British Cables Association
British Standards Society
Chief and Assistant Chief Fire Officers Association
Consumer Policy Committee of BSI
Department for Education and Skills
Department of the Environment for Northern Ireland
Department of Health — NHS Estates
District Surveyors Association
Door and Shutter Manufacturers' Association
Fire Brigades Union
Fire Safety Development Group
Guild of Architectural Ironmongers
Health and Safety Executive
Heating and Ventilating Contractors' Association
Institution of Fire Engineers
Institute of Structural Engineers
Line of Fire
London Fire and Emergency Planning Authority
Ministry of Defence — UK Defence Standardization
National House Building Council
Nuclear Industry
Office of the Deputy Prime Minister — Building Division
Royal Institute of British Architects
Royal Institution of Chartered Surveyors — Building Control Forum
Scottish Executive — Construction and Building
Steel Window Association
Co-opted members

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# Contents

# Foreword

This part of BS 5588 has been prepared by Technical Committee FSH/14. It supersedes BS 5588-5:1991, which is withdrawn.

This new edition represents a retitling and full revision of the standard, and introduces the following principal changes:

a) new recommendations for vehicle access, water supplies, fire control centre, drawings for fire service use and smoke control;

b) removal of all recommendations relating to fire-fighting lifts that are now covered in BS EN 81-72;

c) updating of recommendations to reflect new regulations and changes in practice since the previous edition.

It has been assumed in the preparation of this part of BS 5588 that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

As a code of practice, this part of BS 5588 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.**

**Summary of pages**

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 43 and a back cover.

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## 1 Scope

This part of BS 5588 gives recommendations and guidance on access and facilities for fire-fighting. It is not applicable to buildings under construction.

## 2 Normative references

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

BS 3251, Specification — Indicator plates for fire hydrants and emergency water supplies.

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 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 5395-1, Stairs, ladders and walkways — Part 1: Code of practice for the design, construction and maintenance of straight stairs and winders.

BS 5499-1, Graphical symbols and signs — Part 1: Safety signs, including fire safety signs — Specification for geometric shapes, colours and layout.

BS 5588-4:1998, Fire precautions in the design, construction and use of buildings — Part 4: Code of practice for smoke control using pressure differentials.

BS 5839-1, Fire detection and alarm systems for buildings — Part 1: Code of practice for system design, installation, commissioning and maintenance.

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

BS 5839-9, Fire detection and alarm systems for buildings — Part 9: Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems.

BS 6387:1994, Specification for performance requirements for cables required to maintain circuit integrity under fire conditions.

BS 7671, Requirements for electrical installations — IEE Wiring Regulations — Sixteenth edition.

BS 7846:2000, Electric cables — 600/1 000 V armoured fire-resistant cables having thermosetting insulation and low emission of smoke and corrosive gases when affected by fire.

BS EN 81-1:1998, Safety rules for the construction and installation of lifts — Part 1: Electric lifts.

BS EN 81-2:1998, Safety rules for the construction and installation of lifts — Part 2: Hydraulic lifts.

BS EN 81-72:2003, Safety rules for the construction and installation of lifts — Part 72: Particular applications for passenger and goods passenger lifts — Firefighters lifts.

BS EN 1155, Building hardware — Electrically powered hold-open devices for swing doors — Requirements and test methods.

BS EN 12845, Fixed firefighting systems — Automatic sprinkler systems — Design, installation and maintenance.

## 3 Terms and definitions

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

**3.1**
**basement**
storey with a floor which at some point is more than 1.2 m below the highest level of ground adjacent to the outside walls

**3.2**
**bridgehead**
part of a building, usually the floor below the fire (floor above in the case of basements), from which fire-fighting teams can be safely committed to attack a fire

**3.3**
**car control station**
control panel in a lift car for the use of passengers

**3.4**
**control equipment**
electrical switches, door interlocks and apparatus associated with the operation and programming of a lift service

**3.5**
**depth**
distance of the lowest point of the floor of the lowest storey of a building to the fire service access level measured at the centre of that face of the building where the distance is greatest

**3.6**
**dual-entry fire-fighting lift**
fire-fighting lift provided with two sets of doors, one used for normal operations and the other in the fire-fighting mode

**3.7**
**ductwork**
system of enclosures of any cross-sectional shape for the distribution or extraction of air

**3.8**
**emergency lighting**
lighting provided for use in the event of failure of the supply to the normal lighting

**3.9**
**escape route**
route forming part of the means of escape from any point in a building to a final exit

**3.10**
**final exit**
termination of an escape route from a building giving direct access to a street, passageway, walkway or open space, and sited to enable the rapid dispersal of persons from the vicinity of a building so that they are no longer in danger from fire and/or smoke

**3.11**
**fire door**
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

NOTE A fire door may have one or more leaves, and the term includes a cover or other form of protection to an opening in a fire-resisting wall or floor or in a structure surrounding a protected shaft.

**3.12**
**fire-fighting lift**
lift with fire protection measures, including controls that enable it to be used under the direct control of the fire service in fighting a fire

**3.13**
**fire-fighting lobby**
protected lobby provided within a fire-fighting shaft giving access from a fire-fighting stair to an accommodation area, and normally to any associated fire-fighting lift and fire main

NOTE Corridors serving residential accommodation can be regarded as fire-fighting lobbies.

**3.14**
**fire-fighting shaft**
protected enclosure containing a fire-fighting stair, fire-fighting lobbies, a fire main and, if provided, a fire-fighting lift together with any machinery space

**3.15**
**fire-fighting stair**
protected stairway communicating with an accommodation area only through a fire-fighting lobby

**3.16**
**fire load**
quantity of heat which could be released by the combustion of all the combustible materials in a volume, including the facings of all bounding surfaces

NOTE The fire load is expressed in joules.

**3.17**
**fire main**
water supply pipe, fitted with an outlet and control valve at specified points, installed in a building for fire-fighting purposes

**3.18**
**fire resistance**
ability of a component or construction of a building to meet for a stated period of time the requirements specified in a fire resistance standard, e.g. BS 476 or BS EN 1363-1

**3.19**
**fire service access level**
level at which there is suitable entry to the building and to a fire-fighting shaft from an area to which fire service appliances have access

**3.20**
**floor area**
area enclosed by the inner surfaces of a wall, including internal walls

**3.21**
**floor void**
cavity between a structural floor and a platform above, through which building services can pass

**3.22**
**grille**
security or protective mesh positioned over the opening to a duct or in a door to allow air discharge into a room or space

**3.23**
**height**
distance of the surface of the highest point of the floor of the highest storey (excluding any such storey consisting exclusively of plant rooms) to the fire service access level measured at the centre of that face of the building where the distance is greatest

**3.24**
**lift landing**
floor space from which a lift car is normally entered at each level

**3.25**
**lift landing door**
sliding portion of a lift well enclosure at each landing that gives access to a lift car when open

NOTE This is separate from the lift car door.

**3.26**
**lift machine**
unit, including the motor, which drives and stops a lift

**3.27**
**lift well**
space in which a lift and counterweight (if any) move

**3.28**
**means of escape**
structural means whereby a safe route in the event of fire is provided for persons to travel from any point in a building to a place of safety

**3.29**
**non-combustible**
not capable of undergoing combustion under specified conditions
[BS EN ISO 13943]

**3.30**
**pressure differential system**
system of fans, ducts and vents provided for the purpose of creating a pressure differential between a fire zone and a protected space

**3.31**
**pressurization system**
method of smoke control using differentials, where the air pressure in the spaces being protected is raised above that in the fire zone

**3.32**
**protected corridor/lobby**
circulation area consisting of a lobby or corridor enclosed with fire-resisting construction (other than any part that is any external wall of a building)

**3.33**
**protected shaft**
stairway, lift, escalator, chute, duct or other shaft of fire-resisting construction which enables persons, objects or air to pass from one compartment to another

**3.34**
**refuge**
area that is both separated from a fire by fire-resisting construction and provided with a safe route to a storey exit, thus constituting a temporarily safe space for disabled people to await assistance for their evacuation

**3.35**
**smoke shaft**
enclosed space in a building provided for venting smoke from a fire-fighting stair or one or more fire-fighting lobbies

**3.36**
**sprinkler**
temperature-sensitive sealing device which opens to discharge water for fire extinguishing

**3.37**
**sprinkler installation**
part of a sprinkler system comprising a set of main control valves, the associated pipe work and sprinklers

**3.38**
**sprinkler system**
system for providing sprinkler protection in a building, comprising one or more sprinkler installations and the water supply

NOTE This does not include town mains and bodies of water such as lakes or canals.

**3.39**
**vent**
device that is permanently open or can be opened to permit the passage of air or smoke between a part of a building and the external air

NOTE Examples include windows, roof lights, doors, louvres and grilles.

## 4 General

Fire-fighters need to be able to reach a fire quickly, with their equipment. Physical safety and lives, both those of the fire-fighters and those of the occupants of the building, and the preservation of the building and its contents, can be jeopardized by delays in reaching the area of the fire.

In most new buildings, fire service operations do not necessarily contribute to the evacuation of occupants, except where progressive horizontal evacuation techniques are used, e.g. in some residential buildings. Rescue by the fire service can provide an additional factor of safety, but this is not generally taken into account in any calculation of probable risk to the building or occupants for the design of a building.

Fire-fighting facilities should be selected and designed to assist the fire service in protecting life, protecting fire-fighters, reducing building losses, salvaging property and goods and minimizing environmental damage. Early consultation with the approving authority is recommended when deciding upon which facilities should be provided.

NOTE 1 The exact choice of facilities depends on the use, size or layout of the building, the nature of its contents, and the site upon which it is situated.

Fire-fighting facilities should include, where appropriate:

a) provision for summoning the assistance of the fire service as early as possible;

b) means of enabling the fire service to locate and reach the building on fire as quickly as possible, including information facilities and the provision of vehicular access for fire appliances to the perimeter of the building or site;

c) provision of and access to sufficient supplies of a fire-fighting medium;

NOTE 2 The usual fire-fighting medium is water, but other media may be used, e.g. bulk foam supplies.

d) provision of easy and speedy entry to the interior of the building or site for fire-fighters and their equipment;

e) means of enabling fire-fighters, once they have entered a building, to reach any point within that building in the shortest possible time, including the provision of fire-fighting lifts if appropriate;

f) means of ensuring that once fire-fighters have arrived at a position within a building, they can remain there in relative safety whilst they carry out their rescue and fire-fighting roles;

g) provision for removing the products of combustion from the building both during and after fire;

h) provision for securing and storing of salvaged goods or artefacts on site;

i) provision of automatic fire suppression systems to restrict the growth of a fire;

j) provision of fire-resisting structural elements to prevent the premature collapse of the building or site;

k) provision of fire-resisting compartments and structures to limit the uncontrolled spread of fire;

l) provision of automatic fire-resisting barriers to reduce the fire compartment sizes;

m) provision of facilities to release, or extract, smoke and heat from the building or site;

n) provision of fire-fighting and fire-fighter access facilities within the building or site;

o) provision for fire service communications;

p) provision for removing spent fire-fighting extinguishing medium.

Building designers should ensure as far as possible that the life safety risk to fire-fighters is minimized, whilst still allowing them to:

1) successfully carry out the rescue of persons or animals;

2) locate and extinguish a fire with minimal damage; and

3) minimize any short-term or long-term catastrophic damage to the environment.

Sprinkler systems provide an effective means of controlling the outbreak of fire, although they cannot always suppress it. Where sprinkler systems are used, they should conform to BS 5306-2 or BS EN 12845. Other provisions such as compartment size, the use of automatic fire barriers and smoke control systems can all add to a building's fire strategy and management and can reduce the need for fire service involvement. Even if a sprinkler system or other type of containment system is installed, however, the fire service still need to be able to access any part of a building affected by fire.

## 5 Vehicle access

### 5.1 General

Every building should be provided with suitable access for fire-fighting purposes; roadways should be constructed to allow access for fire appliances, and entry points to buildings should be readily identifiable to the fire service.

Vehicle access should be provided to small buildings (i.e. buildings up to 2 000 $m^2$ with a top storey less than 11 m above ground level) to within 45 m of every point on the projected plan area or "footprint" of the building (see Figure 1) or to 15 % of the perimeter, whichever is the less onerous. Vehicle access to all other buildings that do not have fire mains should be provided in accordance with Table 1. Every building to which vehicle access is so provided should have a suitable door, not less than 750 mm wide, giving access to the interior of the building.

NOTE For buildings with fire mains, see **5.3**.

Individual dwelling entrances should be not more than 45 m from the point of vehicle access.

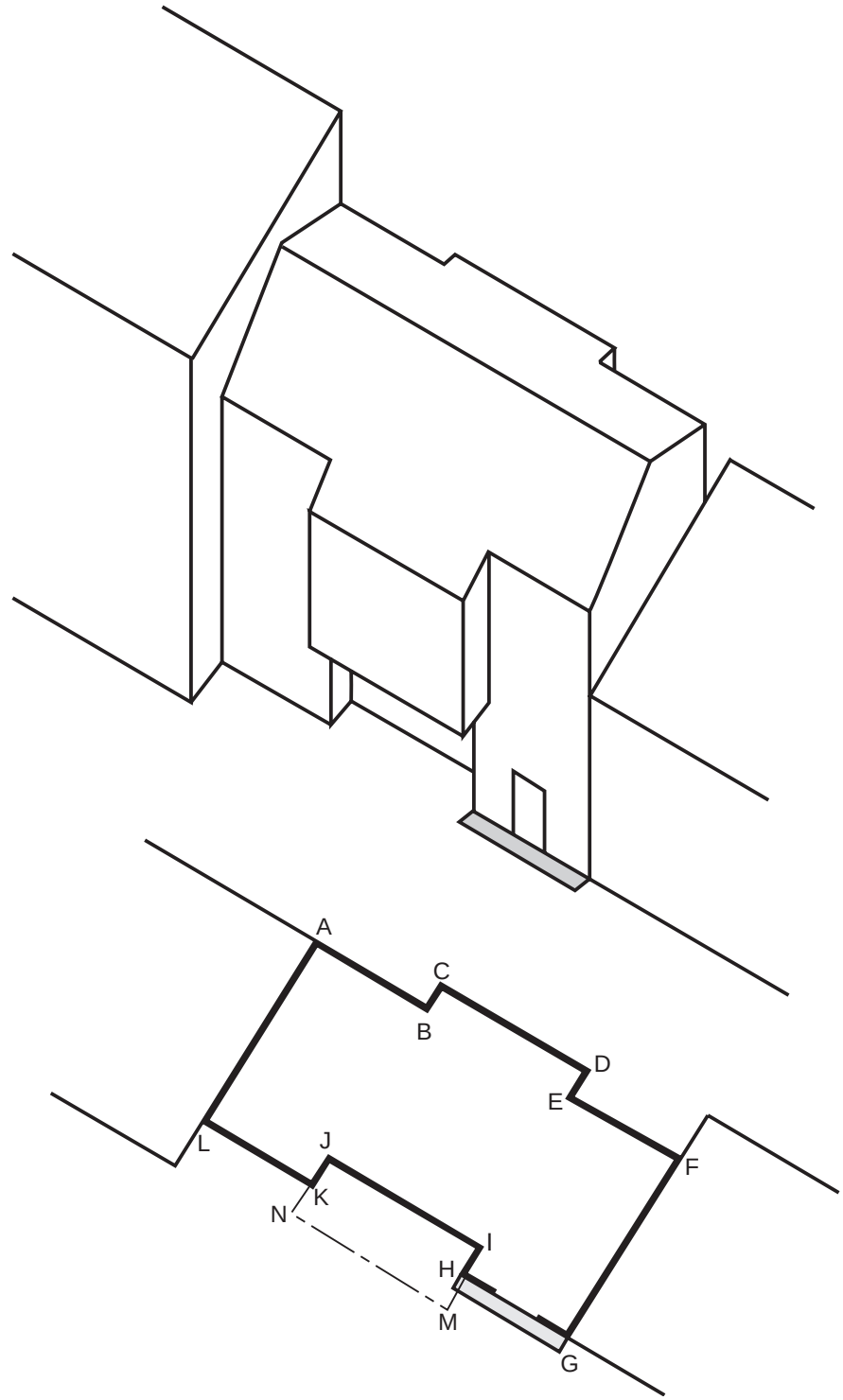
**Table 1 — Fire service vehicle access to buildings (excluding blocks of flats) not fitted with fire mains**

| Total floor area of building[a] $m^2$ | Height to floor of top storey of building m | Type of appliance[b] | Position of access % of perimeter[c] |
|---|---|---|---|
| ⩽2 000 | ⩽11 | Pump | [d] |
| | >11 | Pump and high-reach | 15[e] |
| 2 000 to 8 000 | ⩽11 | Pump | 15 |
| | >11 | Pump and high-reach | 50[e] |
| 8 000 to 16 000 | ⩽11 | Pump | 50[e] |
| | >11 | Pump and high-reach | 50[e] |
| 16 000 to 24 000 | ⩽11 | Pump | 75[e] |
| | >11 | Pump and high-reach | 75[e] |
| >24 000 | ⩽11 | Pump | 100[e] |
| | >11 | Pump and high-reach | 100[e] |

NOTE 1 Consultation with the relevant approving authority is advised on all matters concerning fire access. For Scotland, access is dictated by hydrant position.

NOTE 2 In the case of storage buildings, height should be measured to mean roof level.

[a] The total floor area is the aggregate of the floor areas of all the storeys in the building.
[b] "Pump" = pumping appliance; "high-reach" = aerial appliance, e.g. turntable ladder or hydraulic platform.
[c] "Perimeter" refers to the face of the total length of all exposed perimeter walls.
[d] See **5.1**.
[e] Any perimeter wall (elevation) to which vehicle access is provided should have a door, not less than 750 mm wide, giving access to the interior of the building.




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

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

The perimeter of the building for the purposes of Table 1 is the sum of lengths of the two external walls, taking account of the footprint, i.e. (A to B to C to D to E to F) + (G to H to M to N to K to L).

If the dimensions of the building were such that Table 1 requires vehicle access, the shaded area illustrates one possible example of 15 % of the perimeter.

NOTE There should be a door into the building in this length (see **5.1**).

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

**Figure 1 — Example of building footprint and perimeter**

### 5.2 Access for high-reach appliances

Vehicle access to the exterior of a building is needed to enable high-reach appliances, e.g. turntable ladders and hydraulic platforms, and pumping appliances to supply water and equipment for fire-fighting and rescue activities.

The relevant approving authorities should be consulted to ascertain their recommendations relating to access roads and hard-standings, in terms of load-bearing capability, turning circles, widths, lengths, headroom, proximity to dry riser inlets, etc.

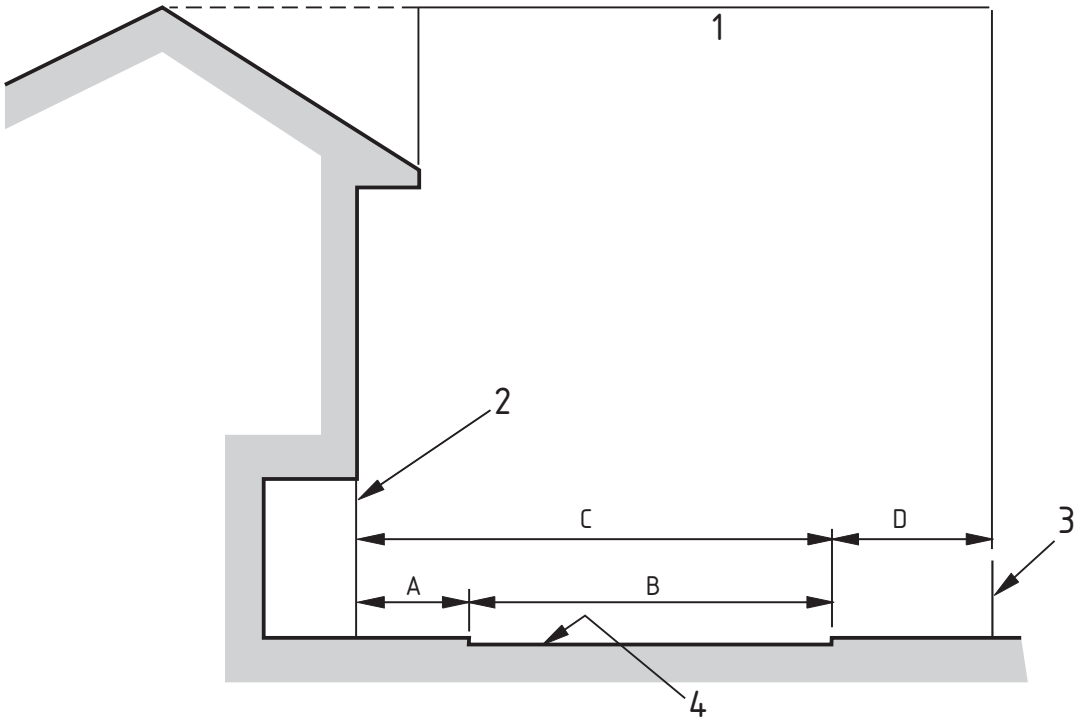
NOTE The size and mass of fire appliances is not standardized. The dimensions of access routes and hard-standings will vary according to the fire appliances that are used in a particular fire authority area (see Figure 2). The size and height of a building also has an effect on access facilities. An example of typical access route dimensions for high-reach appliances is shown in Table 2.

Turning facilities should be provided in any dead-end access route that is more than 20 m long. This can be by a hammer-head or turning circle (see Table 2).

Overhead obstructions, e.g. cables and branches, that would interfere with the operation of high-reach appliances, should be avoided in the zone shown in Figure 2 and Table 3.

**Table 2 — Example of measurements for a typical vehicle access route**

| Appliance type | Min. width of road between kerbs<br>m | Min. width of gateways<br>m | Min. turning circle between kerbs<br>m | Min. turning circle between walls<br>m | Min. clearance height<br>m | Min. carrying capacity<br>tonnes |
|---|---|---|---|---|---|---|
| Pump | 3.7 | 3.1 | 16.8 | 19.2 | 3.7 | 12.5 |
| High-reach | 3.7 | 3.1 | 26.0 | 29.0 | 4.0 | 17.0 |
| NOTE Because the weight of high-reach appliances is distributed over a number of axles, it is considered that their infrequent use of a carriageway or route designed to 12.5 tonnes is not likely to cause damage. It would therefore be reasonable to design the road base to 12.5 tonnes, although structures such as bridges should have the full 17 tonnes capacity. | | | | | | |




**Key**

1 Overhead obstructions should be avoided in this zone
2 Face of building at ground level or vertical plane of projecting upper storey
3 Obstruction
4 Hard-standing or access road
A Maximum distance of near edge of hard-standing from building
B Minimum width of hard-standing
C Minimum distance of further edge of hard-standing from building
D Minimum width of unobstructed space (for swing of appliance platform)

**Figure 2 — Relationship between building and hard-standing/access road for high-reach fire appliances**

**Table 3 — Dimensions of high-reach fire appliances**

Dimensions in metres

| Dimension (see Figure 2) | Type of appliance | |
|---|---|---|
| | Turntable ladder | Hydraulic platform |
| A | 4.9 | 2.0 |
| B | 5.0 | 5.5 |
| C | 10.0 | 7.5 |
| D | — | 2.2 |
| NOTE Hard-standing for high-reach appliances should be as level as possible and should not exceed a gradient of 1 in 12. | | |

### 5.3 Buildings (other than shopping complexes) fitted with fire mains

NOTE 1 For shopping complexes, see **5.4**.

Fire mains enable fire-fighters within a building to connect their hoses to a water supply. In buildings fitted with fire mains, pumping appliances need access to the perimeter at points near the mains, where fire-fighters can enter the building to make a hose connection from the appliance to pump water into the main. Fire mains should be provided in all buildings with fire-fighting shafts.

Wet rising mains should be provided in buildings with a floor at more than 60 m above fire service vehicle access level. In lower buildings where fire mains are provided, either wet or dry mains are suitable. In the case of a building fitted with dry fire mains there should generally be access for a pumping appliance to within 18 m of each fire main inlet connection point and the inlet should be visible from the appliance (see Note 2).

NOTE 2 The sight criteria may be varied with the approval of the approving authority.

In the case of a multi-storey building fitted with a wet fire main system, the pumping appliance access should generally be:

a) within l8 m of, and within sight of, a suitable entrance giving access to the main; and

b) in sight of the inlet for the emergency replenishment of the suction tank for the main (see Note 2).

In the case of a single-storey building fitted with a wet fire main system, fire appliance access should be provided to within 45 m of each of a sufficient number of outlet valves such that no point in the building is more than 60 m from an outlet valve, measured along a route suitable for laying hose.

Access roadways should generally be positioned to allow pumping appliances to be positioned within 18 m of, and in sight of, any other inlet points (see Note 3).

NOTE 3 Discussion on pumping appliance access might be needed with the water authority on replenishment from the mains.

### 5.4 Shopping complexes

#### 5.4.1 *Single-storey shopping complexes*

NOTE 1 The dimensional recommendations given in this subclause are generally applicable for single-storey complexes up to about 30 000 $m^2$ and/or having one dimension not greater than 190 m. Where the overall floor area of a complex is particularly extensive, it might be necessary to increase the recommended dimensions.

Single-storey shopping complexes pose fewer difficulties for fire-fighters than multi-storey complexes (see **5.4.2**). For example, there is no need to transport personnel and equipment between storeys. However, a single-storey complex can cover an extensive area and therefore access roadways are still necessary to enable fire appliances to drive near to selected entry points to the complex.

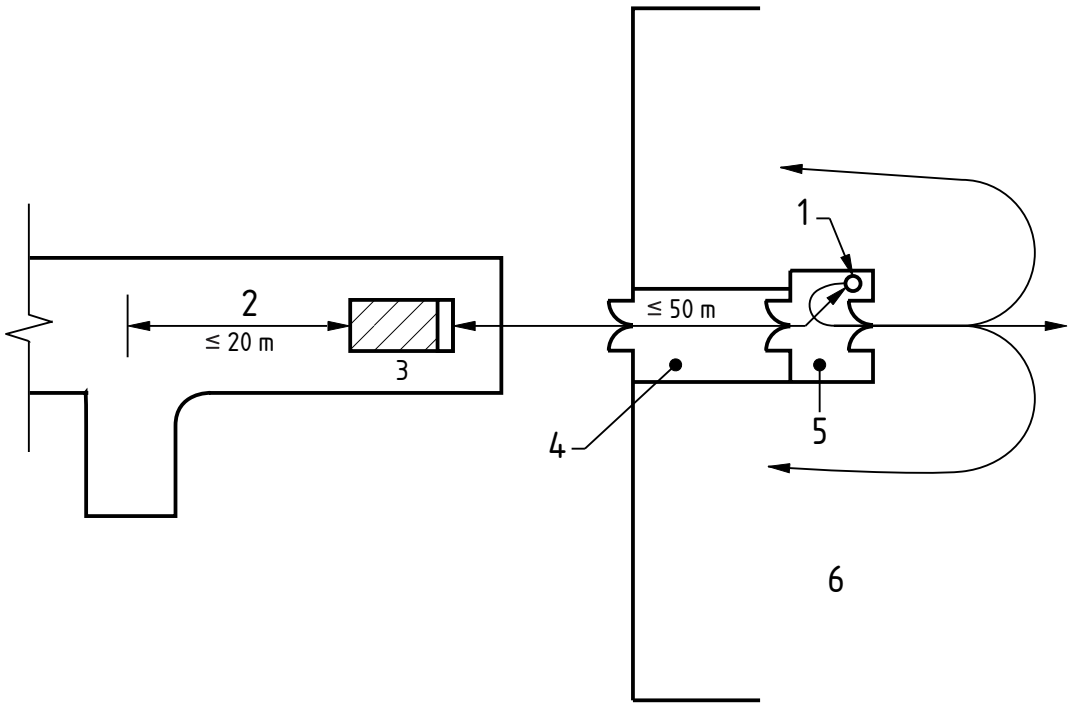
The distance between the fire appliance and the fire should be kept to a minimum, to reduce the time taken for laying out hose. The provision of a wet fire main system can enable an increased distance between the fire appliance parking position and the wet main outlet valves. The route within the complex taken by fire-fighters to reach the outlet valve should be protected by fire-resisting construction.

If a wet fire main system is installed, it should conform to BS 5306-1 and 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 building is more than 60 m from an outlet valve, measured along a route suitable for laying hose (see Figure 3).

If a wet fire main system is not installed, fire appliance access should be provided 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 4).

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 building when occupied meets the 60 m criterion.

Turnaround facilities should be provided so that fire appliances do not have to reverse more than 20 m.

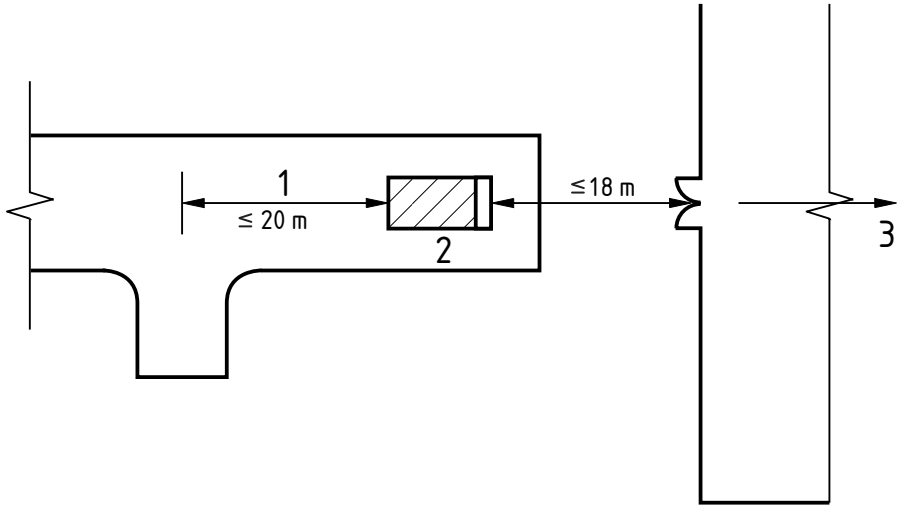



**Key**

1 Wet fire main
2 Reversing distance
3 Appliance
4 Protected corridor
5 Protected lobby
6 Floor area[a]

[a] No point on the floor area should be more than 60 m from the outlet valve (measured along the hose line) or, for design purposes, more than 40 m in a direct line.

**Figure 3 — Access to floor areas in single-storey complexes with wet fire mains**




**Key**

1 Reversing distance

2 Appliance

3 Floor area[a]

[a] No point on the floor area should be more than 60 m from the outlet valve (measured along the hose line) or, for design purposes, more than 40 m in a direct line.

**Figure 4 — Access to floor areas in single-storey complexes with no fire main**

### 5.4.2 *Multi-storey shopping complexes*

Roadways used for fire service access may be public highways or, if within the boundaries of a large complex, service roadways used by vehicles delivering goods. These access roads can be covered and at any level. If they are covered or are at low level then special provisions might be needed to make this possible. If they are above ground level, access into a building from the roadway can be possible in both upward and downward directions.

The fire resistance of any floors over an access roadway should be such as to minimize any possibility of collapse onto fire appliances at work during a fire.

It should be ascertained whether access can be made available to upper levels or podium decks by way of ramps where there might be access across the open or top deck to other structures within the complex. Any such ramps should be of suitable gradient, load-bearing capacity and width for fire appliance use.

Access roadways for multi-storey shopping complexes should:

a) be positioned such as to allow pumping appliances to proceed to within either:

1) 18 m of, and in sight of, each dry fire main inlet connection point; or

2) 45 m if a wet fire main system is installed;

b) 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;

c) be provided with turnaround facilities so that fire appliances do not have to reverse more than 20 m (see Figure 5).

NOTE Attention is also drawn to the approving authority's construction requirements for access roadways.

Hard-standings should preferably be level or should not exceed a gradient of 1 in 12.

If access roads are enclosed at any level, then provision should be made for the venting of exhaust fumes, heat and smoke, emergency lighting, communications facilities and additional water supplies. Specifically, enclosed or covered access roads should:

1) have a fire resistance of not less than 120 min;

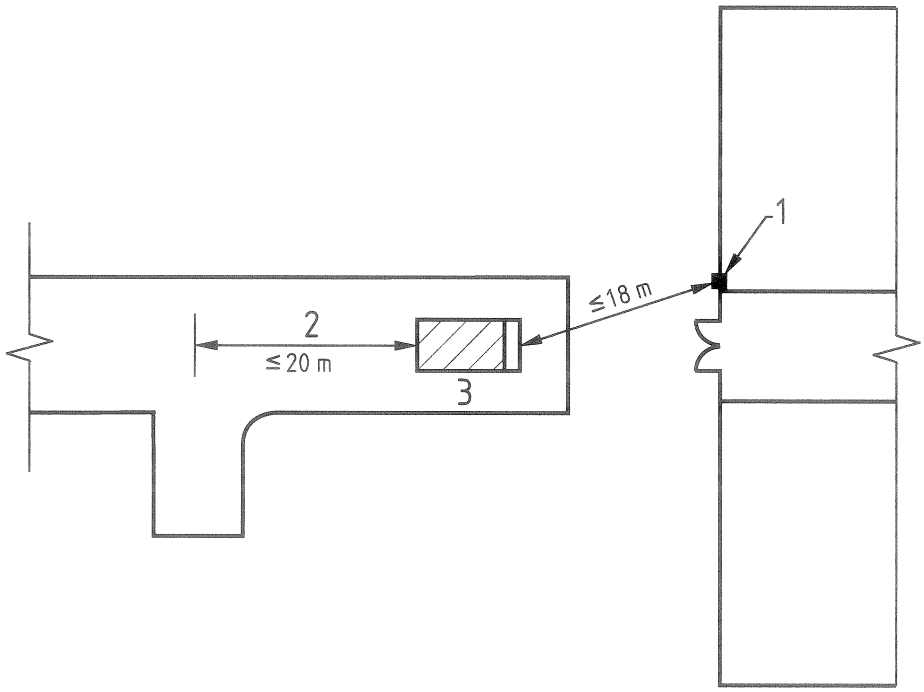
2) be provided with:

   i) ventilation to remove exhaust fumes from a pumping appliance in operation;

   ii) fire telephones;

   iii) primary lighting;

   iv) 3 h emergency lighting in accordance with BS 5266-1.




**Key**

1 Dry main outlet

2 Reversing distance

3 Appliance

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

## 6 Water supplies for fire service use

### 6.1 Location and access to external water supply

All premises should be provided with a supply of water for fire-fighting. Fire-fighters have to lay out hose between the water supply and the fire appliance and then to the fire, so these distances should be kept to a minimum. Hydrants should be located in positions that are near to both building entry points (which may also be entry points to fire-fighting shafts containing fire mains) and fire appliance parking positions. These practices apply whether fire appliance access is at ground level or below ground level.

Mains and hydrants should be capable of delivering a sufficient flow of water to enable effective fire-fighting to be undertaken. In areas without an adequate water main, a bulk or static supply should be arranged.

The water supply, capacity and position of fire appliance access points should be agreed with the approving authority. If this takes the form of a static tank or dam, the capacity should be related to the size of the building and the risk involved.

NOTE 1 An unlimited and guaranteed natural water source is expected to be acceptable to the approving authority, subject to access and hard-standing for fire appliances being provided. Early consultation with the water authority and approving authority is recommended.

The water supply should comprise one or a combination of the following:

a) hydrants provided by the water supply company on the street mains;

b) private hydrants provided by the occupier, designed and installed in accordance with BS 5306-1, ideally forming part of a ring main system;

c) hydrant outlets positioned:

1) not more than 60 m from an entry to any building on the site;

2) not more than 120 m apart;

3) preferably immediately adjacent to roadways or hard-standing facilities provided for fire service appliances; and

4) not less than 6 m from the building or risk so that they remain usable during a fire (generally a water supply capable of providing a minimum of 1 500 l/min at all times should be provided);

d) a static or natural water supply providing a minimum capacity of 45 000 l.

All hydrants should have signage in accordance with BS 3251.

NOTE 2 Attention is drawn to any relevant water legislation for the area.

NOTE 3 If a building exceeds 120 m in height, additional water capacity might be necessary.

### 6.2 Internal water supply

Wet and dry rising and falling mains should be installed in accordance with BS 5306-1.

Landing valves should be installed in each fire-fighting lobby and at each fire service access level. They should be sited and their outlets directed such that:

a) access to them is unobstructed;

b) personnel can safely lay out and charge hose lines before entering the fire compartment;

c) there is minimal risk of any discharge of water from the outlet coming into contact with lift controls and lift communications equipment or of flowing into the lift well (see **7.2.8**), e.g. by siting them away from lift landing doors;

d) there is minimal risk of exposure to fire from the accommodation if a door is open;

e) hoses can be connected, charged and advanced into the accommodation without excessive kinking of the hose line or obstruction to fire doors and exit routes.

Dry falling mains serving basements 10 m or more below ground should either:

1) serve only the storeys below the charging point; or

2) be fitted with a pressure limiting device to prevent excessive pressure developing at landing valves below the charging point.

## 7 Fire-fighting facilities

### 7.1 Fire-fighting shafts

#### 7.1.1 *Provision of fire-fighting shafts*

Fire-fighting shafts should be provided in tall buildings, buildings with deep basements, and buildings with large floor areas. Buildings or complexes that are not particularly high and do not have deep basements, but have a large floor area, can also benefit from the provision of fire-fighting shafts.

In large complexes with a variety of uses, fire-fighting shafts may serve separate parts of the complex. For example, in a complex consisting of high-rise offices over a shopping centre, the offices may be provided with a dedicated fire-fighting shaft that does not serve the shopping centre. It is important that any such arrangement is logical and simple, so that fire service personnel have no difficulty in finding the fire-fighting shafts serving the areas they need to reach.

Since the ladders on most modern fire service vehicles only reach a maximum height of 11 m, a fire within buildings with a storey height of over 11 m is generally fought by way of a protected escape stair. The time taken to move hoses up to levels over 11 m and to charge them can be considerable. A higher building can therefore benefit from a fire main adjacent to any escape stair. Fire service personnel might need to check several storeys when they arrive to assess the situation, and the fire-fighting lift should serve all the storeys they might need to reach.

NOTE BS EN 81-72 refers to lifts serving all floors. However, fire and rescue services in the UK advise that fire-fighting lifts serve the storeys that fire service personnel need to reach (see Table 4).

At least one fire-fighting shaft should be provided in each of the types of building shown in Table 4 (for numbers of fire-fighting shafts, see **7.1.2**). Each fire-fighting shaft should contain all of the appropriate facilities for the type of building, as shown in Table 4.

**Table 4 — Provision of fire-fighting shafts**

| Type of building | Recommended content of fire-fighting shaft |
|---|---|
| Buildings or parts of buildings[a] where the height of the surface of the floor of the topmost storey (excluding any storey consisting entirely of plant rooms) exceeds 18 m | Fire-fighting stair<br>Fire-fighting lobbies provided with a fire main<br>Fire-fighting lift installation |
| Buildings where the depth of the surface of the floor of the lowermost storey exceeds 10 m | Fire-fighting stair<br>Fire-fighting lobbies provided with a fire main<br>Fire-fighting lift installation |
| Buildings with a height of 11 m or more, but less than 18 m | Escape stair<br>Unvented fire-fighting lobby provided with a fire main |
| Buildings intended to be used as shops, factories or for storage of goods or materials where the height of the topmost storey exceeds 7.5 m, with the floor area of any storey above the ground storey not less than 900 $m^2$ | Fire-fighting stair<br>Fire-fighting lobbies provided with a fire main |
| Buildings where there are two or more basement levels, each with a floor area exceeding 900 $m^2$ | Fire-fighting stair<br>Fire-fighting lobbies provided with a fire main |

[a] The reference to parts of buildings covers situations such as tower blocks rising above a podium.

### 7.1.2 *Number of fire-fighting shafts*

Where storeys are large more than one fire-fighting shaft can be necessary to provide access within a reasonable distance of a fire-fighting shaft. If an automatic sprinkler system is not fitted, sufficient fire-fighting shafts should be provided such that:

a) on every storey, the floor area on that storey served by any fire-fighting shaft does not exceed 900 $m^2$;

b) the distance along which hose can be laid from the doorway between the fire-fighting shaft and the accommodation to any point on that storey does not exceed 60 m.

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 meets the 60 m criterion.

If the building is fitted throughout with an automatic sprinkler system, and the largest storey is over 18 m above ground level, the number of fire-fighting shafts should be not less than the minimum recommended in Table 5.

**Table 5 — Minimum number of fire-fighting shafts in buildings fitted with sprinklers**

| Floor area of largest storey<br>$m^2$ | Minimum number of fire-fighting shafts |
|---|---|
| <900 | 1 |
| 900 to 2 000 | 2 |
| >2 000 | 2 plus additional shafts to meet the relevant hose distances |

NOTE 2 Where a building size is such that more than three fire-fighting shafts might be needed, the provision and positioning of fire-fighting shafts may be addressed by utilizing the relevant hose distance subject to agreement from the relevant approving authority.

### 7.1.3 *Siting of fire-fighting shafts*

Fire-fighting shafts should be located such that they allow access to every part of every storey that they serve and should wherever possible be sited against an exterior wall.

If it is not possible to locate the fire-fighting shaft against an exterior wall, the route from the fire service entrance to the fire-fighting shaft should be as short as possible and should be protected by fire-resisting construction to ensure that fire does not affect the route or cut off the means of escape for fire service or other personnel within the building.

NOTE Longer corridors are sometimes acceptable to a fire authority if enhanced fire protection or facilities are provided, e.g. the protected corridor serves only the fire-fighting shaft; the provision of a second protected corridor; the provision of a wet fire main.

The layout of the fire-fighting shaft at fire service access level should be such that fire-fighters entering the fire-fighting lift and persons escaping down the fire-fighting stair do not obstruct each other.

Entry to a fire-fighting shaft at fire service access level should be available either:

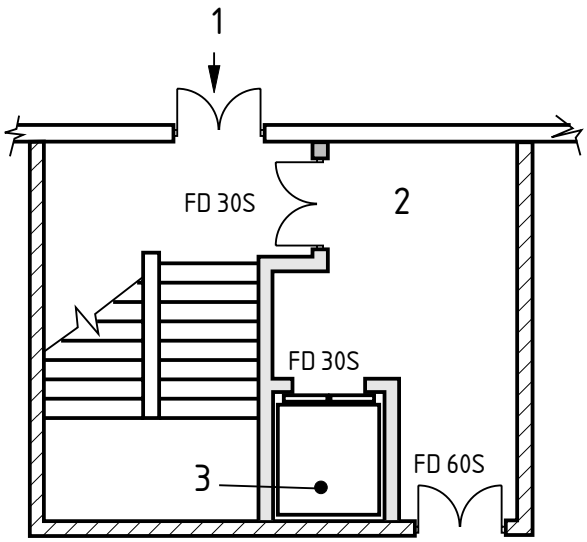
a) directly from the open air (see Figure 6); or

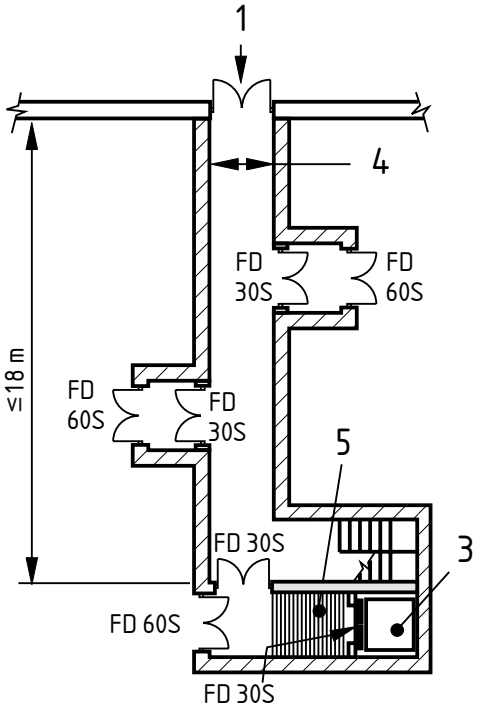
b) by way of a protected corridor not exceeding 18 m in length. The corridor is deemed to be part of the fire-fighting shaft, and any access to it from the accommodation should be by way of protected lobbies.

It should not be necessary for persons escaping down the stair to pass through the fire-fighting lobby at fire service access level. Where a protected corridor for fire-fighting access also forms part of the means of escape from the accommodation, it should be 500 mm wider than that required for means of escape purposes (to allow room for fire service personnel to move towards the fire-fighting shaft), and the fire-fighting lobby should have a minimum area of 5 $m^2$ clear of any escape routes so that it can act as a fire service mustering point [see Figure 6a)].

The fire-fighting lobby at fire service access level should be large enough to act as a command post where fire-fighters and fire-fighting equipment can be safely assembled. A building might have a building control centre that could be used by the fire service, or the fire service might use a mobile command centre, etc., and such operational details should be discussed by the developer with the fire service.

Where a dry fire main is provided, there should be appliance access to within 18 m of the inlet connection to the main, within sight of the connection and with direct access thereto (see also **5.3**).

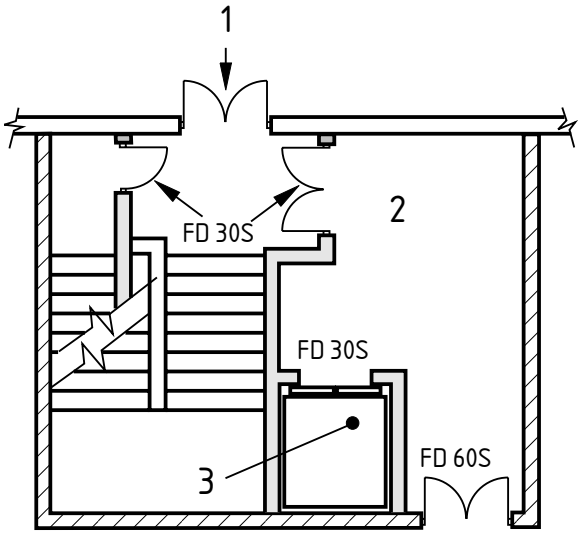


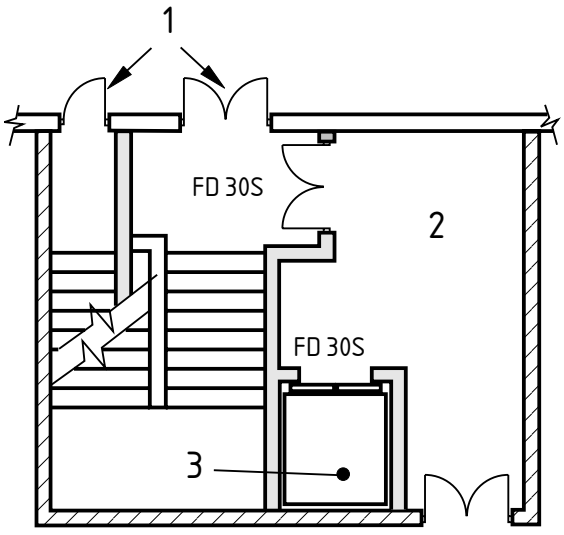




i) Access directly from open air

ii) Access via a corridor

a) Fire service access at lowest storey




i) Access to basement via stair to upper storeys

ii) Access direct to basement

b) Fire service access directly from open air ground level in a building with basements

**Key**

| | |
|---|---|
| 1 | Fire service access at fire service access level |
| 2 | Fire-fighting lobby |
| 3 | Fire-fighting lift |
| 4 | Width of corridor 500 mm wider than needed for means of escape |
| 5 | Fire service mustering point (minimum 5 $m^2$) |
| FD #S | Fire door with # min fire resistance with smoke seal |
| | Minimum fire resistance of 1 h from both sides |
| | Minimum fire resistance of 2 h from outside the fire-fighting shaft and 1 h from inside the fire-fighting shaft |

**Figure 6 — Typical fire-fighting shaft layout at fire service access level**

### 7.1.4 *Layout of fire-fighting shafts*

NOTE 1 For the operation of passenger lifts within fire-fighting shafts, see the Note to **7.2.4**.

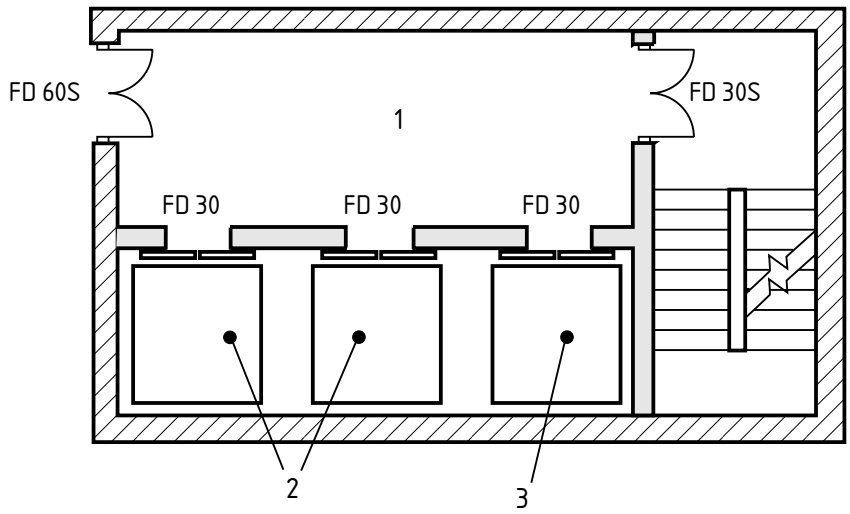
It is essential that fire-fighting personnel, having left the fire-fighting lift to enter the fire-fighting lobby, can enter the fire-fighting stair enclosure without having to traverse an area of risk within any storey of the building. Therefore it is necessary that the fire-fighting lift, lobbies and stair are within a protected enclosure and that the fire-fighting stair is as close as possible to the fire-fighting lift so as to provide a means of escape. Access should be provided at all levels served by the fire-fighting shaft.

Access to the accommodation from a fire-fighting lift or stair should be through a fire-fighting lobby, as a single fire door cannot provide adequate protection to the fire-fighting stair and lift from a fire in the accommodation. The lobby also serves as a bridgehead from which fire-fighting operations can be mounted. The doors between the fire-fighting stair and fire-fighting lobby should be kept free from any fastenings.

NOTE 2 The fire-fighting lift landing doors are fire doors.

NOTE 3 If a fire-fighting lift does not serve the topmost storey of a building, the fire-fighting lobby on the topmost storey serves the fire-fighting stair only. If the topmost storey consists only of the fire-fighting lift machinery space, no lobby is necessary.

If other lifts are placed in the same well as a fire-fighting lift, they should not introduce significant additional fire risks into the fire-fighting shaft (see BS EN 81-72). Entry from within the building to any other lift in the same well should be through the same protected lobby from which the fire-fighting lift is entered (see Figure 7).




**Key**

| | |
|---|---|
| 1 | Fire-fighting lobby |
| 2 | Passenger lifts |
| 3 | Fire-fighting lift |
| FD #[S] | Fire door with # min fire resistance [with smoke seal] |
| | Minimum fire resistance of 1 h from both sides |
| | Minimum fire resistance of 2 h from outside the fire-fighting shaft and 1 h from inside the fire-fighting shaft |

The passenger lifts should conform to **7.1.4**.

**Figure 7 — Passenger lifts within a fire-fighting shaft**

Whenever possible a fire-fighting shaft should not be exposed to the dangers of radiant heat from an adjacent face of the building. Where this is not possible, the construction of the fire-fighting shaft should be designed to take into account the heat radiation it could be exposed to during a fire.

The stair from a fire-fighting shaft may be extended into a part of the building not requiring a fire-fighting shaft provided that either:

a) the fire-fighting shaft is extended accordingly, including the provision of fire-fighting lobbies and any fire main; or

b) the extension to the stair is separated from the fire-fighting shaft by fire-resisting construction.

Goods lifts and service lifts should not be located within fire-fighting shafts. Only services associated with the fire-fighting shaft should pass through or be contained within the fire-fighting shaft. A fire-fighting shaft should not contain any cupboards or provide access to service shafts serving the remainder of the building.

Passenger lifts should not be located within a fire-fighting shaft unless the lift cars are constructed in accordance with BS EN 81-72, are clearly and conspicuously marked "Do not use for goods or refuse", and have access only from a fire-fighting lobby.

If a fire-fighting shaft contains sanitary accommodation, such accommodation should not:

— be used as a cloakroom;

— contain any portable heating appliances;

— contain any gas appliance other than a water heater or an incinerator.

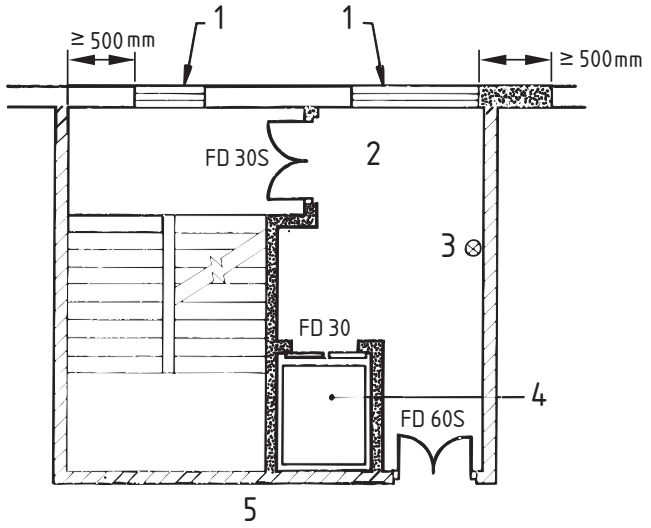
#### 7.1.5 *Fire resistance of fire-fighting shafts*

Where a fire-fighting shaft is sited against an exterior wall, if any glazed area or opening in the exterior wall of the fire-fighting shaft is less than 500 mm from the junction of the fire-fighting shaft with the exterior wall, then the fire resistance of the external wall immediately adjacent to the glazed area or opening should be not less than 1 h from both sides for a horizontal distance of 500 mm [see Figure 8a)].

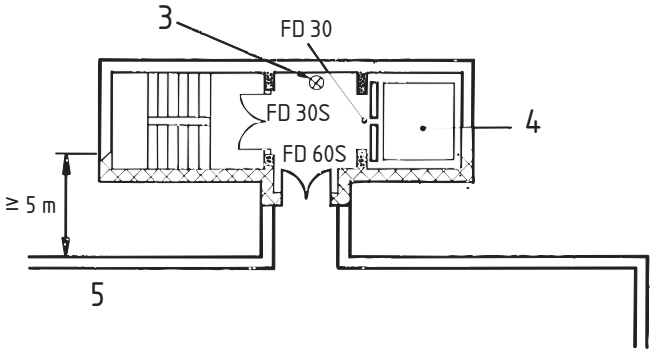
If one or more walls enclosing a fire-fighting shaft are exterior walls, one of the following recommendations apply unless the distance between the fire-fighting shaft and the accommodation is not less than 5 m [see Figure 8b), Figure 8c) and Figure 8d)]:

a) either the side nearest the accommodation of any exterior wall facing or adjacent to the fire-fighting shaft should have a fire resistance of 2 h; or

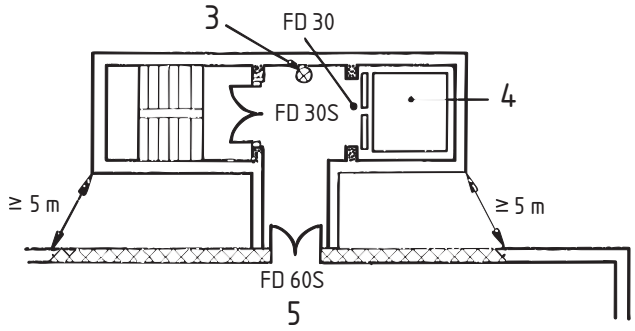
b) the side internal to the fire-fighting shaft of any exterior wall facing or adjacent to the accommodation should have a fire resistance of 2 h.



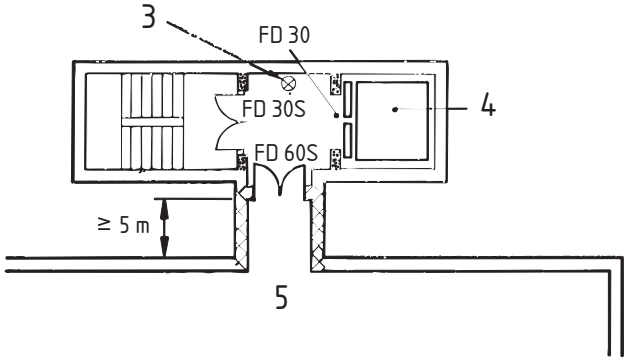

a) Example 1




b) Example 2




c) Example 3




d) Example 4

**Key**

| | |
|---|---|
| 1 | Openable areas |
| 2 | Fire-fighting lobby |
| 3 | Fire main |
| 4 | Fire-fighting lift |
| 5 | Accommodation |
| FD #[S] | Fire door with # min fire resistance [with smoke seal] |

Minimum fire resistance of 1 h from both sides

Minimum fire resistance of 2 h from outside the fire-fighting shaft and 1 h from inside the fire-fighting shaft

Minimum fire resistance of 2 h from accommodation

**Figure 8 — Examples of protection of the fire-fighting shaft from external fire**

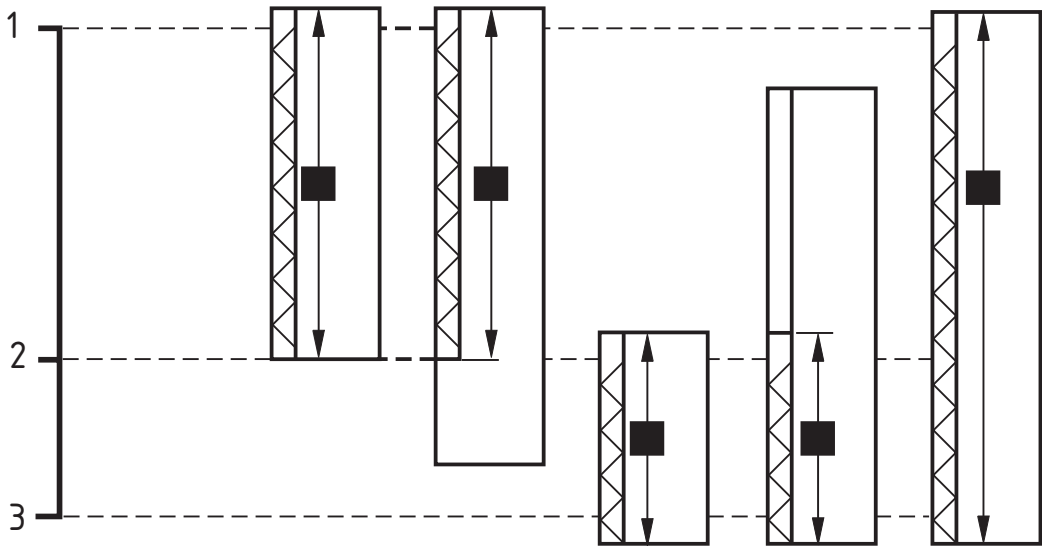
### 7.2 Fire-fighting stairs, lobbies and lifts

#### 7.2.1 *General*

The minimum extent of fire-fighting lifts and stairs in tall buildings and buildings with deep basements is shown in Figure 9.

The installation of a fire-fighting lift within a stair enclosure is not generally recommended, as it has the potential for increasing the fire load within a means of escape staircase. In the case of refurbished buildings where design constraints make the provision of a fire-fighting lift in a fire-fighting lobby impracticable then, subject to additional measures (see **7.2.5**), a lift may be sited within its own fire-resisting shaft in the fire-fighting stair enclosure. However, this provision is not recommended in residential buildings, as the lack of ongoing statutory control makes the additional measures unenforceable.

Because it is the line of retreat if the fire-fighting lift fails, the fire-fighting stair needs to serve every storey served by the fire-fighting lift. The lift and stair are also used together during fire-fighting operations.




**Key**

1 Tall building (>18 m)

2 Fire service access level

3 Building with deep basement (⩾10 m)

Extent of fire-fighting stair

Extent of fire-fighting lift

NOTE 1 A stair serving floors both above and below ground level should be separated at or about ground level (which might not necessarily be fire service access level) except where the staircase is pressurized.

NOTE 2 It is not necessary for floors above and below fire service access level to be served by the same stair.

NOTE 3 The lift need not serve the topmost storey if it consists exclusively of plant rooms.

NOTE 4 It is not necessary for floors above and below fire service access level to be served by the same lift.

**Figure 9 — Minimum extent of fire-fighting stairs and lifts in tall buildings and buildings with deep basements**

### 7.2.2 *Fire-fighting stairs*

Fire-fighting stairs should be sufficiently wide to be easily used by fire-fighting personnel carrying fire-fighting equipment. Fire-fighting stair enclosures should be provided with facilities for smoke control (see **13.2**) to ensure that they remain relatively smoke-free.

To prevent smoke from basement storeys from penetrating the stair enclosure above ground level, fire-fighting stairs serving floors both above and below ground level should be separated at ground floor by a fire door (see Figure 6).

Fire-fighting stairs should be designed in accordance with BS 5395-1, with a width between the walls or balustrades of not less than 1.1 m. This width should be maintained clear for a vertical distance of 2.0 m, measured from the pitch line or landing floor level, with the following exceptions:

a) stringers, each intruding into the stair not more than 30 mm; and

b) handrails, each intruding into the stair not more than 100 mm.

Emergency lighting in fire-fighting stair enclosures should conform to BS 5266-1 (see also Clause **14**).

### 7.2.3 *Fire-fighting lobbies*

A fire-fighting lobby serves the fire-fighting lift and an approach stair. It is necessary:

a) as the means of final approach to the fire floor;

b) for floor-to-floor movement during fire-fighting operations;

c) as an assured and safe route of egress if the lift should fail or its reliability become uncertain;

d) in offering a safe area on the floor below the fire floor, where fire-fighters and fire-fighting equipment can be assembled before commitment to fire-fighting operations.

Lobbies have to be of sufficient size and design to enable the fire service to lay out fire-fighting hose and connect it to the outlet from the fire main (if provided) without undue congestion, but not so large as to encourage any form of storage or unauthorized use. To this end, fire-fighting lobbies should have a clear floor area of not less than 5 $m^2$. The clear floor area should not exceed 20 $m^2$ for lobbies serving up to four lifts, or 5 $m^2$ per lift for lobbies serving more than four lifts. All principal dimensions should be not less than 1.5 m and should not exceed 8 m in lobbies serving up to four lifts, or 2 m per lift in lobbies serving more than four lifts.

Fire-fighting lobbies should be clearly and conspicuously marked with a notice conforming to BS 5499-1, stating “Fire-fighting lift lobby: do not obstruct lift doors. Do not use for storage”. In buildings where the fire-fighting lift is the only lift, an additional notice should be provided stating “Do not leave goods in lift”.

The layout of a fire-fighting lobby and the positions of all doors should reduce, as far as is practicable, risks arising from:

1) the creation of dead-ends (in which fire-fighters can become cut off from access to the safety of the stair or become disorientated in poor visibility);

2) the direct exposure of lift landing doors to the effects of fire through the doorway leading into the accommodation.

In residential buildings designed in accordance with BS 5588-1, protected ventilated common corridors or lobbies are expected to protect the fire-fighting stairs without the need to provide additional dedicated ventilated lobbies. However, where a fire-fighting shaft is pressurized (see **13.2.2**), a lobby should be provided in accordance with BS 5588-4 (Class B system).

Fire-fighting lobbies should not form part of a general circulation route within any storey except for circulation between storeys and to sanitary accommodation (see **7.1.4** and **7.2.6**). Such sanitary accommodation should not:

— be used as a cloakroom;

— contain any portable heating appliances;

— contain any gas appliance other than a water heater or an incinerator.

Fire-fighting lobbies should be provided with facilities for smoke control (see **13.2**).

Emergency lighting in fire-fighting lobbies should conform to BS 5266-1 (see also Clause **14**).

NOTE In shopping complexes, protected lobbies or protected corridors connecting fire-fighting stairs to malls or other accommodation should be deemed to be fire-fighting lobbies if there is adequate space for fire-fighters to lay out their hose and connect it to the fire main outlet valve. However, in the case of residential buildings provided with a fire-fighting shaft ventilated by natural means, there is no need to increase the area of ventilation beyond that recommended in BS 5588-1.

### 7.2.4 *Fire-fighting lifts*

A fire-fighting lift installation includes the lift car itself, the lift well and the lift machinery space, together with the lift control system and the lift communications system.

Fire-fighting lift installations should conform to BS EN 81-72, and to BS EN 81-1 or BS EN 81-2 as appropriate for the particular type of lift.

A fire-fighting lift, unlike a normal passenger lift, is designed to operate so long as is practicable when there is a fire in parts of the building beyond the confines of the fire-fighting shaft, as it is used to transport fire-fighters and their equipment to a floor of their choice.

NOTE The lift may be used in normal times as a passenger lift by the occupants of the building but, in order to prevent the risk of the entrance being obstructed when the lift is required to go into the fire-fighting mode, it is essential that it is not used for moving refuse, nor for moving goods. In buildings provided with a single lift, its use for the transport of goods needs to be avoided unless essential, lift lobbies need to be kept clear, and when used for moving goods it is essential that the doors are not propped open.

It is essential that the lift doors are power-operated.

Fire-fighting shafts should be provided with fire-fighting lifts (see Figure 9) in:

a) buildings with deep basements ($\geqslant$10 m), in which case the fire-fighting shaft should serve fire service access level and all storeys below it;

b) tall buildings ($\geqslant$18 m), in which case the fire-fighting shaft should serve fire service access level and all storeys above it, although the fire-fighting lift need not serve any storey on which there is no entrance to any accommodation, or the topmost storey of the building if it consists exclusively of plant rooms;

c) buildings that are both deep and tall, in which case the fire-fighting shaft should serve all storeys, although the fire-fighting lift need not serve any storey on which there is no entrance to any accommodation, or the topmost storey of the building if it consists exclusively of plant rooms. Storeys below fire service access level may be served by a different fire-fighting lift from that serving the upper storeys, and any fire-fighting stair that serves levels both above and below ground level should be separated at ground level.

If a building contains separate units of accommodation with their entrances from common circulation spaces, e.g. as is the case with some flats and maisonettes, there should be access to each unit from a fire-fighting lift, either directly or via a common circulation space.

If a fire-fighting shaft contains a fire-fighting lift, the fire-fighting stair in that shaft should serve every storey served by the fire-fighting lift.

### 7.2.5 *Fire-fighting lifts in stair enclosures in refurbished buildings*

The fire-fighting lift should generally not be installed in the fire-fighting stair enclosure, but it is acceptable to do so (see Figure 10) in the following circumstances:

a) the building is being refurbished (see **7.2.1**);

b) the building is put to non-residential use;

c) the fire-fighting lift is sited so that the movement of fire service personnel between the lift and the lobby does not impede the use of the stair by the building occupants during an evacuation;

d) the building evacuation scheme is single-stage;

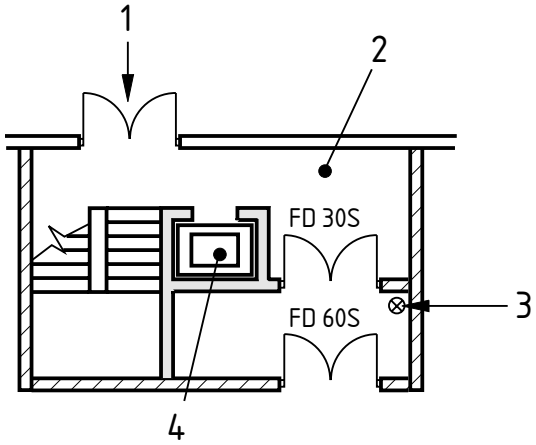
e) the lift is to be used for the evacuation of disabled people (see BS 5588-12);

f) the fire-fighting lift is not to be used as a goods or service lift;

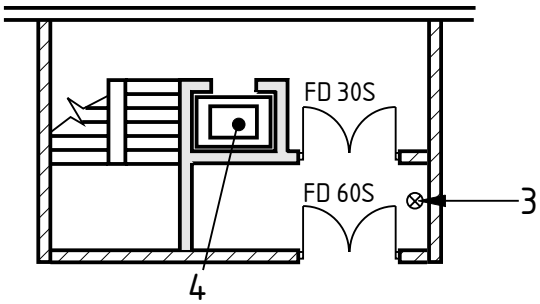
g) the fire-fighting shaft does not extend below ground level;

h) the lift well is inspected monthly and any combustible materials removed.

If the fire-fighting lift is installed in the fire-fighting stair enclosure, the fire-fighting shaft should not extend below ground level, and the lift well should be inspected monthly and any combustible materials removed.




a) Access level




b) Accommodation level

**Key**

| | |
|---|---|
| 1 | Fire service access level |
| 2 | Fire service access lobby |
| 3 | Fire main |
| 4 | Fire-fighting lift |
| FD #S | Fire door with # min fire resistance with smoke seal |
| | Minimum fire resistance of 1 h from both sides |
| | Minimum fire resistance of 2 h from outside the fire-fighting shaft and 1 h from inside the fire-fighting shaft |

**Figure 10 — Fire-fighting lift within escape stair**

### 7.2.6 *Dual-entry fire-fighting lifts*

Where it is impractical to locate all adjacent lifts within the fire-fighting shaft, a dual-entry fire-fighting lift may be provided with a separate fire-fighting lobby accessible through a second set of lift doors (see Figure 11).

However, because of the additional risks that this arrangement places on the safety of the fire-fighting shaft, a number of additional precautions need to be taken:

a) certain additional facilities need to be provided by the lift control system (see BS EN 81-72:2003, **5.8.9**);

b) the number of dual-entry fire-fighting lifts serving any storey should not exceed half the total number of lifts for that storey;

c) the fire resistance of the lift landing door to the main lift lobby should be increased to 60 min;

d) any storey served by a single fire-fighting lift should not be served by a dual-entry fire-fighting lift.

Where a fire-fighting lift is dual-entry, the lift landing doors to the main lift lobbies should be separated from the accommodation by an enclosure with a fire resistance of not less than 30 min (see Figure 11). The doors to this enclosure should be self-closing, but not by means of rising butts. Means of overriding the self-closing device may be provided by a hold-open system incorporating an automatic release mechanism conforming to BS 5839-3 or BS EN 1155. The automatic release mechanism should release the door to close automatically in the event of:

1) the detection of smoke by suitable automatic apparatus mounted at high level in the accommodation adjacent to a door to the main lift lobby enclosure;

2) failure of a power supply;

3) operation of a fire-fighting lift switch;

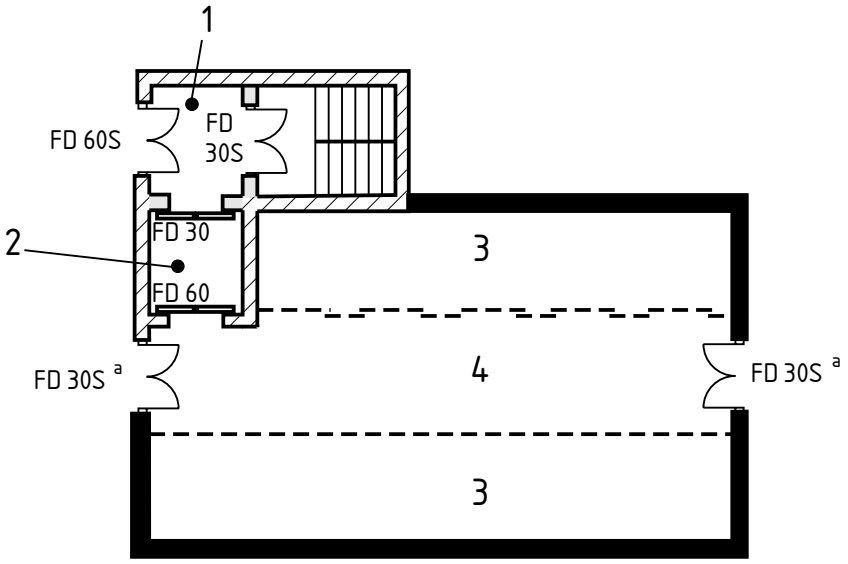
4) operation of a fire alarm system;

5) manual operation at a central control point;

6) actuation of an automatic fire extinguishing system (e.g. a sprinkler system);

7) the removal, for whatever reason, of a smoke detector in a fire detection zone protecting accommodation directly accessible from the fire-fighting shaft.

Such doors should be suitably marked on both sides, at approximately eye level, with the appropriate sign conforming to BS 5499-1.




**Key**

| | |
|---|---|
| 1 | Fire-fighting lift lobby |
| 2 | Fire-fighting lift |
| 3 | Passenger lifts (or sanitary accommodation) |
| 4 | Main lift lobby |
| FD [#S] | Fire door with # min fire resistance [with smoke seal] |

Minimum fire resistance of 1 h from both sides

Minimum fire resistance of 2 h from outside the fire-fighting shaft and 1 h from inside the fire-fighting shaft

Minimum fire resistance of 30 min from both sides

[a] May be held open subject to the door being automatically released (see **7.2.6**).

**Figure 11 — Typical fire-fighting shaft layout for a dual-entry fire-fighting lift**

### 7.2.7 *Fire-fighting lift cars*

The construction and design of fire-fighting lift cars, together with the installation of fire-fighting lifts, should conform to BS EN 81-72.

Fire-fighting lift cars should be provided with a means of external rescue of trapped fire-fighters in the lift car.

NOTE 1 With regard to BS EN 81-72:2003, **5.4.3**, attention is drawn to the fact that the means of rescue used is determined by the fire service.

In buildings provided with more than one lift, fire-fighting lift cars should be clearly and conspicuously marked with a notice conforming to BS 5499-1 stating "Fire-fighting lift: Do not use for goods or refuse".

In fire-fighting shafts with a pressure differential system in accordance with **13.2.2**, the lift doors should be capable of opening/closing against the maximum pressure difference attained when the system is fully operational.

NOTE 2 As fire-fighting lifts are provided with two independent sources of power, except for some residential buildings, it is not necessary to provide facilities for emergency operation additional to those specified in BS EN 81.

### 7.2.8 *Water protection of lift wells*

There have been several recorded occasions when water from a landing valve, hose lines, etc., has entered the lift well and caused malfunction of the installation when it reached electrical door interlocks, car controls, etc. It is therefore necessary to minimize both the effects of water on lift operations, and the probability of water entering the lift well in the first place.

To minimize the effect of water penetration, electrical equipment within the fire-fighting lift well and on the car should be protected against water in accordance with BS EN 81-72.

There are a number of ways in which water penetration can be avoided or minimized, and the method chosen should be appropriate to the building. Suitable methods include the provision of drainage channels and drainpipes, and/or laying the lift landing floor to a fall so that any water entering the lobby will not enter the lift well but will drain away down the stairs and/or into a smoke shaft and/or to gargoyles or scuppers on the outside of the building (see Annex A).

The provision of sprinkler heads within the fire-fighting lift well is not desirable. In lifts conforming to the recommendations given in this part of BS 5588, it is unlikely that fire would arise in the lift well other than from combustibles within the car, which could not be reached by sprinkler discharge. Furthermore, any cooling effect from sprinkler discharge could not reliably control excessive temperatures in the lift well, should a fire develop there, which would make the lift unsafe to use. However, absence of sprinkler heads does not obviate the need for protection from water. Any sprinklers installed in the fire-fighting lobby should be sited so that they do not drench the lift landing doors or controls.

NOTE The minimum flow rate from a fire main is recommended in BS 5306-1 is 25 L/s, and this is considered to be representative of likely flow rates from other sources.

### 7.2.9 *Fire-fighting lift machinery spaces*

Machinery spaces for fire-fighting lifts should conform to all the relevant requirements of BS EN 81.

It is essential that a fire in the fire-fighting lift machinery space does not lead to the fire-fighting shaft becoming smoke-logged, and that the risk of the operation of the fire-fighting lift machine being affected by water during fire-fighting operations is minimized. To achieve this, the machinery space and associated equipment for a fire-fighting lift should not be sited below the lift well, and should be protected from malfunction caused by water and be protected against fire in accordance with BS EN 81-72. The fire-fighting lift machinery space is most effectively protected by incorporation within the fire-fighting shaft. If the lift machine is sited directly within the lift well, thus obviating the need for a separate machinery space, then similar safeguards should be provided for the lift machine and associated equipment as for a conventional lift machinery space.

NOTE A similar degree of protection is necessary for power supplies, generators and all other apparatus essential for the operation of the fire-fighting lift (see Clause **8**).

# 8 Fire-fighting lift control systems

## 8.1 General

Fire-fighting lift control systems should conform to BS EN 81-72. A fire-fighting lift switch should be provided to enable the fire service to obtain immediate control of the fire-fighting lift(s) in a fire-fighting shaft. Provision should be made to control access to the fire-fighting switch. If there are two or more lifts installed together, there should be clear indication as to which lift is the fire-fighting lift.

NOTE prEN 81-71[1)] gives requirements for lifts that are located in areas subject to vandalism.

## 8.2 Operation of the fire-fighting lift control system

Lifts in the fire-fighting shaft should operate normally until the fire-fighting lift switch is activated.

NOTE 1 When the fire-fighting lift is activated it immediately renders inoperative all call buttons both on the lift landings and in the lift cars, and brings the fire-fighting lift and other lifts in the fire-fighting shaft to the fire service access level. It is not necessary to interconnect separate or multiple groups of lifts with other fire-fighting lifts as it can be undesirable to disable the whole building.

NOTE 2 The locking shut of the landing doors is carried out as part of the normal lift operations. Operation of the fire-fighting lift is dependent on the successful locking shut of these doors.

If, as part of the fire strategy in a particular building, the fire-fighting lift (and any other lifts within the fire-fighting shaft) is brought to the fire service access level on operation of the fire alarm system, the lift car and landing controls should be disabled until the fire-fighting lift switch has been operated.

If a lift is travelling away from the fire service access level it should stop (without opening its doors) at the next available floor according to the lift speed and the minimum slow-down distance of the drive system. The lift should then reverse direction to travel without stopping to the fire service access level.

NOTE 3 It is important that any lift travelling away from the fire service access level is able to stop and reverse without the car doors opening.

On arriving at the fire service access level, all lift doors in the fire-fighting shaft should open to allow any passengers to exit, after which the lift doors should close on all the lifts, except the fire-fighting lift.

The fire-fighting lift should return as soon as practicable to the fire service access level. It should be possible for the fire-fighting lift (and any other lifts within the fire-fighting shaft) to be returned to fire service access level at any time by switching the fire-fighting lift switch from “1” to “0” (for a minimum of 5 s) and back to “1”.

NOTE 4 It might be desirable to install a “Lift under fire service control” sign illuminated within each lift car, which remains illuminated until the fire-fighting lift switch is returned to the “0” position.

The car controls of the fire-fighting lift should become active only after it has arrived at the fire service access level and the fire-fighting lift switch has been operated. Once the fire-fighting lift has arrived at the fire service access level, its doors should open and it should then operate as follows.

a) Fire personnel entering the lift car should be able to register a call to any selected landing in the building by sustained pressure on a car control until the car doors have fully closed.

b) If a car control is released before the doors have fully closed, the doors should immediately reopen and the call should be cancelled.

c) Once the lift is moving, it should be possible to register additional calls on the car controls. The lift should travel in the direction of the first call registered, and should stop at the first floor encountered for which a call is registered.

d) The doors should remain closed unless they are operated by continuous pressure on the “door open” control. It should not be possible to open the doors without sustained pressure on the control.

e) Release of the “door open” control before the doors are fully open should cause the doors to automatically re-close.

NOTE 5 This allows fire service personnel to observe the situation immediately outside the lift landing doors in the fire-fighting lobby.

f) Once the doors are fully open they should remain open until a new call is registered at the car control station.

[1)] In preparation.

The operating of the lift should be independent of the switch position of:

— any collective control;

— any attendant's changeover switch or control;

— any emergency switch in the lift car;

— any caretaker's immobility switch;

— any security, commissionaire's, caretaker's or similar cut-out switch.

NOTE 6 When the fire-fighting lift is out of service because of engineering work, it is important that a "lift under maintenance" sign be placed on the lift at fire service access level.

NOTE 7 On becoming aware of the signal it is important that the engineer immediately reinstates lift operation if the lift is safe to use and then leaves the building. If it is not possible to reinstate lift operation immediately, it is advised that the engineer leaves the building and awaits (at fire service access level) the arrival of the fire service.

### 8.3 Changeover from primary to secondary supply after operation of the fire-fighting lift switch

On loss of the primary supply the lift, if travelling, comes to an emergency stop and the lights go out. The emergency lighting comes on immediately. There is then a delay of up to 30 s while the secondary supply is established, which is indicated by the restoration of the main lighting in the lift car. The system design should be in accordance with BS EN 81-72.

Changeover of electrical supplies should be in accordance with BS EN 81-72.

NOTE See also Clause **14**.

### 8.4 Lift communications systems

A lift communication system conforming to BS EN 81-72 should be provided as part of the fire-fighting lift installation and should be separate from the fire service communications system (see Clause **9**).

## 9 Fire service communications systems

In large or complex buildings, there needs to be a reliable means of communicating from the fire service access level to all fire-fighting lobbies and the lift machinery space or panel where provision is made to recover a stalled lift car.

Mobile communications should preferably be supplemented by some form of fixed communications system, e.g. a fire telephone system. Fire telephone handsets should be provided at strategic points, at each entrance, in fire-fighting lobbies and in the control room and should be permanently fixed equipment.

Fire-fighters normally 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.

The fire telephone system should be in accordance with BS 5839-9.

## 10 Fire control centre

A fire control centre should be provided in all buildings designed for phased evacuation, and in large or complex buildings, to enable the fire service to assume control of an incident immediately on arrival. The fire control centre should be either:

a) a room dedicated solely as a fire control centre; or

b) combined with the management central control room.

The fire control centre should be adjacent to a fire service access point and should be readily accessible, preferably directly from the open air. If this is not practicable, the route to the fire control centre should be protected.

Because of the possible need for the fire control centre to be operational over an extended period of time, it should be separated from the remainder of the building by 2 h fire-resisting construction and should incorporate facilities to enable it to function as normal during an emergency.

The fire control centre should be provided with a 3 h non-maintained system of emergency lighting supplied from a source independent of the normal lighting to enable the control centre to operate satisfactorily in the absence of the normal lighting supply.

Throughout the building, a reliable means of communication with the fire control centre (see Clause **9**), either a fire telephone system or a radio telecommunication system acceptable to the fire authority, should be provided for use by the management of the building in conjunction with the fire control system and control of evacuation, and for communications between fire service personnel.

The fire control centre should contain:

1) all control and indicating equipment for the fire alarm and other fire safety systems for the building;

2) indicator panels showing the location of the incident and status of all automatic fire protection installations and facilities;

3) manual override switches associated with all automatic fire protection installations and facilities (other than those that have to be located either adjacent to their equipment or elsewhere where local control is needed, e.g. overrides for gaseous fire extinguishing systems or sprinkler system main or floor isolating valves);

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

5) a communication system providing a direct link between the control room and all fire-fighting lobbies, fire service access points and refuges for disabled people;

NOTE 1 This may be, for example, an intercom or fire telephone.

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

7) a public address system;

8) controls and monitor screens for closed circuit television (CCTV) if it is provided for the control of evacuation;

9) the fire routine for the building;

NOTE 2 BS 5588-12 gives recommendations for fire routines.

10) keys or other devices needed to facilitate access throughout the building and to operate any mechanical and electrical systems;

11) floor plans of the building as described in Clause **12**;

12) telephone numbers of principal staff/building services engineers;

13) a facility to sound the evacuation signal in each evacuation zone by individual switches or throughout the building by means of a single switch. The single switch for total evacuation should be protected against accidental operation and from being inadvertently left on when the building is fully occupied;

NOTE 3 Such a switch should not be used to signal the evacuation of the building when fully occupied where stairs have been provided to cope only with phased evacuation, as the stairs will be too narrow.

14) a facility to sound the alert signal throughout the building;

15) a clock to time phases of evacuation;

16) a visual indication in the control panel relating to the status of relevant parts of the building where an evacuation signal has been given;

17) a facility to cancel any automatic sequencing of phases of the evacuation procedure except for the initial phase;

18) a wall-mounted writing board with suitable writing implements for displaying important information.

The control centre should be staffed by a competent person, familiar with the use and operation of the installed equipment, while the building is occupied.

Clear differentiation should be provided where possible between fire, security and building management systems within the control centre.

NOTE 4 In large or complex buildings it can be appropriate to equip the control room with CCTV for the surveillance of floor areas.

NOTE 5 Management responsibilities in respect of general efficiency, staffing and organization of a control centre are outlined in BS 5588-12.

## 11 Fire-fighters' emergency switches for discharge lighting installation

Discharge lighting installations, such as floodlights and neon advertising signs, can operate at voltages that are a hazard to fire-fighters. They should be able to be switched off in the case of a fire.

An exterior or interior lighting installation designed to work at a voltage normally exceeding 1 000 V a.c. or 1 500 V d.c. if measured between any two conductors, or 600 V a.c. or 900 V d.c. if measured between any conductor and earth, should be controlled by a fire-fighter's emergency switch, installed in accordance with BS 7671.

## 12 Drawings for fire service use

In large or complex buildings and those having extensive accommodation below ground level, it can help the fire service if drawings of the building showing fire protection and escape facilities are made available. Drawings should include plans and sections to a scale agreed with the enforcing authorities.

The drawings should be located such that they can be readily referred to in an emergency. The plans should be displayed near the fire service access point(s), in any fire control centre and at any other locations agreed with the fire service. Plans of basement accommodation should be displayed at the fire service access storey in any stairway (or lobby) leading to the basement. Additional copies of the drawings should ideally be supplied to the fire authority to enable pre-planning for an emergency.

The plans should include the direction of North, a linear scale bar and a "You are here" indicator, and should clearly indicate the location of all relevant fire-fighting equipment together with any other relevant information such as geographic location and escape routes. Examples of items that should be indicated on the plans include:

a) surrounding streets;

b) exits, stairs, corridors, evacuation lifts and any refuges for disabled people;

c) fuel storage areas, gas and oil main controls;

d) electrical main and submain controls, including stand-by generators;

e) ventilation plant and control switches, including controls for any smoke control system using pressure differentials;

f) sprinkler valves;

g) hose reels;

h) hydrants and fire mains;

i) shutters and doors released automatically in the event of fire, and any central control point for release;

j) smoke outlets and control systems;

k) openable windows for smoke ventilation in sealed buildings;

l) main and any secondary fire alarm panels, and zoning of fire alarm systems;

m) pump rooms supplying fire protection systems;

n) fire-fighting stairs and fire-fighting lifts;

o) automatic fire extinguishing systems;

p) foam inlets;

q) telephone communication points and any fire control centre.

# 13 Heat and smoke control

## 13.1 General

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 fire-fighting operations within a building.

Effective means should be provided to ventilate the fire-fighting shaft of smoke in such a way as to minimize the possibility of serious contamination of the fire-fighting stairwell (see **13.2**).

Products of combustion from basement fires tend to escape via stairways, making access difficult for fire service personnel. Providing outlets for smoke can reduce this problem. Venting can improve visibility and reduce temperatures, making search, rescue and fire-fighting less difficult (see **13.3**).

In addition to any measures that are needed to keep smoke from restricting the use of any fire-fighting shafts, there is also a need to remove smoke from basements, car parks, loading docks and covered roadways (see **13.4** and **13.5**).

## 13.2 Smoke control for fire-fighting shafts

### 13.2.1 *General*

Fire-fighting shafts should be provided with smoke control systems as follows:

a) fire-fighting shafts serving basements more than 10 m below ground level should be provided with a pressure differential system (see **13.2.2**);

b) all other fire-fighting shafts should be provided with either a pressure differential system (see **13.2.2**) or natural ventilation (see **13.2.3**).

### 13.2.2 *Smoke control using pressure differential systems*

Pressure differential systems for fire-fighting purposes should be designed and installed in accordance with BS 5588-4:1998, Class B systems.

### 13.2.3 *Venting of fire-fighting shafts by natural means*

#### 13.2.3.1 *General*

Openable vents should be provided in accordance with Table 6.

**Table 6 — Recommendations for fire-fighting shafts ventilated by natural means**

| Fire-fighting provisions within building | | Openable vent | |
|---|---|---|---|
| **Fire-fighting stair or lobby** | **Position of stair or lobby** | **Geometric area of vent** $m^2$ | **Position of vent** |
| Stair | On external wall | 1.0 | At each storey |
| Stair | Not on external wall | 1.5 | At top of stair |
| Stair | Serving only basement levels less than 10 m depth and leading directly to a final exit | — | None[a] |
| Lobby | Above ground level on an external wall | 1.0 | Near to ceiling direct to open air |
| Lobby | Above ground level not on an external wall | 1.5 | At each storey to a smoke shaft |
| Lobby | At each basement level | 1.0 | High level direct to open air or to a smoke shaft serving only that level |
| Smoke shafts should be in accordance with **13.2.3.2**.<br>Openable vents should be in accordance with **13.2.3.3**. | | | |
| [a] The door to the final exit serves as a vent. | | | |

**13.2.3.2** *Smoke shafts*

Smoke shafts serving basements should discharge direct to open air at ground level where the exits from the building and fire service access would not be affected by the smoke discharge.

A smoke shaft serving a basement should be covered with either a metal grille designed to prevent blockage of the shaft by rubbish, or breakable material, easily accessible from the appropriate fire service access level.

Smoke shafts serving storeys above ground level should meet the following recommendations.

a) The smoke shaft should be fully open to the external air at top and bottom. The opening at the top of the smoke shaft should not be located where it could be subjected to adverse wind effects (i.e. it should always have negative wind pressure coefficients).

b) The cross-sectional area (geometric free area) of the smoke shaft should be at least 3 $m^2$.

c) The lobby ventilator should have a geometric free area of at least 1.5 $m^2$.

d) Both the width and the height of the lobby ventilator should be not less than 1 m.

e) The top of the lobby ventilator should be located as close to the ceiling of the lobby as is practicable, and should be at least as high as the top of the door connecting the lobby to the stairwell.

NOTE An alternative approach to smoke control using smoke shafts is given in BRE Report 79204 [1].

**13.2.3.3** *Openable vents*

All openable vents provided for smoke control, with the exception of vents sited above a stair, should:

a) be outward opening;

b) not be top hung;

c) open a minimum of 30°;

d) be clearly identifiable and accessible;

e) be fitted with:

1) simple lever handles; or

2) rotary drives to simple rack or gear operated devices; or

3) locks that can be operated by the fire service.

NOTE Openings should be guarded to a height of not less than 1.1 m from floor level.

The top of lobby vents should be located as close to the ceiling of the lobby as is practicable, and should be at least as high as the top of the door connecting the lobby to the stairwell.

Openable vents situated above a stair should be provided with a remote control mechanism located adjacent to the fire service access doorway and clearly marked as to its function and means of operation. The mechanism should be capable of opening and closing the vent. All connections between the remote control and opening mechanism should be within the fire-fighting shaft. Where any part of the remote control mechanism is powered by electricity, a secondary supply should be provided.

## 13.3 Venting of smoke and heat from basements

### 13.3.1 *General*

A system of smoke and heat ventilation should be provided from every basement storey, except for:

a) a basement in a single dwelling; or

b) any basement storey that has:

1) a floor area of not more than 200 $m^2$; and

2) a floor not more than 3 m below the adjacent ground level.

NOTE Where basement compartments have external doors or windows they do not need smoke outlets. It is common for basements to be open to the air on one or more elevations.

Systems may be either natural, using one or more smoke outlets (**13.3.2**), or powered (**13.3.3**). For smoke and heat ventilation systems from basement car parks, see **13.4**.

### 13.3.2 *Natural smoke and heat ventilation*

Smoke outlets (also referred to as smoke vents) provide a route for smoke to escape to the open air from the basement level(s). They can also be used by the fire service to let cooler air into the basement(s). See Figure 12. Where practicable, each basement space should have one or more smoke outlets. It is not always possible to do this, e.g. where the plan is deep and the amount of external wall is restricted by adjoining buildings. Under these circumstances it is acceptable to vent spaces on the perimeter and allow other spaces to be vented indirectly by fire-fighters opening connecting doors. If a basement is compartmented, each compartment should have direct access to venting, without having to open doors etc. into another compartment.

Smoke outlets should:

a) be not less than 2.5 % of the floor area of each storey;

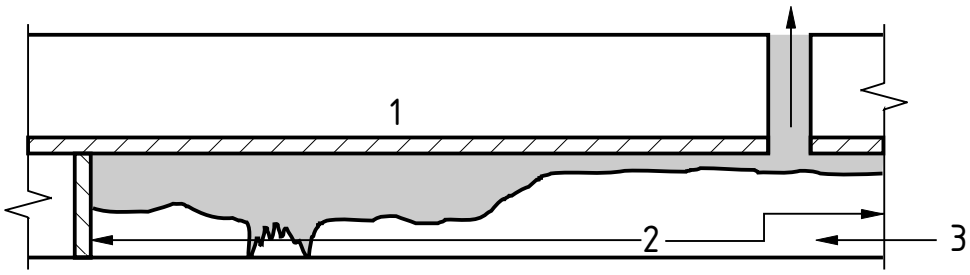
b) be sited at high level, either in the ceiling or in the wall of the space they serve;

c) be evenly distributed around the perimeter of the building, to discharge into the open air outside the building;

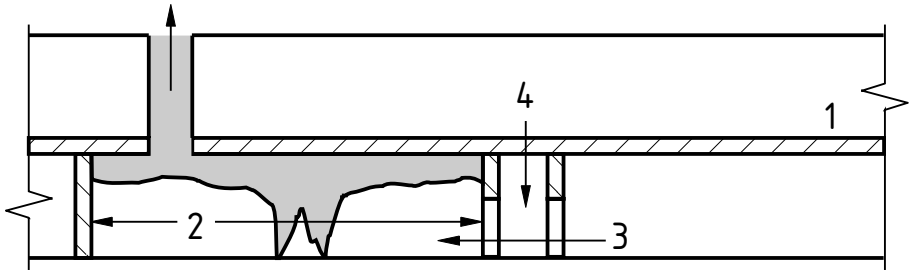
d) not be placed where they would prevent the use of escape routes from the building.

If an outlet terminates at a point that is not readily accessible it should be kept unobstructed, and should be covered only with a non-combustible grille or louvre.

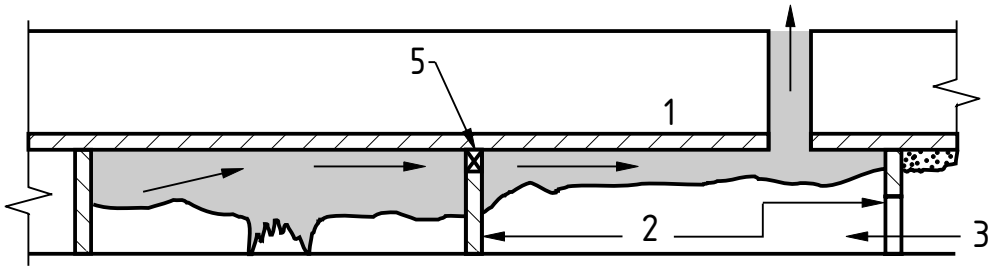
If an outlet terminates in a readily accessible position it may be covered by a panel, stallboard or pavement light that can be broken out or opened. The position of such covered outlets should be suitably indicated.



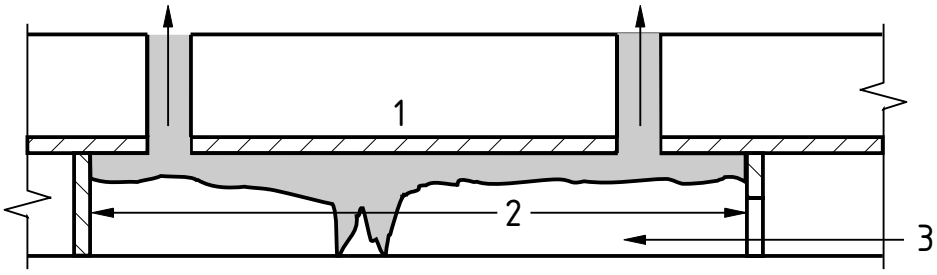

a) Small basement area ($\leqslant$450 m$^2$) with access via a large space




b) Small basement area ($\leqslant$450 m$^2$) with corridor access only




c) Large basement area (>450 m$^2$) with smoke vented via an adjacent large space




d) Large basement area (>450 m$^2$) provided with an inlet air supply

**Key**

1 Ground level
2 Basement area
3 Inlet air supply
4 Corridor access
5 Powered exhaust ventilator

Smoke

**Figure 12 — Ventilation provisions for basement rooms**

### 13.3.3 *Powered smoke and heat ventilation*

A system of powered smoke and heat ventilation may be provided as an alternative to natural venting, to remove smoke and heat from basements, provided that the basement storey(s) are fitted with a sprinkler system. The sprinkler system should be in accordance with BS 5306-2 or BS EN 12845 [it is not considered necessary in this particular case to install sprinklers on the storeys other than the basement(s) unless they are needed for other reasons].

If a powered extract system is used, it should:

a) provide ten air changes per hour;

b) be capable of handling gas temperatures of 300 °C for not less than 60 min;

c) come into operation automatically either on activation of the sprinkler system or by an automatic fire detection system conforming to BS 5839-1 (at least L3 standard). For further guidance refer to BS EN 12101-3.

## 13.4 Venting of smoke and heat from car parks

### 13.4.1 *General*

A system of smoke ventilation should be provided from every car park storey. The system may be either natural (see **13.4.2**) or powered (see **13.4.3**).

### 13.4.2 *Natural ventilation of smoke and heat from car parks*

Each storey should be ventilated either by permanent openings in the walls at each car parking level, or by smoke vents at ceiling level. Permanent openings should have an aggregate vent area not less than 2.5 % of the floor area at that level, of which at least half should be in two opposing walls. Smoke vents should have an aggregate area of permanent opening totalling not less than 2.5 % of the floor area at that level, of which at least half (1.25 %) should be shared equally in two opposing walls.

### 13.4.3 *Powered ventilation of smoke and heat from car parks*

In most basement car parks, and in some enclosed car parks, it is not always possible to obtain the minimum standard of natural ventilation openings set out in **13.4.2**. In such cases a system of ventilation should be provided as follows.

a) The system should be independent of any other ventilating system and should be designed to operate at six air changes per hour for normal petrol vapour extraction, and at ten air changes per hour in a fire condition.

b) The system should be designed to run in two parts, each part capable of extracting 50 % of the rates set out in a), and designed so that each part can operate either singly or simultaneously.

c) Each part of the system should have an independent power supply which would operate in the event of failure of the main supply.

d) Extract points should be arranged so that 50 % of the outlets are at high level, and 50 % at low level.

e) The fans should be rated to run for not less than 60 min at:

1) 300 °C for sprinklered buildings; and

2) 600 °C for unsprinklered buildings.

f) The ductwork and fixings should be constructed of materials with a fire rating of not less than 600 °C or equivalent to the fire resistance rating of any compartment boundary through which it passes, whichever is the greater.

### 13.5 Smoke and heat ventilation from loading docks and covered service roadways

All enclosed loading docks exceeding 200 $m^2$ and covered service roadways should be provided with a smoke control system capable of either:

a) 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; or

b) exhausting smoke at a minimum rate equivalent to ten air changes per hour in the affected area.

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

## 14 Electrical services

### 14.1 Primary and secondary supplies

Where electrical services in the building are essential to maintaining the effectiveness of fire-fighting facilities, a secondary power supply (e.g. a generator) should be provided that is capable of operating safely in fire conditions (see Note 1). When determining the means for the provision of a secondary supply, the overall electrical distribution system within the building should be taken into account, as well as the power needs for other equipment requiring a secondary or standby power supply.

NOTE 1 In the case of some residential buildings where regular maintenance of a generator would not be expected, the power supplies may be via two separate intakes into the building from the same external substation and then by two separate routes to the fire-fighting shaft.

NOTE 2 For legal and technical reasons, power supply companies have reservations about offering a power supply from a second substation to provide protection against the occurrence of a fault (unconnected with the fire) on the high-voltage distribution system. Accordingly, a generator or an independent power supply needs to be provided if protection against faults is required by the occupier.

Changeover from primary to secondary power supply should be automatic so that lighting and smoke control within the fire-fighting shaft, and any pumps for the fire main, continue in operation.

Both the primary and secondary sources of power to the fire-fighting shaft should be sufficiently protected against fire and water damage. They should also be separated from each other, so that a failure in cable or equipment, either by mechanical breakdown or damage by fire, in any one system, does not affect the other supply. Protection against fire can be achieved through choice of cable, choice of route (e.g. through protected areas, or external to the building) or by the use of fire-resisting construction.

The fire procedures of the building should not include the isolation of the circuits supplying power to the fire-fighting shaft and its associated services.

The primary electrical supply to a fire-fighting lift should be obtained from a sub-main circuit exclusive to the lift and independent of any other main or sub-main circuit. Other lifts in the fire-fighting shaft may be fed from the same primary supply, provided that:

a) the supply is adequate for this purpose; and

b) arrangements are such that a fault occurring in any other lift in the fire-fighting shaft or power supplies will not affect in any way the operation of the fire-fighting lift.

The secondary power supply should be independent of the primary power supply to the fire-fighting shaft, e.g. an automatically starting system. The secondary power supply should be capable of providing the power for a fire-fighting lift within 30 s of the failure of the primary electrical supply. Where the secondary power source is a generator it should be capable of providing the necessary power for at least 3 h without replenishment of fuel. A supply from another substation should be from one that does not normally provide the incoming supply to the building. The secondary supply should be of sufficient capacity to:

1) maintain in operation:

— the fire-fighting lift and its ancillary equipment;

— normal lighting and other services within the fire-fighting shaft;

— the fire service communications system (see Clause **9**);

— any powered ventilation or pressurization system which operates in conjunction with the operational use of the fire-fighting shaft;

— any pump(s) required to feed the fire main;

2) permit the automatic recall to fire service access level of all other lifts in the fire-fighting shaft, if necessary in sequence and at reduced speed.

The distribution should be organized such that the secondary supply remains live when the remainder of the supplies in the building are isolated in an emergency.

Cables, switchgear and other equipment transmitting the secondary power supply should be separated from those of the primary supply or physically protected so that a breakdown, or any cause of a breakdown on one supply, does not lead to simultaneous failure of the other supply.

The primary and secondary power supply cables should be terminated in a changeover device located within the fire-fighting shaft.

NOTE 3 This is not to be confused with the lift shaft.

The changeover device should automatically effect a transition from the primary to the secondary power supply if any phase of the primary power supply to the fire-fighting shaft fails.

### 14.2 Installation

Cables supplying current to the fire-fighting lift installation and any other fire-fighting facilities associated with the fire-fighting shaft should be installed in accordance with BS 7671 and with the manufacturer's instructions, and should:

a) be located in a protected shaft, where possible in the lift well; or

b) be adequately protected against the action of fire for a period not less than that required for the structural fire protection of the fire-fighting shaft; or

c) be classified as CWZ in accordance with BS 6387:1994 and, where applicable, also meet the requirements of BS 7846:2000, Annex L relating to cables of a diameter exceeding 20 mm.

NOTE A standard giving requirements for fire safety cables, BS 7346-6, is currently in preparation.

Any electrical substation, distribution board, generator, hydraulic pump or other apparatus which supplies or transmits power to the fire-fighting lift installation, or any equipment associated with the fire-fighting shaft (e.g. pressurization fans, pumps for fire mains, etc.), should be:

1) protected from the action of fire in the building for a period not less than that recommended for the enclosing structure of the fire-fighting shaft;

2) in accordance with the general principles of structural fire protection for a lift machinery space (see BS EN 81-1 and BS EN 81-2).

Lighting, lift and communication circuits and equipment should be safeguarded as appropriate to ensure that the failure, or cause of failure, of any one component of the installation does not lead to the failure of another component.

Cables other than those necessary for the operation of the fire-fighting lift (and any other lifts within the fire-fighting lift well) should be located outside the fire-fighting lift well, although within the fire-fighting shaft.

Smoke detection systems should conform to BS 5839-1.

### 14.3 Labelling of electrical supplies

An indication of the status of any of the following should be provided adjacent to the fire-fighting lift switch and duplicated in any fire control room:

a) the primary and secondary power supplies;

b) any powered ventilation or pressurization systems;

c) any pumps feeding fire mains.

All switchgear controlling supplies to the fire-fighting shaft and its ancillary equipment should be secured against unauthorized operation and clearly labelled "Fire-fighting shaft: do not switch off".

Additional warning labels should be provided, with their location and wording depending on whether the isolating protective device is fed from the live side or the dead side of the main isolating device.

1) If fed from the live side:

   i) the label on the isolating protective device for the fire-fighting shaft supply should read: "Warning: this supply remains live when the main switch is turned off"; and

   ii) a label should be placed on the main isolating device reading: "Warning: the fire-fighting shaft supply remains live when this switch is turned off".

2) If fed from the dead side, a label should be fixed to the main isolating device reading: "Warning: this switch also controls the supply to the fire-fighting shaft".

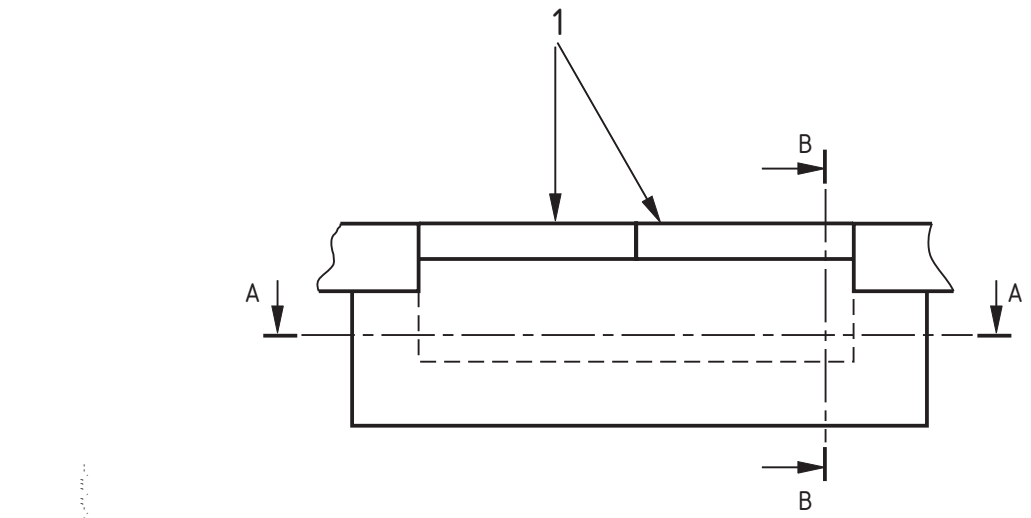
The indicators for power supplies should identify which system is supplying the fire-fighting shaft. The indicators for powered ventilation systems, pressurization systems and fire main pumps should indicate whether the equipment is in operation, and not merely whether it is energized.

## Annex A (informative)
## Typical arrangements to keep fire-fighting lift wells free from water

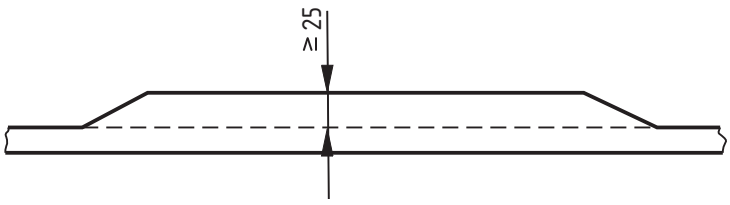
Examples of typical arrangements to keep fire-fighting lift wells free from water include:

— the use of a raised threshold to the lift entrance (see Figure A.1);
— the use of a drainage grid to the lift entrance (see Figure A.2);
— the use of a floor sloped away from the lift entrance (see Figure A.3).

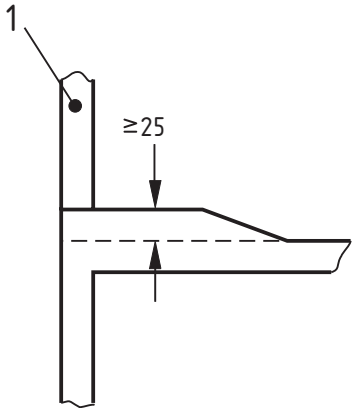
Dimensions in millimetres




a) Plan view




b) Section A–A

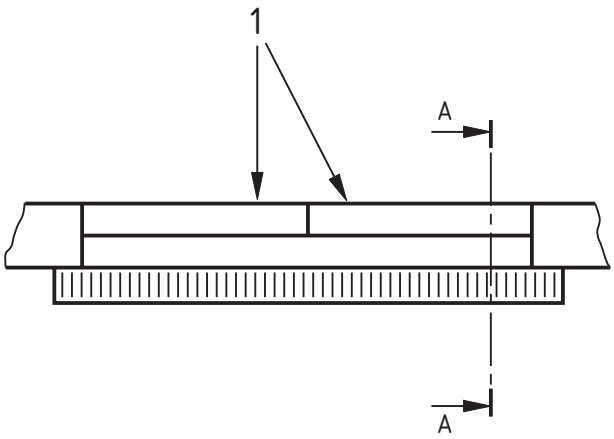



c) Section B–B

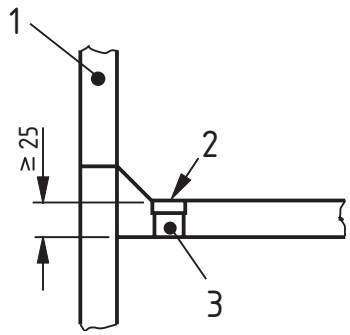
**Key**
1 Lift landing door

**Figure A.1 — Raised threshold to lift entrance**

Dimensions in millimetres




a) Plan view



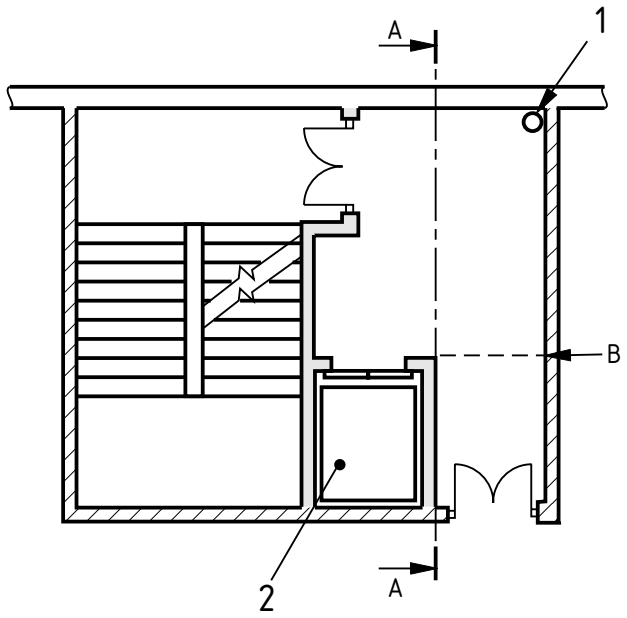

b) Section A–A

**Key**

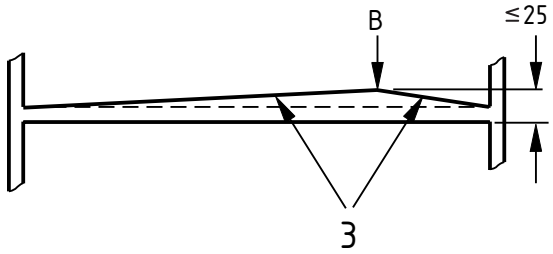
1 Lift landing door
2 Drainage grid
3 Gulley leading to drainpipe

**Figure A.2 — Drainage grid to lift entrance**

Dimensions in millimetres




a) Plan view




b) Section A–A

**Key**

1 Landing valve of fire main
2 Fire-fighting lift
3 Minimum fall 1:100

**Figure A.3 — Floor sloped away from lift entrance**

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[2)] In preparation.

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