Overview Fire Safety Strategy Report

For

Change of Use from Office to Residential
and
3rd to 6th Floor Extension

29 - 30 High Holborn
London
N1 7LJ

Reference: FSE2227

Issue No: 02

27th August 2022

Revision History

Issue Number:	Issue Date:
Stage 2 - 01	27th July 2022
Reason for Revision:	
First Draft Issue	
Issue Number:	**Issue Date:**
Stage 2 - 02	27th August 2022
Reason for Revision:	
Mechanical Smoke Ventilation Shaft Included	
Prepared By:	**Contact:**
Jon Davies BSc Hons, MRICS	jdavies@heliosconsultancy.com 07801 032 950
Reviewed by:	**Contact:**
Paul Currie BEng, PhD, CEng, MIFireE	pcurrie@heliosconsultancy.com 07570 624 720

Client Details

Client:	Westcombe Group
Client Address:	7 Churchill Court, 58 Station Road, Harrow, Middlesex.HA2 7SA
Project:	Change of Use from Office to Residential and 3rd to 6th Floor Extension, 29 - 30 High Holborn, London

Validity

This report is produced on the basis of the information and experience available at the time of preparation. It is applicable to the above-mentioned project only in accordance with the client's instructions. It is only valid provided no other modifications are made other than those for which a formal opinion has been sought from and given by Helios Fire & Construction Consultancy UK.

The report outlines the principal opinion of Helios Fire & Construction Consultancy and is prepared based on information issued by other parties, this report should not be viewed as an approval of that information and no liability is accepted for its accuracy.

All legislation quoted is primarily concerned with life safety and property protection is not specifically considered although the fire protection provisions to be provided for the building will offer some degree of property protection.

Furthermore, other issues such as insurers' requirements, cultural heritage, environmental, or continuity issues have not been specifically addressed or included within the development of the fire safety strategy.

Table of Contents

1. Introduction

This report presents the fire safety strategy for the redevelopment including Change of Use from Office to Residential on the ground to second floors to the rear of the property and 3rd to 6th Floor Extension, 29 - 30 High Holborn, London. 29 – 30 High Holborn is made up of a mix of uses with the ground floor containing an existing retail unit with the front upper floors containing office accommodation.

To the rear of the property the first and second floors contain office accommodation.

Figure 1: Front and Rear Elevations

1.1. Purpose of Report

The objective of this report is to develop a fire safety strategy, which satisfies the functional requirements for life safety of the Building Regulations 2010.

British Standard (BS) 9991 2015 and BS 9999 2017 will be used as the guidance documents for the development in order to achieve statutory approval under Part B of the Building Regulations 2010.

Note: BS 9999 2015 has been used, however, as a cautionary note BS 9991 is currently under development and the proposed draft changes have been issued. Whilst there is no guarantee of the elements that will be included in the revised BS 9991 it should be noted that some elements could change dependant on when the building regulation application is made. Should you require any further details please contact Helios.

Note: Volume 1 of Approved Document B (ADB) has also been utilised for elements such as requirements for provision of sprinklers and external wall requirements as this is considered the most current guidance relating to residential buildings.

Where no specific provision is mentioned in this fire strategy regarding any particular aspect reference should be made to BS 9991, BS 9999 and Approved Document B where appropriate.

This report details the fire safety strategy and is intended to highlight the key design issues and the proposed solutions to meet the challenges of compliance with the Building Regulations 2010.

This document will therefore act as the basis of discussions between the design team and Approval Authorities, in order to obtain approval in principle for the design in respect to fire safety compliance.

1.2. Sources of Information

The information within this report is based on the following information and drawings provided to Helios Fire & Construction Consultancy up to the date of this report.

Table 1: Information Used

Title	Number	Revision
Location and Site Plans	FLU. 1241.LP.01	NA
Existing Ground and First Floor Plan	FLU.1241.3.01	NA
Existing 2nd Floor Plan	FLU.1241.3.02	NA
Proposed Ground and First Floor Plan	FLU.1241.3.03	Rev D
Proposed 2nd to 6th Floor Plan	FLU.1241.3.04	Rev C
Proposed 7th Floor Plan	FLU.1241.3.05	Rev C
Proposed Front Elevation	FLU.1241.3.06	Rev A
Proposed Rear Elevation	FLU.1241.3.07	NA
Proposed Side Elevation	FLU.1241.3.08	NA
Proposed Rear Street Scene	FLU.1241.3.09	Rev A
Approved Front Elevation	FLU.1241.3.12	NA
Approved Rear Elevation	FLU.1241.3.13	NA
Approved Side Elevation	FLU.1241.3.14	NA

2. Overview of Development

2.1. Description of Development

This report has been developed in conjunction with the design team to the requirements of the Planning Gateway One.

The Site is located in the High Holborn area of London, the sites primary access is via Fulwood Place which is accessed from the main High Holborn A40.

The proposed development site at 29 – 30 High Holborn is made up of a mix of uses with the ground floor containing an existing retail unit with the front upper floors containing office accommodation.

To the rear of the property the first and second floors contain office accommodation.

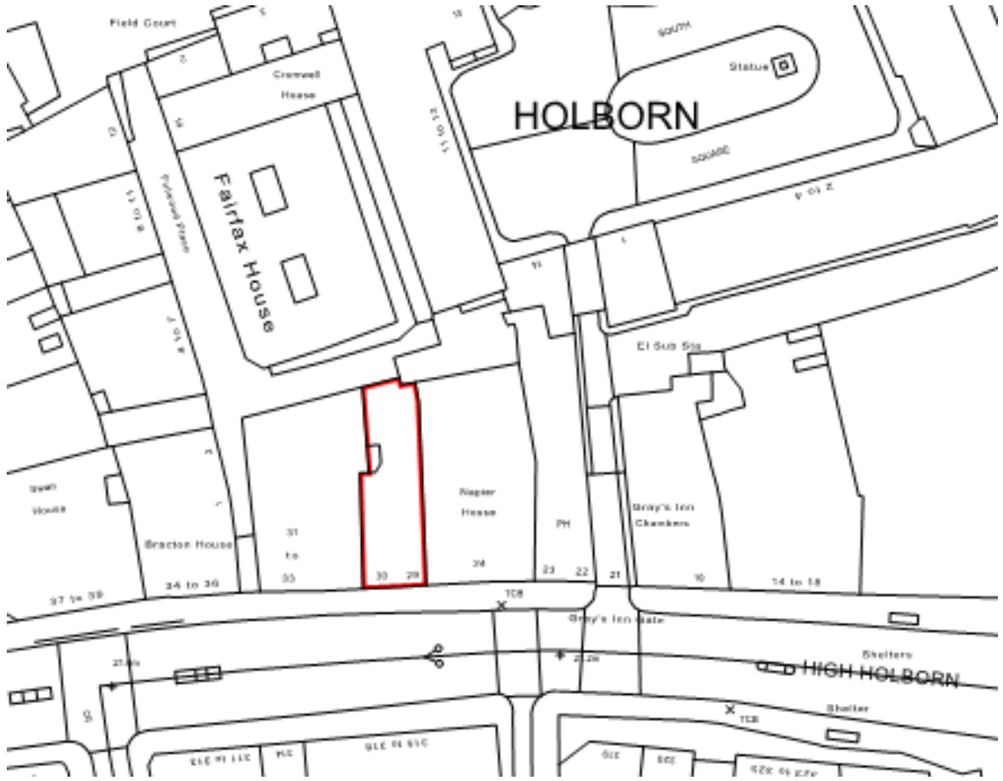


Figure 2: Site Location

The development consists of Change of Use from Office to Residential on the ground to second floors to the rear of the property and 3rd to 6th Floor Extension, 29 - 30 High Holborn

Figure 3: Rear Street Scene

2.2. Building Height

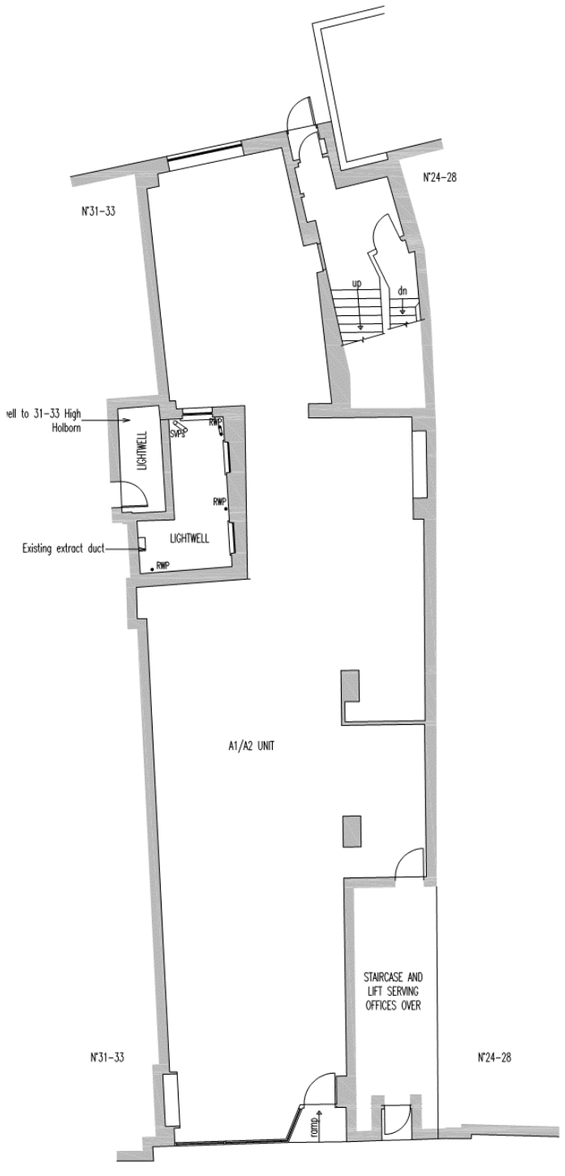
The heights of the top floor above the lowest ground level have been scaled from the drawings provided and are summarised in the table below.

Table 2: Height of Top Floor

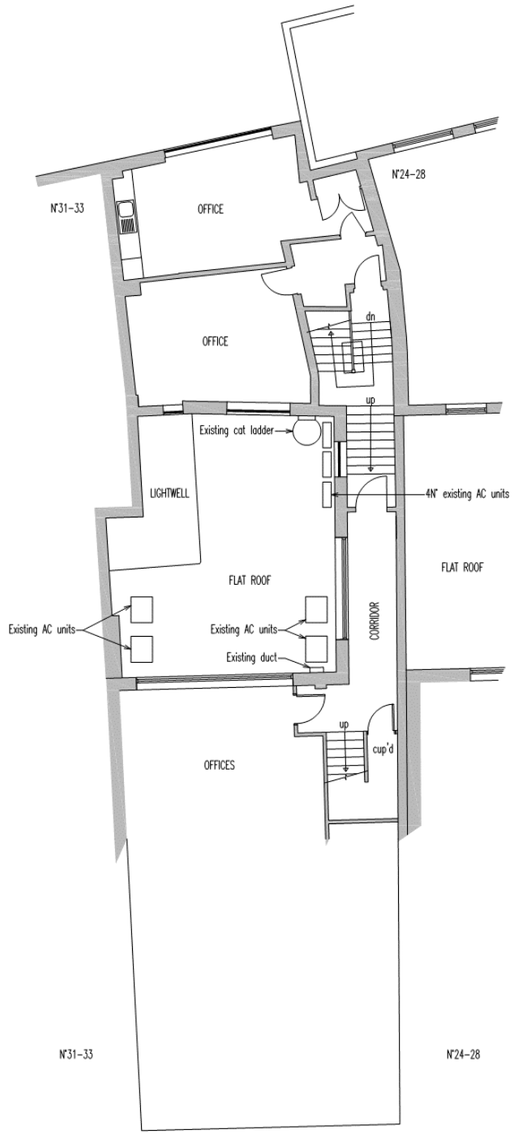
Building	Height of Top Floor	Comments
29 - 30 High Holborn	Circa 17.9m	Height measure to 6th floor level.

Design Team to confirm heights provided in the table above are accurate.

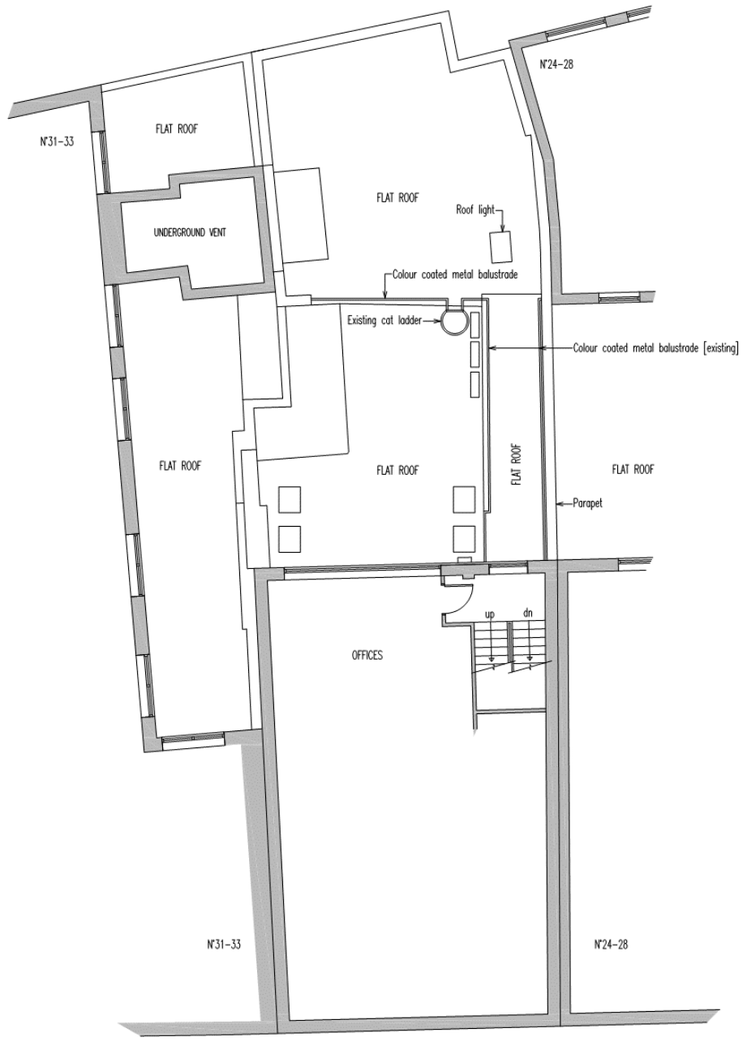
2.3. General Building Arrangements



GROUND FLOOR PLAN AS EXISTING

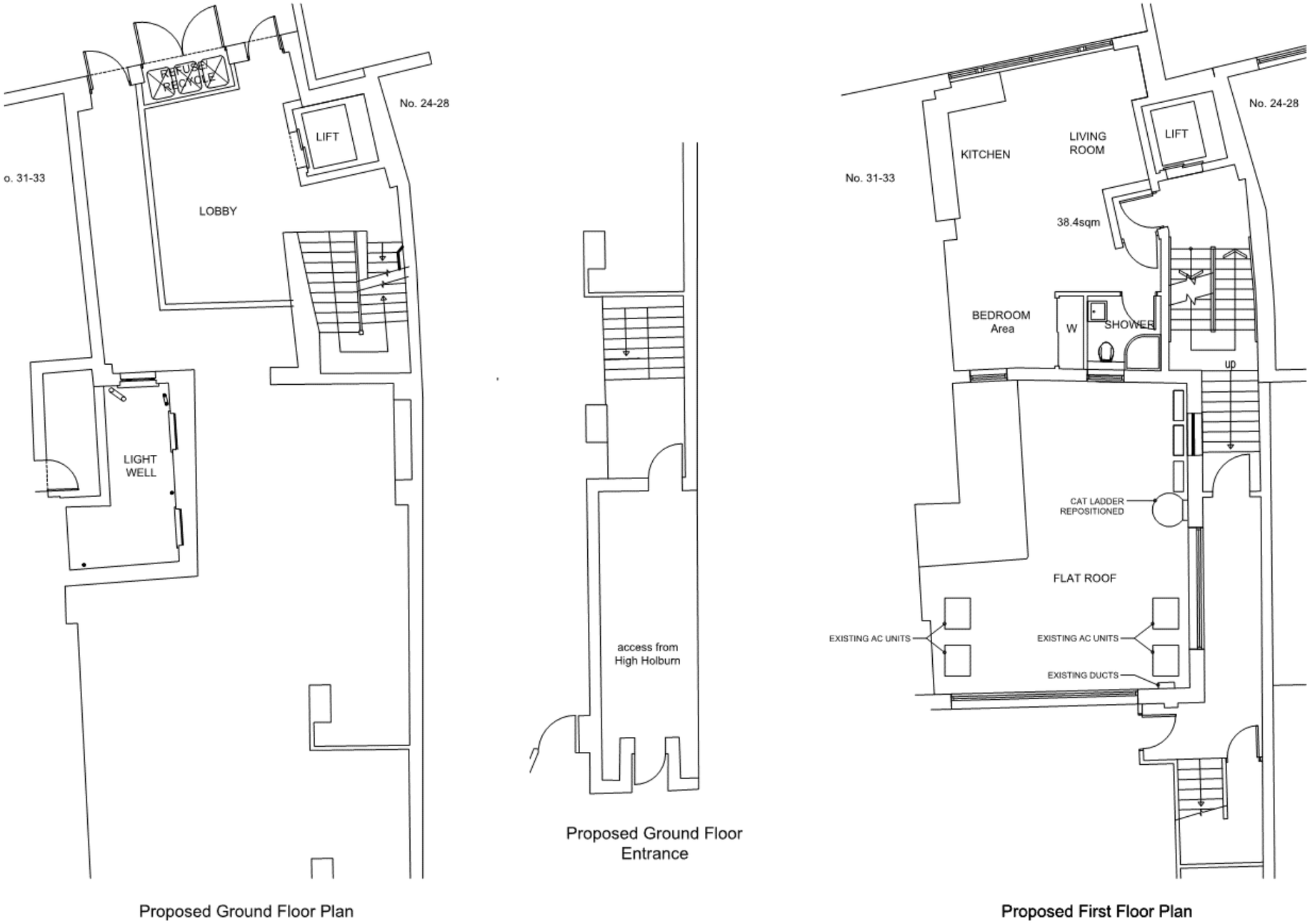


1ST FLOOR PLAN AS EXISTING



ROOF PLAN AS EXISTING

Figure 4: Existing Layouts

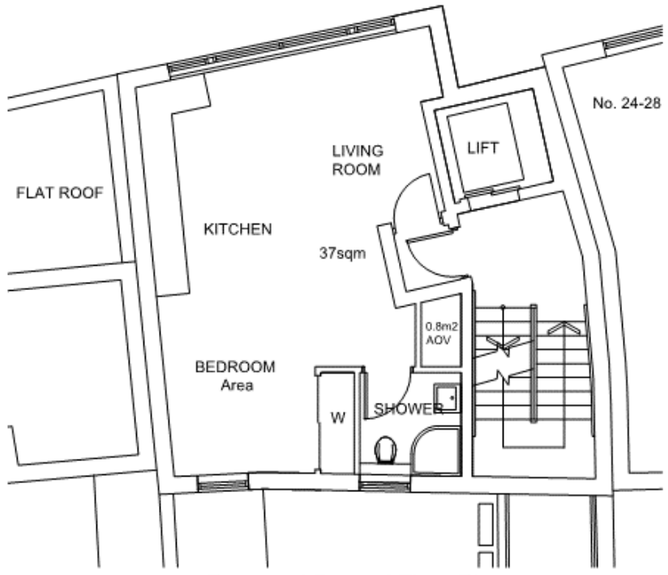


Proposed Ground Floor Plan

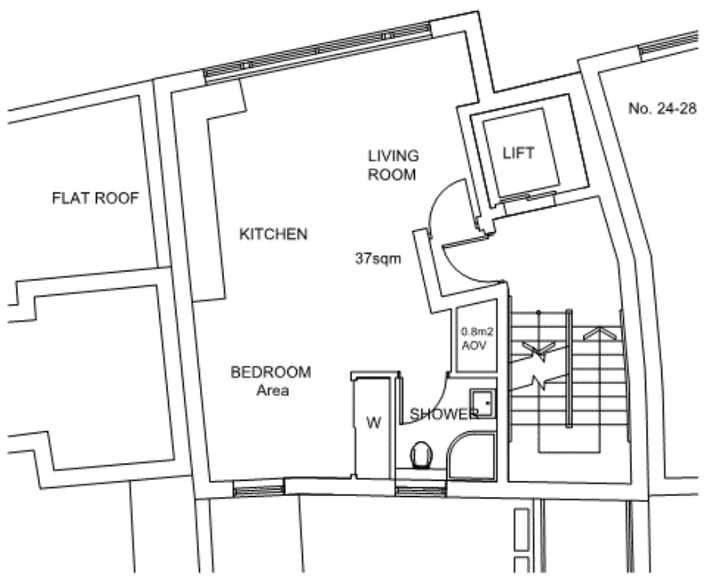
Proposed Ground Floor Entrance

Proposed First Floor Plan

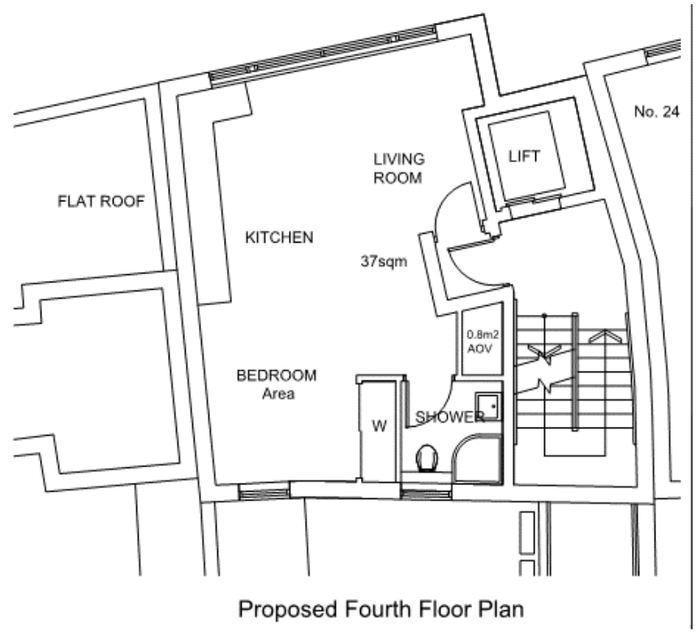
Figure 5: Proposed Ground and First Floors



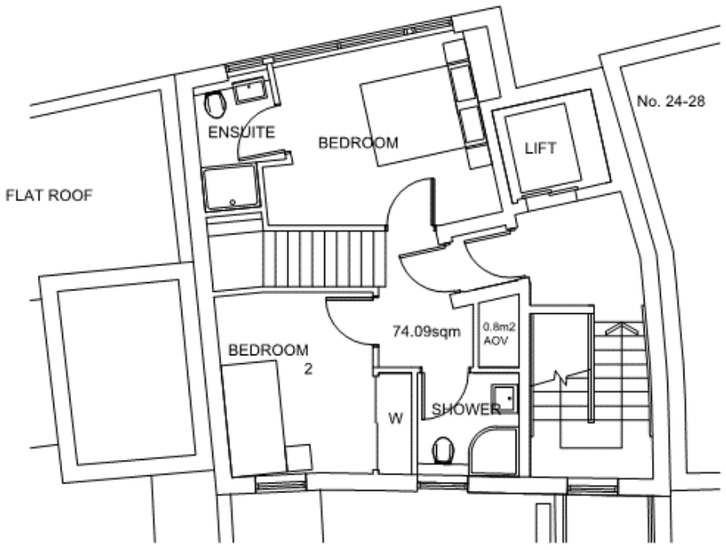
Proposed Second Floor Plan



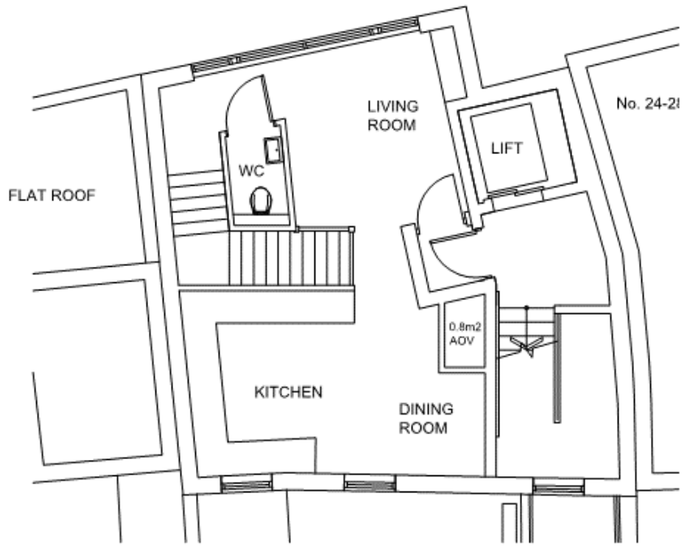
Proposed Third Floor Plan



Proposed Fourth Floor Plan



Proposed Fifth Floor Plan



Proposed Sixth Floor Plan

Figure 6: 2nd to 6th Floor Layouts

2.4. Occupancy Numbers

This fire strategy has been developed on the basis of the maximum occupancies presented in the tables below.

Floor	Beds	Occupancy	Comments
Ground	NA as separate tenancy		
First	1	2	2 People per Bed Space
Second	1	2	2 People per Bed Space
Third	1	2	2 People per Bed Space
Fourth	1	2	2 People per Bed Space
Fifth	2	4	2 People per Bed Space
Sixth	NA	NA	Living Area
Total Building		**12**	
Total Above Lower Ground		**12**	

Table 3: Assumed Occupancy

3. Statutory Compliance

3.1. The Building Regulations

The building will be subject to the statutory requirements of the Building Regulations 2010. It is, therefore, necessary for the building to meet the functional requirements of Part B of Schedule 1 of these Regulations. These requirements relate to:

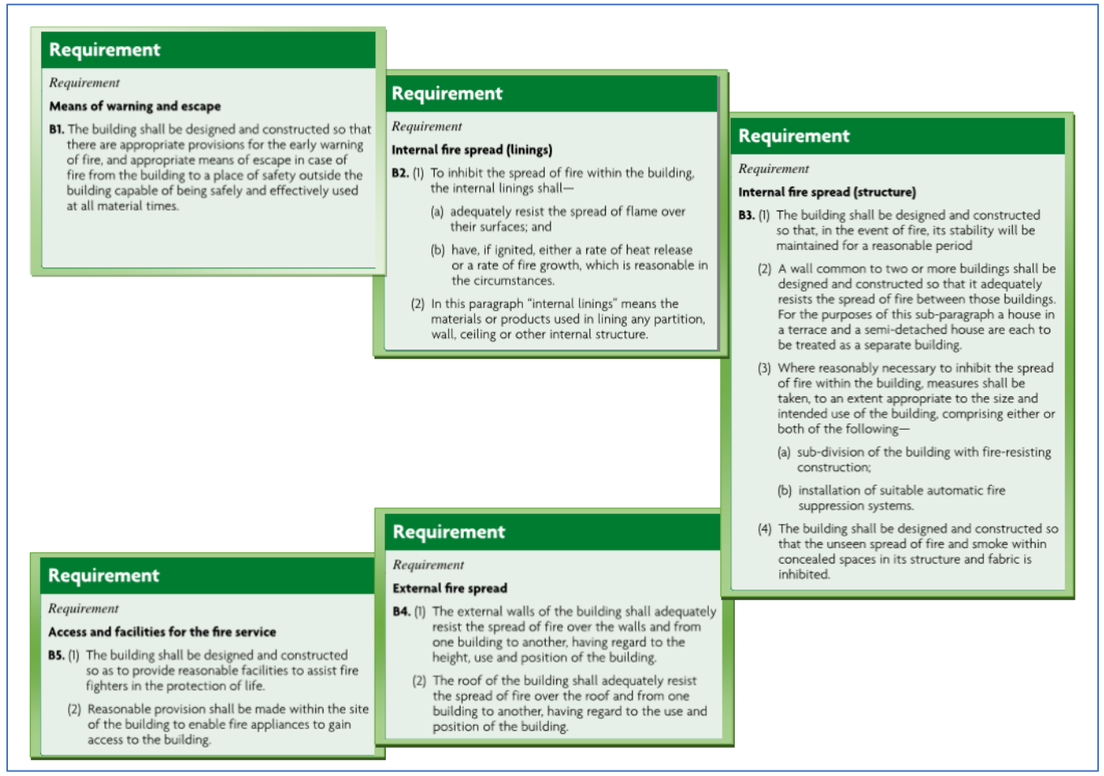


Figure 7: Schedule 1 Part B of the Building Regulations 2010

3.2. Regulation 7 of the Building Regulations

In assessing the Building Regulations and schedule 1 this report will also specifically highlight and assess Regulation 7 of the Building Regulations relating to 'Materials and Workmanship' which outlines the general principals of materials being used in the construction being appropriate for the circumstances in which they are used and installed, and also commenting on the workmanship standards and certification expected for material installation.

3.3. Guidance

For the building, compliance with the above requirements will be achieved by the guidance of BS 9991: 2015 and BS 9999: 2017 where appropriate and supplementing this with fire engineering solutions, when necessary, to ensure that the key fire safety objectives for the design are achieved.

Note: Volume 1 of Approved Document B has also been utilised for elements such as requirements for provision of sprinklers and external wall requirements as this is considered the most current guidance relating to residential buildings.

Also, we must assess Regulation 7 of the Building Regulations relating to 'Materials and Workmanship' which outlines the general principals of materials being used being appropriate for the circumstances in which they are used and installed.

This legislation is primarily concerned with life safety and property protection is not specifically considered although the fire protection provisions to be provided for the building will offer some degree of property protection.

Furthermore, other issues such as insurers' requirements, cultural heritage, environmental, or continuity issues have not been specifically addressed or included within the development of the fire safety strategy.

3.4. Planning & The London Plan 2021

As part of planning, it is necessary to consider the London Plan 2021. The policy in the London Plan relating to fire safety is contained in Policy D12. It states that

A. In the interests of fire safety and to ensure the safety of all building users, all development proposals must achieve the highest standards of fire safety and ensure that they:

1. Identify suitably positioned unobstructed outside space:

   a) for fire appliances to be positioned on

   b) appropriate for use as an evacuation assembly point

2. Are designed to incorporate appropriate features which reduce the risk to life and the risk of serious injury in the event of a fire, including appropriate fire alarm systems and passive and active fire safety measures

3. Are constructed in an appropriate way to minimise the risk of fire spread

4. Provide suitable and convenient means of escape, and associated evacuation strategy for all building users

5. Develop a robust strategy for evacuation which can be periodically updated and published, and which all building users can have confidence in

6. Provide suitable access and equipment for firefighting which is appropriate for the size and use of the development.

B. All major development proposals should be submitted with a Fire Statement, which is an independent fire strategy, produced by a third party, suitably qualified assessor.

The statement should detail how the development proposal will function in terms of:

7. The building's construction: methods, products and materials used, including manufacturers' details

8. The means of escape for all building users: suitably designed stair cores, escape for building users who are disabled or require level access, and associated evacuation strategy approach

9. Features which reduce the risk to life: fire alarm systems, passive and active fire safety measures and associated management and maintenance plans

10. Access for fire service personnel and equipment: how this will be achieved in an evacuation situation, water supplies, provision and positioning of equipment, firefighting lifts, stairs and lobbies, any fire suppression and smoke ventilation systems proposed, and the ongoing maintenance and monitoring of these

11. how provision will be made within the curtilage of the site to enable fire appliances to gain access to the building

12. ensuring that any potential future modifications to the building will take into account and not compromise the base build fire safety/protection measures.

3.5. The Regulatory Reform (Fire Safety) Order 2005 & Fire Safety Act 2021

Once the building is completed and occupied, the Regulatory Reform Fire Safety Order 2005 (RR (FS) O) becomes the controlling fire safety legislation.

It is necessary, among other things, under this order for the owner/occupier of the building to carry out and maintain a fire safety risk assessment. The building's management team will also be responsible under this order to ensure that the building's fire safety provisions are appropriately managed, maintained and tested over the whole life of the building.

3.6. Regulation 38 of the Building Regulations

To enable a comprehensive Fire Risk Assessment to be carried out as noted in Regulation 38 of the Building Regulations 2010 'The person carrying out the work shall give all relevant fire safety information to the responsible person not later than the date of completion of the work, or the date of occupation of the building or extension, whichever is the earlier' in this regulation:

Fire safety information - means information relating to the design and construction of the building or extension, and the services, fittings and equipment provided in or in connection with the building or extension which will assist the responsible person to operate and maintain the building or extension with reasonable safety.

Relevant building - is a building to which the Regulatory Reform (Fire Safety) Order 2005 applies or will apply after the completion of building work.

Relevant change of use - is a material change of use where, after the change of use takes place, the Regulatory Reform (Fire Safety) Order 2005 will apply, or continue to apply, to the building; and

Responsible person - has the meaning given by Article 3 of the Regulatory Reform (Fire Safety) Order 2005.

3.7. Construction, Design and Management Regulations

Projects undertaken within the UK are subject to the requirements of the Construction, Design and Management Regulations (CDM).

This report defines the strategy for meeting the functional and performance requirements for fire safety in the finished building. Where any conclusions or recommendations have been arrived at which specify particular materials, products, or forms of construction these will have been assessed, in accordance with CDM Regulation 9 (Duties for Designers). In the event that these involve significant residual risks or health and safety critical assumptions, this information will be made available to the Principal Designer. Where the architect or other consultants use the standards put forward in this report to specify works, they are understood to be competent in alerting the Client, Principal Designer, and Contractor and Building Occupier.

4. Access and Facilities for the Fire Service

4.1. General Access

The existing access to the rear portion of the site is a pedestrian route only, as is the current access to the surrounding buildings, this access is via Fulwood Place.

The front of the property can be accessed via High Holborn as shown below.

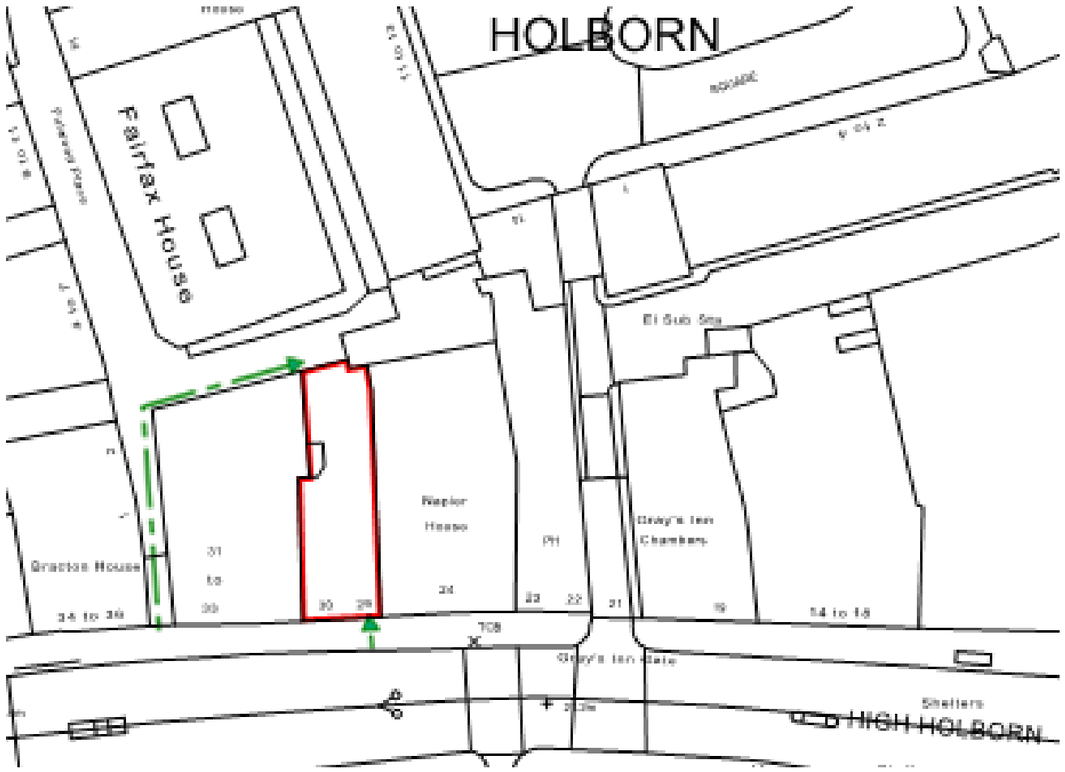


Figure 8: Access Site Plan

4.2. Fire Service Access

As noted above the existing access to the rear portion of the site is a pedestrian route only, as is the current access to the surrounding buildings, this access is via Fulwood Place.

It is proposed to provide an additional access route for the fire service via High Holborn and the staircase that serves the front portion of the offices. This route will be for fire service access only and will substantially improve the access to the rear of the site and reduce the distances fire fighters will have to travel.

Fire service vehicle access will be provided as shown in the figure below.

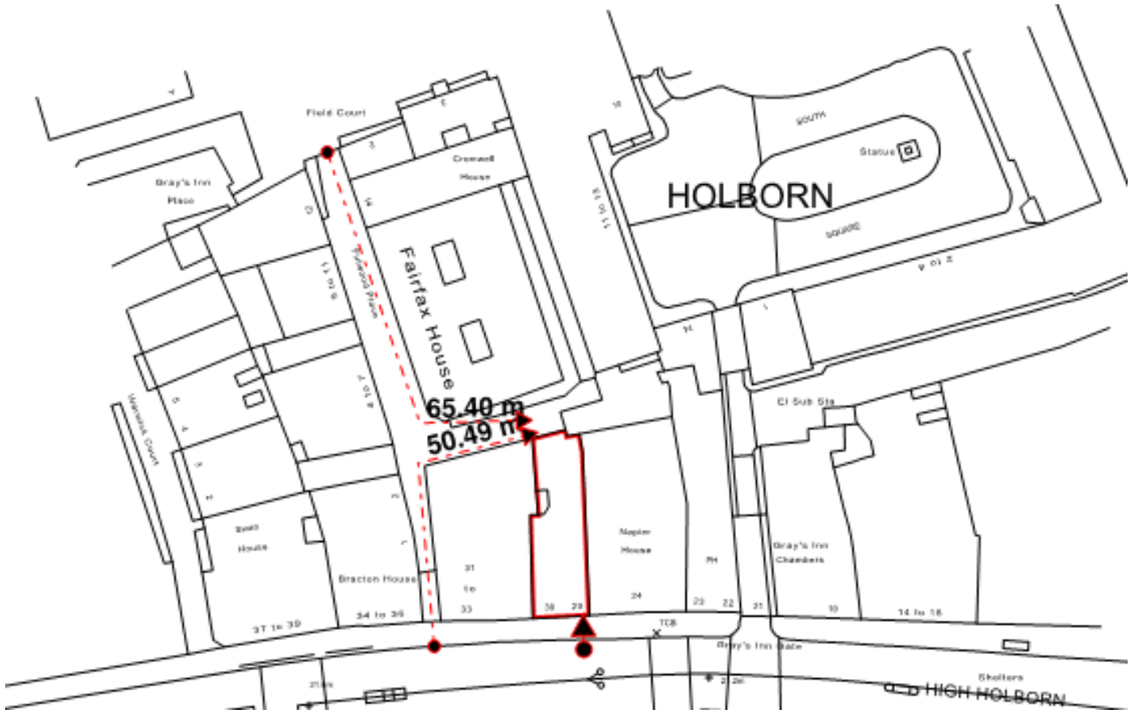


Figure 9: Proposed Fire Service Access Locations

The building will be required to be provided with a dry riser serving the residential areas on the basis the 60m hose distances cannot be met from the tender parking locations.

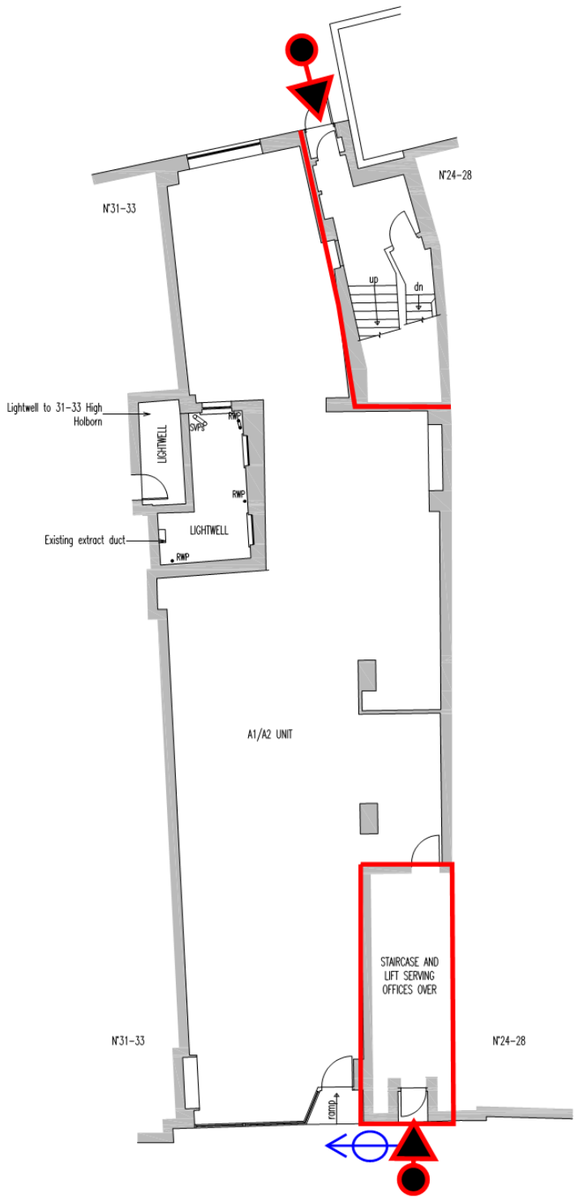


Figure 10: Ground Floor Fire Service Access

As shown above the proposed revised fire service access at ground floor will be provided from High Holborn in addition to the existing pedestrian route.

This new access point from Holborn will at first floor transition to the rear staircase via a 60-minute protected route as shown below.

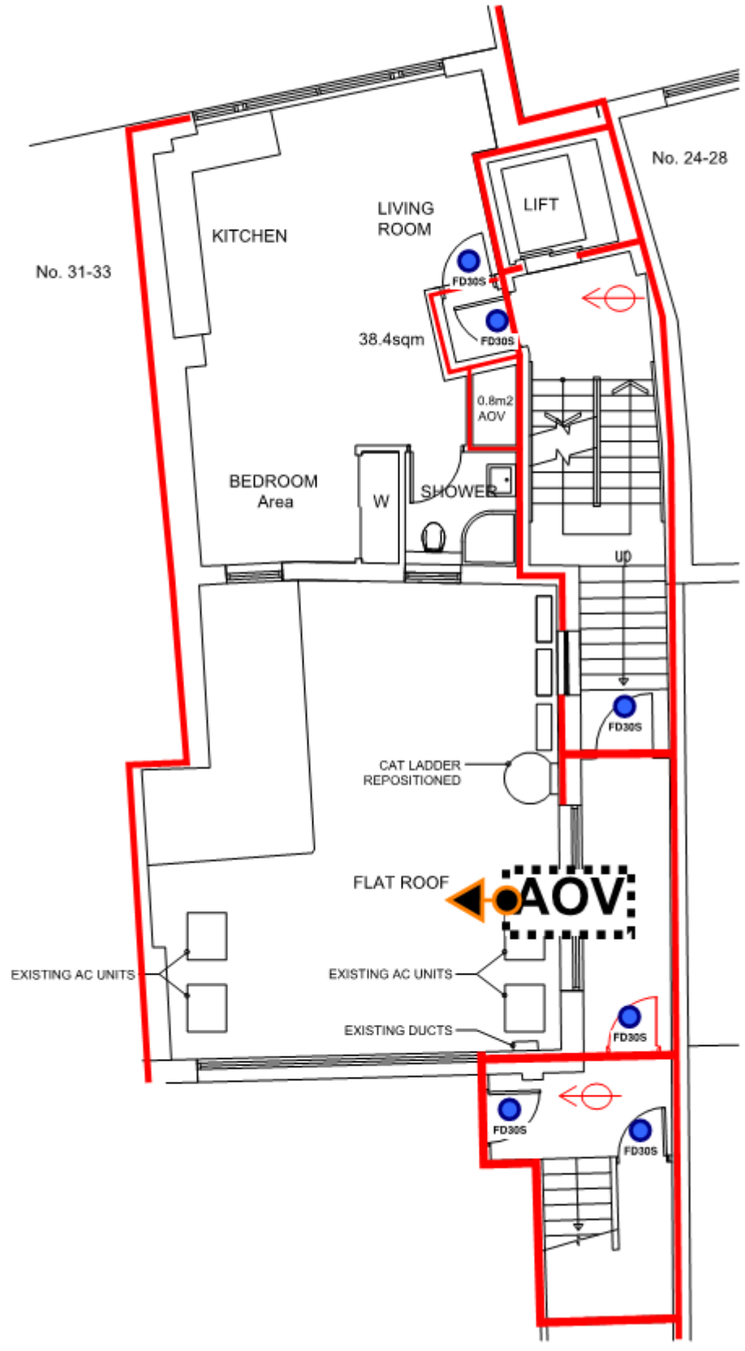


Figure 1: Fire Service Access First Floor

4.3. Firefighting Water Supplies

For buildings provided with dry rising mains, hydrants should be provided within 90 metres of dry fire main inlets and not more than 90 metres apart.

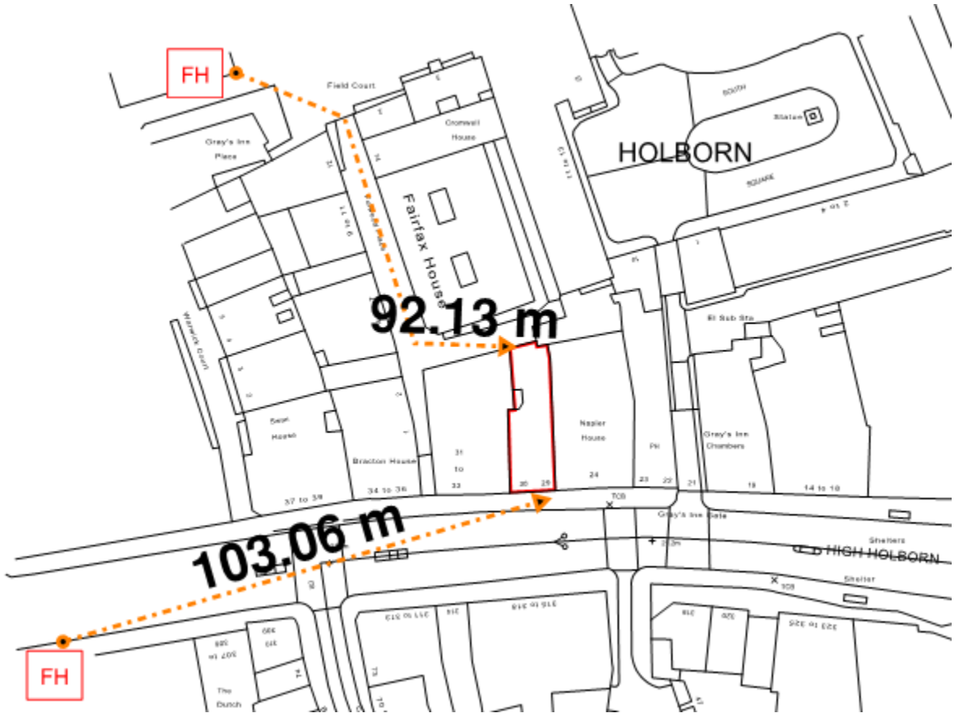


Figure 1: Hydrant Location and Associated Distances

The figure above shows that existing Fire Hydrants (FH) are located on High Holborn & Field Court. It would appear the existing hydrants are marginally in excess of the 90m dry riser allowance , during detailed design the designers will need to confirm locations and dimensions of the proximity of the hydrants.

4.4. Internal Firefighting Provisions

4.4.1. Cores Utilized for Fire Fighting

It is proposed to provide a fully protected and ventilated protected staircase including a dry riser within the staircase that will allow a hose to get within 60m of every point of every apartment [60m based on the inclusion of a suppressions system AWFSS].

The figure below illustrates the recommended layout of the protected cores for a residential building.

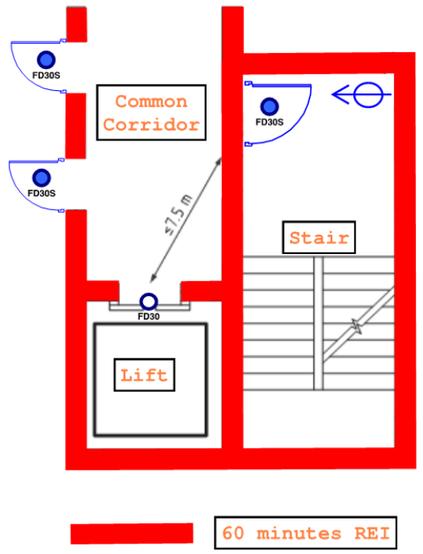


Figure 11: Residential Fire-fighting Shaft Layout

4.4.2. Stairs for Fire Fighting Access

The minimum clear width for a stair used for firefighting is 1100mm and the stairs should be designed in accordance with Clause 50.3.2.1 of BS 9991:2015.

Other requirements for stairs used for firefighting are:

- The shafts should not contain any cupboards or provide access to service shafts serving the remainder of the building unless they are enclosed in the same level of fire resistance as the staircase enclosure.
- The stair should have a clear width of not less than 1100m, this width should be kept clear for a vertical distance of 2m.
- Emergency escape lighting in the stair enclosures should be provided in accordance with BS 5266-1.
- Signage numerically indicating the floor level should be provided within the fire-fighting stair.
- Within this development the staircases are provided at 1200mm as this will encompass the accessibility requirements and means of escape requirements.

4.4.3. Lifts used for Fire Fighting.

There are no requirements to provide lifts used for firefighting in this development as the top floor heights are less than 18m albeit the rear block will be provided with Evacuation Lifts designed to BS EN 81-1 or BS EN 81-2, and BS EN 81-70 with suitable dual power supplies.

Should the attending fire service require the use of these lifts they will be provided with suitable facilities and the power supply to the lift will consist of primary and secondary supplies.

4.4.4. Dry Rising Main

A dry rising fire main is provided in the development. All riser inlets should be on an external wall or external area and the fire service pump appliance will be able to get within 18m of the inlet, the inlet will be clearly visible from the appliance.

Additionally, the dry rising fire main will be provided with:

- Suitable water supply and a fire service breaching inlet.
- Two-way breaching inlet for a 100mm main.
- Provided with an inlet box in accordance with BS5041-5 being mounted between 400mm and 600mm above ground level.
- A drain valve at the base and an air release valve to the head of the system.
- Provided with landing valves with its lowest point 750mm above floor level.
- Have an operating pressure of 12 bar.

4.4.5. Protected Common Lobby

Stairs in residential accommodation used for firefighting should be provided with lobby protection to act as a bridge head for firefighting operations and to protect the staircase from ingress of smoke. Within the rear block, the level of protection provided to the stairs by the common protected corridors and communal ventilation system is deemed adequate and additional star lobbies not required subject to the inclusions as shown on the Helios SK's.

4.5. Smoke Ventilation

Ventilation is required to the common corridors/lobbies in the residential development for both means of escape and firefighting to maintain the staircase free of smoke.

The communal corridors are required to be ventilated; this can be provided by one of the following.

- Automatic Opening Ventilators (AOV) to the exterior of the building with a minimum geometric free area of 1.5m^2, that are fitted in the common corridor or lobby directly adjacent to the stair at as high a level as practicable and an automatic openable vent sited as high a level as is practicable on the top storey of the stair way having a minimum geometric free area of 1m^2.
- A smoke shaft that is fitted in a common corridor (located away from the stair), and an automatic openable vent that is sited as high as is practicable on the top storey of the stairway, having a minimum geometric free area of 1.0m^2.
- A mechanical smoke ventilation system that is fitted in the protected lobby or protected corridor, directly adjacent to the staircase enclosure and an automatic openable vent that is sited at a high as level practicable on the top storey of the stairway and having a minimum geometric free area of 1m^2.
- A pressure differential system.

The rear block has a single staircase with a single ventilated lobby included. There are no extended corridor access routes and, on that basis, as noted in BS 9991 Section 14 in this scenario the design has limited the travel distance to 7.5m in the ventilated portions of corridors.

The proposal is to limit travel distances to 7.5m in the ventilated portion of the corridors; this is in line with the guidance offered in BS 9991 – Diagram 6a and Section 14.1.3.

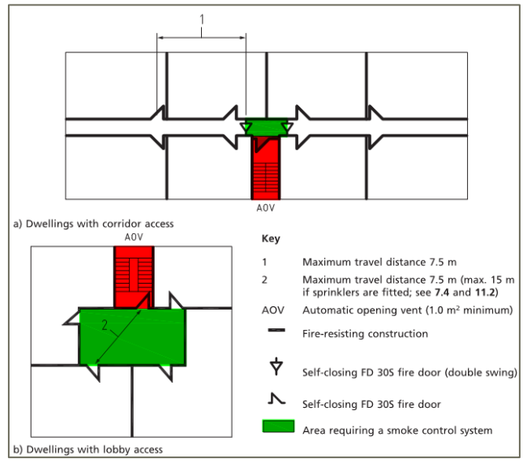


Figure 12: Typical Smoke Ventilation Layout

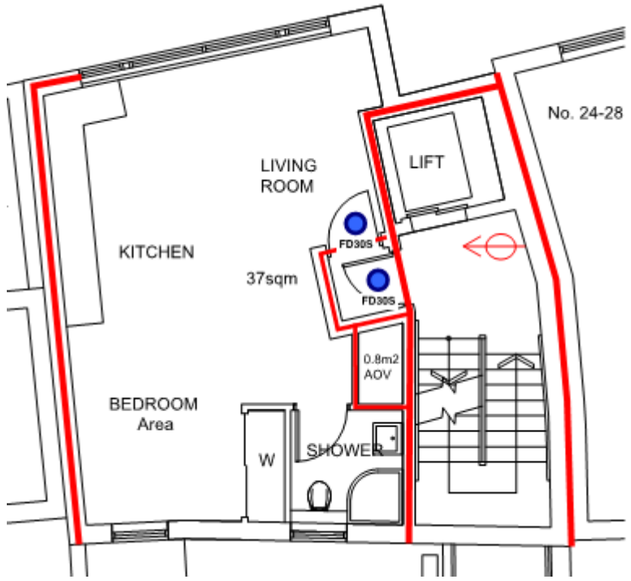


Figure 13: Ventilated lobby Layout

Additionally, where the fire service access transitions from High Holborn to the rear staircase serving the residential accommodation, an additional ventilated lobby should be provided separating the front and rear staircases.

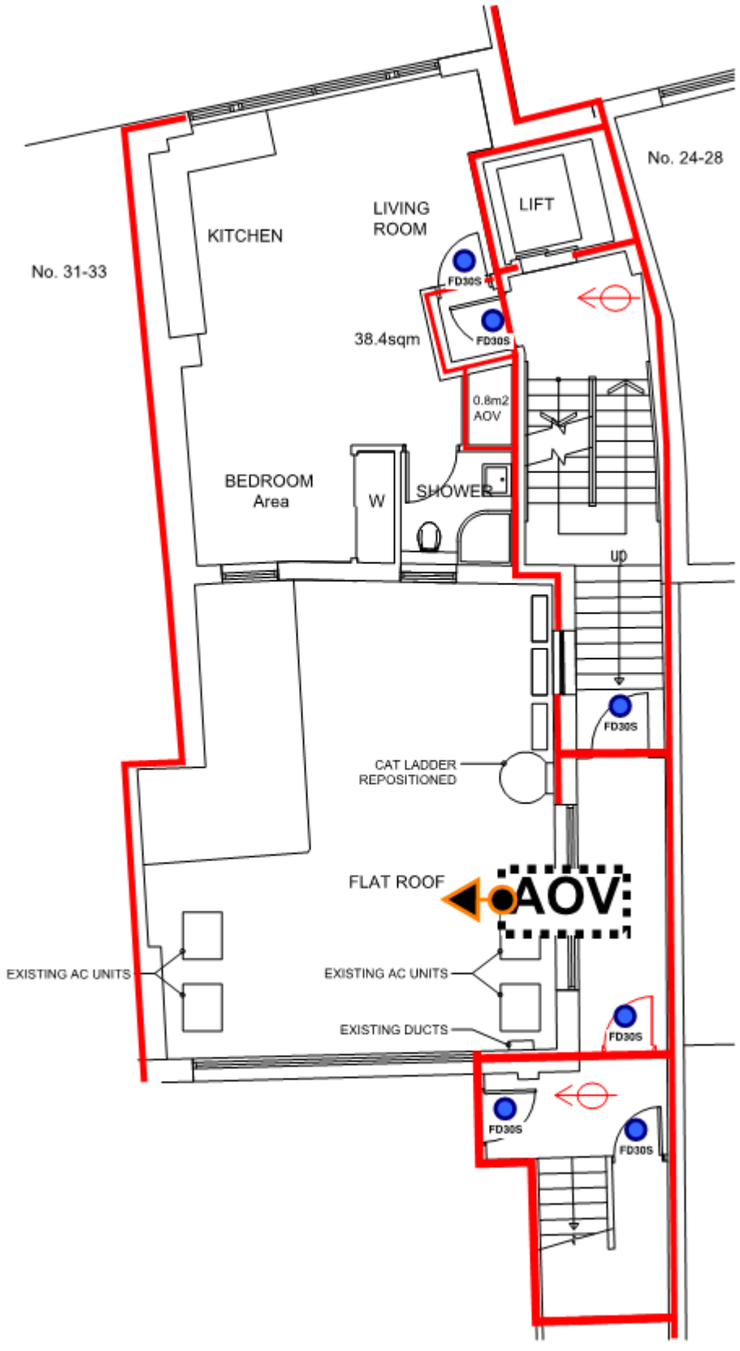


Figure 14: Additional AOV at Stair Transitions

4.6. Automatic Water Fire Suppression System

The works areas as noted above are in excess of 11m and will therefore be fitted with a comprehensive automatic water fire suppression system as noted in Section 5.7 below

4.7. Wayfinding Signage

Due to the height of the building, people who are escaping and / or the fire service attending a potential fire can find themselves easily disorientated especially if there is smoke present.

Whilst not required under BS 9991 the most current guidance on this type of accommodation [Approved Document B 2020] notes that the benefits of the Wayfinding signage for the fire service and for means of escape is invaluable and on this basis the wayfinding signage will be provided in the full premises i.e. floor identification signs will be provided on every landing of a protected stairway and every protected corridor/lobby into which a firefighting lift opens.

We have referenced the Approved Document in this section opposed to BS 9991 the design guide we are using, on the basis BS 9991 has no specific requirements for the additional wayfinding signage but in our opinion, we are specifying an enhanced standard based on the risks posed by the occupancy type and scale of the development.

Wayfinding signage for the fire service will be provided in the full premises; floor identification signs will be provided on every landing of a protected stairway and every protected corridor/lobby into which a firefighting lift opens.

Apartment indicator signs to identify apartment numbers should also be used and supplemented by arrows where necessary.

The floor identification signs should meet all of the following conditions:

- The signs should be located on every landing of a protected stairway and every protected corridor/lobby.
- The text should be in sans serif typeface with a letter height of at least 50mm. The height of the numeral that designates the floor number should be at least 75mm.
- The signs should be visible from the top step of a stair.
- The signs should be mounted between 1.7m and 2m above floor level and, as far as practicable, all the signs should be mounted at the same height.
- The text should be on a contrasting background, easily legible and readable in low level lighting conditions or when illuminated with a torch.

For more information see the May 2020 amendments to Approved Document B.

5. Active Fire Protection Systems

5.1. Evacuation Strategy

Residential

The evacuation procedure for the residential floors is a 'Defend in Place' stay put policy. This means that the only occupants who are expected to evacuate initially are; the occupants of the apartment of origin of the fire or occupants who are directly affected by the effects of the fire.

All other occupants are expected to remain in place until fire service intervention and in a worst-case scenario where they are required to evacuate under fire service direction.

Ancillary Spaces

The ancillary spaces i.e., plant rooms, bin stores etc. will have a single staged evacuation strategy. This means that on activation of detection all sounders will operate within the ancillary space and any communicating ancillary space.

5.2. Fire Detection & Alarm System

The minimum required alarm and detection system in accordance with BS 9991:2015 for the Multi occupant apartments is a Grade D Category LD 1 installed in accordance with BS 5839 Part 6:2019.

To the new apartments It is proposed to provide a Grade D1 Category LD1 fire detection and alarm system within all the apartments in accordance with BS 5839-6.

The minimum required alarm and detection system for the common corridors is a Category L5 alarm and detection system installed in accordance with BS 5839 Part 1:2017.

Note: the alarm and detection system within the common corridor is only to operate the smoke control and does not need to generate an evacuation alarm.

5.3. Emergency Lighting & Signage

Emergency lighting should be installed in accordance with BS 9991 Clause 44.2 and BS5266 so that on the failure of the normal lighting the emergency lighting will allow occupants to escape safely by.

- Providing means of locating and identifying escape routes and signage.
- Providing suitable means of escape.
- Allowing safety measures to be carried out effectively.
- Providing adequate cover to high-risk task areas.
- Allowing people to safely evacuate away from the building.

For a full detailed listing of locations BS 5266 should be consulted but as an indication:

Areas Requiring Emergency Lighting
Windowless accommodation
Stairways
Internal Corridors more than 30m long
Means of escape routes
Changes in level or direction
Electricity ad generator rooms
Switch room/ battery room for emergency lighting

Table 4: Indicative Emergency lighting locations

Illumination should also be provided to key areas where specific tasks as to be carried out and at focal points; an indicative list is provided below as a guide; for the full listing and planes of reference for specialist areas please consult BS 5266 Part 1: 2016.

Location	Response Time [S]	Minimum Illuminance [Lx]	Minimum Duration	Reference Plane
Plant Rooms & Switch Rooms	5	15	Full rated – building duration	In plane of visual task
Fire alarm control and indicating Equipment	5	15	Full rated – building duration	In plane of visual task
Reception areas	5	15	Full rated – building duration	In plane of visual task
Panic Bars or security devices	5	5	Full rated – building duration	Horizontal on plane of panic bar / vertical at wall mounted signage and security devices.

Table 5: Indicative Specific Lux Levels

Escape and other fire safety signage should also be provided in accordance with BS ISO 3864 Part 1: 2011 and BS5499 Part 4: 2013.

Fire doors should have signage as detailed in Section 9.4 below.

5.4. Category B Protective Devices

There are apartments within the scheme that include open plan arrangements. See Section 6.1 for more information.

As it can be seen in the typical layouts of the studio apartments the cooking facilities are not enclosed as per BS 9991 recommendations i.e., exceed 8m x 4m.

On this basis each cooking facility will be provided with a Category B Preventative Cut Off Device to BS EN 50615 in addition to the suppression and early warning system.

BSEN 50615 describes three categories of protective device:

- Category A – Device for extinguishing and simultaneous power cut-off of the appliance.
- Category B - Device for preventive power cut-off of the appliance.
- Category AB - Device for preventive power cut-off of the appliance, followed by extinguishing if flame occurs.

The protective device is effective only for fires on the hob and is not intended to protect against fires in the oven or in places adjacent to the cooker. It is noted the building wide suppression system would cover the adjacent areas.

> This European standard deals with the safety of electric devices used for detection, prevention and suppression of fire originated:
>
> - from a cooking process, or
> - from flammable material left on the hob.

A Category B device may give some protection against fires originating in other (non-cooking) materials left on the hob, however this will depend on the nature and quantity of materials.

A Category B device shall switch-off the appliance before a fire originates and an audible warning of at least 65 dB measured 1 m distance in accordance with EN 54-3 shall be generated until the user reset the alarm. Thus, the system is more proactive than a suppression system.

> ***Category B devices***
>
> ***Category B*** *devices shall switch-off the appliance before the flames start and an audible warning of at least 65 dB measured 1 m distance in accordance with EN 54-3 shall be generated until the user stops the alarm, for example by pressing a button, or the temperature of the oil starts to decline.*

The key benefit with these devices is they are designed to prevent a fire starting so they are a proactive device; these devices are widely accepted by statutory authorities where it is proposed to remove the fire rated enclosure to the cooking facilities subject to fitting of Category B device complying with BSEN 50615.

This is on the basis it is intended to have the effect of eliminating the risk for a cooking fire as a ‘Preventative Cut off Device’ is assessed so that it will shut off the device prior to flames occurring.

The Category B system will mitigate the risk posed by the cooking appliance within the apartment through the following:

- The Category B system will comply with the new European standard BS EN-50615 *Household and similar electrical appliances – Safety – Particular requirements for devices for fire prevention and suppression for electric hobs*.
- The system should be assessed in a third-party, accredited test laboratory (VTT Expert Services).
- The Category B system monitors the cooking appliance and will react to any sharp rise in temperature by isolating power supply to the hob, therefore turning it off.
- The Category B system will give an audible and visual alarm when temperature reach 200°C and cut off power supply to the hob before temperature reach 330°C.
- The Category B system will sound an alarm, before a fire is ignited, the audible alarm will not be less than 80dB, as well as audible alarm, the system will also provide a visual alarm.
- The system will isolate power supply to the hob if it is tampered with.
- If the battery is low, the system will give audible and visual alarm, and if the battery has expired then it will not be possible to turn on the cooking appliance without a replacement.
- It will not be possible for the occupants to adjust the device as it will require a qualified specialist to access the settings.
- The system has ten-year minimum lifespan.

As stated earlier the provision of Category B system will ensure that a fire is prevented as a result of misuse of cooking appliance or from flammable material left on the hob. Hence, the system is considered to be sufficient as a compensatory feature where cooking appliance are located close to the exit proximity and are not enclosed.

5.5. Automatic Water Fire Suppression System [AWFSS]

As the development is in excess of 11m in height an AWFSS should be provided to the residential sections of the building and the ground floor areas where support is relied on for the structural stability of the new floors.

This construction and floor make up will be confirmed during the detailed design period.

The sprinkler specification will be addressed by the project team in conjunction with a specialist adviser to confirm specific design parameters to provide effective protection, but the system will be in accordance with BS 9251 2021.

The following information is informative; compliant systems and design assumptions will need to be ratified with the Specialist Sprinkler Designer as they would be deemed the 'Competent Person' as stated in BS 9251: 2021.

Where no specific provision is mentioned in this section regarding any particular aspect of the system reference should be made to BS 9251:2021 itself.

Once a system specification is proposed consultation with other interested parties (client, insurer) is advisable.

Note: *According to BS 9991: 2015, sprinklers should be provided within the ancillary areas in accordance with either BS 9251 or BS EN 12845: 2015.*

The areas of the building provided with the AWFSS with the exclusions as noted below.

- Where communal areas / corridors are managed areas and considered to be sterile within a fire strategy report and with agreement by the AHJ, the number of design sprinklers can be limited to two in these areas only.
- Bathrooms, shower rooms and toilets with a floor area less than 5m2 are exempt on the basis they have "linings conforming to BSEN 13501-1:2018 Class A1, A2-s3, d2 and B-s3, d2, and which are not prepared for white goods, such as washing machines, dryers, electric showers or water heaters.
- Staircases, if they contain materials confirming to "BSEN 13501-1:2018, Class B-s3 or better for construction materials and B(fl) or better for flooring, including subcategories such as d0, d1, d2 for construction materials and s1 and s2 for flooring, surface spread of flame and constructed as a fire-resistant separation.
- Enclosed vertical shafts are only exempt if they contain materials confirming to "BSEN 13501-1:2018, Class B-s3 or better for construction materials and B(fl) or better for flooring (including subcategories such as d0, d1, d2 for construction materials and s1 and s2 for flooring), surface spread of flame and constructed as a fire-resistant separation
- Cupboards and Pantries with a floor area of less than $2m^2$ or where the least dimension does not exceed 1m are exempt unless they are prepared for consumer units or electrical equipment (excluding a single light).
- Ceiling Voids.
- Uninhabited loft / roof voids.
- Attached buildings such as garages etc with no direct connection.
- Crawl spaces
- External balconies permanently open.

If it is determined by the system designer that a BS 9251 residential sprinkler system is still appropriate to use for all areas, the category for the system should be Category 3 as the building is less than 18m in height and communal/ancillary areas need to be covered

Table 6: BS 9251 Category 3 Sprinkler System Review

Design Standard BS9251 2021	Notes
1. Category 3 System	Apartments more than 18m and communal areas to be covered by the suppression system.
2. Minimum Design Parameters	4mm/min for a single head operation or 2.80 mm/min through each sprinkler operating simultaneously up to a maximum of 2 - 4 sprinklers in a single area of operation. Where communal areas / corridors are managed areas and considered to be sterile within a fire strategy report and with agreement by the AHJ, the number of design sprinklers can be limited to two in these areas only.
3. System flow rate to be calculated discharge density multiplied by the area of operation.	• Maximum area coved by a single sprinkler head is $25m^{2.}$ • No more than 5.5m apart, and no more than half the design spacing distance from a wall. • Sprinklers no closer than 2.4m.
	• Shielding and obstructions need to be taken into consideration.
4. Duration 30 minutes	
5. Sprinkler heads should be quick response.	
6. Hydraulic calculations required.	
7. Stored Water Tank	• Tank sizing based on the maximum flow demand multiplied by the required duration. • Low water alarm system. • Dedicated Sprinkler pump
8. Flow Switches connected to the AFD system and RAMS	Minimum floor by floor.
Note: This overview is for discussion only and should not be taken / used as a technical specification or a technical design note for tendering, installation or as a detailed design requirement.	

It has been agreed that the car par, bin store and cycle store will be subdivided to ensure the maximum compartment size is less than $100m^{2.}$

5.5.1. Benefits Taken with Inclusion of Sprinklers

The following benefits have been taken with the inclusion of sprinklers.

- Open plan apartments
- Extended hose distances

5.6. Smoke Ventilation

5.6.1. Common Corridor Smoke Control System

The principle of the smoke control system within the common corridor is that a vent is provided to the lobby or corridor adjoining the stair to facilitate the removal of smoke through the vent prior to it entering the staircase enclosure. The vents can either be located on an external wall or in a vertical shaft. A vent is also provided from the top storey of the stairway to outside air to function as an outlet if smoke enters the staircase or as an inlet to make the system more efficient prior to the arrival of the fire service.

The communal corridors or lobbies adjacent to the stair are required to be ventilated. The smoke control system provided to the corridor or lobby adjoining the stair facilitates the removal of smoke through the vent prior to it entering the staircase enclosure.

Annex A:

'The primary objective of smoke control in residential buildings is to protect the staircase enclosure; however, the adjacent protected corridor or lobby might also gain some protection.

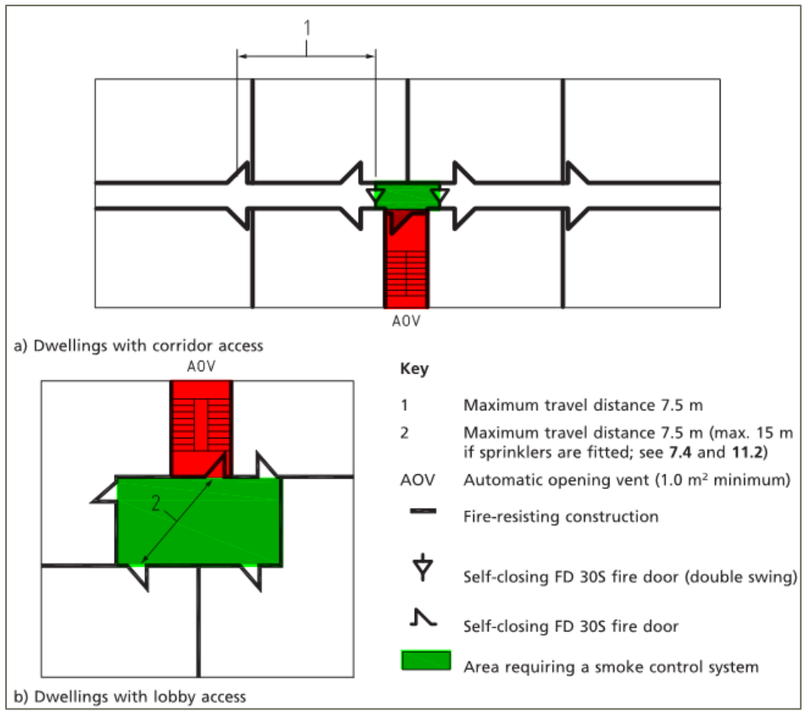


Figure 15: Typical Smoke Ventilation Layout

The communal corridors are required to be ventilated; this can be provided by one of the following.

- Automatic opening ventilators (AOV) to the exterior of the building with a minimum geometric free area of 1.5m^2, that are fitted in the common corridor or lobby directly adjacent to the stair at as high a level as practicable and an automatic openable vent sited as high a level as is practicable on the top storey of the stair way having a minimum geometric free area of 1m^2.
- A smoke shaft that is fitted in a common corridor (located away from the stair), and an automatic openable vent that is sited as high as is practicable on the top storey of the stairway, having a minimum geometric free area of 1.0m^2.
- A mechanical smoke ventilation system that is fitted in the protected lobby or protected corridor, directly adjacent to the staircase enclosure and an automatic openable vent that is sited at a high as level practicable on the top storey of the stairway and having a minimum geometric free area of 1m^2.
- A pressure differential system

Note: BS 9991 specifies that either natural smoke shafts or mechanical pressure differential systems should be used for ventilation protecting stairs in buildings over 30m i.e. The provision of AOV's direct to outside on elevations is not considered suitable due to potential issues with external wind pressure on the vents on floors over 30m.

It is proposed to utilise mechanical ventilation for the development as a more efficient system than a natural smoke shaft system providing an enhanced level of safety,

The requirements for natural and mechanical smoke ventilation and the approach to be adopted in the different areas of the building are discussed below.

5.6.2. Mechanical Smoke Shafts

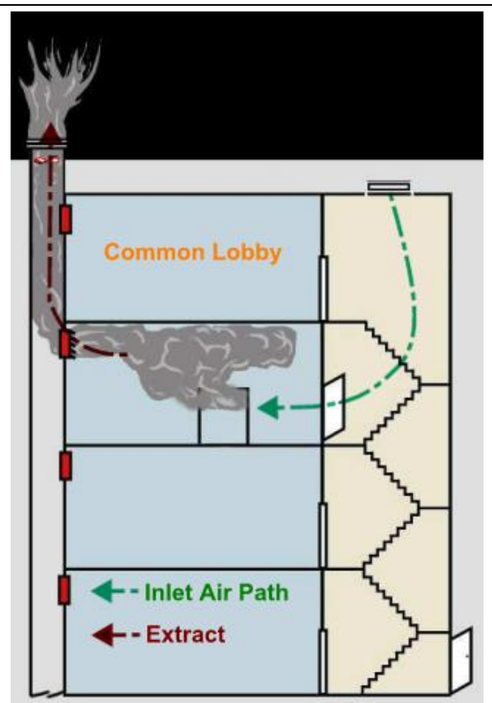
Where mechanical ventilation is provided, the mechanical smoke shafts will depressurise the lobbies and remove any smoke in the area; the system will be validated by CFD modelling including demonstrating tenability as noted in the Smoke Control Association Guide and BSEN 12101

The staircase lobby / corridor provided with a mechanical smoke ventilation system will be designed in accordance with BS 9991:2015 Clause 14.2.4 which states.

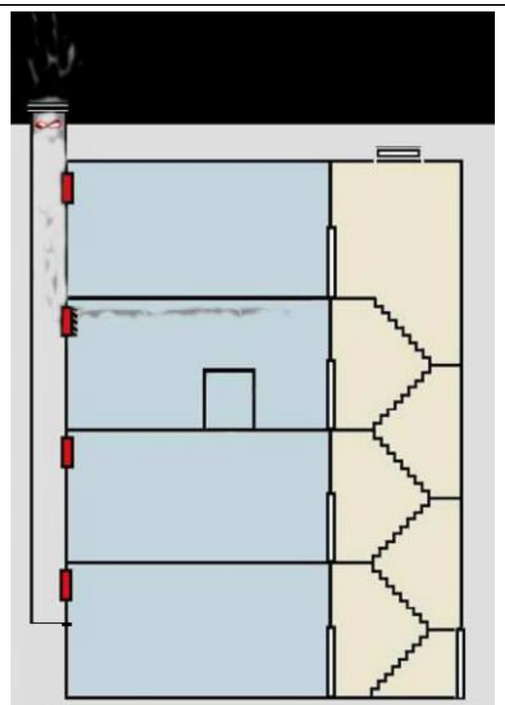
- The smoke shaft should be fully open to the external air at the top and closed at the base.
- The top of the lobby or corridor vent should be located as close to the ceiling of the lobby or corridor as is practicable and should be at least as high as the top of the door connecting the lobby or corridor to the stairwell.
- The lobby or corridor vents, in closed position, should have a minimum fire and smoke resistance performance of 60 minute and integrity (leakage) no greater than 3m^3/h/m^2 when tested in accordance with BSEN 1366 Part 2.
- No services other than those relating to the smoke shaft should be contained within the smoke shaft.
- Mechanical smoke ventilation should demonstrate conditions in the lobby or corridor and stairs that are equivalent to or better than the natural ventilation system it replaces.
- A secondary power supply should be provided to the fans and all actuators and controls.
- The maximum pressure at the door handle on the escape route should not exceed 100n.

The size of the smoke shaft and the fan duty will be determined by the specialist designers using CFD modelling, and the detailed justification will be based on a tenability analysis based on the physical staircase and lobby dimensions.

The system will operate on a duty and standby system. When the staircase door opens during the escape and firefighting phases this will provide an inlet air path (due to 1m^2 AOV at the head of the stair – see below) allowing the mechanical smoke extract system to clear the staircase lobby and keep the staircase free of smoke ingress.



Stair Door Open



Stair Door Closed

Mechanical Smoke Ventilation System

To ensure the inlet air paths are adeqautely provided, the staircase will be provided with a 1.0m^2 automatic opening vent to the head of the staircases with a geometric free area measured as noted below.

1.1.1. General Requirements

All smoke shafts should be constructed either of non-combustible materials conforming to BS 476 Part 4 or any material which, when tested in accordance with BS 476 Part 11, does not flame or cause any rise in temperature on either the centre of specimen or the furnace thermocouples. The smoke shaft should run vertically from top to bottom with no more than 4 metres of the shaft at an inclined angle (max 30°).

No services other than those relating to the smoke shaft should be contained within the smoke shaft.

An AOV is also required at the head of each stair with a free area of 1.0m^2.

The rear block has a single staircase with a single ventilated lobby included. There are no extended corridor access routes and, on that basis, as noted in BS9991 Section 14 in this scenario the design has limited the travel distance to 7.5m in the ventilated portions of corridors.

The proposal is to limit travel distances to 7.5m in the ventilated portion of the corridors; this is in line with the guidance offered in BS9991 – Diagram 6a and Section 14.1.3.

During the detailed design, the ventilation provision will be assessed in line with BS 9991.

Approach to be agreed with the Authorities having Jurisdiction during the detailed design phase.

Figure 16: Illustrative Ventilated lobby Layout

Additionally, where the fire service access transitions from High Holborn to the rear staircase serving the residential accommodation, an additional ventilated lobby should be provided separating the front and rear staircases.

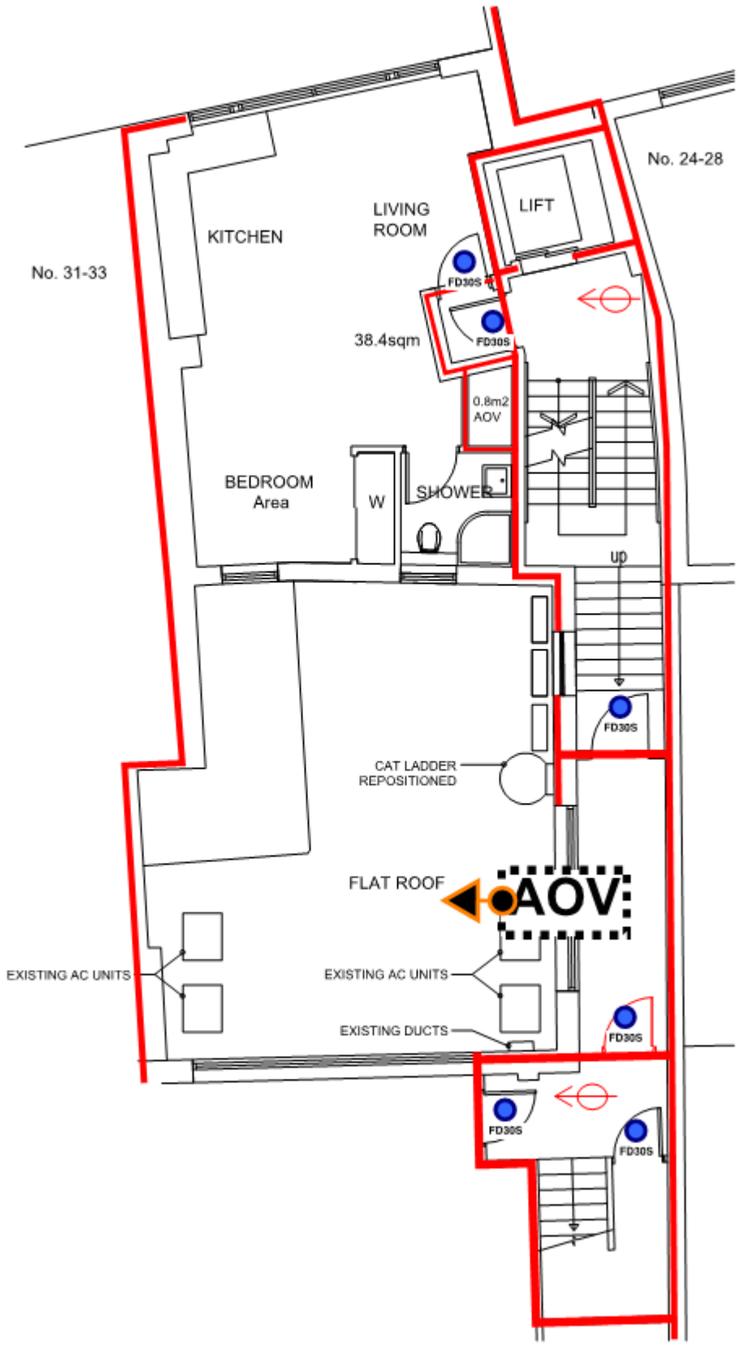


Figure 17: Additional AOV at Stair Transitions

6. Residential Horizontal Evacuation

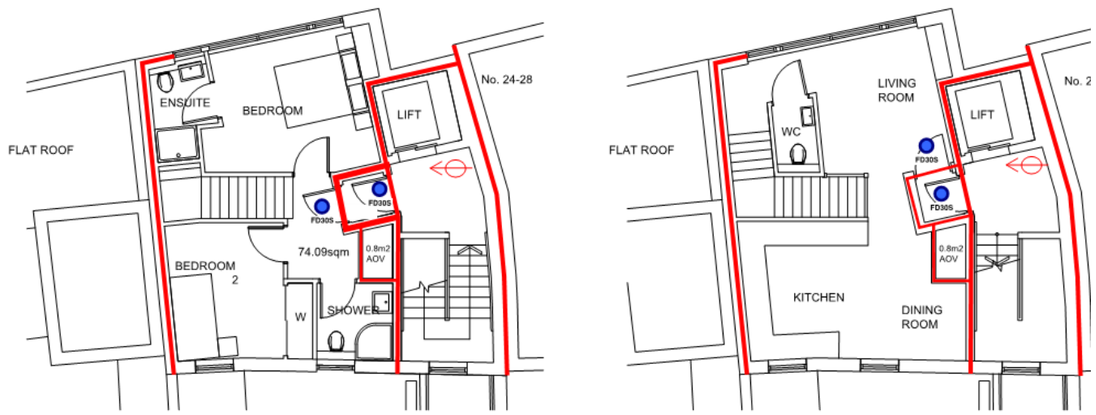
6.1. Principals of Apartment Layouts

The apartments are expected to have been designed in accordance with Clause 9.4 to 9.7 from BS 9991. There are a number of single level studios and one apartment with accommodation on two floors within the scheme, which has followed the recommendations below.

6.1.1. Apartments with Alterative Escape Routes

As noted in BS 9991 9.5.2 apartments that have a floor level that is situated higher than 4.5 m above the ground level should be provided with an alternative exit from any habitable room that is not on the entrance level of the apartment.

As shown below the fifth and sixth floors are part of a single apartment where there is an alternative means of escape on every level.



Proposed Fifth Floor Plan

Proposed Sixth Floor Plan

Figure 2: Apartments With Protected Entrance Halls

6.1.2. Open Plan Apartments

Apartments without internal hallways without having an alternative means of escape. These apartments should meet the recommendations from Clause 9.4.2 from BS 9991. A summary is indicated below.

- Grade D1 LD1 fire detection and alarm system should be provided.
- Automatic Water Suppression System
- The total travel distance from any point of the flat to the entrance door of the flat should be limited to 9 m. This limit may be extended to 20 m if an AWFSS
- Cooking facilities should be sited away from the flat entrance door and the internal escape route.

Additionally in order to minimise the risk posed by a cooker open to the rest of the apartment it is proposed to provide fire prevention devices to the cookers that should be in accordance with BS EN 50615:2015. See Section 5.4 for justification.

With the inclusion of the fire preventative devices and the other requirements set out within BS 9991, the cooker is not considered any worse than other general appliances within the apartment.

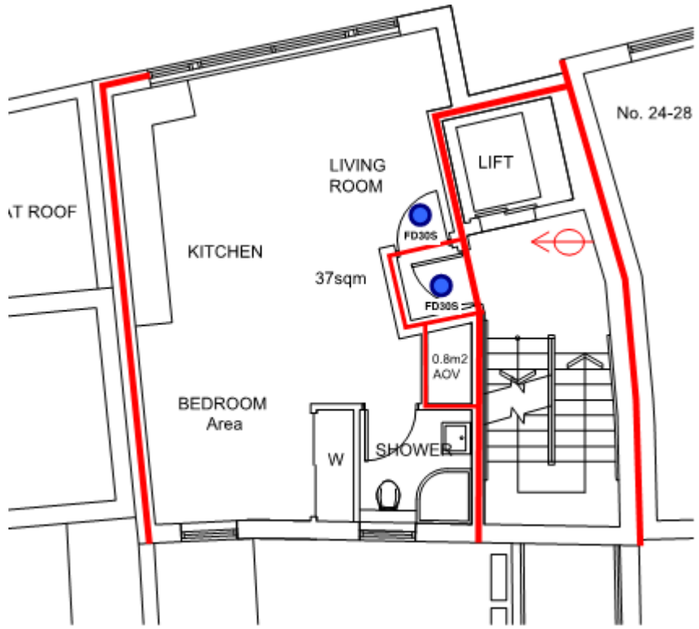


Figure 3: Open Plan Apartments

6.1.3. Travel Distances

The travel distances should be in accordance with BS 9991 and are set out in the table below.

Table 7: Maximum Travel Distances

Area	One Way Travel Distance	Two Way Travel Distance
Open Plan Apartments	20m	NA
Plant rooms, bins stores	9m	18m
Common Corridor	N/A Note 2	N/A Note 2
Roof Escape	60m Note 3	100m Note 3

Note 1: *See Section 5.1 for information on how to measure the travel distance.*

Note 2: *As the common corridors are open balconies the travel distances are limited by fire service hose runs.*

Note 3: *ADBV2 has been supplemented for maintenance access as BS 9991 does not provide information in this regard.*

The travel distances meet the recommendations noted above.

6.1.4. Exit Widths and Escape Routes

For the purposes of this report, the width of a doorway is the clear width of the opening between the door leaf and frame (or projecting building hardware or the width between two opening door leaves in the case of double doors) assuming that the door leaf is free to open 90 degrees or more.

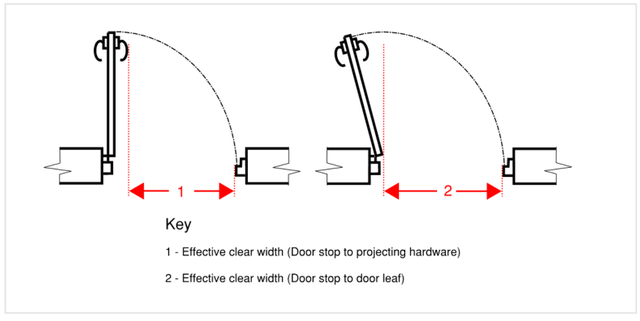


Figure 4: Clear Exit Width

The width of an escape route is the width at 1500mm above the pitch line when defined by the walls or the minimum width of passage available between any fixed obstruction (handrails fixed to the wall are ignored if less than 100mm).

All doors on escape routes fitted with a lock or fastening should be readily operated, without the use of a key and without having to manipulate more than one mechanism.

If doors on escape routes are provided with access control measures all electrically powered locks should automatically unlock on actuation of the fire alarm system.

For the residential areas implementing a stay put evacuation strategy, the minimum clear width of escape routes should achieve 750mm.

For the ancillary areas where a simultaneous evacuation is proposed, the maximum occupancy within each space is not considered to exceed 60 persons, therefore the minimum clear escape width can be 750mm.

Note 1: Other parts of the Approved Documents such as Part M may require larger storey exit widths.

7. Vertical Evacuation

The building is served by a single staircase from first to 6th floor, from first floor 2 staircases are available. As the evacuation strategy is stay evacuation, the stair can achieve a minimum clear width of 750mm in accordance with BS 9991. However, a minimum of 1100mm should be provided. This will ensure suitable firefighting access, and additionally should a full evacuation be required, all occupants would be able to safely use the stair.

7.1. Vertical Escape Routes

7.1.1. Protected Shaft

There are compartment floors within the building and on this basis where the stair passes through the compartment floor the fire resistance should meet the same fire performance as the elements of structure (REI60). See Section 9 for more information on the fire resistance requirements and methods of exposure.

7.2. Mobility Impaired Evacuation

The base code compliant evacuation process is 'Defend in Place' for the residential areas. This means that the only occupants who evacuate are the occupants who are directly affected by the effects of fire (i.e., the fire affected cluster apartment as a whole will evacuate simultaneously). The remaining occupants in other cluster apartments will remain within their apartments unless asked to evacuate by the fire service.

Final exits should not present a barrier for disabled people. Where the route to a final exit does not include stairs, a level threshold and, where necessary, a ramp should be provided to facilitate safe means of escape.

There is no detailed requirement within BS 9991 guidance to provide any facilities specifically for the use by mobility impaired occupants as the primary evacuation strategy is 'Defend in Place' where the high level of compartmentation is deemed to provide adequate protection to the occupants. Where a fire is considered in an individual apartment the occupants are deemed to leave this space and proceed to the protected corridor / staircase which then is the 'Defend in Place' protected location.

Remaining occupants based on the levels of compartmentation should remain in place unless directly affected by heat / smoke; or unless directed to leave by the Fire and Rescue Service. This is the primary driver for the additional ventilation requirements to common staircases in blocks of apartments to maintain tenable conditions in the escape staircases whilst a fire is contained within an individual apartment.

The evacuation plan should not rely on the assistance of the fire and rescue service. This is an important factor that should be considered in the building design.

In addition to BS 9991, which provides guidance on meeting the functional requirements of the Building Regulations, the London Plan set outs specific elements that should be considered relating to inclusive design under Policy D5 Inclusive Design and Policy D12 Fire Safety.

Under the London Plan it is necessary to ensure all buildings are designed and built to incorporate safe and dignified emergency evacuation for all building users by as independent means as possible. It goes on to state under D12 that in all developments where lifts are installed, Policy D5 Inclusive design requires as a minimum at least one lift per core (or more, subject to capacity assessments) to be a suitably sized fire evacuation lift suitable to be used to evacuate people who require level access from the building. Fire evacuation lifts and associated provisions should be appropriately designed and constructed and should include the necessary controls suitable for the purposes intended.

The provision of the single evacuation is considered to meet the requirements of the London Plan based on the defend in place evacuation strategy and building occupancy and is in excess of that required to meet the requirements of the Building Regulations.

Special management procedures might be required where it is reasonably foreseeable that the proportion of mobility impaired people in a building will be relatively high; should this be the case this should be communicated to the design team during the initial design stages and briefing sections of the design.

Where known operational intent or specific management procedures for 'Relevant Persons' have been communicated to the designers this will be reflected in the Fire Safety Strategy and Regulation 38 Information issued. If no additional or specific requirements have been communicated the design will be based on the relevant design standards as noted in the Building Regulations.

7.3. Evacuation Lifts

7.3.1. General

It is proposed that an evacuation lift is provided that can be used by the management team to evacuate mobility impaired occupants.

Where a lift is part of the evacuation sequence for people requiring assistance, it should be an evacuation lift. Where an evacuation lift is used, it is expected that the evacuation will be assisted by an authorised person(s).

An evacuation lift, where provided, should always be available for evacuation purposes. Wherever practicable it needs to be a lift used routinely as a passenger lift and not one used solely for evacuation or occasionally as a lift for transporting goods. It should be designed and installed in accordance with the relevant provisions in BS 8300, BS EN 81-1 or BS EN 81-2, and BS EN 81-70.

An evacuation lift should be situated within a protected enclosure consisting of the lift well itself and a protected lobby at each storey served by the lift and should be provided with a protected route from the evacuation lift lobby at the final exit level to a final exit. It should be associated with a refuge and should be clearly identified.

An evacuation lift should be provided with a switch clearly marked "Evacuation Lift" and situated adjacent to the lift landing door at the final exit storey. Operation of this switch should cause the evacuation lift to return to the final exit storey and should isolate the lift landing call controls.

The evacuation lift should then operate only in response to the lift car control panel and the communication system provided should be in operation. Unauthorised operation of the switch may be prevented by the use of a key operated switch or by placing the switch in a glass-fronted box.

Where evacuation lifts are provided, their use to evacuate people requiring assistance should be a matter of priority. Once under staff control, the lift will therefore only normally be used to evacuate those persons in need of assistance. Alternative power supplies, etc., might only be specified to accommodate the evacuation of people requiring assistance, and might not have sufficient capacity to allow their use by others. Other building occupants should be directed to escape via the routes provided for that purpose.

Where this is planned, the relevant local fire authority should be consulted before implementation.

7.3.2. Power supplies

The primary electrical supply should be obtained from a sub-main circuit exclusive to the lift and independent of any other main or sub-main circuit. Other lifts in the same well may be fed from the same primary supply, provided that the supply is adequate for the purpose and that arrangements are such that a fault occurring in any other lift in that well or the power supplies thereto does not affect in any way the operation of the evacuation lift.

Except for hydraulic lifts serving two storeys only, the lower of which contains a final exit to a place of ultimate safety, an alternative power supply should be provided such as an automatically started generator, a privately owned distribution system that would not be affected by a fire in the building (either by being disconnected for fire-fighting purposes or by failure of the main switchboard providing the normal power supply to the building) or a separately fused protected circuit fed directly from the main incoming electrical supply to the building located in a fire protected enclosure. The cables transmitting the alternative power supply should be separated from those of the primary supply and routed through areas of low fire risk, or should be physically protected so that a breakdown, or any cause of a breakdown, on one cable cannot lead to simultaneous failure of the other supply. Any power switches or isolators should be clearly identified, and labels should be provided at the main switchboard and at the alternative power supply indicating the presence and location of the other supply.

Battery inverters are not normally acceptable as alternative power supplies, unless it can be demonstrated that:

- This power supply is capable of operating the lift at normal speed; and
- It has sufficient capacity to enable the lift to operate enough complete cycles to serve and evacuate every refuge associated with the shaft, at one refuge per cycle (movement from final exit level to a refuge and back to the final exit level being considered as one cycle).

Movement to the level from which the authorised person will take control of the lift should also be included. The capacity should be calculated with allowance for the batteries' supply capacity at the end of their design life.

Where it is reasonably foreseeable that the refuges will be used by more than one user (e.g., some types of sporting, entertainment, transport, or public assembly buildings), and the size of the evacuation lift is such that more than one cycle would be required to evacuate each refuge, the battery capacity should be increased accordingly.

Any electrical substation, distribution board, generator, hydraulic pump, or other apparatus should be protected from the action of fire in the building for a period not less than that specified for the enclosing structure of the evacuation lift installation and in accordance with the general principles of structural fire protection for a lift machine room or machinery space.

7.3.3. Control and operation of evacuation lifts

In all lifts to be used for evacuation, the lift car control should be switched on so that the lift car is under operator control, and the lift car should be taken only to those levels where a person needs assistance, as delays could arise were the lift to remain on normal service with calls registered at many landings. Where the premises have a fire detection and alarm system installed, operation of the alarm will normally cause the lifts to descend or ascend to final exit level and remain in that position. Whilst it is appropriate that an evacuation lift is controlled in this way, the lift car control should be configured to override this signal, when activated.

To manage this system adequately the responsible person should be capable of performing the necessary duties quickly and efficiently at all times during which the building is occupied.

The evacuation procedure for people requiring assistance should begin at the first warning of fire. In premises where there is a two-stage fire warning system, this should be on the sounding of the "alert" or "first-stage" alarm.

Except in two-storey buildings, some form of communication system should be provided to enable the rapid and unambiguous identification of those storeys with people requiring assistance with evacuation and the relaying of this information to the person operating the evacuation or fire-fighting lift car. Such a system may consist of a control sited at each lift landing and linked to the lift car call indicators. Requests may be made to the person controlling the evacuation, either by using visual indicators or a telephone and then relaying to the lift operator by telephone, or by a communications system using personal radio transceivers.

The responsible person immediately available at the final exit level (possibly security or reception staff) should be designated and trained as evacuation lift operators. The duties to be undertaken by a designated member of staff, immediately on receipt of a fire alert signal, should include the following.

An operator designated to take control of the lift should operate the evacuation lift switch, and should:

- Determine the storey and part of the building indicated as the location of the fire.
- Determine the storeys at which people are awaiting assistance; and
- Take control of the lift and proceed to move people requiring assistance to the final exit level.
- A designated person should ensure that:

Any people requiring assistance in the storey for which that person is responsible move to the nearest refuge (lift lobby, etc.) to await the lift; and that the person controlling the evacuation lift is aware that a person or persons is/are waiting for the lift.

Unless a different order has been agreed with the fire authority, evacuation should normally be in the following order:

- The fire floor.
- The floor immediately above the fire floor.
- Other floors above the fire floor starting at the top storey.
- All remaining floors.

It needs to be appreciated, however, that the actual fire conditions might necessitate changes in the planned sequence.

At final exit level, help should be available to assist passengers from the lift thus permitting a rapid vacation of the car and avoiding congestion near final exits.

If an evacuation lift fails to arrive at a landing, or access to it at any level is obstructed by the fire, it will be necessary to use a stairway. If the lift itself remains safe to use it might only be necessary to descend to the storey below using the stairway and from there continue the descent by lift. It is necessary therefore to determine the best method of negotiating stairs and some practice might be necessary.

When the fire and rescue service arrive, the officer in charge should be briefed by the designated senior member of staff co-ordinating the evacuation on both the position and circumstances of the fire and of the progress of the evacuation. Subsequent priorities for the use of evacuation lifts and fire-fighting lifts will then be decided by the fire and rescue service.

7.3.4. Construction of refuges and evacuation lift enclosures - Fire Resistance

Where fire resistance is recommended the period of resistance should be taken (in the absence of any recommendation to the contrary) as being not less than 30 min. Elements of construction forming refuges, evacuation lift enclosures and lobbies should have the following fire resistance.

- Load-bearing walls should have equal fire resistance with respect to load-bearing capacity (and integrity and insulation where appropriate) from either side and should only have un-insulated glazed elements as permitted in BS 9999.
- Non-load-bearing walls and partitions should have equal fire resistance with respect to integrity and insulation from either side and should only have un-insulated glazed elements as permitted in BS 9999.
- Doors should have equal fire resistance with respect to integrity from either side, except in the case of doors to:
    - Lift wells where fire resistance is with respect to exposure of the landing side only.
    - External escape routes where fire resistance should be from the inside.

7.3.5. Glazed elements

Glazed elements that are fire-resisting in terms of integrity and insulation to a level of fire resistance equivalent to that for the structure into which they are installed may be used without restriction.

Glazed elements that are fire-resisting in terms of integrity may be used only where there is a requirement to provide vision panels in order to comply with legislation.

8. Internal Fire Spread Linings

8.1. Wall and Ceiling Linings

The interior wall and ceiling surfaces in a building may have a considerable influence on how fast a fire may develop. Building Regulations requires that internal linings shall adequately resist the spread of flame over their surfaces and, if ignited, have either, a heat release rate or a rate of fire growth, which is reasonable in the circumstances.

It is particularly important that in circulation spaces, where the rapid spread of fire is most likely to prevent occupants from escaping, the surface linings are restricted, by making provision for them to have low rates of heat release and surface spread of flame.

The surface finishes should satisfy the following classifications shown in the table below when evaluated under either the National Classifications (in accordance with BS 476 part 7:1997) or under the European Classifications (in accordance with BS EN 13501-1:2002).

Table 8: Wall and Ceiling Lining Requirements

Location	European Class
Circulation spaces within dwellings	C-s3, d2
Other circulation spaces, including common areas of blocks of apartments	B-s3, d2
Small rooms of areas not more than $4m^2$	D-s3, d2
Small rooms of area not more than $30m^2$ in non-residential accommodation	D-s3, d2

Note: When a classification includes 's3, d2' this means that there is no limit on the production of smoke or flaming droplets/particles

The surface linings of the walls and ceilings should generally conform to the classification recommended above for the appropriate location. However, parts of walls in rooms may be of a lower class but not lower than European Class D-s3, d2 provided that the floor area of those parts in any one room does not exceed one half of the floor area of the room, subject to a maximum of $20m^2$ in residential accommodation, and $60m^2$ in non-residential accommodation.

8.2. Rooflights

Thermoplastic materials that cannot meet the classifications given in the table below and should be classified TP(a) rigid, TP(a) flexible, or TP(b) according to the following methods:

a. TP(a) rigid:

I. Rigid solid PVC sheet.

II. Solid (as distinct from double- or multiple-skin) polycarbonate sheet at least 3 mm thick.

III. Multi-skinned rigid sheet made from unplasticized PVC or polycarbonate which has a Class 1 rating or Class C-s3, d2.

b. TP(a) flexible:

I. Flexible products not more than 1 mm thick that conform to the Type C requirements of BS 5867-2: 2008.

c. TP(b):

I. Rigid solid polycarbonate sheet products less than 3 mm thick, or multiple-skin polycarbonate sheet products that do not qualify as TP(a) by test.

If thermoplastic materials are to be used in windows, roof lights and lighting diffusers in suspended ceilings, they should meet the recommendations shown below.

Table 9: Limitations Applied to Thermoplastic Rooflights and Lighting Diffusers in Suspended Ceilings.

Minimum Classification of Lower Surface	Use of space below	Maximum Area Note 1	Maximum area as percentage of floor area of the space below	Minimum distance between Diffusers / Rooflights
		M^2	Percentage	Meters
TP(a)	Any except protected stairway	No limit Note 2	No limit	No limit
D-s3, d2 or Class 3 C) or TP(b)	Rooms	1	50 Note 3	Distance equal to the largest dimension of the largest diffuser or roof light
		5	50 Note 3	3 Note 3
	Circulation spaces except protected	5	15	3

Note 1 Smaller panels can be grouped together provided that the overall dimension of the group satisfies the dimensions below.

Note 2 Lighting diffusers of TP(a) flexible rating should be restricted to panels of not more than $5m^2$.

Note 3 Class 3 or D-s3, d2 rooflights in industrial and other non-residential purpose groups may be spaced 1800 mm apart, on the basis the rooflights are evenly distributed and do not exceed 20% of the area of the room.

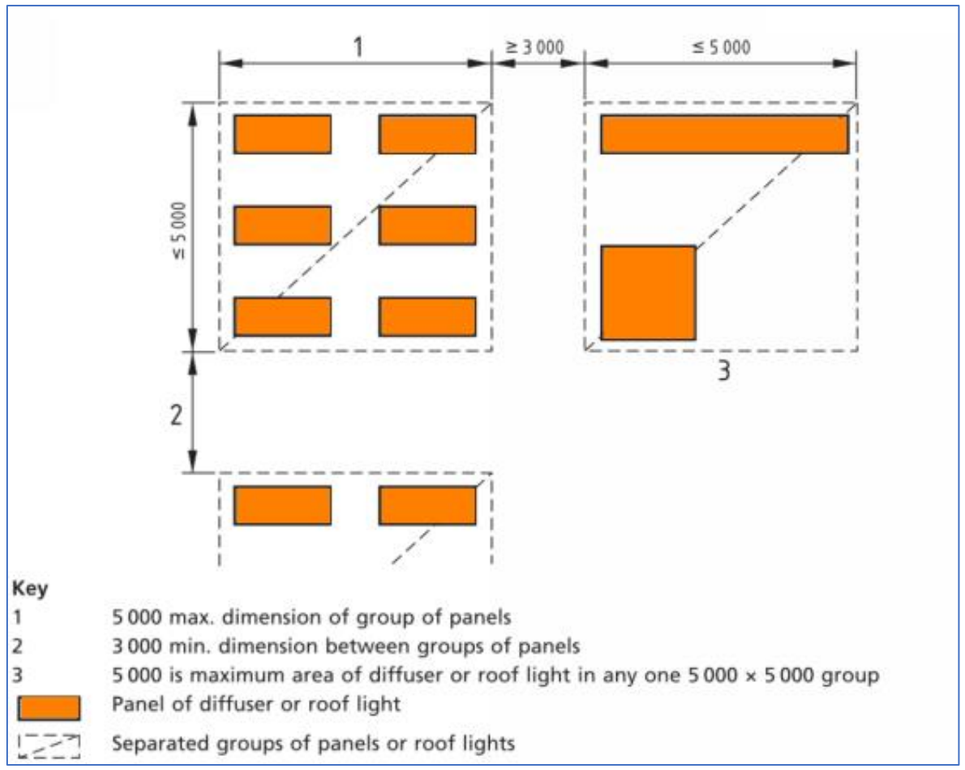


Figure 5: Limitations on Grouping of Rooflights Diffusers

8.3. Lighting Diffusers

Lighting diffusers should meet the relevant classification in the table above or be classified as TP(a) or TP(b) i.e.

- Thermoplastic lighting diffusers meeting classification TP(a) may be used without restriction.
- Thermoplastic lighting diffusers meeting classification TB(b) may be used in ceilings to rooms and circulation spaces (but not protected stairways) only if they meet the recommendations provided above.

9. Internal Fire Spread

Fire resistance is based on the height of top floor circa 17.5m the required structural fire resistance provided should be 60 minutes**.** The elements that support only the roof are excluded from the definition of elements of structure, unless it:

- Form's part of an escape route; or
- Function as a floor (e.g., roof terraces); or
- Is part of a portal frame structure where the roof and the supporting stanchions form a single element of structure; or
- Is integral to the stability of a fire-resisting external wall.

The structure of a roof, and the structure that supports only the roof, does not require fire resistance.

The minimum fire resistance performance requirements are noted within the tables below for each of the blocks. For more information see Table 22 from BS 9999.

9.1. Elements of Structure

Table 10: Table 11: Minimum Fire Resistance Requirements

Part of the Building	Minimum provisions when tested to the relevant part of BS 476 (minutes)			Method of Exposure
	Load bearing capacity [R]	Integrity [E]	Insulation [I]	
Structural Frame, Beam or Column	60	N/A	N/A	Exposed faces
Load bearing Wall	60	N/A	N/A	Each side separately
Floors	60	60	60	From underside
Compartment Floors	60	60	60	From underside
Compartment Walls	60	60	60	Each side separately
Common Corridors / Lobby	60	60	60	Each side separately
Roofs forming an escape route	30	30	30	From underside
External Walls ➢ Any part adjacent to an external escape route	30	30	N/A	From inside the building
➢ Internal Angle to Escape Stair	60	60	60	
➢ External Walls Facing a Boundary [Note 1]	60	60	60	From inside the building [Note 2]
Protected shafts – Service Risers	60	60	60	Each side separately
Enclosure Protected lobby	30	30	30	Each side separately
Cavity Barriers	N/A	30	15	Each side separately

Note 1: This does not apply to permitted unprotected areas as indicated within Section 6.13 of the fire strategy report.

Note 2: If the walls are within 1m of the relevant boundary 'Each Side Separately'.

Generally non-loadbearing external walls do not require fire resistance unless their proximity to the boundary deems that they require a level of fire resistance to protect the building, See Section 11 of this report.

When using an SFS non-loadbearing infill system if no boundary restrictions apply there is no recommendation to apply fire resistance to those elements.

As a cautionary note if cavity barriers are to be fixed to the SFS system dependant on the manufacturer of the cavity barriers and the applicable test data the SFS wall construction in some instances can potentially need to be REI 30.

This is inherent in the majority of the cavity barrier test data where it requires the substrate to be at least the same fire resistance as the cavity barrier and must provide a suitable robust fixing. Additionally, it is generally the standard where cavity barriers should be fixed back to the structural studs as opposed to the weather defence board as noted above. This will be dependent on the manufacturer.

9.2. Compartmentation

Based on the height and the occupancy apartments and ancillary areas are to be separated by 60 minutes compartment walls (in accordance with Table 3 from BS 9991).

All floors to be compartment floors rated at the same structural fire resistance as the compartment in which it is sited [60 minutes].

9.3. Places of Special Fire Hazard

BS 9991 and Approved Document B typically considers the following to be places of special fire hazard:

- Oil-filled transformer room.
- Switch gear room.
- Boiler room.
- Storage space for fuel or other highly flammable substance(s).
- Room that houses a fixed internal combustion engine.

These rooms require a minimum of 60 minutes fire resistance (REI60) and should not connect directly with the means of escape routes or common corridors / stairs.

Table 12: Ancillary Accommodation

Ancillary Accommodation	Minimum Fire Resistance
Storage areas greater than 1m^2 in area but not greater than 450m^2 (other than refuse areas). Includes storage of PE mats as per BB100.	Robust construction having a minimum standard of fire resistance of 30 minutes
Repair and maintenance workshops where flammable or highly flammable liquids are not used or stored	
Kitchens	
Transformer, switchgear and battery rooms for low-voltage or extra low voltage equipment	
Engineering services installation rooms	
Dressing or changing rooms	
Storage areas greater than 450m^2	Robust solid non-combustible construction having a minimum fire resistance of 60 minutes
Service installation rooms	
Places classified has high fire risk areas	
Repair and maintenance workshops where flammable or highly flammable liquids are used or stored	
Covered loading bays and storage areas other those previously mentioned	Robust solid non-combustible construction having a minimum standard of fire resistance equivalent to that required for the elements of construction of the building and in case less than 60 minutes
Refuse storage areas	
Boiler rooms	
Fuel storage areas	
Transformer and switchgear rooms for equipment above low voltage *	
Rooms housing fixed internal combustion engines	
Any electrical substation or enclosure containing any distribution board, generator, powered smoke control plant, pressurisation plant, communication equipment, and any other equipment associated with life safety and fire protection systems	Robust solid non-combustible construction having a minimum standard of fire resistance of not less than 120 minutes

Note: *Any openings in the required construction should be protected by doors having a similar standard of fire resistance and capable of resisting the passage of smoke at ambient temperature.*

9.4. Fire Doors

Fire doors should be provided in all fire rated enclosures in accordance with BS 476: Part 22: 1987 and specified with cold smoke seals (only where smoke seals are required [S or Sa]) in accordance with the recommendations of BS 476 Section 31.1.

The fire resistance requirements for the doors are shown in the table below:

Table 13: Fire Doors

Position of Door	Tested to BS 476-22	Tested to BS EN 1634-1
Compartment Walls	Same fire resistance as the wall it is fitted in with smoke seals (S)	Same fire resistance as the wall it is fitted in with smoke seals (Sa)
Apartment Entrance Door	FD30S	E 30 S_a
Lifts	FD60	E 60
Risers	FD60S	E 60 S_a
Ancillary Accommodation not opening into a protected space	Same fire resistance as the wall it is fitted in	Same fire resistance as the wall it is fitted in
Ancillary Accommodation opening into a protected space	Same fire resistance as the wall it is fitted in with smoke seals (S)	Same fire resistance as the wall it is fitted in with smoke seals (Sa)
Places of Special Fire Hazard (Opening in a Protected Corridor/ Lobby)	As for the wall it is fitted in with smoke seals (S)	As for the wall it is fitted in with smoke seals (S_a)
Places of Special Fire Hazard	As for the wall it is fitted in	As for the wall it is fitted in
Protected Stairway	FD30S	E 30 S_a
Protected Corridor/ Lobby	FD30S	E 30 S_a
Subdivision of corridors	FD30S	E 30 S_a

Note: All fire doors on escape routes should be self-closing except for doors into ancillary accommodation that should be kept locked shut and provided with appropriate signage.

Note: Self closing devices are to be in accordance with Clause 32.1.6.1 of BS 9999.

A fire door that is needed to resist the passage of smoke at ambient temperature conditions (the fire doors with the S or Sa against them) should either.

- Have a leakage rate not exceeding 3m^3/h per metre, when tested in accordance with BS 746-31.1 with the threshold taped and subjected to a pressure of 25 Pa: or
- Meet the classification requirement of Sa when tested in accordance with BS EN 1634-3.

Note: Smoke leakage control can be applied to non-fire-resisting doors.

Threshold gaps for timber doors should be in accordance with BS 8214.

Note: Threshold gaps for all other door types are to be based on the principles set out in BS 8214.

9.4.1. Door Closers

Fire doors can only operate correctly if they are fully closed at the time of fire. The fire doors need to be fitted with a self-closing device. If hold-open devices are installed they need to be either fusible link (not applicable within protected escape routes), an automatic release mechanism which is linked to the fire alarm or be a delayed closing device with a delay adjusted not to exceed 25 seconds.

9.4.2. Fire Door Signage

All fire doors other than lift entrance doors should be marked with the appropriate fire safety sign confirming to BS ISO 3864-1, according to whether the door is:

- To be kept closed when not in use.
- To be kept locked when not in use.
- Held open by an automatic release mechanism.

9.5. Concealed Spaces

Concealed spaces or cavities in the construction of the building provide a ready route for smoke and flame spread, especially in voids above and below ceilings/floors. As the smoke or flames would be concealed it presents a greater danger.

Compartment walls should be carried up to compartment floors or the roof. It is therefore not appropriate to complete a line of compartmentation by fitting cavity barriers above the compartment wall.

Cavity barriers should therefore be provided to sub-divide the cavities to restrict the spread of smoke and flame spread and should be provided in the following areas:

- Around openings and to close off edges of cavities Note 1.
- At the junction between an external cavity wall and any wall, floor or door assembly which forms a fire resisting barrier and every compartment floor Note 2, compartment wall.
- At the junction between every compartment floor and compartment wall.
- Within cavities that exceed the distances set out within the table below.

Note 1: Where Steel Framing Systems (LGSF) are used, if the steel supports the structure, fire stopping (to the same fire resistance as the elements of structure) should be in place of cavity barriers around openings and to close top of cavities.

Note 2: Cavity barriers in the external cavity adjacent to compartment floors should be increased to fire stopping (to the same fire resistance as the elements of structure) if the internal lining of the external walls does not achieve the same fire resistance as the elements of structure.

It is important to continue any compartment wall up through a ceiling or roof cavity to maintain the standard of fire resistance, therefore compartment walls should be carried up full storey height to a compartment floor or the roof as appropriate.

For the protected escape routes, a cavity that exists above or below any fire-resisting construction because the construction is not carried to full storey height or, in the case of a top storey, to the underside of the roof covering, should be either:

- Fitted with cavity barriers on the line of the enclosure(s) to the protected escape route; or
- For cavities above the fire-resisting construction, enclosed on the lower side by a fire-resisting ceiling having fire-resistance tested in accordance with the applicable parts of BS 476 for exposure above and below the ceiling and which extends throughout the building, compartment, or separated part.

For more information see Clause 19.1.2 from BS 9991

Note: it is important to continue compartment walls up through ceilings or roof cavity to maintain the standard of fire resistance. Therefore, the compartment wall should be carried up full storey height to a compartment floor or to the roof. It is not appropriate to complete a line of compartmentation by fitting cavity barriers.

The maximum dimensions of concealed spaces are indicated within the table below.

Table 14: Maximum Dimensions of Cavities

Location	Class of Surface Exposed	Max Dimension in any Direction
Between a Roof & Ceiling	Any Class	20m
Any other Cavity	Class C-s3, d2 / Class 1	20m
	Any Class	10m

The provisions in the table above do not apply to any cavity described below.

- In a wall which should be fire resisting only because it is load bearing.
- In a masonry or concrete external cavity wall (two leaves of brick or concrete each at least 75mm thick, cavity closed around gaps and to close of edges of cavities).
- In any floor or roof cavity above a fire resisting ceiling (at least 30 minutes fire resistance) which extends throughout the building or compartment, subject to a 30m limit on the extent of the cavity.
- Formed behind the external skin of an external cladding system with a masonry or concrete inner leaf at least 75mm thick, provided that the cavity does not contain combustible insulation.
- Below a floor next to the ground or oversite concrete if the cavity is less than 1000mm in height or if the cavity is not normally assessable by persons.
- Within a Plenum used for displacement ventilation.

Every cavity barrier should be constructed to at least 30 minutes fire resistance as indicated in Section 9.1 from this report. It may be formed by any construction provided for another purpose if it meets the provisions for cavity barriers. Cavity barriers in a stud wall or provided around openings should follow the guidance from BS 9991.

It may be formed by any construction provided for another purpose if it meets the provisions for cavity barriers. Cavity barriers in a stud wall or provided around openings may be formed of the following.

- Steel at least 0.5mm thick.
- Timber at least 38mm thick.
- Polythene-sleeved mineral wool, or mineral wool slab, in either case under compression when installed in the cavity.
- Calcium silicate, cement based or gypsum-based boards at least 12mm thick.

The cavity barriers wherever possible should be tightly fitted to a rigid construction and mechanically fixed in position. Where this is not possible the junction should be fire stopped.

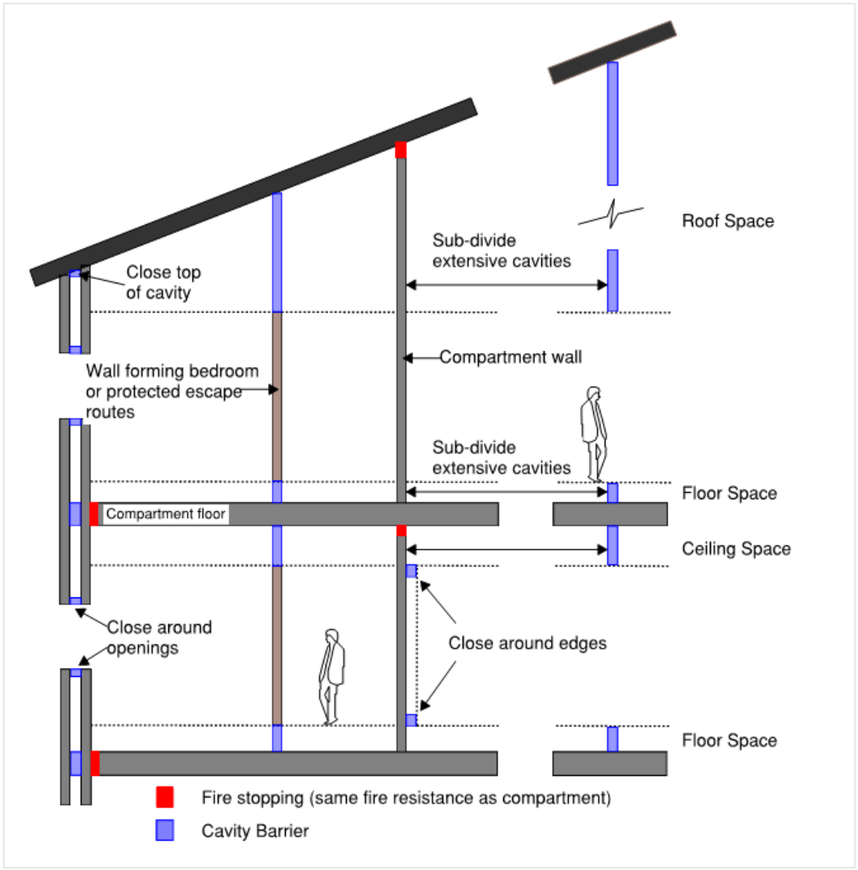


Figure 6: Figure Cavity Barrier Locations

Where a single room exceeds 20m in any direction, cavity barriers within the ceiling void (and within any floor voids) need only to be placed on the line of enclosing walls/partitions of any room and where services penetrate any fire-resisting floors to avoid vertical and horizontal voids meeting, provided that:

- Every cavity barrier should be constructed to at least 30 minutes fire resistance. It may be formed by any construction provided for another purpose if it meets the provisions for cavity barriers. Cavity barriers in a stud wall or provided around openings should follow the guidance from Clause 19.2 from BS 9991.
- The cavity barriers wherever possible should be tightly fitted to a rigid construction and mechanically fixed in position. Where this is not possible the junction should be fire stopped.
- The cavity barriers are no more than 40m apart; and
- The surface of the material/product exposed in the cavity being Class 0 or Class 1 (national class) or Class C-s3, d2 or better (European Class).

Every cavity barrier should be constructed to at least 30 minutes fire resistance. It may be formed by any construction provided for another purpose if it meets the provisions for cavity barriers. Cavity barriers in a stud wall or provided around openings should follow the guidance from Clause 19.2 from BS 9991:2015.

9.6. Protection of Openings and Fire-stopping

9.6.1. Fire-Stopping

If the fire separating element is to be successful, every joint or imperfection fit, or opening to allow services to pass through the element, should be adequately protected by sealing or fire stopping so that the fire resistance of the element is not impaired.

Pipes that pass through a fire separating element, should meet one of the following provisions:

- ***Proprietary seals*** – Provide a proprietary sealing system which has been shown by test to maintain the fire resistance of the wall, floor, or cavity barrier.
- ***Restricted pipe diameter*** – Where a proprietary sealing system is not used, fire stopping may be used around the pipe, keeping the opening as small as possible. The nominal internal diameter of the pipe should not be more than the relevant dimension given in the table below.

Table 15: Maximum Nominal Diameter of Pipes Passing Through Elements

Situation	Pipe Material Maximum Nominal Internal Diameter [mm]		
	Non-Combustible Material	Lead, Aluminium, Aluminium Alloy, uPVC*, Fibre Cement	Any Other Material
Structure [But not a wall separating Buildings] enclosing a protected shaft which is not a stairway or lift shaft	160mm	110mm	40mm
Any other situation	160mm	40mm	40mm

uPVC that complies with BS 4514 or BS 5255.

Note: Any non-combustible material 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.

- ***Sleeving*** – A pipe of lead, aluminium, aluminium alloy, fibre-cement, or uPVC, with a maximum nominal internal diameter of 160mm, may be used with a sleeving of non-combustible pipe. The opening in the structure should be as small as possible and provide fire stopping between the pipe and structure. The sleeve should extend no less than 100mm either side of the structure as indicated in the following figure.

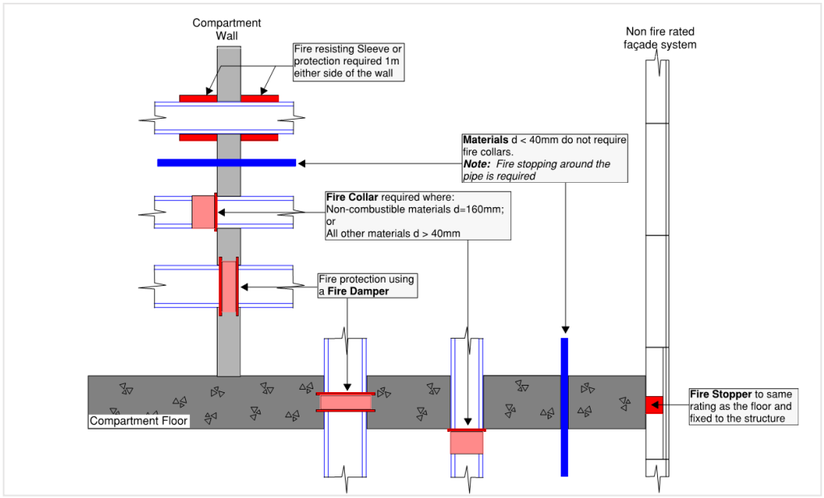


Figure 18: Fire Stopping Methods

9.6.2. Ductwork

Where services and specifically ductwork passes through a fire separating element to maintain the integrity of the fire resisting element there should be a suitable means of maintaining that integrity, this can be done by the use of fire rated construction or suitable damper installations, the suggested 4 methods of demonstrating compliance are noted below.

It should also be noted that around all penetrations in the fire separating elements, including around dampers and ductwork, this should be suitably fire stopped including every joint or imperfection fit or opening that allow ducts to pass through the element.

The detailed means of maintaining the fire integrity of the building is highlighted in BS 9991, BS 9999 & Approved Document B and includes the full descriptions and additional information on how to protect the ductwork and air transfer grilles.

Any ductwork passing through a protected stairway, lobby, or corridor without an opening into that area should be fire resisting.

BS 9991 references out to BS 9999 for more information on how to protect the ductwork and air transfer grilles see Section 21.2 of BS 9991 and clause 32.5 of BS 9999 for additional commentary.

The requirements for each option are indicated below.

Method 1 - Protection Using Thermally Actuated Fire Dampers.

Where ducts pass through general fire resisting construction not mentioned above these dampers can be activated by thermally actuated release mechanisms or the fire alarm system.

Note: Fire dampers should be tested to BS EN 1366 Part 2:1999. And be classified to BS EN 13501 Part 3:2005. They should have an E classification equal to or greater than 60 minutes.

Note: Suitable access should be provided for maintenance and inspection of all dampers.

Note: Method 2 is not suitable for ductwork serving kitchen extracts.

Note: Method 2 is not suitable for ductwork passing through the enclosures of protected escape routes.

Method 2 - Protection Using Fire Resisting Enclosures.

The fire resisting enclosures should achieve the same fire resistance as the wall the ductwork penetrates which forms a compartment known as a protected shaft. This allows a multiplicity of services to be transferred together with the duct to traverse a number of compartments within the building without the need for further subdivisions. Fire dampers [thermally or actuated by Automatic Fire Detection] will only be required where the ductwork enters or leaves the protected shaft.

Method 3 - Protection Using Fire Resisting Ductwork.

The ductwork itself forms a protected shaft. The ductwork should achieve the same fire resistance as the wall the ductwork penetrates. The fire resistance can be achieved by the ductwork material itself, or through the application of a protective material.

Note: The supporting hangers should be capable of supporting the ductwork for not less than the period of fire resistance of the ductwork.

Additionally, where the ductwork serves sleeping accommodation the dampers provided should be actuated by the automatic Fire Detection system and thermally actuated.

However, in the sleeping risk category if all occupants can make unaided simultaneous escape from the affected compartment and the building is fitted with an L1 Automatic Fire detection system to BS 5839 Part 1, then the dampers can be thermally actuated with the exception of the dampers that serve the ducts as they enter each individual compartment.

Note: Fire dampers should be tested to BS EN 1366 Part 2:1999. And be classified to BS EN 13501 Part 3:2005. They should have an E classification equal to or greater than 60 minutes.

Note: Suitable access should be provided for maintenance and inspection of all dampers.

Method 4 – – Automatically Actuated Fire and Smoke Dampers actuated by Automatic Fire Detection.

Where a ductwork system serves more than one compartment or fire separated protected escape route, smoke detector operated fire dampers should be provided where ductwork enters each fire separated section of the escape route.

Additionally, where the ductwork serves sleeping accommodation the dampers provided should be actuated by the automatic Fire Detection system and thermally actuated.

However, in the sleeping risk category if all occupants can make unaided simultaneous escape from the affected compartment and the building is fitted with an L1 Automatic Fire detection system to BS 5839 Part 1, then the dampers can be thermally actuated with the exception of the dampers that serve the ducts as they enter each individual compartment.

Method 1 may be used for ductwork passing through the enclosures of protected escape routes, both where the ductwork does and does not serve the escape route.

Note: Fire dampers should be tested to BS EN 1366 Part 2:1999. And be classified to BS EN 13501 Part 3:2005. They should have an E classification equal to or greater than 60 minutes.

Note: Suitable access should be provided for maintenance and inspection of all dampers.

Note: Method 1 is not suitable for ductwork serving kitchen extracts.

9.7. Air Transfer Grilles

Any air transfer grilles required as part of the ventilation system should not be provided within any wall, door, floor, or ceiling enclosing a protected staircase or entrance hall. Air transfer grilles located in any fire hazard rooms should be provided with both fire and smoke containment operated by adjacent to automatic smoke detection. Any transfer grilles fitted in fire doors will need to be accompanied by a test certificate provided by the door manufacturer.

10. External Fire Spread - Construction

10.1. External Wall Construction

BS 9991 provides specific guidance based on building heights / type of occupancy and proximity to other buildings albeit this is not the most current guidance in relation to external wall combustibility and fire spread.

On this basis it is proposed to utilise the guidance in the amended Volume One of Approved Document B 2019 (with amendments 2020) as this is the most onerous guidance and is in line with current legislation; also, we must assess Regulation 7 of the Building Regulations relating to 'Materials and Workmanship' which outlines the general principals of materials being used being appropriate for the circumstances in which they are used and installed.

This guidance also has specific criteria to be applied for tall 'Relevant Buildings' in excess of 18m. The building has no occupied floor over 18m and is therefore is not classified as a relevant building.

Table 16: Requirements of B4 of the Building Regulations

Requirement Building Regulations B4	
External Fire Spread	
1.	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.
2.	The roof of the building shall adequately resist the spread of fire over the roof and from one building to another, having regard to the height, use and position of the building.

Table 17: Requirement of Regulation 7 of the Building Regulations

Building Regulations - Regulation 7 Materials and Workmanship			
1.	Building work shall be carried out -		
	(a)	With adequate and proper material which -	
		(i)	Are appropriate for the circumstances in which they are used,
		(ii)	Are adequately mixed or prepared, and
		(iii)	Are applied, used, or fixed so as adequate to perform the functions for which they are designed; and
	(b)	In a workmanlike manner.	
2.	Subject to paragraph (3), building work shall be carried out so that materials which become part of an external all, or specified attachment, of a relevant building are of European Classification A2-s1, d0 or Class A1, classified in accordance with BSEN 13501 -1 2007 + A1 2009.		
3.	Paragraph (3) does not apply to		
	(a)	Cavity trays when used between two leaves of masonry:	
	(b)	Any part of a roof (other than any part of a roof which falls within paragraph Iv of regulation 2 [6]) if that part is connected to an external wall;	
	(c)	Door frames and doors;	
	(d)	Electrical installations;	
	(e)	Insulation and waterproofing materials used below ground level;	
	(f)	Intumescent and fire stopping materials where their inclusion is necessary to meet the requirements of Part B of Schedule 1;	
	(g)	Membranes;	
	(h)	Seals, gaskets, fixings, sealants, and backer rods;	
	(i)	Thermal break materials where their inclusion is necessary to meet the thermal performance requirements of Part L of Schedule 1; or	
	(j)	Window frames and glass.	
4.	In this Regulation -		
	(a)	A 'relevant building' means a building with a storey (not including roof top plant areas or any storey consisting exclusively of plant rooms) at least 18m above ground level and which -	
		(i)	Contains one or more dwellings;
		(ii)	Contains and institution, or
		(iii)	Contains a room for residential purposes (Excluding Hostels, Hotels or Boarding Houses); and
	(b)	"above ground level" in relation to a storey means above ground level when measured from the lowest ground level when measured from the lowest ground level adjoining the outside of a building to the top of the floor surface of the storey.	

10.2. Combustibility of External Walls

The following table provides an overview of the different classifications relating to combustibility.

Table 18: Combustibility Classifications

	Euro Code Classification	Description
1	A1	Non-Combustible Materials
2	A2 - s3, d2 or better	Materials of limited combustibility
3	B - s3, d2 or better	Combustible materials – Very limited contribution to fire
4	C - s3, d2 or better	Combustible materials – Limited contribution to fire
5	D - s3, d2 or better	Combustible materials – Medium contribution to fire
6	D2 - s3, d0 or better	Combustible materials – Medium contribution to fire
7	E & Ed2	Combustible materials – High contribution to fire [Only able to resist ignition by a small flame for a short period]
8	F	Combustible materials – Easily Flammable [No performance criteria]

10.3. External Wall Construction

BS 9991 provides specific guidance based on building heights / type of occupancy and proximity to other buildings albeit this is not the most current guidance in relation to external wall combustibility and fire spread.

On this basis it is proposed to utilise the guidance in the amended Approved Document B 2019 as this is the most onerous guidance and is in line with current legislation; also, we must assess Regulation 7 of the Building Regulations relating to 'Materials and Workmanship' which outlines the general principals of materials being used being appropriate for the circumstances in which they are used and installed.

10.4. Combustibility of External Walls

Based on the building heights i.e., less than 18m the building would not be deemed 'Relevant' as described in Regulation 7.

The external walls of buildings other than those described in regulation 7(4) of the Building Regulations should achieve either of the following.

a. Follow the provisions given in paragraphs 12.5 to 12.9, which provide guidance on all of the following.

I. External Surfaces

II. Materials and Products

III. Cavities and Cavity Barriers

IV. Additionally, from BS9991 – External balconies that are enclosed should be constructed and separated from other balconies with compartmentation and fire resisting construction in accordance with Annex D.

b. Meet the performance criteria given in BRE 135 for external walls using full scale test data from BS 8414-1 or BS 8414-2.

It should be noted that additionally the Approved Document 12.4 notes that:

'In relation to buildings of any height or use, consideration should be given to the choice of materials (including their extent and arrangement) used for the external wall, or attachments to the wall, to reduce the risk of fire spread over the wall'.

10.4.1. External Surfaces – Surface Spread of Flame

The surface spread of flame across the external surface of a wall is based directly on the type of building, proximity to site boundaries, height, and its occupants. These categorisations are used to address specific concerns e.g., taller buildings are more difficult for firefighting and have increased evacuation times; assembly buildings where the occupants are generally unfamiliar with the escape routes have increased evacuation times and where buildings are in close proximity to boundaries etc., they are at risk of rapid fire spread from adjacent buildings.

The surface spread of flame rating should be based on table 12.1 of Approved Document B and the criteria noted above.

Building Type	Building Height	Less than 1000 mm from the relevant boundary	1000 mm or more from the relevant boundary
Residential Building	18m or less	Class B – s3, d2 or better	No Provisions

Table 21: External Surface Spread of Flame Provisions

10.4.2. Materials and Products

In relation to the compliance of the built-up system for combustibility we must assess the Approved Document B guidance but also as noted in this guide regardless of height and use a general assessment of combustibility of the building and any associated risks.

12.4 In relation to buildings of any height or use, consideration should be given to the choice of materials (including their extent and arrangement) used for the external wall, or attachments to the wall, to reduce the risk of fire spread over the wall.

This is also reiterated in Regulation 7 whereas the assessment should be based on the fact that materials should be appropriate for the circumstances in which they are used, prepared, and installed in a workmanlike manner.

Approved Document B and Regulation 7 have specific criteria for buildings that exceed 18m in height 'Relevant Buildings' i.e. Any cladding material, insulation product, filler material (not including gaskets, sealants and similar) etc. used in the external wall construction should be of limited combustibility [European Class A2 – s1, d0 or better] unless the wall is of masonry construction. Clause 18.2 BS9991:2015 Approved Document B and Regulation 7.

Below this height there are no specified restrictions noted in Approved Document B for combustibility of external wall products only surface spread of lame criteria and requirements for cavity barriers.

10.4.3. Helios Recommendations for External Wall Construction

Residential - For a building with a storey height of less than 18 metres more than 1m from the boundary there is no restriction on the surface spread of flame for the cladding system and any restrictions on the insulation material used.

Albeit it is Helios's recommendation that cladding materials in the external wall make up should be ***Class A2*** or better when tested in accordance with BSEN 13501 or have been assessed using BR135 and BS8414 as suitable.

10.4.4. Cavities & Cavity Barriers

Cavities in the external walls provide a ready route for smoke and flame spread, additionally the smoke or flames would be concealed and presents a greater danger.

Cavity barriers should therefore be provided to sub-divide the cavities to restrict the spread of smoke and flame spread and should be provided in the following areas:

- Around openings and to close off edges of cavities Note 1.
- At the junction between an external cavity wall and any wall, floor or door assembly which forms a fire resisting barrier and every compartment floor Note 2, compartment wall.

- At the junction between every compartment floor and compartment wall.
- Within cavities that exceed the distances set out within the table below.

***Note 1**: Where Steel Framing Systems (LGSF) are used, if the steel supports the structure, fire stopping (to the same fire resistance as the elements of structure) should be in place of cavity barriers around openings and to close top of cavities.*

***Note 2**: Cavity barriers in the external cavity adjacent to compartment floors should be increased to fire stopping (to the same fire resistance as the elements of structure) if the internal lining of the external walls does not achieve the same fire resistance as the elements of structure.*

The maximum dimensions of concealed spaces are indicated within the table below.

Table 22: Maximum Dimensions of Cavities

Location	Class of Surface Exposed	Max Dimension in any Direction
Open Cavities in External Wall Construction	Class C-s3, d2 / Class 1	20m
	Any Class	10m

The provisions in the table above do not apply to any cavity described below.

- In a wall which should be fire resisting only because it is load bearing.
- In a masonry or concrete external cavity wall (two leaves of brick or concrete each at least 75mm thick, cavity closed around gaps and to close of edges of cavities).
- In any floor or roof cavity above a fire resisting ceiling (at least 30 minutes fire resistance) which extends throughout the building or compartment, subject to a 30m limit on the extent of the cavity.
- Formed behind the external skin of an external cladding system with a masonry or concrete inner leaf at least 75mm thick, provided that the cavity does not contain combustible insulation.
- Below a floor next to the ground or oversite concrete if the cavity is less than 1000mm in height or if the cavity is not normally assessable by persons.
- Within a Plenum used for displacement ventilation.

Every cavity barrier should be constructed to at least 30 minutes fire resistance as indicated in Section 9.2 from this report. It may be formed by any construction provided for another purpose if it meets the provisions for cavity barriers. Cavity barriers in a stud wall or provided around openings should follow the guidance from 19.2 BS9991.

Cavity Barriers may be formed by any construction provided for another purpose if it meets the provisions for cavity barriers. Cavity barriers in a stud wall or provided around openings may be formed of the following.

- Steel at least 0.5mm thick.
- Timber at least 38mm thick.
- Polythene-sleeved mineral wool, or mineral wool slab, in either case under compression when installed in the cavity.
- Calcium silicate, cement based or gypsum-based boards at least 12mm thick.

The cavity barriers wherever possible be tightly fitted to a rigid construction and mechanically fixed in position. Where this is not possible the junction should be fire stopped.

See Section 10.2 for commentary on cavity barriers fixed to non-loadbearing SFS systems.

Where a single room exceeds 20m in any direction, cavity barriers within the ceiling void (and within any floor voids) need only to be placed on the line of enclosing walls/partitions of any room and where services penetrate any fire-resisting floors to avoid vertical and horizontal voids meeting, provided that:

- The cavity barriers are no more than 40m apart; and
- The surface of the material/product exposed in the cavity being Class 0 or Class 1 (national class) or Class C-s3, d2 or better (European Class).

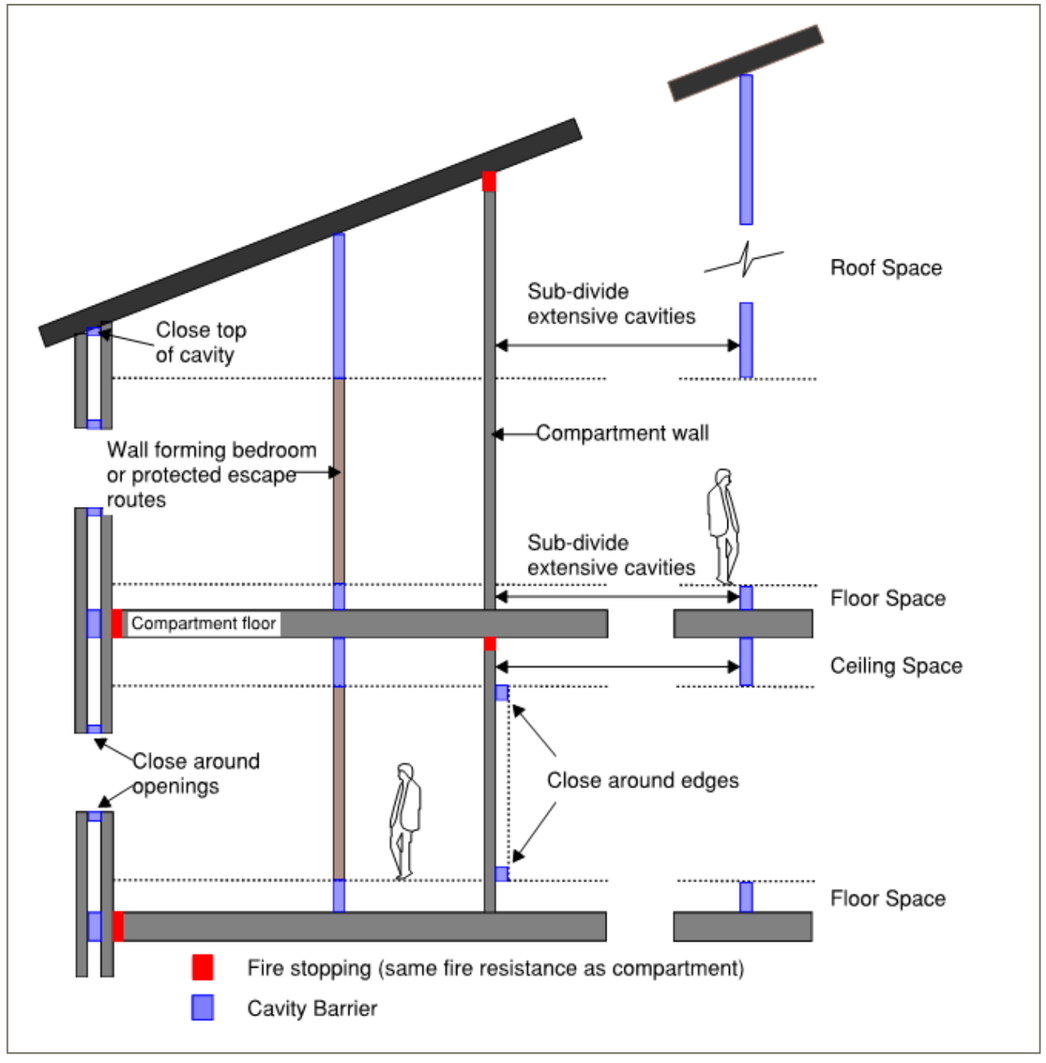


Figure 19: Cavity Barrier Locations

1.1 Roof Coverings

Roof covering refer to the external material layers, not the roof structure as a whole. The table below describes the separation distances from the boundary according to the type of roof covering as described within Clause 18.6 from BS 9991: 2015.

Table 23: Classification of Roof Coverings

Designation of Roof Covering	Minimum distance from any point to Relevant Boundary			
National Class	Less than 6 m	At least 6m	At least 12 m	At least 20 m
B_{Roof} (t4)	Acceptable	Acceptable	Acceptable	Acceptable
C_{Roof} (t4)	Not acceptable	Acceptable	Acceptable	Acceptable
D_{Roof} (t4)	Not acceptable	Acceptable (1 &2)	Acceptable (2)	Acceptable
E_{Roof} (t4)	Not acceptable	Acceptable (1 &2)	Acceptable (2)	Acceptable (2)
F_{Roof} (t4)	Not acceptable	Not acceptable	Not acceptable	Acceptable (1 &2)

1 – Not Acceptable on any of the following Buildings:

- *Industrial, storage or other non-residential purpose groups [Groups 6 & 7] buildings of any size.*
- *Any other building with a cubic capacity of more than 1500m^3.*

2 – Acceptable on buildings not listed above if both of the following apply:

- *Part of the roof has a maximum area of 3m^2 and is a minimum of 1500mm from any similar part.*
- *The roof between the parts is covered with a material rated as Class A2-s3, d2 or better.*

The blocks in this development have been assessed independently and the roof covering criteria assessed based on the red line boundary distances as noted below:

BRoof (t4) are acceptable.

11. External Fire Spread – Building Separation

To prevent the risk of external fire spread to and from adjacent buildings it is necessary to assess the façade and calculate the maximum area of that façade that is allowed to remain unprotected [Non-Fire Rated] based on the maximum radiating panel that could be involved in a fire.

To calculate the maximum unprotected area, we have used the enclosing rectangle method from BR 187 (second edition) to assess the space separation requirements.

11.1. Relevant Boundaries

When considering the boundary distances for assessing external fire spread between neighbouring buildings '**Relevant Boundary'** distances need to be established to accurately calculate the areas requiring protection. There are two types of boundaries which can be considered, these are.

- Site boundary – where the site boundary is adjacent public roads, pathways, train tracks or waterways the boundary can be extended to the mid-point of that feature.
- Notional boundary – this is an imaginary line drawn between two buildings on the same site.

As noted in BR187 if AWFSS are included in the development this effectively reduces the fire size and the intensity of the radiating panel; on this basis if a suppression system is included to BS 9251 or BSEN 12845 this allows for a doubling of the allowable unprotected area or a halving of the required boundary distances.

The relevant boundaries are noted below.

11.2. Space Separation Calculations

The allowable amount of unprotected area on the elevations has been calculated by using the BR 187 Enclosing Rectangle method, this method is based on the distance to the relevant boundary and size of the smallest rectangle which encloses all the unprotected areas within a single compartment on each elevation.

Unprotected areas are considered to be the following.

- Any part of the external façade that has a period of fire resistance less than the appropriate level noted within Section 9.1;
- Included within the unprotected area calculation is any section of the external wall which has a combustible material more than 1mm thick as its external surface. 50% of the total area should be counted as unprotected.

The following does not contribute to the unprotected areas.

- Any part of the external wall of a stairway in a protected shaft (same fire resistance as Section 6.1.
- Small, unprotected areas in a fire rated façade in accordance with BS 9991.

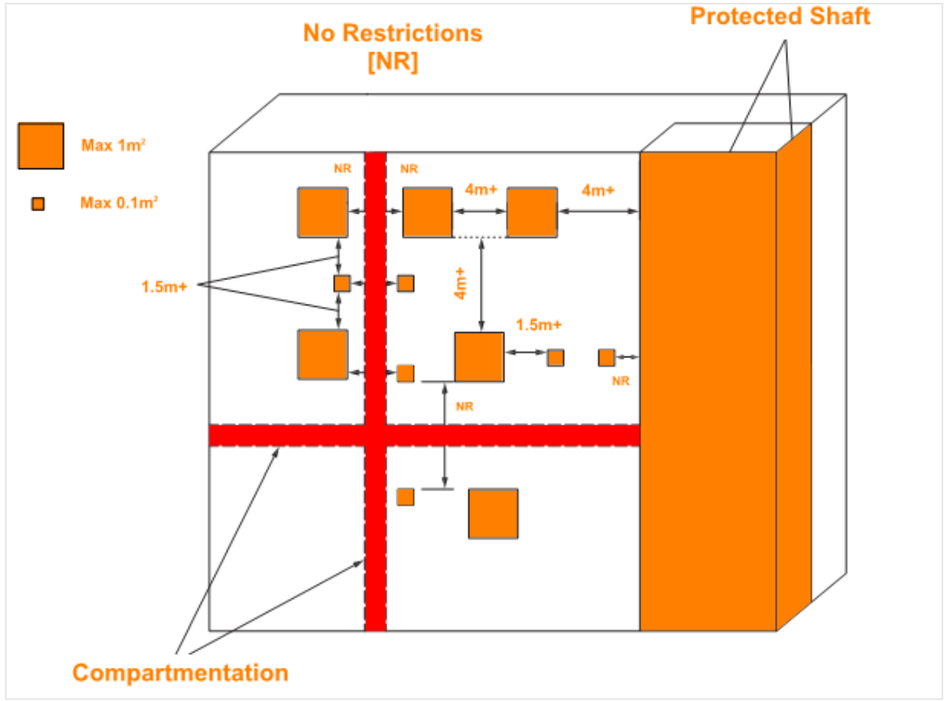


Figure 7: Small Allowable Unprotected Areas

Where the building is provided with AWFSS, the amount of unprotected area may be doubled or the distance to the boundary may be halved.

These calculations have been conducted based on the following assumptions.

- All elevations are considered unprotected.
- Compartment floors are provided.
- Every apartment is considered an individual compartment – Most onerous situation used is the 2 storey apartment.
- Space separation based on 84kW/m^2 in residential areas.
- Required Boundary Distances can be halved for the sprinkler protected areas on basis that the compartment protected by the AWFSS.

The table below contains the space separation calculations; these are based on the largest single compartment on that relevant elevation i.e., the largest radiating panel.

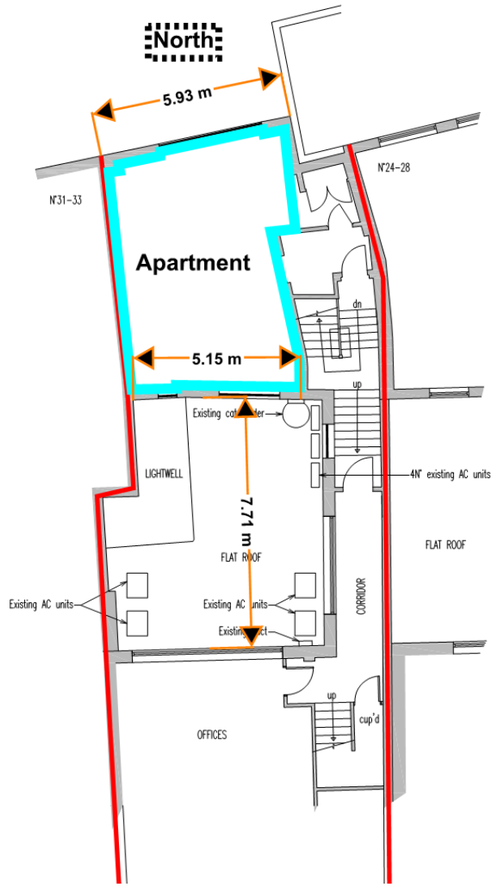


Figure 8: Boundary Site Layout

Table 19: Boundary Condition Assessment

Elevation	Actual Elevation H x W		Enclosing Rectangle H x W		Unprotected [%]	Required Distance [m]	Boundary Distance [m]	Comments
North	6.0 m	6.0m	6m	6.0m	100	2.0m*	2.0m	0m² protection required
East	NA Party Wall 60minutes fire resisting							
South	6.0 m	6.0m	6.0	6.0m	100	2.0m*	3.5m	0m² protection required.
West	NA Party Wall 60minutes fire resisting							

[1] Largest compartment based on largest apartment.

*Distance halved based on the inclusion of AWFSS