52 Avenue Road





Building Services Engineers + Environmental Design Consultants + Fire Engineers + Lighting Designers atelierten.com

FIRE STRATEGY REPORT

MAY, 2022

PROJECT INFORMATION

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PREPARED

PREPARED BY:	JONATHAN LIU
SIGNED:	
DATE:	12.01.2022

CHECKED

CHECKED BY:	SCOTT HALL
SIGNED:	
DATE:	12.01.2022

APPROVED

APPROVED BY:	SCOTT HALL
SIGNED:	
DATE:	12.01.2022

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ATELIER TEN

226 West George Street Glasgow G2 2PQ T +44 (0) 141 333 0499



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1.0 Executive Summary

This fire strategy report has been produced by Atelier Ten for 52 Avenue Road which consists of town houses and a health and wellbeing centre.

Fire Safety Goals: The main section of legislation that drives the fire safety requirements for this project is the Building Regulations for which Approved Document B provides guidance for.

Means of Escape: Means of escape is afforded by the single escape stair and an evacuation lift for each town house and two escape stairs for the health and wellbeing centre at basement level.

The town house basement level shares the single escape stair for evacuation.

Automatic Fire Detection: The automatic detection system installed in this building is category LD2.

Fire Resistance: The required fire resistance (FR) for the structure is 30 mins in the case of three storey dwellinghouses with an upper storey height of up to 11 m, increased to 60 minutes minimum for compartment walls separating buildings.

Access and Facilities for the Fire Service: As the existing site is in a built-up area the fire service access to the site is already established and it is not proposed to alter the current arrangements. There are buildings that exceed 45 m from the pumping appliance with the current site layout which will need addressing as the design progresses.

1.1 Scope and objective

- This report considers a single point of ignition. Wilful fire-raising involving accelerants or multiple ignition sources is not considered in this assessment as it is outside the scope of Approved Document B.
- The data, methodologies, calculations and conclusions documented within this report specifically relate to the building and must not be used for any other purpose.
- The documentation that forms the basis for this report is listed within Section 2.1.
- This report has been prepared based upon information provided by others. Atelier Ten has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated into this report as a result.

1.2 Project Review

Avenue Rd involves the development of new town houses and a basement level health and wellbeing centre only accessible to staff and the residents of the new town houses.

1.3 Recommendations

The information contained within this fire strategy details the minimum level of fire safety required to meet the Mandatory Standards of Approved Document B 2019. We would always recommend that the level of fire safety be enhanced beyond the minimum standards where practical. This can generally be achieved by implementing the following fire safety measures:

- property protection perspective.
- Enhanced detection systems Both selection of detection system and location of detectors can be critical in alerting occupants to a fire in the building. Enhancing the detection system can result in earlier detection and a faster evacuation of occupants.
- Additional fire separation Additional fire separation (both active and passive) to areas, such as stores and comms rooms etc, can reduce the fire load in a building and can assist with limiting fire and smoke spread beyond the area of fire origin.
- Enhanced management strategy A well prepared and regularly reviewed management in use strategy – above the minimum level required by the Fire Scotland Act – can result in a more efficient evacuation and can offer better assistance to occupants requiring assistance to evacuate.

2.0 Method of Compliance

The current Building Regulations contain requirements for fire safety of buildings which are described in a number of published guidance documents:

- Approved Document B general guidance applicable to the majority of simple buildings;
- BS: 7974 guidance relevant to fire engineering principles for buildings.
- BS: 9991 Fire safety in the design, management and use of residential buildings – Code of practice

However as noted in Approved Document B Fire Engineering can provide an alternative approach to fire safety. The documents quoted in Approved Document B go on to say that "A fire engineering approach will take the total fire safety needs of the building into account. It can provide a more holistic and economic solution than can be achieved by a more prescriptive approach".

2.1 Design Information

This report was based upon DOMVS London.

TABLE 2-1: DRAWING INFORMATION DRAWING TITLE

PROPOSED GROUND FLOO

PROPOSED TOWN HOUSE

PROPOSED TOWN HOUSE ROOF

EAST BUILDING PROPOSED

WEST BUILDING PROPOSEI UNIT SCHEME

THE PAVILION PROPOSED UNIT SCHEME



This report was based upon the following drawing and design information provided by

ATION		
	DRAWING NO.	DATE
DR PLAN	208-255A	-
PLANS LGF-GF-FF-SF	SK1019L	-
PLANS BASEMENT &	SK1020C	-
D ELEVATIONS - 12	208-273B	-
D ELEVATIONS - 12	208-272B	-
ELEVATIONS - 12	208-274B	-

3.0 Means of Warning and Escape

The requirements outlined in Approved Document B for Escape state;

B1

• The building shall be designed and constructed so that there are appropriate provisions for the early warning of fire, and appropriate means of escape in case of fire from the building to a place of safety outside the building capable of being safely and effectively used at all material times.

In the Secretary of State's view, the Requirement of B1 will be met if:

- There are sufficient means for giving early warning of fire to people in the • building.
- All people can escape to a place of safety without external assistance.
- Escape routes are suitably located, sufficient in number and of adequate capacity.
- Where necessary, escape routes are sufficiently protected from the effects of fire and smoke.
- Escape routes are adequately lit and exits are suitably signed.
- There are appropriate provisions to limit the ingress of smoke to the escape routes, or to restrict the spread of fire and remove smoke.
- For buildings containing flats, there are appropriate provisions to support a stay put evacuation strategy.

3.1 Fire Alarm and Detection – Dwellinghouses

The installation of smoke alarms, or automatic fire detection and alarm systems can significantly increase the level of safety by automatically giving an early warning of fire.

All dwellings should have a fire detection and alarm system, minimum Grade D2 Category LD2 standard, in accordance with the relevant recommendations of BS 5839-6.

Smoke alarms should be mains operated and conform to BS EN 14604.

Heat alarms should be mains operated and conform to BS 5446-2.

Smoke and heat alarms should have a standby power supply, such as a battery (rechargeable or non-rechargeable) or capacitor. More information on power supplies is given in clause 15 of BS 5839-6.

Performance requirements for fire alarm system:

- Dwellings Category LD2 to BS 5839: Part 6
- Assembly Category L2

Means of Escape – Dwelling Houses 3.2

3.2.1 Escape from The Ground Storey

All habitable rooms (excluding kitchens) should have either of the following.

- An opening directly onto a hall leading to a final exit.
- An emergency escape window or door.

The design achieves this provision.

3.2.2 Escape from Dwelling houses With One Storey More Than 4.5 m **Above Ground Level**

This is an assumption as the building height is still to be confirmed.

The dwelling house should have either of the following.

- a. Protected stairway a stair separated by fire resisting construction (minimum REI 30) at all storeys, that complies with one of the following.
 - Extends to a final exit.
 - Gives access to a minimum of two ground level final exits that are ii. separated from each other by fire resisting construction (minimum REI 30) and fire doorsets (minimum E 20).

Cavity barriers or a fire resisting ceiling (minimum El 30) should be provided above a protected stairway enclosure.

b. Alternative escape route – a top storey separated from lower storeys by fire resisting construction (minimum REI 30) and with an alternative escape route leading to its own final exit.

The deign achieves the provision for a protected stairway extending to a final exit.

3.2.3 Passenger Lifts

A passenger lift serving any storey more than 4.5 m above ground level should be in either of the following.

- The enclosure to the protected stairway.
- A fire resisting lift shaft (minimum REI 30).

The design meets the provision for a fire resisting lift shaft.

3.2.4 Air Circulation Systems

All of the following precautions should be taken to avoid the spread of smoke and fire to the protected stairway.

- Transfer grilles should not be fitted in any wall, door, floor or ceiling of the stair enclosure.
- Any duct passing through the stair enclosure should be rigid steel. Joints between the ductwork and stair enclosure should be fire-stopped.
- Ventilation ducts supplying or extracting air directly to or from a protected stairway should not serve other areas as well.
- · Any system of mechanical ventilation which recirculates air and which serves both the stair and other areas should be designed to shut down on the detection of smoke within the system.
- For ducted warm air heating systems, a room thermostat should be sited in the living room. It should be mounted at a height between 1,370 mm and 1,830 mm above the floor. The maximum setting should be 27°C.

3.2.5 Emergency Escape Windows and External Doors

following.

- the following.
- A minimum area of 0.33 m².
- floor.

- Windows should be capable of remaining open without being held.

3.2.6 Inner Rooms

An inner room is permitted when it is one of the following.

- A kitchen
- A laundry or utility room.
- A dressing room.
- A bathroom, WC or shower room. provided with an emergency escape window.
- A gallery that complies with the guidance.

of the following apply.

- It complies with the above.

None of the access rooms is a kitchen.

The lower ground floor laundry/utility is accessed via an inner room. This does not meet the provisions stated above as both the access rooms are kitchens.





Windows or external doors providing emergency escape should comply with all of the

· Windows should have an unobstructed openable area that complies with all of

A minimum height of 450 mm and a minimum width of 450 mm (the route through the window may be at an angle rather than straight through). The bottom of the openable area is a maximum of 1,100 mm above the

• People escaping should be able to reach a place free from danger from fire. · Locks (with or without removable keys) and opening stays (with child-resistant release catches) may be fitted to escape windows.

Any room on a storey that is a maximum of 4.5 m above ground level which is

A room accessed only via an inner room (an inner inner room) is acceptable when all

The access rooms each have a smoke alarm.

The lower ground floor ensuite is accessed via the guest/staff bedroom which is an inner room so the wine corridor and bedroom should have smoke alarms.



3.2.7 Balconies and Flat Roofs

Where a flat roof forms part of a means of escape, it should comply with all of the following.

- It should be part of the same building from which escape is being made.
- The route across the roof should lead to a storey exit or external escape route.
- The part of the roof (including its supporting structure) forming the escape route, and any opening within 3 m of the escape route, should be of fire resisting construction (minimum REI 30).

A balcony or flat roof intended to form part of an escape route should be provided with guarding etc. in accordance with Approved Document K.

3.2.8 Basements

Basement storeys containing habitable rooms should have one of the following.

- An emergency escape window or external door providing escape from the basement.
- A protected stairway leading from the basement to a final exit.

The basement levels have access to a protected stairway leading to a final exit.

3.3 Means of Escape – Health and Wellbeing

Centre

The number of escapes routes and exits to be provided depends on the number of occupants and the travel distance limitations. For the basement level Health and Wellbeing Centre, the maximum recommended travel distance in one direction is 18 m and 45 m where travel is possible in more than one direction.

The occupancy of the Health and Wellbeing Centre was estimated using the load factors from NFPA.

TABLE 3-1: H&W CENTRE OCCUPANCY

SPACE	NO. OF ROOMS	AREA PER ROOM (m ²)	LOAD FACTOR	OCCUPANCY PER ROOM	TOTAL OCCUPANCY
Ground Floor					
Library/Residential Lounge	1	90	4.6	20	20
Sauna	1	9	1.4	7	7
Steam Room	1	9	1.4	7	7
Gym	1	132	4.6	29	29
Pool	1	126	4.6	28	28
Vitality Pool	1	15	4.6	4	4
Pool deck	1	74	2.8	27	27
Treatment Rooms	2	12	n/a	2	4
Staff Kitchenette	1	55	9.3	6	6
				Total	132

The estimated number of occupants for the Health and Wellbeing Centre is more than 60 and no more than 600, therefore, two exits are required.

A choice of escape routes is of little value if they are all likely to be disabled simultaneously, alternative escape routes should either be in directions 45 ° or more apart or if they are in directions less than 45 °, they should be separated from each other by fire-resisting construction.

All escape routes should have a clear headroom of not less than 2 m except in doorways.

3.3.1 Inner rooms

- a. The occupant number of the inner room does not exceed:
 - i i ii.
- b. The inner room is not a bedroom.
- C. corridor).
- d. access room.
- The travel distance from any point in the inner room to the exits from the e. access room does not exceed the recommended travel distances. f.
 - The access room meets both of the following conditions. i.
 - ii.
- g. One of the following arrangements is made.

 - The door or walls of the inner room contain a vision panel ii. (minimum 0.1 m²), so people can see if a fire starts in the access
 - room.
 - The access room is fitted with an automatic fire detection and alarm system to warn occupants if the inner room if a fire starts in the access room.

iii.

3.3.2 Access to Storey Exits

3.3.3 Separation of Circulation Routes from Protected Stairways

between different parts of a building at the same level.

- An inner room is at risk if a fire starts in the access room. Such an arrangement should only be accepted if all of the following conditions are satisfied.
 - 30 people for 'residential (institutional)' buildings
 - 60 people for other purpose groups.
 - The inner room is entered directly from the access room (nut not via a

The escape from the inner room does not pass through more than one

- It is not a place of special fire hazard.
- It is in the control of the same occupier.
- The enclosures (walls or partitions) of the inner room stop a minimum of 500 mm below the ceiling.

- The second means of escape to the fire exit stair does not meet the provisions above as the occupants have to escape through the staff kitchenette from the staff hallway and then through the storage area before reaching the fire escape stair.
- Where a storey has more than one escape stair, it should be planned so that it is not necessary to pass through one stair to reach another. However, it would be acceptable to pass through one stair's protected lobby to reach another stair.
- Where they serve protected stairways that are part of primary circulation routes, selfclosing fire doors should be fitted with an automatic release mechanism, to avoid them being rendered ineffective by misuse. Otherwise, the stair (and any other associated exit passageway) should not form part of the primary circulation route

3.3.4 Width of Escape Routes and Exits

The width of escape routes and exits depends on the number of persons needing to use them.

TABLE 3-2 WIDTH OF ESCAPE ROUTES AND EXITS

ROOM	OCCUPANT NUMBER	REQUIRED WIDTH	ACTUAL WIDTH
Library/Residential Lounge	20	750 mm	1,300 mm
Sauna	7	750 mm	780 mm
Steam Room	7	750 mm	780 mm
Gym	29	750 mm	1,300 mm
Pool area	59	750 mm	1,300 mm
Treatment Rooms	4	750 mm	780 mm
Staff Kitchenette	6	750 mm	1,300 mm, 780 mm

3.3.5 Calculating exit Capacity

Where multiple storey exits are available, fire might prevent one from being used. Remaining exits need to be wide enough for all occupants, so when using table 3-1, the largest should be discounted.

Stairs should not be at least as wide as any storey exit leading onto them.

To calculate how many people two or more available exits (after discounting) can accommodate, add together the maximum numbers of people that each exit can accommodate.

For example, three exits each 850 mm wide accommodate 3 x 110= 330 people.

The Health and Wellbeing Centre is required to have at least 2 exits, so it has to be assumed that a fire might prevent the occupants from using one of them. The largest exit should therefore be discounted with the remaining exits needing to be wide enough to allow all the occupants to leave quickly.

The final exits in the Health and Wellbeing Centre need to open in the direction of escape as the number using the individual exits are more than 60.

3.3.6 Provision of Refuges

Refuges form part of the management plan and offer relatively safe areas for people to wait for a short period only. Refuges should meet the following conditions.

- a. Refuges should be provided on every storey (except ones consisting only of plant rooms) of each protected stairway providing an exit from that storey.
- b. Refuges do not need to be located within the stair enclosure, but should enable direct access to the stair.
- c. The number of refuge spaces does not need to equal the number of wheelchair users who may be in the building. A single refuge may be occupied by more than one person during the evacuation procedure.

Refuges should be a minimum of 900mm x 1400mm in size and accessible by someone in a wheelchair. Where sited in a protected stairway, protected lobby or



Refuges should be provided with an emergency voice communication (EVC) system complying with BS 5839-9. It should consist of Type B outstations communicating with a master station in the building control room (if one exists) or next to the fire detection and alarm panel. In some buildings, wireless technology may be more appropriate.

The design achieves the provision.

3.3.7 Width of Escape Stairs

The width of escape stairs should meet all of the following conditions.

- a. It should be at least as wide as any exits giving access to the stairs.
- b. It should be no less than the minimum widths given in table 3-3.
- c. It should not reduce at any point on the way to a final exit.

Approved Document K requires stairs more than 2000mm wide in public buildings to have a central handrail.

TABLE 3-4 MINIMUM WIDTH OF ESCAPE STAIRS

SITUATION OF STAIR	MAXIMUM NUMBER OF PEOPLE SERVED ⁽¹⁾	MINIMUM STAIR WIDTH (mm)
1a. In a 'residential (institutional)' building (unless the stair will only be used by staff	150	1000(2)
1b. In an 'assembly and recreation' building and serving an area used for assembly purposes (unless the area is less than 100m ²)	220	1100
1c. In any other building and serving an area with an occupancy of more than 50	Over 220	See note 3
2. Any stair not described above	50	800(4)

Notes:

- 1. Assessed as likely to use the stair in a fire emergency.
- 2. Section 6 of BS 9999 recommends that firefighting stairs should be at least 1100mm wide.
- 3. See table 3-5 for the size of stairs for simultaneous evacuation.
- 4. To comply with the guidance in Approved Document M on minimum widths for areas accessible to disabled people, this may need to be increased to 1000mm.

Calculation of Minimum Stair Width

The width depends on the number of stairs provided and the escape strategy (simultaneous or phased evacuation). If the maximum number of people needing to use escape stairs is unknown, calculate it using the floor space factors.

Discounting of Stairs

Regardless of escape strategy, where two or more stairs are provided, it should be assumed that one might not be available during a fire. Each stair should be discounted in turn to ensure the capacity of the remaining stairs is adequate. This applies to buildings with or without a sprinkler system.

This does not apply if either of the following applies.

- a. Escape stairs are protected by a smoke control system designed in accordance with BS EN 12101-6.
- through a protected lobby.

Despite these exceptions, at least one storey exit still needs to be discounted.

Simultaneous Evacuation

The width of escape stairs should take account of the number of people using them while evacuating all storeys at the same time. The following stairs should be designed to allow simultaneous evacuation.

- a. All stairs serving basements.
- b. All stairs serving buildings with open spatial planning.
- C.

TABLE 3-6 CAPACITY OF STAIRS FOR BASEMENTS NUMBER OF FLOORS MAXIMUM NUMBER OF PEOPLE SERVED BY A STAIR OF WIDTH: SERVED 1.000 mr 150 1 2 190 3 230

The minimum stair width should be 1,000 mm



b. Escape stairs are approached on each storey (except the top storey)

All stairs serving 'residential (other)' or 'assembly and recreation buildings.

n	1,100 mm	1.200 mm
	220	240
	260	285
	300	330



FIGURE 3.2: TRAVEL DISTANCE

3.3.8 Enclosure of Escape Stairs

enclosure).

3.3.9 Construction of Escape Stairs

The flights and landings of escape stairs should be constructed of materials achieving class A2-s3, d2 or better in all of the following situations.

- building.
- - c. If the escape stair serves any storey that has a floor level more than 18m above ground or access level
 - below ground level.
 - e. If the escape stair is a firefighting stair

Materials achieving class B-s3, d2 or worse may be added to the top horizontal surface, except on firefighting stairs.

3.3.10 Exits from Protected Stairs

Every protected stairway should lead to a final exit, either directly or via an exit passageway. Any protected exit corridor or stair should have the same standard of fire resistance and lobby protection as the stair it serves.

3.3.11 Use of Space Within Protected Stairways

A protected stairway may only include any of the following.

- a. Sanitary accommodation or washrooms, as long as the accommodation is not used as a cloakroom. A gas water heater or sanitary towel incinerator may be installed in the accommodation, but no other gas appliance. b. If the protected stairway is not a firefighting stair: a lift well.
- c. If the protected stairway is not the only stair serving the building or part of the building: a reception desk or enquiry office area at ground or access level. The reception or enquiry office area should have a maximum area of
- 10m².



Every internal escape stair should be a protected stairway (within a fire resisting

a. If the escape stair is the only stair serving the building or part of the building, unless the building has two or three storeys and is an office

b. If the escape stair is within a basement storey

d. If the escape stair is external, except where the stair connects the ground floor or ground level with a floor or flat roof a maximum of 6m above or

d. If the protected stairway is not the only stair serving the building or part of the building: cupboards enclosed with fire resisting construction.

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FIGURE 3.3: COMPARTMENTATION



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4.0 Internal Fire Spread – Dwellinghouses

4.1 Linings

The requirements outlined in Approved Document B for Internal Fire Spread Linings state:

B2.

- To inhibit the spread of fire within the building, the internal linings shall: Adequately resist the spread of flame over their surfaces, and Have, if ignited, a rate of heat release of a rate of fire growth, which is reasonable in the circumstances.
- Internal linings mean the materials or products used in lining any partition, wall, ceiling or other internal structure".

In the Secretary of State's view, requirement B2 is met by achieving a restricted spread of flame over internal linings. The building fabric should make a limited contribution to fire growth, including a low rate of heat release.

It is particularly important in circulation spaces, where linings may offer the main means by which fire spreads and where rapid spread is most likely to prevent occupants from escaping.

Requirement B2 does not include guidance on the following.

Generation of smoke and fumes. The upper surfaces of floors and stairs. Furniture and fittings.

4.1.1 Classification of Linings

TABLE 4-1: CLASSIFICATION OF LININGS	
LOCATION	CLASSIFICATION
Small rooms of area not more than 4 m ²	D 63 d2
Garages of area not more than 40 m ²	D-33, uz
Other rooms (including garages)	C eS 43
Circulation spaces within dwelling houses	0-53, uz
Linings do not include:	
 Doors and door frames; 	

- Window frames and frames in which glazing is fitted;
- Architraves, cover moulds, picture rails, skirtings and similar narrow members; or
- Fireplace surrounds, mantle shelves and fitted furniture.

Parts of walls in rooms may be of a poorer performance than specified (but not worse than Class D-s3, d2. In any one room, the total area of lower performance wall lining should be less than an area equivalent to half of the room's floor area, up to a maximum of 20 m² of wall lining.

4.1.2 Rooflights

Rooflights should meet the following classifications, according to material. No guidance for European fire test performance is currently available, because there is no generally accepted test and classification procedure.

- Non-plastic rooflights should meet the relevant classification in the table.
- Plastic rooflights, if the limitations in Table 4.2 and Table 12.2 are observed, should be a minimum class D-s3, d2 rating. Otherwise they should meet the relevant classification in the table.

4.2 Structure

The requirements outlined in Approved Document B for Internal Fire Spread Structure state:

B3 -

- The building shall be designed and constructed so that, in the event of fire, its stability will be maintained for a reasonable period.
- A wall common to two or more buildings shall be designed and constructed so that it adequately resists the spread of fire between those buildings. For the purposes of this sub-paragraph a house in a terrace and a semi-detached house are each to be treated as a separate building.
- Where reasonably necessary to inhibit the spread of fire within the building. measures shall be taken, to an extent appropriate to the size and intended use of the building, comprising either or both of the following:
 - Sub-division of the building with fire-resisting construction;
 - Installation of suitable automatic fire suppression systems.
- The building shall be designed and constructed so that the unseen spread of fire and smoke within concealed spaces in its structure and fabric is inhibited.

In the Secretary of State's view, requirement B3 is met by achieving all of the following.

- · For defined periods, loadbearing elements of structure withstand the effects of fire without loss of stability.
- Compartmentation of buildings by fire resisting construction elements.
- Automatic fire suppression is provided where it is necessary.
- Protection of openings in fire-separating elements to maintain continuity of the fire separation.
- Inhibition of the unseen spread of fire and smoke in cavities, in order to reduce the risk of structural failure and spread of fire and smoke, where they pose a threat to the safety of people in and around the building.

The extent to which any of these measures are necessary is dependent on the use of the building and, in some cases, its size, and on the location of the elements of construction

4.2.1 Fire Resistance of The Structure

Fire resistance for the elements of structure is dependent on fire severity, building height and building occupancy. The height of the topmost storey is up to 11 m.

The performance requirements for structural fire resistance are therefore:

- Structural Fire Resistance 30 min
- Compartment Walls Separating buildings 60 min
- Protected Stairway 30 min

The following are excluded from the definition of element of structure for the purposes of these provisions:

- Structure that only supports a roof, unless:
 - The roof performs the function of a floor, such as a roof terrace, or as a means of escape, or
 - The structure is essential for the stability of an external wall which needs to have fire resistance; and
- The lowest floor of the building.
- External walls, such as curtain walls or other forms of cladding, which transmit only self-weight and wind loads and do not transmit floor load.

4.2.2 Provision of Compartmentation

Dwelling houses that are semi-detached or in terraces should be considered as separate buildings. Every wall separating the dwelling houses should be constructed as a compartment wall.



4.2.3 Construction of Compartment Walls and Compartment Floors

All compartment walls and compartment floors should achieve both of the following.

Form a complete barrier to fire between the compartments they separate.

Have the appropriate fire resistance.

- following.

 - Fire-stopped.

If trussed rafters bridge the wall, failure of the truss due to a fire in one compartment should not cause failure of the truss in another compartment.

4.2.4 Compartment Walls Between Buildings

Adjoining buildings should only be separated by walls, not floors. Compartment walls common to two or more buildings should comply with both of the following. • Run the full height of the building in a continuous vertical plane. Be continued through any roof space to the underside of the roof.

4.2.5 Junction of Compartment Wall with Roof

A compartment wall should achieve both of the following.

- the continuity of fire resistance. Be continued across any eaves.

To reduce the risk of fire spreading over the roof from one compartment to another, a 1,500 mm wide zone of the roof, either side of the wall, should have a covering classified as BROOF(t4), on a substrate or deck of a material rated class A2-s3, d2 or better.

Materials achieving class B-s3, d2 or worse used as a substrate to the roof covering and any timber tiling battens, fully bedded in mortar or other suitable material for the width of the wall may extend over the compartment wall in buildings that are a maximum of 15 m high.

centred over the wall.

As an alternative to the provisions above, the compartment wall may extend through the roof for a minimum of either of the following.

- following applies.

 - BROOF(t4).

4.2.6 Cavities

Cavities in the construction of a building provide a ready route for the spread of smoke and flame, which can present a greater danger as any spread is concealed. For the purpose of this document, a cavity is considered to be any concealed space.

• Timber beams, joists, purlins and rafters may be built into or carried through a masonry or concrete compartment wall if the openings for them are both of the

As small as practicable.

Meet the underside of the roof covering or deck, with fire-stopping to maintain

Double-skinned insulated roof sheeting with a thermoplastic core should incorporate a band of material rated class A2-s3, d2 or better, a minimum of 300 mm in width,

 Where the height difference between the two roofs is less than 375 mm, 375 mm above the top surface of the adjoining roof covering.

200 mm above the top surface of the adjoining roof covering where either of the

The height difference between the two roofs is 375 mm or more. The roof coverings either side of the wall are of a material classified as

4.2.7 Provision of Cavity Barriers

To reduce the potential for fire spread, cavity barriers should be provided for both of the following.

- To divide cavities.
- To close the edges of cavities.

Cavity barriers should not be confused with fire-stopping details.

Cavity barriers should be provided at all of the following locations.

- At the edges of cavities, including around openings (such as windows, doors and exit/entry points for services).
- At the junction between an external cavity wall and every compartment floor and compartment wall.
- At the junction between an internal cavity wall and every compartment floor, compartment wall or other wall or door assembly forming a fire resisting barrier.

It is not appropriate to complete a line of compartment walls by fitting cavity barriers above them.

The compartment wall should be extended to the underside of the floor or roof above.

Construction and Fixings for Cavity Barriers 4.2.8

Cavity barriers, tested from each side separately, should provide a minimum of both of the following:

- 30 minutes' integrity (E 30)
- 15 minutes' insulation (I 15).

They may be formed by a construction provided for another purpose if it achieves the same performance.

Cavity barriers in a stud wall or partition, or provided around openings, may be formed of any of the following.

- Steel, a minimum of 0.5 mm thick. •
- Timber, a minimum of 38 mm thick. ٠
- Polythene-sleeved mineral wool, or mineral wool slab, under compression when installed in the cavity.
- Calcium silicate, cement-based or gypsum-based boards, a minimum of 12 mm thick.

4.3 **Protection of Opening and Fire-Stopping**

The performance of a fire-separating element should not be impaired. Every joint, imperfect fit and opening for services should be sealed. Fire-stopping delays the spread of fire and, generally, the spread of smoke as well.

4.3.1 **Openings for Pipes**

Pipes passing through a fire-separating element, unless in a protected shaft, should meet one of the alternatives A, B or C below.

Alternative A: Proprietary seals (any pipe diameter)

Provide a proprietary, tested sealing system that will maintain the fire resistance of the wall, floor or cavity barrier.

Alternative B: Pipes with a restricted diameter

Where a proprietary sealing system is not used, fire-stop around the pipe, keeping the opening for the pipe as small as possible. The nominal internal diameter of the pipe should not exceed the relevant dimension given in

Table 4-2 for pipes of specification (b) used in situation 2 or 3 assumes that the pipes are part of an above-ground drainage system and are enclosed. If they are not, the smaller diameter given for situation 5 should be used.

Alternative C: Sleeving

following.

- Lead.
- Aluminium.
- Aluminium alloy.
- Fibre-cement

A high melting point metal means any metal (such as cast iron, copper or steel) which, if exposed to a temperature of 800 °C, will not soften or fracture to the extent that flame or hot gas will pass through the wall of the pipe.



A pipe with a maximum nominal internal diameter of 160 mm may be used with a sleeve made out of a high melting point metal if the pipe is made of one of the

uPVC (pipes should also comply with either BS 4514 or BS 5255).

TABLE 4-2 MAXIMUM NOMINAL INTERNAL DIAMETER OF PIPES PASSING THROUGH FIRE SEPARATING ELEMENT

	PIPE MATERIAL AND MAXIMUM NOMINAL INTERNAL DIAMETER (mm)				
SITUATION	(a) Non- combustible material ⁽¹⁾	(b) Lead, aluminium, aluminium alloy, uPVC ⁽²⁾ , fibre cement	(c) Any other material		
 Structure (but not a wall separating buildings) enclosing a protected shaft that is not a stair or a lift shaft 	160	110	40		
2. Compartment wall or compartment floor between flats	160	160 (stack pipe) ⁽³⁾ 110 (branch pipe) ⁽³⁾	40		
3. Wall separating dwelling house	160	160 (stack pipe) ⁽³⁾ 110 (branch pipe) ⁽³⁾	40		
4. Wall or floor separating a dwellinghouse from an attached garage	160	110	40		
5. Any other situation	160	40	40		

Notes:

 Any non-combustible material (such as cast iron, copper or steel) which, if exposed to a temperature of 800 °C, will not soften or fracture to the extent that flame or hot gas will pass through the wall of the pipe.

• uPVC pipes complying with BS 4514 and uPVC pipes complying with BS 5255.

• These diameters are only in relation to pipes forming part of an above-ground drainage system and enclosed. In other cases, the maximum diameters against situation 5 apply.

4.3.2 Ventilation Ducts and Flues Passing Through Fire-Separating Elements

If air handling ducts pass through fire-separating elements, the load-bearing capacity, integrity and insulation of the elements should be maintained using one or more of the following four methods.

In most ductwork systems, a combination of the four methods is best to combat potential fire dangers.

- Method 1 thermally activated fire dampers.
- Method 2 fire resisting enclosures.
- Method 3 protection using fire resisting ductwork.
- Method 4 automatically activated fire and smoke dampers triggered by smoke detectors.

Flats and Dwellings

Where ducts pass between fire-separating elements to serve dwellings, fire dampers or fire and smoke dampers should be actuated by both of the following.

- Smoke detector-controlled automatic release mechanisms.
- Thermally actuated devices.

Kitchen Extract

Methods 1 and 4 should not be used for extract ductwork serving kitchens. The likely build-up of grease within the duct can adversely affect dampers.

Ducts Passing Through Protected Escape Routes

Method 1 should not be used for extract ductwork passing through the enclosures of protected escape routes as large volumes of smoke can pass thermal devices without triggering them.



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FIGURE 4-1: BASEMENT - COMPARTMENTATION



FIGURE 4-4: LOWER GROUND - COMPARTMENTATION





Key: 60min FR duration -30min FR duration -



FIGURE 4-3: SECOND FLOOR - COMPARTMENTATION



FIGURE 4-2: GROUND FLOOR - COMPARTMENTATION



FIGURE 4-5: FIRST FLOOR - COMPARTMENTATION





FIGURE 4-6: SITE - COMPARTMENTATION



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Key:	
60min FR duration -	_
30min FR duration -	_

5.0 External Fire Spread

The requirements outlined in Approved Document B for External Fire Spread state:

B4 - "The external walls of the building shall adequately resist the spread of fire over the walls and from one building to another, having regard to the height, use and position of the building.

The roof of the building shall adequately resist the spread on fire over the roof and from one building to another, having regard to the use and position of the building.

Resisting Fire Spread Over External Walls 5.1

The external wall of a building should not provide a medium for fire spread if that is likely to be a risk to health and safety. Combustible materials and cavities in external walls and attachments to them can present such a risk, particularly in tall buildings. The guidance in this section is designed to reduce the risk of vertical fire spread as well as the risk of ignition from flames coming from adjacent buildings.

The external surfaces (i.e. outermost external material) of external walls should comply with the provisions in Table 4-3. The provisions in Table 4-3 apply to each wall individually in relation to its proximity to the relevant boundary.

The external surfaces of the building should be constructed of materials to at least the standard noted in the table below:

TABLE 4-3 PROVISIONS FOR EXTERNAL SURFACES

BUILDING TYPE	BUILDING HEIGHT		LESS THAN 1 m FROM BOUNDARY	1 m OR MORE FROM BOUNDARY
"Relevant buildings"	More than 18 m		Class A2-s1, d0 ^[1] or better	Class A2-s1, d0 ^[1] or better
Any other Building	More	from ground level to 18 m	Class B-s3, d2 [2]	Class C-s3, d2 ^[3] or better
	18 m	from 18 m in height and above	or better	Class B-s3, d2 ^[2] or better
	18 m or less		Class B-s3, d2 ^[2] or better	No provisions

Note

[1] The restrictions for these buildings apply to all the materials used in the external wall and specified attachments

[2] Profiled or flat steel sheet at least 0.5 mm thick with an organic coating of no more than 0.2 mm thickness is also acceptable.

[3] Timber cladding at least 9 mm thick is also acceptable.

In a building with a storey 18 m or more in height any insulation product, filler material (such as the core materials of metal composite panels, sandwich panels and window spandrel panels but not including gaskets, sealants and similar) etc. used in the construction of an external wall should be class A2-s3, d2 or better. Where regulation 7(2) applies, that regulation prevails over all the provisions in this paragraph.

Balconies are classified as attachments to external walls and as such should achieve the required standard for external walls.

5.1.1 Regulation 7(2) and Requirement B4

Regulation 7(1)(a) requires that materials used in building work are appropriate for the circumstances in which they are used. Regulation 7(2) sets requirements in respect of external walls and specified attachments in relevant buildings.

Regulation 7(2) applies to any building with a storey at least 18 m above ground level and which contains one or more dwellings; an institution; or a room for residential purposes (excluding any room in a hostel, hotel or a boarding house). It requires that all materials which become part of an external wall or specified attachment achieve class A2-s1, d0 or class A1, other than those exempted by regulation 7(3).

The above includes student accommodation, care homes, sheltered housing, hospitals and dormitories in boarding schools. See regulation 7(4) for the definition of relevant buildings.

The requirement in regulation 7(2) is limited to materials achieving class A2-s1, d0 or class A1.

External walls and specified attachments are defined in regulation 2 and these definitions include any parts of the external wall as well as balconies, solar panels and sun shading.

Regulation 7(3) provides an exemption for certain components found in external walls and specified attachments.

Material Change of Use

Regulations 5(k) and 6(3) provide that, where the use of a building is changed such that the building becomes a building described in regulation 7(4), the construction of the external walls, and specified attachments, must be investigated and, where necessary, work must be carried out to ensure they only contain materials achieving class A2-s1, d0 or class A1, other than those exempted by regulation 7(3).

Additional Considerations

The provisions of regulation 7 apply in addition to requirement B4. Therefore, for buildings described in regulation 7(4), the potential impact of any products incorporated into or onto the external walls and specified attachments should be carefully considered with regard to their number, size, orientation and position.

Particular attention is drawn to the following points.

- a. Membranes used as part of the external wall construction above ground level should achieve a minimum of class B-s3, d0.
- b. Internal linings should comply with the guidance provided in Section 4.
- c. Any part of a roof should achieve the minimum performance as detailed in Section 9.1.3 of this report.
- d. As per regulation 7(3), window frames and glass (including laminated glass) are exempted from regulation 7(2). Window spandrel panels and infill panels must comply with regulation 7(2).
- e. Thermal breaks are small elements used as part of the external wall construction to restrict thermal bridging. There is no minimum performance for these materials. However, they should not span two compartments and should be limited in size to the minimum required to restrict the thermal bridging (the principal insulation layer is not to be regarded as a thermal break).
- Regulation 7(2) only applies to specified attachments. Shop front signs and f similar attachments are not covered by the requirements of regulation 7(2), although attention is drawn to paragraph 10.15g.
- g. While regulation 7(2) applies to materials which become part of an external wall or specified attachment, consideration should be given to other attachments to the wall which could impact on the risk of fire spread over the wall.

5.1.2 Boundaries

To prevent external fire spread from and to adjacent buildings ADB recommends limiting the extent of unprotected areas to the sides of a building to ensure adequate protection is provided against the external spread of fire from one building to another.

the provisions for space separation if:

the BRE Report BR 187; and

and Boundary Distances".

Table 4-4 shows the percentage of unprotected area allowed for dwellings without sprinklers for each elevation and Table 4-5 shows the percentage of unprotected area allowed for dwellings with sprinklers for each elevarion.

For each elevation, the worst case 'enclosing rectangle' has been calculated. Where the calculation shows this rectangle to be allowed 100 % unprotected area, the remainder of the elevation can also be 100 % unprotected.



The relevant boundary used for the assessment is usually the site boundary.

- However, where the external wall faces onto a space that is unlikely to be developed. e.g. road, then the boundary can be assumed to be halfway across this feature.
- A wall situated at least 1,000 mm from any point on the relevant boundary will meet
- a. The extent of unprotected area does not exceed that given by the method from
- b. The rest of the wall is fire resisting from the inside of the building.
- The maximum allowed unprotected area in the external walls of the building should be in accordance with BRE Report 187 - "External Fire Spread - Building Separation

$$u = \frac{(d / f)^2}{(wh)}$$

d = distance from relevant boundary

- *h* = *height of enclosing rectangle*
- w = width of enclosing rectangle
- f = factor f from BRE 187



FIGURE 4-7: EAST ELEVATION



FIGURE 4-8: NORTH ELEVATION



FIGURE 4-9: BOUNDARY DISTANCES



D (m)	f	W (m)	H (m)	U (%)		
Town Houses						
3.5	0.60	11.5	11.2	26		
11.4	0.70	6.9	11.2	100		
7.9	0.68	6.9	11.2	100		
7.2	0.68	6.9	11.2	100		
8.9	0.69	6.9	11.2	100		
17.9	0.72	11.5	11.2	100		
3.5	0.60	6.9	11.2	43		
5.4	0.65	6.9	11.2	89		
4.5	0.63	6.9	11.2	65		
5.3	0.65	11.5	11.2	52		
2.5	0.55	6.9	11.2	26		
4.5	0.63	6.9	11.2	65		
11.7	0.70	6.9	11.2	100		
11.5	0.70	11.5	11.2	100		
4.5	0.63	6.9	11.2	65		
	D (m) 3.5 11.4 7.9 7.2 8.9 17.9 3.5 5.4 4.5 5.3 2.5 4.5 11.7 11.5 4.5	D (m) f Town Hou 3.5 0.60 11.4 0.70 7.9 0.68 7.2 0.68 8.9 0.69 17.9 0.72 3.5 0.60 5.4 0.65 4.5 0.63 5.3 0.65 4.5 0.63 11.7 0.70 11.5 0.70 4.5 0.63	D (m)fW (m)Town Houses3.50.6011.511.40.706.911.40.706.97.90.686.97.20.686.98.90.696.917.90.7211.53.50.606.95.40.656.94.50.636.95.30.6511.52.50.556.94.50.636.911.70.706.911.50.7011.54.50.636.9	D (m)fW (m)H (m)Town Houses3.50.6011.511.211.40.706.911.27.90.686.911.27.20.686.911.28.90.696.911.217.90.7211.511.23.50.606.911.25.40.656.911.25.30.6511.511.25.30.656.911.24.50.636.911.211.70.706.911.211.50.7011.511.24.50.636.911.2		

TABLE 4-7 UNPROTECTED AREAS ALLOWED WITH SPRINKLERS

ELEVATION	D (m)	F	W (m)	H (m)	U (%)	
Town Houses						
North Unit 4, 9	3.5	0.60	11.5	11.2	53	
North Unit 5	11.4	0.70	6.9	11.2	100	
North Unit 6	7.9	0.68	6.9	11.2	100	
North Unit 7	7.2	0.68	6.9	11.2	100	
North Unit 8	8.9	0.69	6.9	11.2	100	
South Unit 1, 12	17.9	0.72	11.5	11.2	100	
South Unit 5, 8	3.5	0.60	6.9	11.2	87	
South Unit 6, 7	5.4	0.65	6.9	11.2	100	
East Unit 1-4	4.5	0.63	6.9	11.2	100	
East Unit 8	5.3	0.65	11.5	11.2	100	
East Unit 9, 12	2.5	0.55	6.9	11.2	53	
East Unit 10, 11	4.5	0.63	6.9	11.2	100	
West Unit 1-4	11.7	0.70	6.9	11.2	100	
West Unit 5	11.5	0.70	11.5	11.2	100	
West Unit 9-12	4.5	0.63	6.9	11.2	100	

When calculating the external fire spread for buildings the size of a fire depends on the compartmentation within the building. A fire may involve a complete compartment but will not spread to other compartments.

Therefore, where the enclosing rectangle has been measured it may include two compartments, however only the biggest compartment is considered for the calculations. The other compartment would be counted as protected area in the calculation. This also occurs where the elevation is not a 'rectangular' shape. This is shown in the following figures.





FIGURE 4-10: GRAPHICAL REPRESENTATIONS OF CALCULATING UNPROTECTED AREA

5.2 Roof Coverings

In line with the space separation requirements, roof covering must limit external fire spread. Using 6 m as a relevant limit, the following class of roof surfaces may be used.

BOUNDARY DISTANCE	EUROPEAN CLASS
Less than 6 m	B _{ROOF} (t4)
At least 6 m	Broof(t4), Croof(t4)
At least 12 m	B _{ROOF} (t4), C _{ROOF} (t4)
At least 20 m	$B_{POOF}(t4)$ $C_{POOF}(t4)$ $D_{POOF}(t4)$



6.0 Access and Facilities for the Fire and **Rescue Service**

The requirements outlined in Approved Document B for Fire Service Requirements state:

B5 - "The building shall be designed and constructed so as to provide reasonable facilities to assist firefighters in the protection of life.

Reasonable provision shall be made within the site of the building to enable fire appliances to gain access to the building".

Provisions covering access and facilities for the fire service are to safeguard the health and safety of people in and around the building. Their extent depends on the size and use of the building. Most firefighting is carried out within the building. In the Secretary of State's view, requirement B5 is met by achieving all of the following.

- External access enabling fire appliances to be used near the building.
- Access into and within the building for firefighting personnel to both:
 - Search for and rescue people _
 - Fight fire.
- Provision for internal fire facilities for firefighters to complete their tasks.
- Ventilation of heat and smoke from a fire in a basement.

Vehicle Access

For dwelling houses, access for a pumping appliance should be provided to within 45 m of all points inside the dwelling house.

Access routes and hardstanding's should comply with the guidance in Table 6-1.

Dead-end access routes longer than 20 m require turning facilities, as in Figure 6-4. Turning facilities should comply with the guidance in Table 6-1.

TABLE 6-1 TYPICAL FIRE AND RESCUE SERVICE VEHICLE ACCESS ROUTE SPECIFICATION

APPLIANCE TYPE	MIN. WIDTH OF ROAD BETWEEN KERBS	MIN. WIDTH OF GATEWAYS	MIN. TURNING CIRCLE BETWEEN KERBS	MIN. TURNING CIRCLE BETWEEN WALLS	MIN. CLEARANCE HEIGHT	MIN. CARRYING CAPACITY
Pump	3.7 m	3.1 m	16.8 m	19.2 m	3.7 m	12.5 tonnes
High Reach	3.7 m	3.1 m	26 m	29 m	4 m	17 tonnes

The Areas highlighted in figure 6-1 are taken to be dwellings that exceed a hose distance of 45 m from the pumping appliance to the furthest point within the dwelling.

The horizontal hose length within the dwelling is measured from the ground floor entrance to the stair and then the second floor stair to the furthest point as shown in Figure 6-2 and Figure 6-3 which gave a total distance of approximately 15 m. The uppermost storey is approximately 7.6 m so the total distance within the dwelling is 22.6 m.

As a result, the hose length exceeds 45 m when the distance from the pumping appliance to the entrance of the of the dwelling exceeds 22.4 m



FIGURE 6-5: FIRE SERVICE ACCESS



GLASS LIGHT

FIGURE 6-7: SECOND FLOOR HOSE LENGTH



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7.0 Venting of Heat and Smoke from Basements – H&W Centre

Heat and smoke from basement fires vented via stairs can inhibit access for firefighting personnel.

This may be reduced by providing smoke outlets, or smoke vents, which allow heat and smoke to escape from the basement levels to the open air. They can also be used by the fire and rescue service to let cooler air into the basements

Each basement space should have one or more smoke outlets. Where this is not practicable (for example, the plan area is deep and the amount of external wall is restricted by adjoining buildings), the perimeter basement spaces may be vented, with other spaces vented indirectly by opening connecting doors. This does not apply for places of special fire hazard.

If a basement is compartmented, each compartment should have one or more smoke outlets, rather than indirect venting.

A basement storey or compartment containing rooms with doors or windows does not need smoke outlets.

Smoke outlets connecting directly to the open air should be provided from every basement storey, except for any basement storey that has both of the following.

- a. A maximum floor area of 200 m².
- b. A floor a maximum of 3 m below the adjacent ground level.

Strong rooms do not need to be provided with smoke outlets.

7.1.1 Natural Smoke Outlets

Smoke outlets should be both of the following.

- a. Sited at high level in either the ceiling or wall of the space they serve.
- b. Evenly distributed around the perimeter, to discharge to the open air.

The combined clear cross-sectional area of all smoke outlets should be a minimum of 1/40 of the area of the floor of the storey they serve.

Separate outlets should be provided from places of special fire hazard.

8 If the smoke outlet terminates at a point that is not readily accessible, it should be kept unobstructed and covered only with a class A1 grille or louvre.

If the smoke 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 covered smoke outlets should be suitably indicated.

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

7.1.2 Mechanical Smoke Extract

If basement storeys are fitted with a sprinkler system, a mechanical smoke extraction system may be provided as an alternative to natural venting. Sprinklers do not need to be installed on the other storeys unless needed for other reasons.

The air extraction system should comply with all of the following.

- a. It should give at least 10 air changes per hour.
- b. It should be capable of handling gas temperatures of 300 °C for not less than one hour.
- c. It should do either of the following.
 - i. Be activated automatically if the sprinkler system activates.
 - Be activated by an automatic fire detection system that conforms to BS 5839-1 (minimum L3 standard).

Further information on equipment for removing hot smoke is given in BS EN 12101-

3.



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