NEBOSH Fire Certificate Unit FC1

FIRE SAFETY AND RISK MANAGEMENT

ELEMENT 4: FIRE PROTECTION IN BUILDINGS

SAMPLE MATERIAL

(Material correct Autumn 2013)

nebosh Approved centre 335

RRC
27-37 St George's Road London SW19 4DS United Kingdom
T +44 (0)20 8944 3100 F +44 (0)20 8944 7099
info@rrc.co.uk www.rrc.co.uk Skype ID rrctraining

RRC TRAINING

Fire Protection and Prevention of Fire Spread Within Buildings

Key Information

- Fire safety requirements concerning structural features of buildings are contained in the **Building Regulations 2010** or **Building (Scotland) Act 2003**.
- The elements of structure are principally the main load-bearing elements of a building and have a significant influence on structural fire safety.
- The main requirements for fire resistance of elements of structure are resistance to collapse, integrity to prevent fire and smoke penetration, insulation to prevent transfer of excessive heat, and effective fire resistance of fire doors.
- Compartmentation inhibits spread of fire within buildings but needs to be supplemented with protection of openings in compartment walls and floors, and fire stopping of any gaps.
- Internal fire growth can be increased by building lining materials, and the fixtures, fittings and contents of the building; each of these elements should be considered individually in an attempt to minimise fire spread.
- External fire spread can be prevented by considering the construction of external walls and roofs, the distance between buildings, and the use or activities undertaken at the particular and surrounding premises.

Building Regulations 2010

Building construction has a major impact on the spread of fire; you will find fire safety requirements relating to structural features in the following building legislation (depending on locality):

- **Building Regulations 2010.**
- **Building Regulations (Northern Ireland) 2012.**
- **Building (Scotland) Act 2003** (and regulations made under it).

All have broadly similar provisions relating to fire safety.

The **Building Regulations 2010** apply to new buildings and alterations in England and Wales only, and are supported by a number of Approved Documents which give practical guidance on how to comply with the Regulations.

The **Building Regulations** and Approved Documents complement specific fire safety legislation which covers:

- General fire precautions – **Regulatory Reform (Fire Safety) Order 2005**.
- Process-related fire precautions – **Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR)**.

Where fire safety is concerned, the main relevant Approved Document is **Part B**, *Fire safety*, and is produced as:

- Volume 1 – Dwellinghouses.
- Volume 2 – Buildings other than Dwellinghouses.

Each deals with the same five major areas:

- Means of warning and escape, e.g. alarms, escape routes.
- Internal fire spread (linings), e.g. wall and ceiling linings.
- Internal fire spread (structure), e.g. compartmentation, fire-stopping.
- External fire spread, e.g. space separation, roof coverings.
- Access and facilities for the fire services, e.g. fire mains, vehicle access.

Approved Document Part M *Access to and Use of Buildings* covers access for the disabled.

BS 9999:2008 *Code of practice for fire safety in the design, management and use of buildings* gives recommendations and guidance on the design, management and use of buildings to achieve acceptable levels of fire safety for all people in and around buildings.

Elements of Structure

Elements of structure are principally the main structural load-bearing elements of a building with the addition of all compartment walls (which may or may not be load-bearing).

Planning and designing for fire safety

Jargon Buster

Elements of structure

Defined in Appendix E to Approved Document B as a(n):

- Member forming part of the structural frame of a building or any other beam or column.
- Load-bearing wall or load-bearing part of a wall.
- Floor.
- Gallery - a floor which is less than one-half of the area of the space into which it projects.
- External wall.
- Compartment wall - a fire-resisting wall (or floor) used to separate one fire compartment from another.

Elements of Structure – Properties for Fire Resistance

In Approved Document B, **fire resistance** is described as "*the ability to resist the effects of fire*".

For structural elements this includes:

- **Resistance to collapse:**
  - Maintenance of load-bearing capacity of load-bearing elements.
- **Fire and smoke penetration:**
  - Maintenance of element integrity to prevent passage of fire/smoke.
- **Transfer of excessive heat:**
  - Maintenance of insulation properties to prevent conduction of heat.
- **Resistance of fire doors:**
  - The period of time a door can successfully hold back the spread of fire.
  - Shown as a fire rating, e.g. a fire door with a 30 minute rating, which is the most commonly used in the UK, is shown as FD30.

Compartmentation

Compartmentation reduces the rate of fire spread and keeps fires relatively small by subdividing the building into smaller fire-resisting units using fire-resisting walls and floors.

The degree of compartmentation needed depends on factors such as:

- **Building use/fireload**, which determines the likelihood of a fire starting and its severity.
- **Building height** to the floor of the top storey, which affects ease of evacuation and access by the fire brigade.
- Presence of **sprinklers**, which may control and rapidly extinguish a developing fire.

There are situations where compartmentation is necessary:

- A **wall** common to two buildings.
- Parts of a building largely used for **different main purposes**, such as an office over a shop.
- Places of **special fire hazard** (switch rooms, boiler rooms - with enclosure in a fire-resisting structure).
- Storeys with **large floor areas** in non-residential buildings such as offices, shops and industrial premises.
- **High-rise buildings** with storey floors above 30 m above ground level (with each floor as a compartment floor).

Compartments should form a **complete barrier to fire**:

- No **gaps** between walls and floors to allow fire to spread between the compartments.
- Sufficient **fire resistance** of at least 30 minutes and sometimes considerably longer.

Special types of fire compartment construction are termed **protected shafts**, such as stairways and service shafts; walls/floors bounding such features must be made as compartment walls/floors.

Designing and building for fire safety

Openings in Compartmentation and Fire Stopping

Openings in compartment walls should be limited to:

- Doors - fire resistant, with typically at least 30 minutes integrity.
- Pipes, ventilation ducts, flues, chimneys, appliance ventilation ducts.
- Refuse chutes - non-combustible.
- Atria.
- Protected shafts.

These openings need to be protected where they pass through the fire compartment wall/floor, in order to maintain the fire resistance of the compartment. Measures include:

- For flues:
  - Flue walls are fire-resisting.
- For pipes:
  - Proprietary seal.
  - Fire-stopping around the pipe where it passes through the compartment.
  - Non-combustible sleeving around the pipe, used in conjunction with fire-stopping.

Jargon Buster

Fire-stopping

A seal to stop or restrict the progression of fire/smoke (but may need to allow for thermal expansion if necessary).

Fire-stopping materials include:

- Cement mortar.
- Gypsum-based plaster.
- Glass fibre.
- Ceramic/resin binder mixtures.
- Intumescent mastics (which expand on the application of heat/flame).

Topic Focus

Poor fire stopping leads to:

- Reduction in the level of fire resistance.
- Passage of heat and combustion products through the holes.
- Potential for fire to spread easily between the fire compartments.
- Potential for heat and combustion products to inhibit employees' escape.

Other reasons for reduced effectiveness of compartmentation in a building:

- Poorly maintained or badly fitting fire doors.
- Fire doors wedged open.
- Absence of, or damage to, intumescent seals.
- Absence of, or poorly maintained, shutters in ducting.
- Poorly fitting or damaged ceiling tiles in fire-resisting false ceilings.
- Absence of, or damage to, fire-resistant glazing.
- Absence of, or damage to, cavity barriers.

Concealed spaces/cavities, such as ceiling voids (e.g. above a suspended ceiling), roof/loft cavities and inside stud partition walls are an easy route for smoke/fire. The principal means of control is by use of **cavity barriers** which:

- Divide up a cavity to act as a barrier to progression of the fire.
- Must have at least 30 minutes' fire resistance.
- May contain openings, as described above for fire compartments.

Internal Fire Growth

The speed and significance of internal fire growth can be influenced by building and lining materials and the fixtures, fittings and contents of the building. These should all be considered individually when attempting to minimise fire spread.

Lining Materials

These are used to line partitions, walls, ceilings or other internal structures and should:

- Resist the spread of surface flame.
- Not have an unreasonable rate of fire growth and heat release.

Resistance to surface spread of flame is indicated by a class number, with:

- **0** being the highest rating for brickwork, concrete, ceramic tiles and plasterboard used in most circulating spaces and escape routes, and
- **3** being the lowest rating for timber, plywood, hardboard, glass reinforced polyester used in small rooms for non-residential accommodation.

Unprotected cellular plastic linings (for walls and ceilings) are a particular fire hazard and have been the subject of alerts issued by the Health and Safety Executive.

Topic Focus

For surface lining materials:

- The risk of fire spread and its growth depend on:
  - Ignitability.
  - Rates of surface flame spread and heat release.
  - Amount of smoke produced.
  - Propensity to produce flaming droplets.
- To minimise the risk from fire, surface lining materials should:
  - Resist ignition.
  - Have a low rate of surface flame spread and heat release limiting the amount of smoke produced and the rate of fire growth.
- Examples of low risk surface lining materials include:
  - Exposed blockwork.
  - Exposed brick work.
  - Mineral fibre board.
  - Woodwool slabs.
  - Plasterboard and skim.
  - Intumescent linings.

Fixtures, Fittings and Contents

Seating, workstations, furniture, floor coverings, curtains and blinds are usually made from carbonaceous material and/or plastics and will therefore contribute to internal fire growth if a fire breaks out unless treated to be flame retardant.

Preventing External Fire Spread

External Walls and Roofs and Distance Between Buildings

As well as being concerned about internal fire growth, fire resistance is also required for external walls and roofs to resist the spread of fire over the building itself and from one building to another.

The likelihood and consequences of fire spread **between buildings** depends on the:

- **Size** and **intensity** of the fire in the building concerned.
- **Distance** between the buildings.
- **Fire protection** given by their facing sides.
- **Risk to people** in the other building(s).

Requirements for **external walls** include:

- **Load-bearing** parts must always be fire-resisting - to maintain resistance to collapse.
- **Parts next to an external escape route** must have 30 minutes' fire resistance - to protect those escaping from fire inside the building.

External walls of **tall buildings** must always be fire resistant - regardless of distance to the boundary.

Non-load bearing external walls may have variable levels of fire resistance depending on the separation distance from the boundary:

- Less than 1 m - fire-resisting from both sides.
- Greater than 1 m - fire resistance on the inside surface.

Roof requirements include:

- Steep-angled roofs (more than 70° from the horizontal) are treated as external walls.
- Non-combustible roof coverings (natural slate) have no restrictions.
- Combustible roof coverings (thatch, wood shingles) must be at least 6 m from the boundary.

Use of Premises and Surrounding Premises

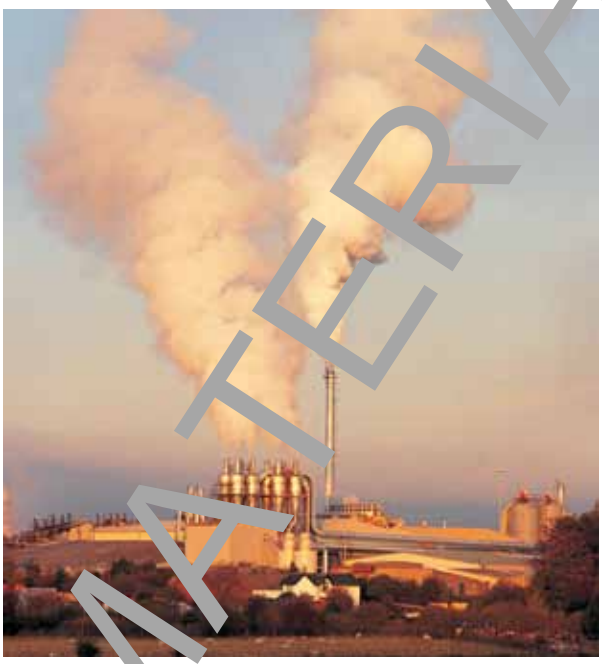
The use of the building or the Purpose Group that it falls into affects the degree of fire resistance required to prevent external fire spread. This use classification represents different levels of hazard:

- Premises used for office-type work - **Group 3**.
- Factories and other industrial premises used for manufacturing - **Group 6**.

Factors affecting Choice of Building Materials

In an ideal world, all buildings would be designed and constructed to give 100% fire resistance and zero risk of internal fire spread and growth. This is, however, unlikely to be technically feasible and would be costly and quite possibly unnecessary. A number of factors will influence the choice of building materials:

- The design, layout and size of the building - open plan, high rise or single storey.
- The intended use of the building - office use, explosives manufacture.
- Type of occupancy - vulnerable persons, hospital with immobile patients.
- The fire properties of proposed materials - ignitability, flammability, fire resistance, speed of smoke spread and behaviour in fire.
- Cost and availability.



A building's use affects its Purpose Group classification

Topic Focus

Fire can spread **externally** between buildings by:

- Flame spread.
- Radiated heat.
- Burning brands and embers.
- Effect of wind.

Methods of **minimising** external fire spread between buildings:

- Adequate distance between buildings.
- External walls constructed from material that prevents or reduces the risk of ignition from an external source and limits the surface spread of fire.
- Roof coverings that offer fire protection to increase their resistance to radiated heat and burning embers.
- Limiting the number of openings in adjacent buildings to reduce the amount of thermal radiation that can pass through the wall and affect the neighbouring building.
- Provision of external drenchers to protect nearby buildings from radiated heat.

Revision Questions

1. What is meant by an "element of structure" in relation to buildings?
2. What do you understand by the term "fire resistance" in relation to structural elements?
3. What is "fire-stopping"? What measures might be taken to preserve the fire resistance of a compartment wall where a water pipe passes through it?

(Suggested Answers are at the end of Unit FC1.)

Means of Escape

Key Information

- The means of escape provides an accessible, well lit, signed route, protected from fire and smoke, which allows people to escape to a place of safety outside the building.
- For effective means of escape there should be alternative escape routes, adequate travel distances and an appropriate number and size of escape routes for the number of occupants in the building.
- Other elements of the means of escape include escape stairs, passageways and doors, suitable protection, emergency lighting, escape lighting and signage, design for progressive horizontal evacuation, and provision of a final exit to a place of safety.
- Maintenance, inspection and testing is required to manage the effectiveness of the means of escape.
- Vulnerable people and people with disabilities or mobility problems may need the use of evacuation lifts and refuges, graphic, aural and tactile way-finding and exit sign systems, and also personal emergency evacuation plans (PEEP).

Jargon Buster

Means of escape

"*Structural means whereby [in the event of fire] a safe route or routes is or are provided for persons to travel from any point in a building to a place of safety*". (Approved Document B)

Place of safety

"*A safe area beyond the premises*". (Regulatory Reform (Fire Safety) Order 2005)

A **means of escape**:

- Is part of the **structure** of the building.
- Provides an **accessible, well lit, signed** route.
- Has fire and smoke **removed/restricted** for long enough to allow escape to a **place of safety**:
  - Outside the building.
  - Beyond a final exit.
  - Far enough away from the building so that a person is no longer at significant risk of harm from fire.

Principles of Means of Escape and General Requirements

Approved Document B describes principles for the design of means of escape.

Normally **alternative means of escape** should be provided. However, it is not always possible to get directly to an **ultimate place of safety** (i.e. outside the building through a final exit) within a reasonable time/distance.

In such circumstances, buildings should be designed so that people can get to a **place of relative safety** (e.g. protected stairway, protected corridor, storey exit) on a route to a final exit, within a reasonable distance.

For the first part of the journey the escaping person will initially travel through an unprotected area, and then through a protected area for the remainder.

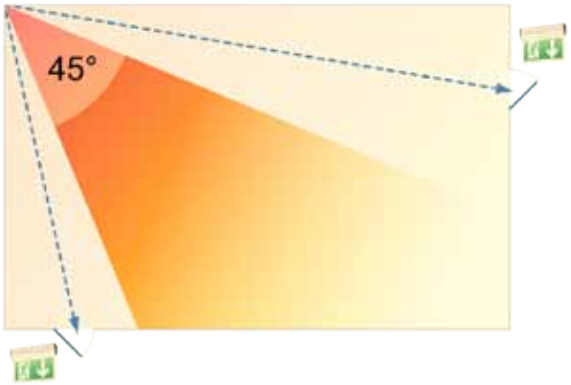
The initial unprotected area should be as short as possible.

Lifts (except evacuation lifts for disabled people), portable ladders, throw-out ladders, fold-down ladders, chutes and the like are not acceptable means of escape.

Alternative Escape Routes

These should be:

- Available so that a person can escape from anywhere in the building, even if the first choice route turns out to be impassable.
- In directions at least 45° apart from any point in the room to prevent blocking by the same fire.



Acceptable Alternative Escape Routes

Dead-end corridors are not normally acceptable.

Maximum Travel Distances

Jargon Buster

Maximum travel distance

"The actual distance to be travelled by a person from any point within the floor area to the nearest storey exit, having regard to the layout of walls, partitions and fittings." (Approved Document B)

Storey exit

"A final exit, or a doorway giving direct access into a protected stairway, firefighting lobby, or external escape route". (Approved Document B)

The **maximum travel distance** depends on the level of fire risk:

- How many escape routes are provided.
- The building use.

The following table gives illustrative examples for **horizontal escape** (i.e. travel within a storey).

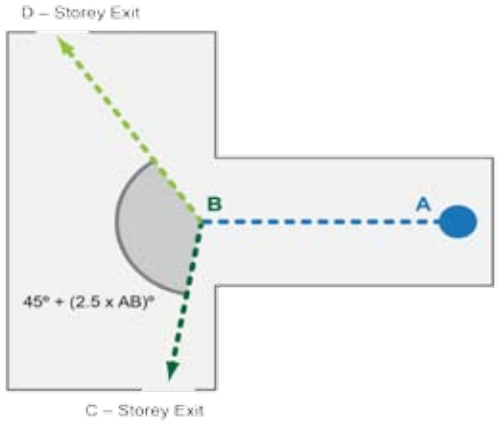
Maximum Travel Distance for Horizontal Escape

Building use	Maximum travel distance to the nearest exit where escape in one direction only provided (m)	Maximum travel distance to the nearest exit where escape in more than one direction provided (m)
Industrial – normal risk	25	45
Industrial – high risk	12	25
Shop and commercial	18	45
Office	18	45

Note: The maximum travel distances are to the **nearest exit**. Any other exits can be further away.

For **dead-ends**:

- The total travel distance to the storey exit (ABC or ABD) should not exceed the guidance figure for "more than one direction".
- The maximum dead-end travel distance (AB) should also not exceed the "one direction only" figure.



"Dead-End" Escape Routes

Number and Size of Escape Routes for Number of Occupants

The greater the number of persons on the premises, the more escape routes are needed.

For **known occupancy**, Approved Document B gives the following guidelines on escape routes/exits:

Number of Escape Routes Per Occupancy

Maximum number of persons	Minimum number of escape routes/exits
60	1
600	2
>600	3

For **unknown occupancy** the number of persons on the premises can be estimated by dividing the floor area by a "floor space factor" discounting stairs, lifts and toilets from the calculation. The floor space factor is simply a figure of roughly how much floor space each person needs in a given area and some examples are given below:

Example Floor Space Factors

Area type	Floor space factor (m^2/ person)
Public bars without seating	0.3
Amusement arcade, assembly hall, bingo hall, club	0.5
Factory production area	5.0
Office	6.0
Warehouse	30.0

Example

In an office area of 600 m^2 with a floor space factor of 6.0 m^2/person the estimated capacity would be 600/6.0 = **100 people.**

From the earlier table (**Number of Escape Routes Per Occupancy**) a maximum number of 100 persons would need a minimum number of two escape routes.

Occupancy also determines the **minimum width** required for each escape route and exit:

- 750 mm for up to 50 people.
- 850 mm for up to 110 people.

The minimum width is greater for areas accessible to disabled people.

An existing exit width will therefore determine the **exit capacity** for that route.

For example, **3 exits**, each **850 mm wide**, will give a total exit capacity of **330 people**.

Requirements for Escape Stairs

So far we have looked at horizontal escape. In a multi-storey building, we also need to consider vertical means of escape using escape stairs.

The **number** of escape stairs required depends on:

- The constraints imposed by the requirements for horizontal escape routes to keep within maximum travel distances.
- Whether independent stairs are required in a mixed occupancy building where there are very different use areas with very different fire risks.
- Whether a single stair is acceptable. For example, if independent stairs are not required (see above), basements and small premises which fulfil certain conditions are permitted to have a single stair.
- Provision of adequate width for escape providing for enough total exit capacity.
- Whether the stairs also need to serve as fire-fighting stairs used in larger buildings by the fire brigade.

The **width** of escape stairs depends on:

- The exits which lead to them (of equal width).
- The likely number of people using the stairs in a fire emergency.
- The number of floors served.
- The type of evacuation (phased versus simultaneous).

Also escape stairs should not:

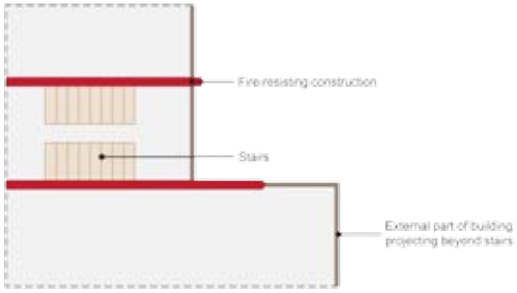
- Be wider than 1400 mm (for stairs with a descent of 3 m or more), unless fitted with a central handrail to ensure full use of the available width.
- Reduce in width at any point on the way to the final exit to create a bottleneck.
- Be less than 1000 mm wide (although some circumstances may allow 800 mm).

Internal Escape Stairs

So that an adequate level of fire protection for internal escape stairs is achieved there are the following requirements:

- **Enclosure** - internal escape stairs should generally be protected within a fire-resisting enclosure.
- **Protected lobby/protected corridor/smoke control system** – may be necessary as additional protection where:
  - There is only a single stairway serving a multi-storey building.
  - Phased evacuation systems are in operation.
- **Discharge to final exit** – or to a protected exit passageway leading to a final exit.
- **Adjoining (protected) stairways** - need to be separated by an enclosure.
- **Use of space** – kept free of all sources of ignition and fuel.
- **External walls** – may need additional protection as shown below:
  - The stairwell is situated at an "internal corner"

of the building façade with part of the building projecting beyond it.
  - A fire in the projecting part may make the stairs unusable.
  - Fire protection of the side wall of the stairwell should therefore be continued for at least 1800 mm into the external wall of the adjacent projecting façade.



Extended Side Wall Protection of Protected Stairways

- **Gas service pipes** - should not normally be incorporated into a protected stairway.

Basement Escape Stairs

These are more likely to be filled with smoke:

- A stairway forming a single escape route from upper storeys must not continue on down into the basement.
- The basement stairway should be separate (protected lobby/corridor) from the upper storey escape route.

External Escape Stairs

These are allowed provided there is at least one external escape stair to escape from every part of each storey.

In areas accessible to the public:

- Doors giving access to external escape stairs must be fire-resisting and self-closing.
- The adjacent external wall of the building must be fire-resisting.
- Weather protection must be provided if more than 6 m in vertical height.

Passageways/Corridors and Doors

Passageways, corridors and doors along escape routes should meet the following requirements:

- **Openings** into rooms off escape corridors should be fitted with doors (these do not need to be fire doors).
- **Headroom** should be at least 2 m (though door frames can project below this height).
- **Floor surfaces** (including stair treads) should be chosen to minimise slipperiness when wet.
- **Ramps** should be designed to comply with requirements for access for disabled people.
- **Slopes** should not be greater than 35° to the horizontal.
- **Final exits** should be:
  - At least as wide as the minimum required for the escape routes that lead to them.
  - Sited to aid rapid escape away from the vicinity of the building, e.g. straight onto a street.
- Any **doors** along the escape route should:
  - Be easily opened.
  - Open in the direction of escape and to at least 90°.
  - Be fitted with vision panels.
  - Not be revolving, turnstiles or automatic.

Protection of Escape Routes

Corridors must have fire-resistant walls and self-closing fire doors in the following circumstances:

- Corridors serving a bedroom.
- Most dead-end corridors where escape is in only one direction.
- Most corridors common to two or more different occupancies.

Where an escape route needs to be enclosed by a fire-resistant construction 30 minutes' fire resistance is generally adequate.

Topic Focus

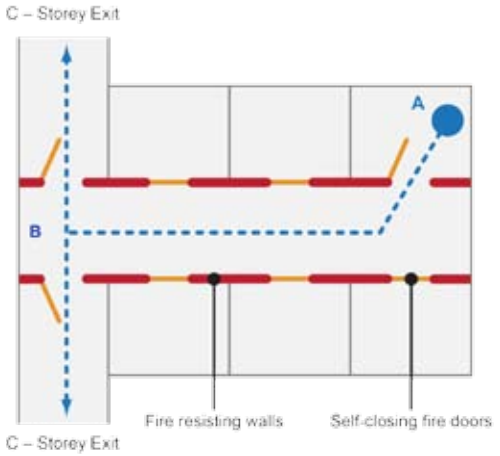
Items that **should not be located** on protected routes:

- Heaters, either portable, gas supplied or with naked flames.
- Cooking appliances.
- Upholstered furniture.
- Coat racks.
- Electrical equipment.
- Lighting using naked flames.
- Gas boilers, pipes or meters.
- Unprotected notice boards and display materials.
- Open shelving with documents.

Fire doors have a minimum fire resistance of 30 minutes' integrity and resist the passage of smoke.

Where a corridor (more than 12 m long) **connects two or more storey exits** it needs to be subdivided by self-closing fire doors to prevent being blocked by smoke.

Similarly **dead-end corridors** must be fire protected. Where the dead-end exceeds 4.5 m in length, it must be separated from the main corridor with **self-closing fire doors** to stop smoke cutting off both alternatives illustrated in the following figure.



Dead-End and Main Corridors

Fire-Resistant Doors

Fire-resistant doors prevent the spread of fire and smoke, protect the means of escape and segregate areas of special risk.

Fire resistance must be complete across the door assembly and all components including door seals and glazing, must be capable of achieving this.

The fire door must be correctly fitted to the corridor or protected stairwell and this requires that the:

- Frame be of the correct size and material, and installed correctly.
- Gaps between the frame and wall are correctly filled.
- Correct intumescent seals are used.
- Vision panels are correctly framed and glazed.
- Correct closer is fitted.

Topic Focus

Features of a **fire-resisting door set**:

- The door is fitted with:
  - Three hinges to maintain integrity.
  - A positive self-closing device.
  - A "keep closed" sign at eye level.
  - Intumescent strips and smoke seals to prevent the passage of combustion products.
- The door provides a good fit for the frame and closes correctly.
- If the door contains a window it is made from Georgian wire or insulated glass.

Fire doors should be regularly **inspected and maintained** to ensure their continued effectiveness, particularly to check that:

- The door closes effectively from any angle of opening using only the door closer.
- There are no foreign bodies or other objects obstructing the door.
- Any smoke seals are correctly fitted and undamaged.
- The door has not dropped on its hinges.
- The door closing arm is effective.
- Glazing is secure and intact.
- Door hold-open devices are working effectively.
- Doors are not wedged open.

Fire doors may not provide the required fire resistance if they:

- Have been incorrectly specified - excessively large gaps around the frame or at the bottom of the door which will allow smoke and fire penetration.
- Are inappropriately used - blocking fire doors open will allow the fire to travel past the fire barrier in which the door is placed.

Topic Focus

A fire-resisting door **may not provide adequate protection** in the event of a fire because:

- The door is wedged open, possibly with a fire extinguisher.
- A gap exists around the door frame due to incorrect specification or poor fitting.
- Smoke seals are damaged or the intumescent strips have been removed.
- Glazing is damaged or has been replaced with glass of inadequate fire resistance.
- The door is warped or does not close properly due to an obstruction or a damaged closure.
- Fire integrity of the door has been reduced following unauthorised and poor alteration work.
- Door hinges have failed through incorrect installation, poor workmanship and lack of maintenance.
- The door has been repeatedly painted with solvent-based paints.

Emergency Escape Lighting

Emergency escape lighting is independent of the main lighting and activated by battery power when the main lighting fails. Batteries are kept on permanent charge under normal conditions and are typically designed to last at least an hour. Lighting supplying escape stairs should be on a separate circuit from any other escape route lighting.

Escape lighting is required in escape routes in workplaces in:

- Underground/windowless areas.
- Internal corridors more than 30 m long.
- Open-plan areas more than 60 m^2.
- Most stairways.

Emergency lighting should:

- Provide enough light to allow people to move along the route.
- Clearly indicate the escape route itself.
- Allow for easy location of fire call points.

Emergency Escape Signage

Signs should clearly indicate the escape route.

Escape route signs have white pictograms on a green background (**Health and Safety (Safety Signs and Signals) Regulations 1996**) and are placed on doors, exits and escape routes. Text may be used to supplement the signs.

Examples are:

Emergency Escape Signs

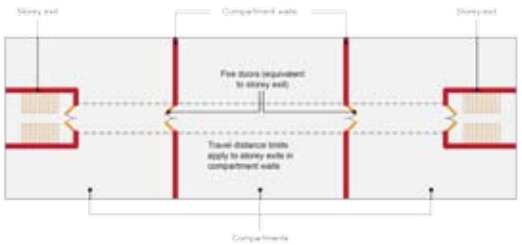
Progressive Horizontal Evacuation

Here evacuation is progressive to adjoining compartments on the same horizontal level and it enables evacuation to a place of relative safety.

It is used in places such as residential care homes and hospitals where it would be difficult to evacuate patients to an ultimate place of safety in one move.

Further evacuation to the ultimate place of safety can take place if it should prove to be necessary.

The following figure shows a suitable design (adapted from Approved Document B).



Progressive Horizontal Evacuation

Final Exit to a Place of Safety

The purpose of the means of escape is:

- To provide an accessible, well lit/signed route where fire/smoke are removed/restricted,
- For long enough to allow escape beyond a final exit,
- To a place outside the building which is sufficiently far away from the building that a person is no longer at significant risk of harm.

How to get to a place of safety

Management Actions to Maintain Means of Escape

To be effective the physical means of escape must be actively maintained to avoid:

- Fire doors left wedged open.
- Corridors and exits blocked with furniture.
- Fire exits left locked/chained.
- Combustibles stored under stairs.
- Failed emergency lighting.
- Damaged wall/ceiling linings.

There are many other examples which might compromise fire integrity.

It is therefore important to have a proactive **maintenance**, **testing** and **inspection** routine as required, such as:

- Weekly/monthly checks of emergency lighting.
- Annual full system checks.
- Regular inspections of escape routes to check such things as:
  - Housekeeping.
  - Unobstructed routes.
  - Proper closing of fire doors.
  - Adequate signage.

Any deficiencies found should be dealt with promptly.

Escape Requirements for Vulnerable People/Those With Disabilities

Jargon Buster

Vulnerable person

Commonly defined as:

- Elderly persons (over 60).
- Children under 10 years of age.
- Mentally or physically impaired persons.
- Those who are mentally ill or depressed.
- Persons on medication.
- Known substance abusers (alcohol or drugs).

Disability

Includes impairment to:

- Hearing.
- Vision.
- Mobility.

Access requirements for disabled people may mean that minimum dimensions given for exits and corridors have to be increased, and extra room may be needed in a corridor to turn a wheelchair into the exit doorway.

Safe evacuation of disabled people requires a combination of building structural design elements as well as procedural measures. Additional measures which may be required to take account of people with disabilities are:

- **Evacuation lifts:**
  - Specifically for the use of disabled people during an emergency.
  - Designed to maintain operation during such an emergency (whereas normal lifts are not).

  - Fitted with an override control inside the car so that a person inside can take control of the lift and take it to the floor from which disabled people need to be evacuated.
- **Refuges:**
  - Fire-protected areas which offer **temporary** relative safety, until full evacuation if it should be necessary.
  - Useful where a disabled person has to wait for help for full evacuation (such as to negotiate stairs) or needs to rest.
  - Generally located on each storey, within an enclosure (e.g. compartment or protected stairwell/lobby/corridor) and close to an evacuation lift.
- **Graphical escape route signage**: supplemented with that specifically designed to help people with disabilities, e.g. "wheelchair" pictogram, clearly indicating the route for disabled people.
- **Tactile emergency exit signs**: with both the words and pictograms in relief and supplemented with Braille text.
- **Continuous handrails/use of strongly contrasting colours**: can help people with visual impairment but who retain some sight.
- **Tactile route maps** and **indications of facilities** (ramps/stairs): help recognition of building layout.
- **Audible way-finding systems**: sound localisatio systems.
- **Personal Emergency Evacuation Plans** (EEP): specific to the individual with the disabi who may need:
  - To go to a particular location, such s a efuge or evacuation lift.
  - Particular means of being a tte to a ti e, such as visual strobes and trembler ala s/pagers.
  - Help from specific individuals during he evacuation (e.g. buddy system).

Revision Questions

4. Define a "means of escape".
5. Under what circumstances might you need a protected lobby as additional protection for internal escape stairs?
6. What is meant by "progressive horizontal evacuation" and under what circumstances might it be used?

(Suggested Answers are at the end of Unit FC1.)