

FIRE SERVICES EXAMINATIONS BOARD

STUDY NOTE

EXAMINATION	STATION OFFICERS' EXAMINATION
PAPER	FIRE SAFETY, EDUCATION AND ENFORCEMENT
SUBJECT	FIRE SAFETY RISK ASSESSMENT
ITEM	ACCESS AND FACILITIES FOR THE FIRE SERVICE
STUDY NOTE No.	3208

INTRODUCTION TO THE STUDY NOTE

This study note has been prepared as the basis of study in connection with the qualifying examinations for promotion.

Candidates will be expected to demonstrate knowledge of the information contained in the study note and understand how it should be applied:

The 'References' made at the end of the Study Note are included for information only and candidates will not be expected to study these as part of the bibliography.

ACCESS AND FACILITIES FOR THE FIRE SERVICE

1. Introduction

New buildings being designed and constructed and existing buildings being altered, are subject to regulations which require that a range of technical standards are complied with to ensure that the completed or refurbished building is fit for purpose and safe.

The regulations are supported by approved documents, which set out the detail that would satisfy compliance for a wide range of complex issues that could be involved in the design and construction of buildings.

Although the regulations and the 'approved documents' vary in England and Wales to those in Scotland, the principles behind the regulations are the same.

Fire Safety in Buildings is one of the areas supported by approved documents.

In England and Wales the approved document is 'Approved Document B' and comprises of:

- B1 - Means of warning and escape
- B2 - Internal Fire Spread (Linings)
- B3 - Internal Fire Spread (Structure)
- B4 - External Fire Spread
- B5 - Access and Facilities for the Fire Service.

In Scotland the approved document is the Technical Standards for Compliance of which the relevant parts are Part 'D' and Part 'E' and comprise:

- D2 - Fire resistance and non combustibility
- D6 - Distance of sides of buildings from boundaries.

- E2 - Means of escape from fire
- E6 - Internal fire spread
- E9 - Facilities for fire fighting
- E10 - Means of warning of fire.

Whilst the guidance appropriate to each of the above aspects is set out separately many of the provisions are closely interlinked and in practice therefore, all of the above guidance would be taken into account when considering the standard of provision required.

For the purposes of the examination however, the Study Note focuses on the general issues regarding Access for Firefighting; Fire Mains; Access for Firefighting Vehicles; and Venting of Heat and Smoke from Basements.

2. Access and Facilities for Firefighting

The approved documents describe standards for ensuring that:

- (a) There is sufficient external access to enable fire appliances to be brought near to the building for effective use;
- (b) There is sufficient means of access into , and within, the building for fire firefighting personnel to effect rescue and fight fire;
- (c) The building is provided with sufficient internal fire mains and other facilities to assist firefighters in their tasks; and
- (d) The building is provided with adequate means for venting heat and smoke from a fire in a basement.

3. Facilities Appropriate to a Specific Building

The extent to which the above arrangements and facilities are required will depend on the use and size of the building in so far as it affects the health and safety of the people in and around the building.

Generally speaking firefighters carry out the task of firefighting within the building, however:

- (a) In deep basements and tall buildings they need special access facilities equipped with fire mains and their fire appliances will need access to entry points near the fire mains.
- (b) In other buildings, the combination of personnel access facilities offered by the normal means of escape, and the ability to work from ladders and appliances on the perimeter will generally be adequate without special internal arrangements. Vehicle access may be needed to some or the entire perimeter, depending on the size of the building.
- (c) For dwellings and other small buildings, it is usually only necessary to ensure that the building is sufficiently close to a point accessible to fire brigade vehicles.
- (d) In taller blocks of flats, fire brigade personnel access facilities are needed within the building, although the high degree of compartmentation means that some simplification is possible compared to other tall buildings.

4. Access to Buildings for Fire Fighting Personnel

In low-rise buildings without deep basements, firefighter access and facility requirements will be met by a combination of the normal means of escape, the measures for vehicle access described in section 8 which facilitate ladder access to upper storeys and the provision of fire hydrants.

In other buildings the problems of reaching the fire, and working inside near the fire, necessitate the provision of additional facilities to avoid delay and to provide a sufficiently secure operating base to allow effective action to be taken.

These additional facilities which include Firefighting Stairs, a Protected Lobby and Fire Mains combined in a protected shaft are known as a Firefighting Shaft. Some Firefighting Shafts are required to have a Firefighting Lift in addition to the other facilities.

Typically, Firefighting Shafts are provided in the following circumstances:

- (a) Buildings with a floor more than 18m above fire service vehicle access level or with a basement more than 10m below fire service vehicle access level.
- (b) Buildings with a storey of 900m² or more in area, where the floor is at a height of more than 7.5m above fire service vehicle access level and belong to certain purpose groups for example:
 - (i) Shop and commercial;
 - (ii) Specific storage and non-residential buildings.
- (c) Buildings with two or more basement storeys, each one exceeding 900m² in area.

(Note: in Scotland, the requirement under paragraph (b) is with a storey of more than 900m² in area with no stipulated height. Paragraph (c) does not apply.)

If a firefighting shaft is required to serve a basement it need not also serve the upper floors unless they also qualify because of the height or size of the building. Similarly a shaft serving upper storeys need not serve a basement which is not large or deep enough to qualify in its own right. However a firefighting stair and any firefighting lift should serve all intermediate storeys between the highest and lowest storeys that they serve.

Because of the high degree of compartmentation in blocks of flats/ maisonettes, the provisions in this section may be modified.

5. Number of Firefighting Shafts

The number of firefighting shafts required within a building is dependant upon the height of the storeys, the purpose group of the building and whether the building is provided with an automatic sprinkler system installed in accordance with the appropriate British Standard.

6. Design and Construction of Firefighting Shafts

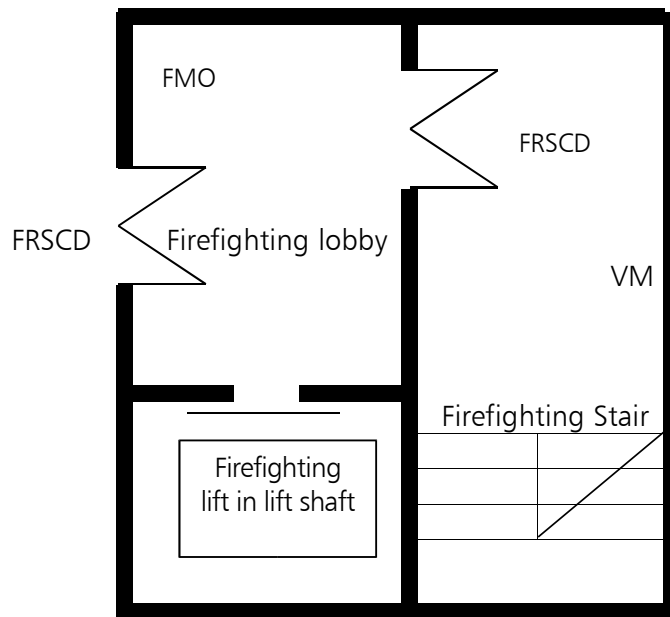
Firefighting shafts should be designed, constructed and installed in accordance with the relevant British Standard for firefighting stairs and lifts in respect of their planning and construction; lift installation and electrical services.

In general a firefighting shaft must have:

- (a) Fire resistance;
- (b) Suitable provision for the control of smoke; and
- (c) A fire main.

Diagram A below shows a typical arrangement for a firefighting shaft. The diagram illustrates the basic components of a firefighting shaft only. It does not infer that this is the only acceptable layout.

Diagram A



Key	
FRSCD	Fire Resisting Self Closing Door
—	Compartment Wall Construction
FMO	Fire Main Outlet
VM	Ventilation Measures

7. Fire Mains

Fire Mains are installed in a building and equipped with valves etc so that the fire service may connect hoses for water to fight fires inside the building.

(a) Types of Fire Main

- (i) Rising Fire Mains serve floors above ground, or upwards from the level at which the fire service gain access (called the fire service vehicle access level) if this is not ground level.
- (ii) Falling Fire Mains serve levels below the fire service vehicle access level.

Fire Mains may be 'Dry Rising Mains' which are normally empty and are supplied through hose from a fire service pumping-appliance. Alternately they may be 'Wet Rising Mains' where they are kept full of water and supplied from tanks and pumps in the building. There should be a facility to allow a wet system to be replenished from a pumping appliance in an emergency.

(b) Provision of Fire Mains

- (i) 'Wet Rising Mains' should be provided in buildings with a floor at more than 60m above fire service vehicle access level.
- (ii) In lower buildings where fire mains are provided, either wet or dry rising mains are suitable.

(c) Number and Location of Fire Mains

- (i) There should be one Fire Main in every firefighting shaft.
- (ii) The outlets from Fire Mains in firefighting shafts should be sited in each firefighting lobby giving access to the accommodation.
- (iii) In the case of a building fitted with 'Dry Rising Mains', there should be access for a pumping appliance to within 18m of each Fire Main inlet connection point. The inlet should be visible from the appliance.
- (iv) In the case of a building fitted with 'Wet Rising Mains', the pumping appliance access should be to within 18m and within sight of, a suitable entrance giving access to the main, and in sight of the inlet for the emergency replenishment of the suction tank for the main.

(d) Design and Construction of Fire Mains

Guidance on other aspects of the design and construction of fire mains not included above is contained in the appropriate British Standard.

8. Vehicle Access

Fire Brigade vehicle access to the exterior of a building is needed to enable high reach appliances such as turntable ladders, hydraulic platforms and aerial platform ladders to be used, and to enable pumping appliances to supply water and equipment for firefighting and rescue activities.

Generally the access requirement increases with building size and height.

When requirements are made for a building(s) for which plans have been deposited under Building Regulations or Standards, the requirements cannot relate to other than those buildings and cannot be applied to existing buildings on the site.

(a) Access to buildings not fitted with fire mains

Typically, the access requirements for Buildings not fitted with Fire Mains are as shown in Table 1 Below:

Table 1 - Fire Service Vehicle Access to Buildings not fitted with Fire Mains			
Total floor area of building m ² (1)	Height of floor of top storey above ground (m)	Provide vehicle access to: (2)	Type of appliance
Up to 2000	Up to 11 Over 11	Within 45m of entrance 15% of perimeter (3)	Pump Pump and High Reach
2000 - 8000	Up to 11 Over 11	15% of perimeter (3) 50% of perimeter (3)	Pump Pump and High Reach
8000 - 16000	Up to 11 Over 11	50% of perimeter (3) 50% of perimeter (3)	Pump Pump and High Reach
16000 - 24000	Up to 11 Over 11	75% of perimeter (3) 75% of perimeter (3)	Pump Pump and High Reach
Over 24000	Up to 11 Over 11	100% of perimeter (3) 100% of perimeter (3)	Pump Pump and High Reach

Notes to Table 1:

- (1) The total floor area is the aggregate of all floors in the building (in some authority areas it excludes basements).
- (2) Every elevation to which vehicle access is provided should have a suitable door, not less than 750mm wide, giving access to the interior of the building.
- (3) Perimeter is the maximum aggregate plan perimeter found by the vertical projection of any overhanging storey onto a ground storey.

The requirements vary for single dwellings and flats and maisonettes.

(b) Access to buildings fitted with fire mains

Pumping appliances need access to the perimeter at points near the mains, where firefighters can enter the building and where in the case of dry mains, a hose connection will be made from the appliance to pump water into the main.

- (i) In the case of a building fitted with 'Dry Rising Mains' there should be access for a pumping appliance to within 18m of each Fire Main inlet connection point. The inlet should be visible from the appliance.

(ii) In the case of a building fitted with 'Wet Rising Mains' the pumping appliance access should be to within 18m, and within sight of, a suitable entrance giving access to the main, and in sight of the inlet for the emergency replenishment of the suction tank for the main.

(c) Design of access routes and hard standings

A vehicle access route (where they are to be used by fire service vehicles) may be a road or other route which, including any manhole covers and the like, meets the standards in Table 2.

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

Notes to Table 2:

(1) Fire appliances are not standardised. Some fire services have appliances of greater weight or different size. In consultation with the Fire Authority, the Building Control Body may adopt other dimensions in such circumstances;

(2) 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 should not 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. Some Authorities require 24 tonne capacity for high reach appliances.

(d) Access for high reach fire appliances

Where access is required to an elevation for High Reach appliances, overhead obstructions such as cables and branches that would interfere with the setting of ladders etc, should be avoided.

The diagram below (Diagram B) shows a typical method for determining how the access and hard standing could be checked for a building requiring a High Reach appliance.

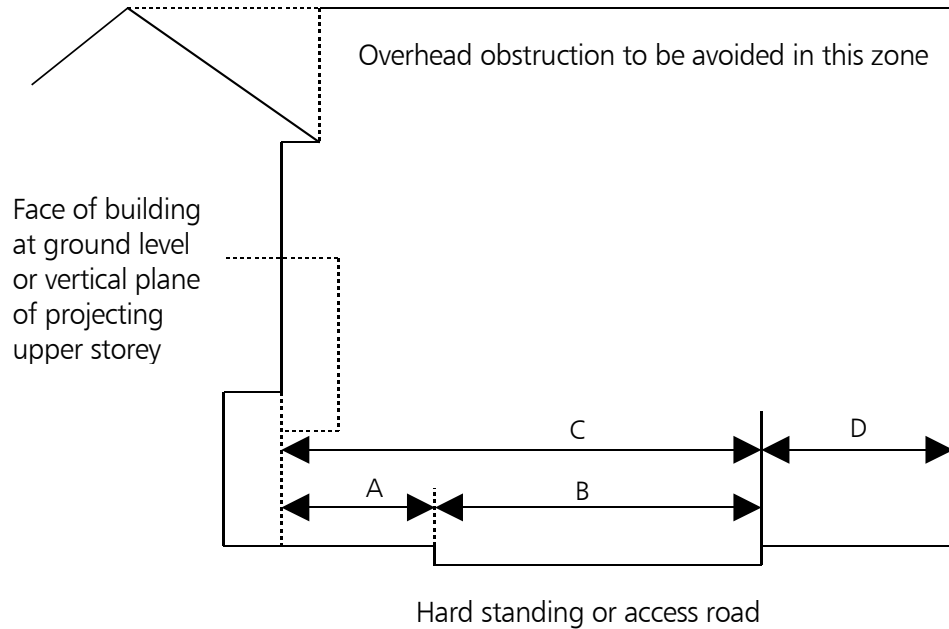


Diagram B - Relationship between building and hard standing/access roads for High Reach Fire Appliance	Type of appliance	
	Turntable ladder Dimension (m)	Hydraulic platform Dimension (m)
A. Maximum distance of near edge of hard standing from building	4.9	2.0
B. Minimum width of hard standing	5.0	5.5
C. Minimum distance of further edge of hard standing from building	10.0	7.5
D. Minimum width of unobstructed space (for swing of appliance platform)	NA	2.2

Notes on Diagram B:

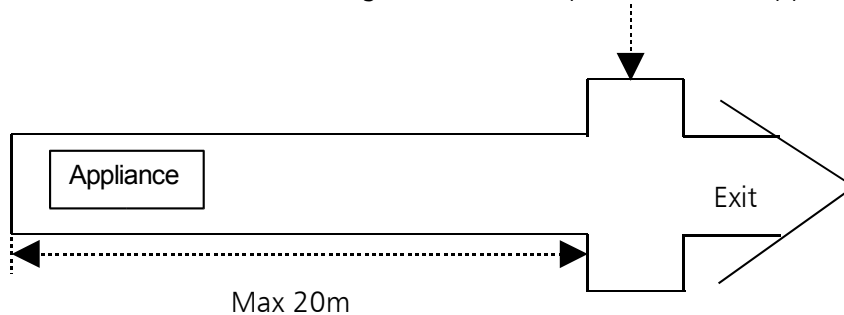
- (1) Hard standing for high reach appliances should be as level as possible and should not exceed a gradient of 1 in 12.
- (2) The hard standing should be capable of withstanding a point load of 8.3 kg/cm² to accommodate jacks.

(e) Appliance Turning Facilities

Turning facilities should be provided in any dead-end access route that is more than 20m long. This can be by a hammerhead or turning circle. (See Diagram C)

Diagram C

Hammerhead, turning circle or other point at which appliance can turn



9. Venting of Heat and Smoke from Basements

The build up of smoke and heat as a result of a fire can seriously inhibit the ability of the fire service to carry out rescue and firefighting operations in a basement. Providing facilities to make conditions tenable for firefighters can reduce the problem.

Smoke outlets (also referred to as smoke vents) provide a route for heat and 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)

(a) Provision of Smoke Outlets

Where practicable, each basement space should have one or more smoke outlets, but it is not always possible to do this where, for example, the basement is deep and the amount of external wall is restricted by adjoining buildings. It is therefore acceptable to vent spaces on the perimeter and allow other spaces to be vented indirectly by firefighters opening connecting doors. However if a basement is compartmented each compartment should have direct access to venting, without having to open doors, etc into another compartment.

Smoke outlets connected directly to the open air should be provided from every basement storey, except for the majority of dwelling houses and other small basements not more than 200m² or not more than 3m below the adjacent ground level. Some authorities accept a level of not more than 4.5m below the adjacent ground level.

Strong rooms need not be provided with smoke outlets.

Where basements have external doors or windows, the compartments containing the rooms with these doors or windows do not need smoke outlets. It is common for basements to be open to the air on one or more elevations. This may be the result of different ground levels on different sides of the building. It is also common in 18th and 19th century terraced housing where an area below street level is excavated at the front and/or rear of the terrace so that the lowest storey has ordinary windows, and sometimes an external door.

(b) Natural Smoke Outlets

Smoke outlets should be sited at high level, either in the ceiling or in the wall of the space they serve. They should be evenly distributed around the perimeter to discharge in the open air outside the building.

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

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

Outlets should not be placed where they would prevent the use of escape routes from the building.

(c) Mechanical Smoke Extract

A system of mechanical extraction 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 the principles of the relevant British Standard. (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.)

The extraction system should conform to the relevant British Standard for such systems and should come into operation automatically on activation of the sprinkler system; alternatively, activation may be by an automatic fire detection system which also conforms to the relevant British Standard.

(e) Construction of Outlet Ducts or Shafts

Outlet ducts or shafts, including any bulkheads over them should be enclosed in non-combustible construction having not less fire resistance than the element through which they pass.

Where there are natural smoke outlet shafts from different compartments of the same basement storey, or from different basement storeys, they should be separated from each other by non-combustible construction having not less fire resistance than the storey(s) they serve.

References

The Building Regulations 1991

Approved Document B, Department for the Environment, Transport, and the Regions (2000 edition)

The Technical Standards for Compliance with the Building Standards (Scotland) Regulations 1990 (as amended)