Stage 2 Fire Safety Strategy Report

For

The Extension at 40 Bernard Street

Reference: FSE2418

Issue No: 01

8th April 2024

Revision History

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Initial issue for comment			
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Client Details

Client	Imperial Hotels
Client Address	Tudehope Ltd, c/o Collier International, 50 george Street, London, W1U 7GA
Project	40 Bernard Street Extension

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.

Transmission and receipt of Information used in the preparation of the Fire Safety Strategy is agreed on the basis outlined in the fee proposal as issued by Helios Fire & Construction Consultancy. Should a web-based document management system be used, information that is specifically to be assessed and reviewed by Helios Fire & Construction Consultancy should be issued directly to the representative of Helios Fire & Construction Consultancy. The acceptance of access onto any web-based system by Helios Fire & Construction Consultancy does not constitute an acknowledgement that all information on the specific portal will have been assessed and reviewed.

Contents

1 Introduction

This report presents the Stage 2 fire strategy report for the refurbishment of the fifth floor and a sixth floor extension at 40 Bernard Street, London. This fire strategy does not cover the rest of the existing office building.

The existing building is provided with an ‘As-Built’ fire strategy. This was provided by Nadim Choudhary CEng, Meng, FIMechE, MIFireE, MCIBSE dated 23/12/22. Reference will be made to the ‘As-Built’ fire strategy throughout this report.

The site plan below indicates the existing office.

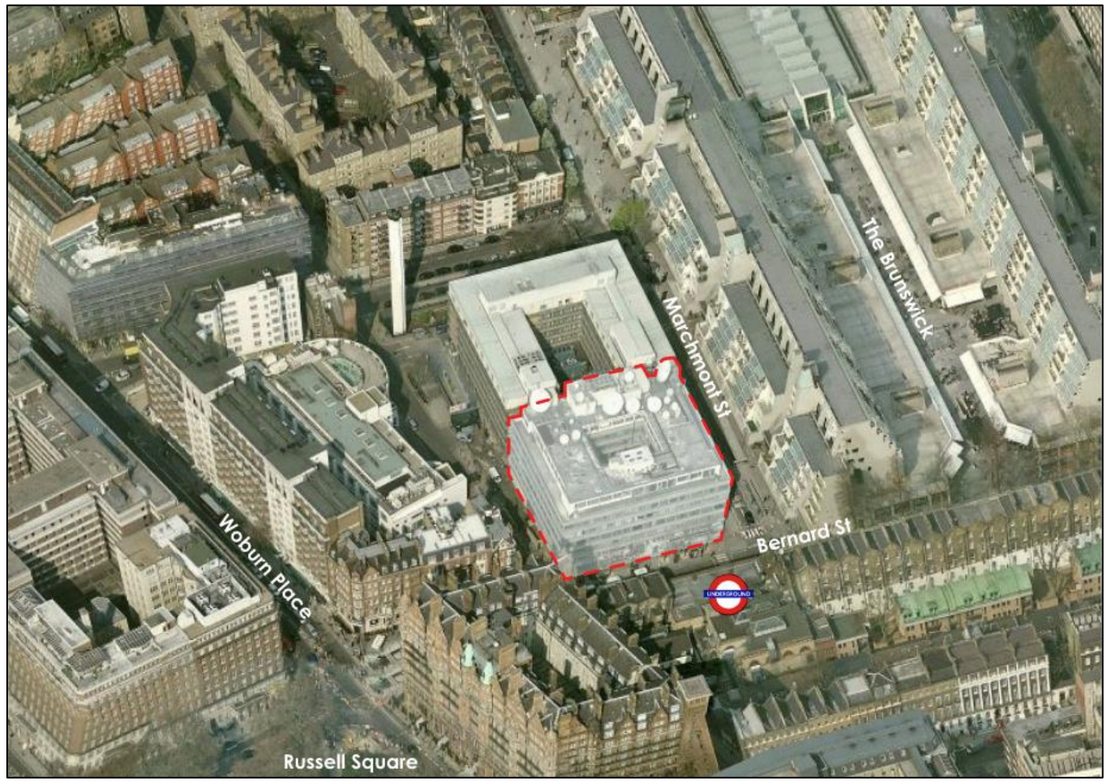


Figure 1: Building Location Plan (Design and Access Statement)

The extension is to provide a 6th floor set back from the current 5th floor. The existing building height exceeds 18m to the top storey. The provision of the new storey will necessitate two of the cores being upgraded to firefighting shafts.

Please refer to the ‘As-built’ fire strategy as noted above for the areas not changing within the building, e.g. all floors other than floor 5 and 6, South and North East stair cores and basement cycle store.

1.1 Building Arrangements

1.1.1 Basement

The main basement layout will remain unchanged however it is to be provided with new cycle storage facilities. The South and North East stair cores are to be upgraded to firefighting shafts with firefighting lifts and mechanical ventilation. The floor area is 4,325m^2. The basement is shared with the neighbouring hotel and it is understood that both buildings are in the same ownership. Design Team to confirm.

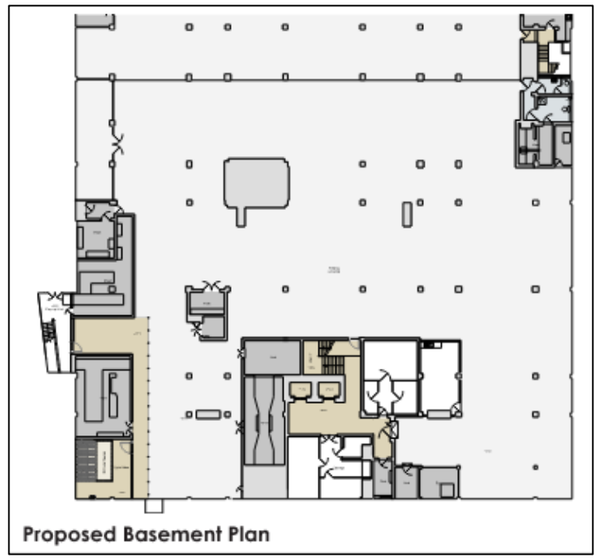


Figure 2: Basement Floor

1.1.2 Ground Floor

The ground floor consists of two retail units flanking the office entrance and a mezzanine. No amendments are proposed to this floor except the South and North East stair cores are to be upgraded to firefighting shafts with firefighting lifts and mechanical ventilation. The floor area is 1,070m^2 and 925m^2 for the mezzanine.

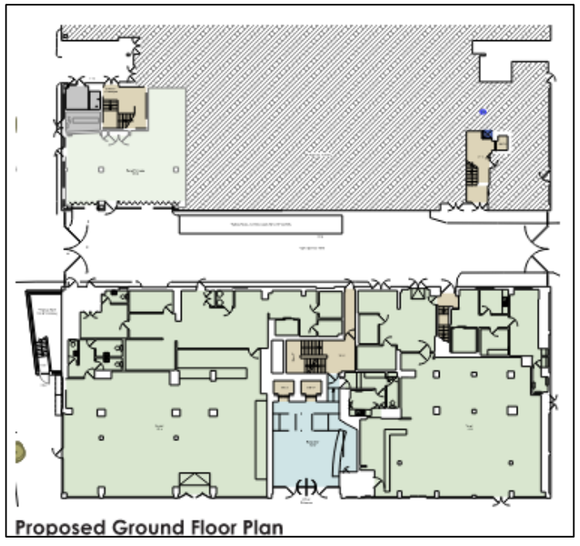


Figure 3: Ground Floor

1.1.3 First to Fourth Floor

The first to fourth floors consist of existing office spaces which are to remain operational during the works. No amendments are proposed to these floors except the South and North East stair cores are to be upgraded to firefighting shafts with firefighting lifts and mechanical ventilation. The floor areas range from 1,270m^2 to 1,595m^2.

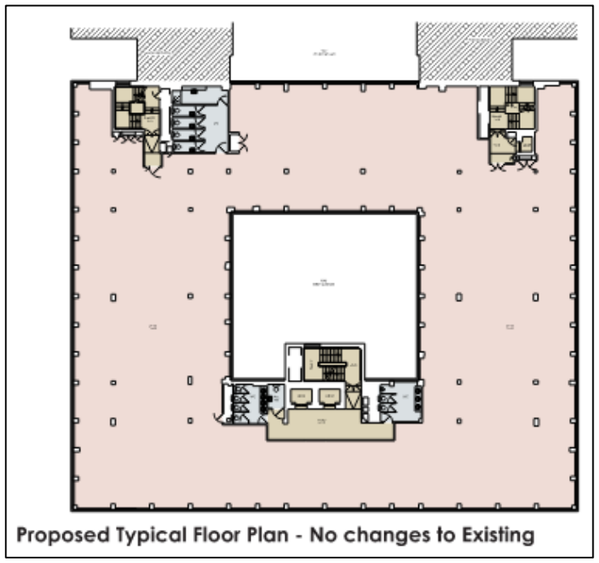


Figure 4: Typical Upper Floors

1.1.4 Fifth Floor

The fifth floor is to be refurbished to provide open plan office accommodation similar to the other office floors. In addition to this the South and North East stair cores are to be upgraded to firefighting shafts with firefighting lifts and mechanical ventilation. The floor area is 1,230m^2.

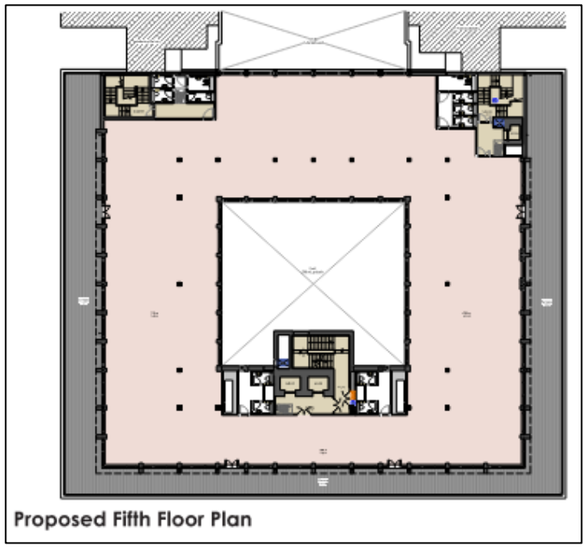


Figure 5: Fifth Floor

1.1.5 Sixth Floor

The sixth floor will provide additional open plan office accommodation. All three cores will continue to the new 6th floor to include the South and North East stair core that are upgraded to firefighting shafts with firefighting lifts and mechanical ventilation. The floor area is 1,230m^2.

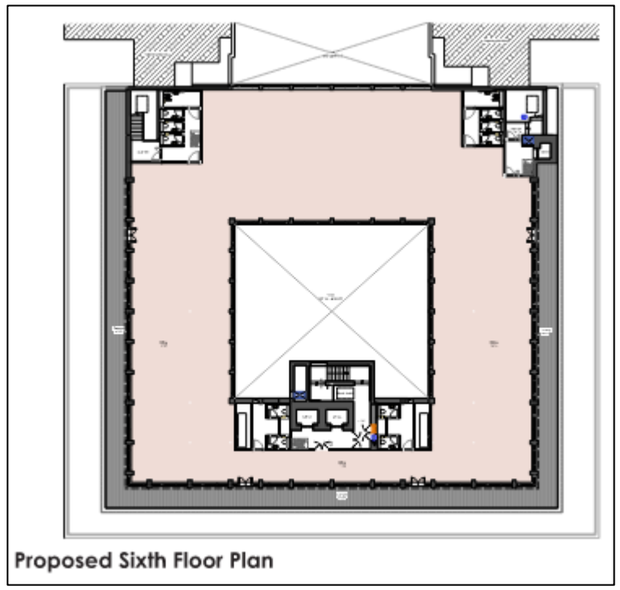


Figure 6: Sixth Floor

1.1.6 Roof

The roof will incorporate a dedicated plant enclosure and PV panels.

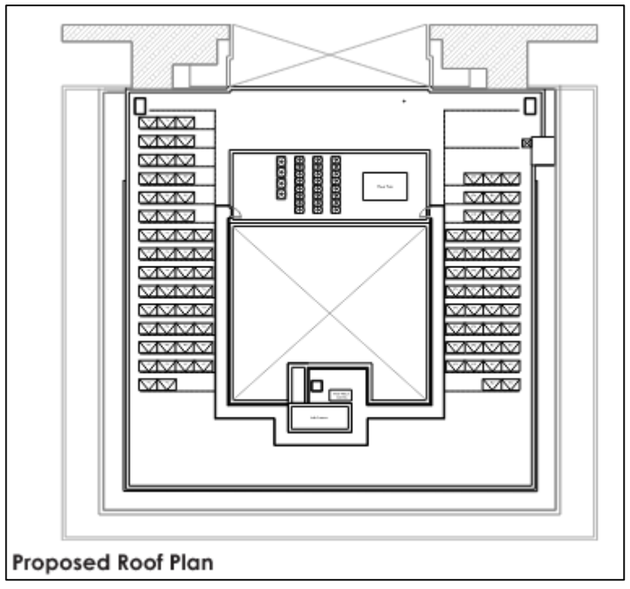


Figure 7: Roof Plan

1.2 Helios Fire Strategy Drawings

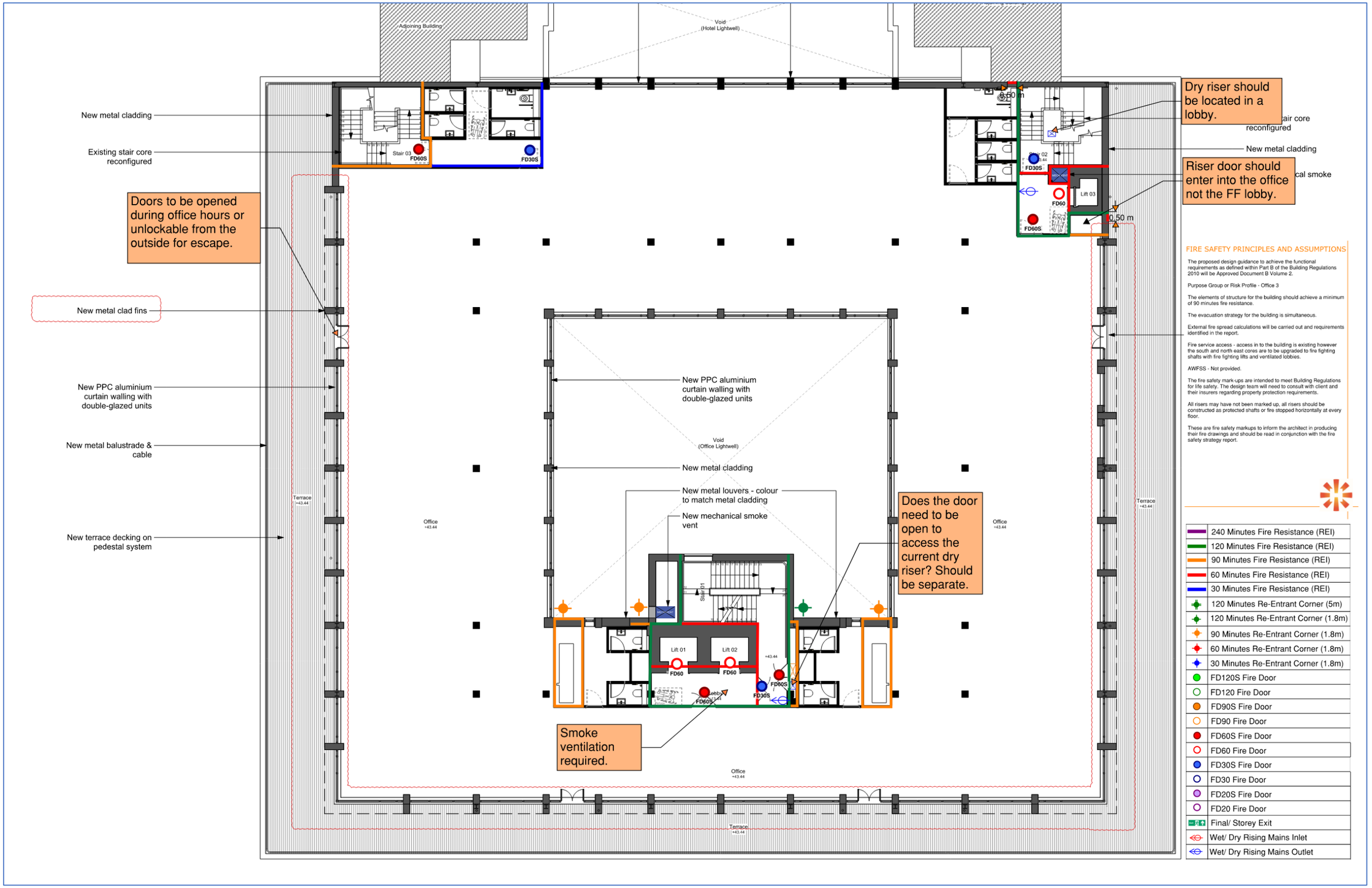


Figure 8: Fifth Floor Fire Strategy

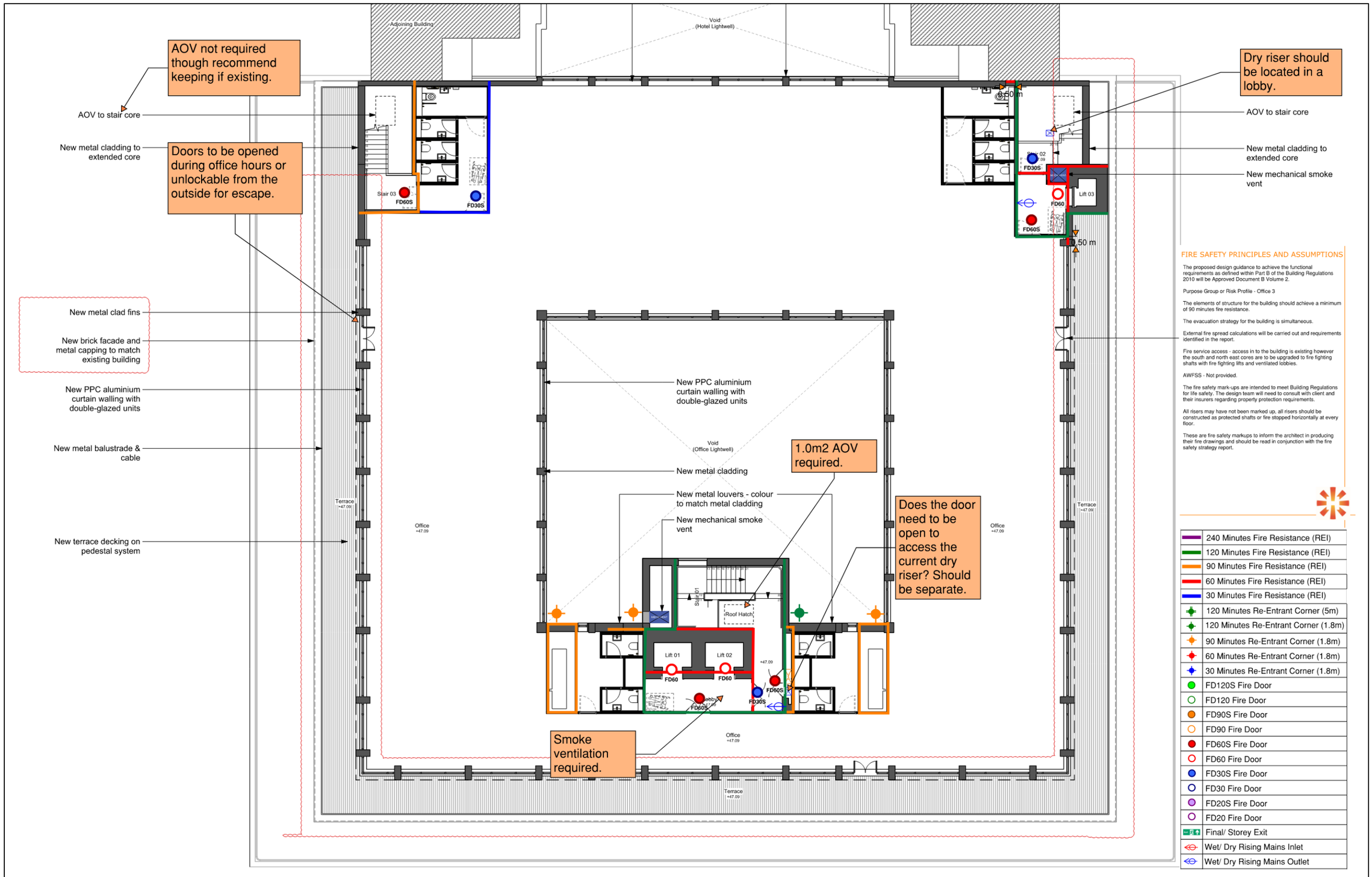


Figure 9: Sixth Floor Fire Strategy

1.3 Building Height

With the addition of the 6th floor, the top storey height from ground floor level is approximately 23.4m.

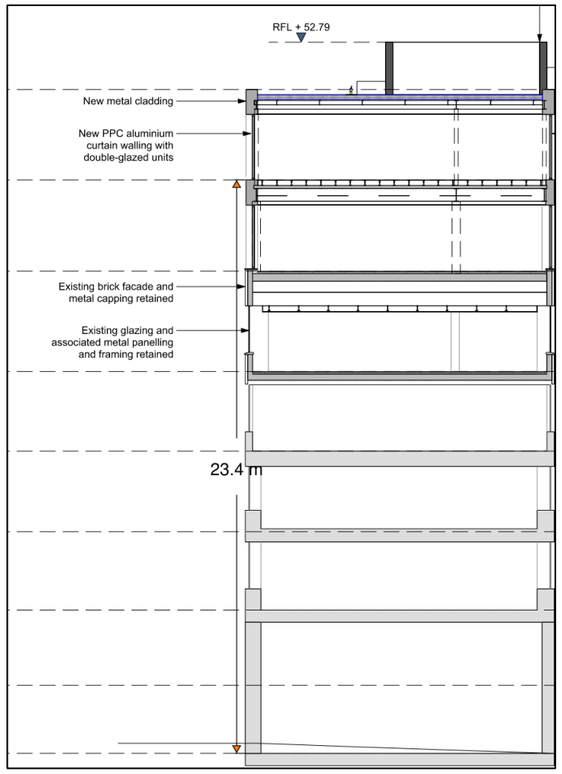


Figure 10: Section

1.4 Occupancy

The occupancy for the building is based on the 'As-Built' report for the basement to fourth floors. The fifth and sixth floors are based on a floor space factor of 6m^2 per person.

Table 1: Occupancy

Floor	Use	Area (m^2)	Floor Space Factor (m^2/person)	Occupancy
6	Office	1,040	6	173
5	Office	1,230	6	205
4	Office	-	-	235 (According to as built fire strategy dated 23.12.24)
3	Office	-	-	233 (According to as built fire strategy dated 23.12.24)
2	Office	-	-	233 (According to as built fire strategy dated 23.12.24)
1	Office	-	-	184 (According to as built fire strategy dated 23.12.24)
M	Office	-	-	120 (According to as built fire strategy dated 23.12.24)
Ground	Retail	-	-	358 (According to as built fire strategy dated 23.12.24)
Basement	Transient	-	-	<50 (According to as built fire strategy dated 23.12.24)
Total				**1,823**

1.5 Purpose of the Report

The objective of this report is to develop a fire safety strategy, which satisfies the performance requirements of the Building Regulations 2010 whilst maintaining an acceptable level of life safety, protection of adjacent property and adequate provisions for fire service intervention.

It is proposed to follow the principles within Approved Document B, Volume 2 (Buildings other than dwelling houses) 2019, 2020 with 2022 amendments referred to as 'Approved Document B' herein of the Building Regulations 2010.

Where no specific provision is mentioned in this fire strategy regarding any particular aspect reference should be made to Approved Document B.

With regard to the provision of Firefighting Shafts Approved Document B recommends following the guidance in BS9999:2017.

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 referred as 'Building Regulations' herein.

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.

1.6 Categorisation of Building Works

When considering works to buildings the criteria of the work should be established and from a regulatory perspective the elements of the building that should be assessed to demonstrate compliance with the Building Regulations.
The alterations under the Building Regulations are classified as a Material Alteration.
Statutory compliance of Material alteration works are limited within the Building Regulations as noted below:
Building work shall be carried out so that, after it has been completed –

a. Any building which is extended or to which a material alteration is made; or
b. Any building in, or in connection with, which a controlled service or fitting is provided, extended or materially altered; or
c. Any controlled service or fitting,

complies with the applicable requirements of Schedule 1 or, where it did not comply with any such requirement, is no more unsatisfactory in relation to that requirement than before the work was carried out.

It should be noted that compliance with Schedule 1 of the Building Regulations does not imply that the existing building should be refurbished in accordance with the suite of Approved Documents but to comply with the Functional Requirements of the Regulations i.e., all new works are to fully comply on the basis that any works do not adversely affect any existing contraventions.

1.7 Design Team / Client Confirmation Required

Further information / confirmation is required by the Design Team / Client and approvals from Building Control, these have been provided in the following colours throughout the report:

'Blue' – Information / confirmation is required.

'Purple' – Approvals are required.

The fire strategy report should be read in full by all relevant parties.

1.8 Sources of Information

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

Table 2: Drawings and Information

Drawing Title	Drawing Number	Revision
Proposed 5th Floor Plan	356 (GA) 105	PL2
Proposed 6th Floor Plan	356 (GA) 106	PL2
Proposed Roof Plan	356 (GA) 107	PL2
Proposed Section	356 (GA) 300	PL3
Proposed West Elevation	356 (GA) 200	PL3
Proposed South Elevation	356 (GA) 201	PL3
Proposed East Elevation	356 (GA) 202	PL3
Proposed North Elevation	356 (GA) 203	PL3
Updated Design & Access Statement – halebrown		02/23
Fire Safety Strategy Report REV 5.0 40 Bernard Street – Nadim Choudhary		23/12/22
Fire Strategy Overview 40 bernard Street – MLM Group		15/06/21

Note: *The figures within this report are intended to illustrate the fire safety principles. For confirmation of layout or other design details, reference should be made to the current plans.*

2 Statutory Compliance

2.1 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:

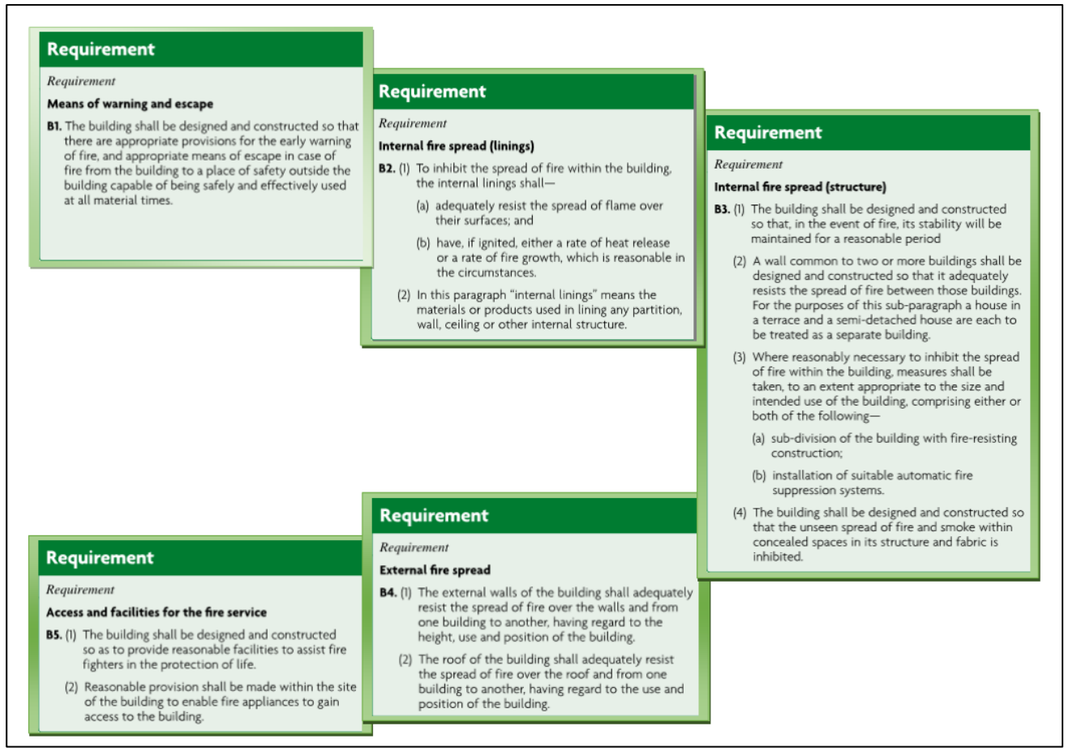


Figure 11: Schedule 1, Part B of the Building Regulations 2010

2.2 Regulation 7 – 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.

2.3 Guidance

Approved Document B, Volume 2 (Buildings other than dwelling houses) 2019, 2020 with 2022 amendments referred to as 'Approved Document B' herein and where appropriate supplementing this with fire engineering solutions when necessary to ensure that the key fire safety objectives for the design are achieved is sufficient in order to demonstrate compliance with Part B of Building Regulations 2010.

This fire strategy is concerned only with the life safety and the report does not specifically include property protection measures.

Where no specific provision is mentioned in this fire strategy regarding any particular aspect reference should be made to Approved Document B.

2.4 Purpose Group

The purpose group of the building is Offices Group 3.

2.5 Accessible Design

Designing a fully accessible means of escape strategy is an integral part of the fire safety strategy for any premises, the design and fire safety management plan should consider the full range of occupants who may use the building, paying particular attention to the specific accessibility requirements of all occupants.

The responsibility for the safe evacuation of all occupants in the premises lies with the building management. Fire safety management plans / Personal Emergency Evacuation Plans [PEEPs] will need to ensure that all occupants can safely evacuate without the assistance of the fire and rescue service.

The incorporation of measures to ensure the safe evacuation of all occupants should be considered at the design stage in conjunction with the end users management systems and staffing policies, as at this early design stage evacuation planning can be more easily incorporated. The early review of accessibility requirements allows for the effective incorporation of escape features to aid evacuation planning and allows the management to preserve the dignity of all occupants of the premises during an evacuation scenario.

The design should consider all primary groups of occupants and recognise that mobility impaired occupants are not solely categorised as wheelchair users.

Mobility impaired occupants generally are considered as wheelchair users, but this category should include all occupants who might not be able to reach a place of ultimate safety in the standard movement evacuation times as noted in PD7974.

Escape routes should be designed taking into consideration all of the occupants' requirements and include any measures that are required to aid mobility-impaired occupants and to aid the management team in providing a dignified evacuation strategy e.g.

- Refuge Areas with communication systems.
- Horizontal evacuation to adjacent compartments.
- The use of suitable designed lifts.
- Level and ramped escape routes.
- Visual aids including visual beacons on the fire alarm system, suitably sized signage, lighting and contrasting edge markings.

Special management procedures might be required where it is reasonably foreseeable that the proportion of disabled 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.

2.6 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.

2.7 The Regulatory Reform (Fire Safety) Order 2005

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 under this order, among other things, 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.

2.8 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.

2.9 Third Party Accreditation Schemes

Independent Third-Party Certification Schemes provide confidence the required level of performance is achieved in the design, product selection, product manufacture, installation and commissioning of a building system, structure or component.

Third party certification schemes for fire protection products, design, installation and commissioning are an effective means of providing assurances of quality, reliability and safety. These schemes can assist in demonstrating compliance with the Material and Workmanship requirements of Regulation 7 to the Building Regulations is satisfied.

Helios would recommend that, where appropriate, manufacturers and installers that are subject to independent certification schemes are considered / specified for this development.

3 Access & Facilities for the Fire Service

3.1 General Access

Existing fire service vehicle access to the building is off Bernard Street with a new riser and firefighting shaft access off Marchmont Street.

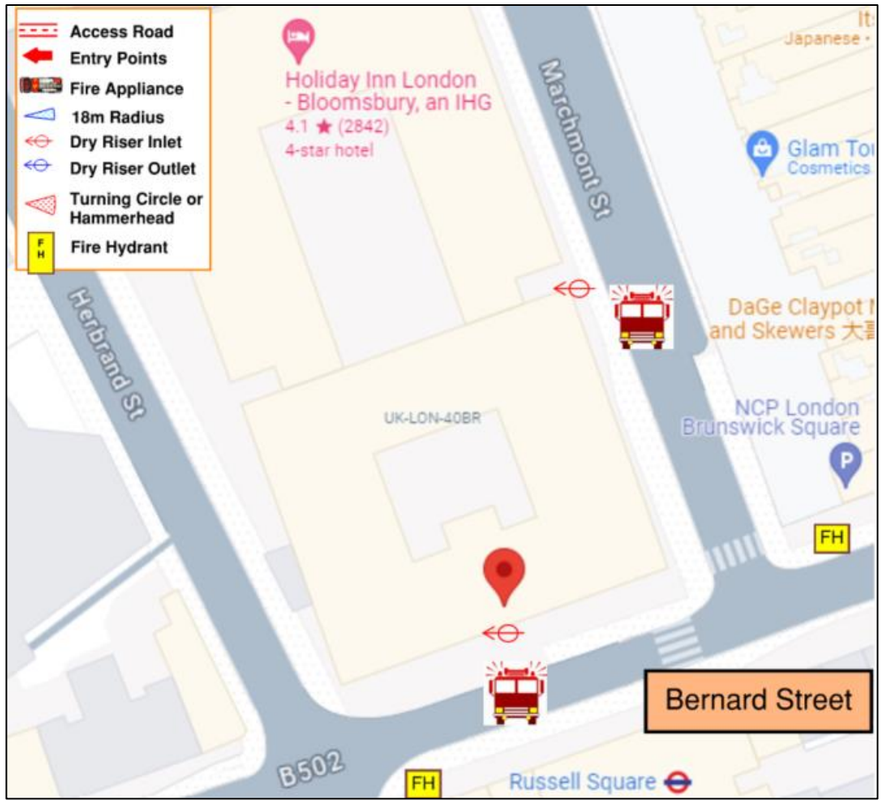


Figure 12: **Existing Fire Service Vehicle Access** (Location Plan from Google Maps)

The current building height to the top storey is over 18m however the As-Built fire strategy noted no firefighting shafts were provided; however with the addition of the sixth floor, the floor height is increased to over 23m and therefore the South stair and North-Eastern stair are to have the stair cores upgraded to firefighting shafts with firefighting lifts and dry risers. Access is provided to these firefighting shafts from Bernard Street and Marchmont Street.

Design team to provide site plan and elevations noting dry riser inlet connections.

3.2 Vehicle Access

The fire service requires to get a pump appliance within 18 metres of the dry rising main inlets which is available from Bernard Street and Marchmont Street.

The existing access provision is expected to be designed in accordance with the table below. The table below contains standardised figures; the local fire service should be consulted with to confirm their requirements.

Table 3: Fire Service Vehicle Access Routes

DB32 Fire Appliance
Overall Length - 8.680m
Overall Width - 2.180m
Overall Body Height - 3.452m
Min Body Ground Clearance 0 0.337m
Max Track Width - 2.121m
Lock to Lock time 6.00s
Kerb to Kerb Turning Radius - 7.910m

Source: 3d Warehouse. Sketchup Image

Appliance	Min. Width of Road between Kerbs	Min. Gateway Width	Min. Clearance Height	Min. Carrying Capacity	Min. Turning Circle	
					Kerb to Kerb	Wall to Wall
Pump	3.7m	3.1m	3.7m	12.5 tonnes	16.8m	19.2m

3.3 Firefighting Shaft Layout

As discussed above, the North-East and Southern stairs should be designed as firefighting shafts. This fire strategy only covers the layout at the Fifth and sixth floors. However Helios recommend the principles be adopted to the lower levels also.

The firefighting shafts should consist of ventilated firefighting stairs, ventilated firefighting lobbies (having a floor area not less than 5m^2), dry riser mains, firefighting lifts. The firefighting lifts should be provided with a secondary power supply.

BS9999 recommends that hose laying distances from the dry riser inlet to any point on a floor should not exceed 60m.

The figure below illustrates the recommended layout of a typical firefighting shaft.

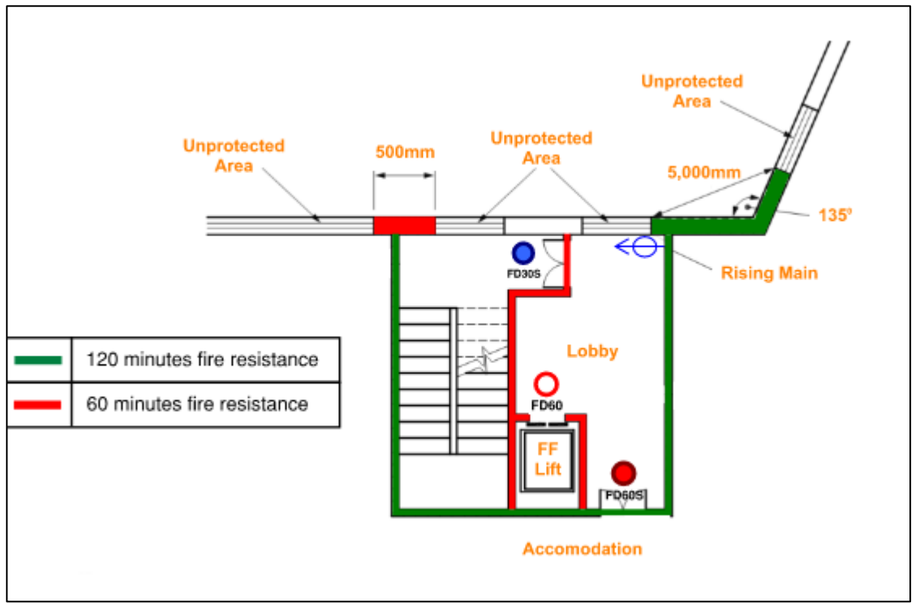


Figure 13: Example of a Firefighting Shaft Layout

Only services associated with the firefighting shaft should pass through a firefighting shaft.

The North-East core appears to have a riser adjacent the lift. Any door into this riser should open into the office.

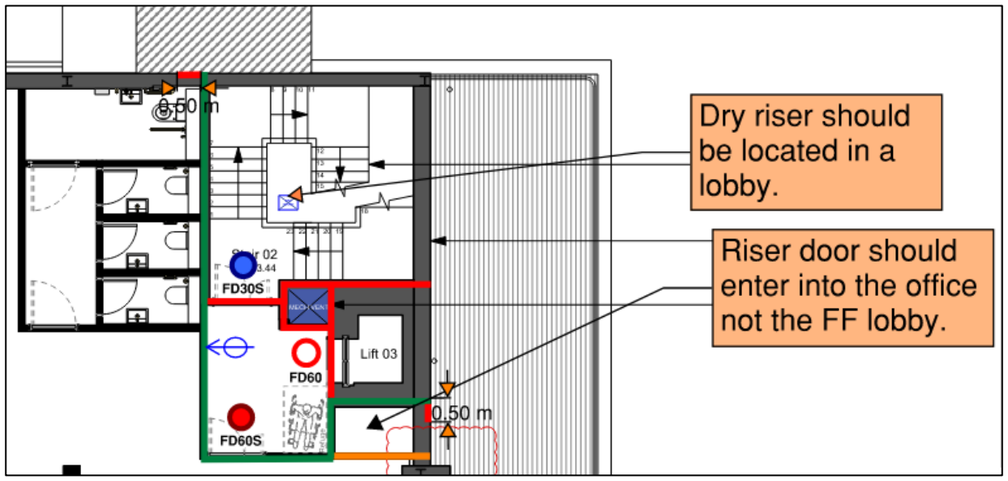


Figure 14: Riser Opening into NE Firefighting Shaft

The South core has existing services with openings into the firefighting stair. This is an existing condition. Helios recommend that the shaft is protected to 120 mins to the firefighting shaft side with FD60S doors. Additional fire-stopping should be provided at floor level to provide further resilience.

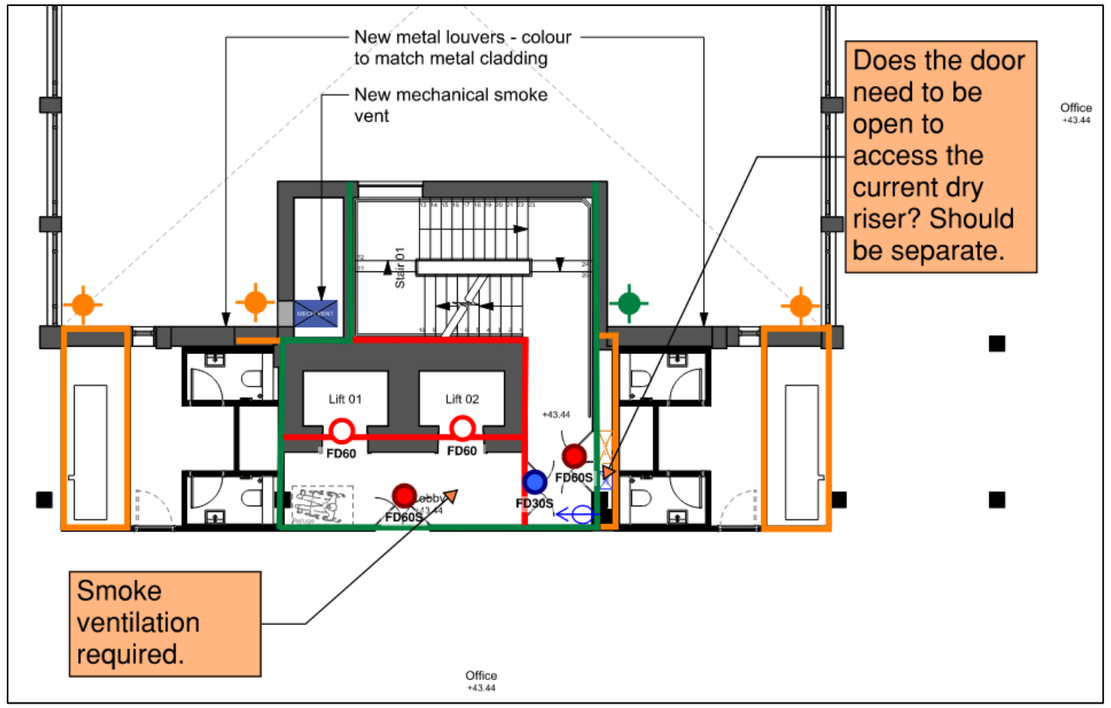


Figure 15: South Firefighting Shaft

3.4 Firefighting Stairs

The firefighting stairs should be designed in accordance with Clause 20.2.4 of BS9999 and in accordance with BS5395-1.

The stairs should be sufficiently wide to be easily used by firefighting personnel carrying firefighting equipment and not less than 1100mm. This width should be maintained clear for a vertical distance of 2000mm, measured from the pitch line or landing floor level, with the following exceptions:

Stringers, each protruding into the stair not more than 30mm; and

Handrails each intruding into the stair not more than 100mm.

An Automatic Opening Vent (AOV) with a geometric free area of 1.0m^2 should be provided at the head of each firefighting stair. This should be designed in accordance with Table 21 from BS9999 and BSEN 12101-2.

3.5 Firefighting Lobbies

The firefighting lobbies should be designed in accordance with Clause 20.2.5 from BS9999. Firefighting lobbies should have a minimum area of 5m^2 and a maximum area of 20m^2. All principal dimensions should be not less than 1.5 metres and should not exceed 8 metres.

3.6 Smoke Ventilation to Firefighting Shafts

Each firefighting shaft requires the provision of smoke ventilation. The proposed ventilation method for each firefighting shaft will be via a mechanical system. Further details on the smoke ventilation provisions are provided in Section **Error! Reference source not found.**.

3.7 Firefighting Lifts

Each of the firefighting shafts should include a firefighting lift. Firefighting lifts should comply with Clause 20.4 of BS9999, BSEN 81-20 and BSEN 81-72. This will be an upgrade on the existing lift provision.

The lift doors should be power-operated.

A firefighting shaft should serve fire and rescue service access level and all storeys above it, although the firefighters lift need not serve any storey on which there is no entrance to any accommodation, or the topmost storey of the building if it consists exclusively of plant rooms.

The firefighting lift installation includes the lift car itself, the lift installation within the well and the lift machinery spaces, together with the lift control system and the fire service communications system. The firefighting installations should conform to BSEN 81 – 72.

The power supply to the lift and lighting should consist of primary and secondary supplies. There will also be a means to minimize the effect of water penetration into the firefighting lift well.

Access points to the lift are to be designed in accordance with BSEN 81-72.

3.8 Fire Mains

Fire mains should be provided in accordance with Clause 22.1 of BS9999 and should be designed and installed in accordance with BS9990.

As the building does not have any floor higher than 50 m above ground level, dry fire mains are proposed to be installed serving each of the firefighting shafts.

There should be access for a pumping appliance to within 18m of each fire main inlet connection point, typically on the face of the building, and the inlet should be visible from the appliance.

Dry riser outlet connection point should be located within the firefighting lobby.

3.9 Firefighting Water Supplies

The building is existing and there are fire hydrants within 100m to an entry point of the building as shown in Figure 12:

3.10 Power Supplies

Any life safety system will require secondary power supplies, see Section 4.8 for more information.

4 Active Fire Protection Systems

4.1 Evacuation Approach

The standard evacuation approach for the building is to be confirmed as a single staged simultaneous evacuation of the entire building. This means on activation of detection, or a manual call point the whole building will be put into alarm and all occupants evacuate.

Design team to confirm that the existing office evacuation strategy is simultaneous.

4.2 Fire Detection and Alarm

The 'As-Built' report has assumed a Category L2 fire detection and alarm system has been installed within the building. It is proposed to extend this system to 6th floor. This provides detection to the following areas.

- All escape routes (stairs, corridors, circulation area and access rooms to inner rooms)
- Rooms off of escape routes.
- High hazard rooms.

***Note**: If the system is modified, the system should be designed, installed, and commissioned in accordance with BS5839-1.*

On the activation of a detector or manual call point the fire detection and alarm system will have interfaces and links as necessary to operate equipment/ devices within the building, key examples are indicated below. The list is not exhaustive and for full information see BS5839-1.

- Electromagnetic hold-open devices on fire doors – released to closed position.
- Security systems on exit doors - released as required.
- Gas supply valves (kitchens/ plant areas) – isolate.
- Fire and smoke dampers – close.
- Lifts – to ground floor.
- Smoke control to the firefighting lobby and stair.
- Heating, ventilation, and air conditioning systems – shut down to restrict spread of smoke and hot gases.

In areas where audibility may be reduced due the activities in these spaces e.g., areas with high ambient sound levels where hearing protection is likely to be worn) visual devices should be considered e.g., plant areas, roof areas etc.

- Visual alarm devices should be sufficient in number and distribution to be readily visible from all normally accessible locations, throughout the area in which they are provided, under normal ambient lighting levels.
- The visual alarm signal should flash at a rate within the range of 30 to 120 flashes per minute.
- The visual alarm signal should be clearly distinguishable from any other visual signal used in the premises.
- Visual alarm signals should be white or red, or both white and red, in colour, unless use of another colour is necessary to distinguish the signals from other visual signals.
- Care needs to be taken to ensure, as far as reasonably practicable, that visual alarm signals do not cause epileptic seizures in people with photosensitive epilepsy.
- The intensity of output of visual alarm devices should be sufficient to attract attention, but not so high as to cause visibility issues due to glare.
- Visual alarms should be securely fixed in accordance with the mounting position (ceiling or wall) and orientation in accordance with the manufacturer's details, mounting position should be no more than 2.1m from FFL.

4.3 Automatic Water Fire Suppression System [AWFSS]

AWFSS is not expected to be provided. Design team to confirm.

4.4 Emergency Lighting & Signage

Emergency lighting should be installed in accordance with Approved Document B V2, BS5266-1 and BSEN 1838 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 BS5266 should be consulted but as an indication:

Table 4: Indicative Emergency Lighting Locations

Areas Requiring Emergency Lighting
All windowless and underground accommodation
All escape routes including external escape routes
Internal corridors more than 30m long
Open plan areas more than 60m^2
All sanitary accommodation with a floor area over 8m^2
Electricity and generator rooms
Switch room/ battery room for emergency lighting

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 BS5266-1: 2016.

Table 5: Indicative Specific Flux Levels

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
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.

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

Fire doors should have signage as detailed in Section 9 below.

4.5 Fire and Smoke Dampers

If fire and smoke dampers are required in the building to maintain compartmentation. The provision of dampers is discussed within 9.4.2.

4.6 Emergency Voice Communication Systems

Disabled refuges should be provided with emergency voice communication points (EVCs). The EVC system should be designed and installed in accordance with BS5839-9:2021 and the communication points should link with a suitably located master station.

The provision of EVC's should be part of a management strategy for disabled occupant evacuation as referred to in Section 6.4.

4.7 Smoke Ventilation to Firefighting Shafts

As highlighted in Section 3.3 each firefighting shaft requires the provision of smoke ventilation. The proposed ventilation method for each of the firefighting shafts is mechanical as discussed below.

Where a mechanical smoke ventilation system is used, CFD modelling should be undertaken by specialist designers to ensure that the system provides adequate protection.

Where a mechanical smoke ventilation system uses a shaft, it should meet the following recommendations.

1. The top of the lobby vent should be located as close to the ceiling of the lobby as is practicable, and should be at least as high as the top of the door connecting the lobby to the stairwell.
2. The lobby vents, in the closed position, should either:
    a. have a minimum fire and smoke resistance performance of 60 min and a leakage rate no greater than 200 $m^3/h/m^2$ when tested in accordance with BSEN 1366-2; or
    b. be in accordance with BSEN 12101-8.
3. The smoke shaft should be constructed of materials classified as A1 in accordance with BSEN 13501-1:2007+A1, or of materials determined to be non-combustible when tested in accordance with BS476-4, or of any material which when tested in accordance with BS476-11 does not flame or cause any rise in the temperature on either the centre of the specimen or the furnace thermocouples.
4. Any smoke shaft which penetrates fire compartments should, as a minimum, maintain the same level of fire compartmentation as that which has been breached.
5. No services other than those relating to the smoke shaft should be contained within the smoke shaft.
6. Fans should be capable of handling gas temperatures of 300 °C for a continuous period of not less than 60 min and tested in accordance with BSEN 12101-3.
7. It should operate automatically either on activation of the sprinkler system or by an automatic fire detection system in accordance with BS5839-1:2013.
8. The system should have a power supply in accordance with BS 8519.
9. Any ductwork should be fire-resisting (Method 2 or Method 3; see Section **Error! Reference source not found.**) maintaining at least 75% of the cross-sectional area of the duct. The fire resistance should be not less than 60 min or equivalent to the fire resistance rating of any compartment boundary through which it passes, whichever is the greater.
10. Where only a single mechanical extract is provided the fans should be duty/standby fans, as fan failure would result in failure of the system.

Each of the firefighting stairs will be provided with an AOV at the head of the stair with a minimum aerodynamic free area of $0.7m^2$.

The size of the mechanical smoke shafts will be dependant on feedback from smoke control specialist.

4.8 Power Supplies

All power supplies, electrical wiring and control equipment should be protected against the effects of fire for an appropriate period. Power and control cables should be installed in accordance with BS8519: 2020. A secondary power supply is required for essential fire safety measures, e.g.

- Fire detection and alarm system.
- Emergency voice communication system
- Emergency lighting and illuminated signage.
- Fire detection and alarm system.
- Emergency lighting and illuminated signage.
- Firefighters' lifts.
- Firefighting shafts (associated equipment and normal lighting);
- Firefighting intercommunications installations.
- Smoke control/ventilation systems
- Fire and smoke dampers
- Automatic opening doors or powered locks on escape routes

Note: *the systems shall comply with their respective British Standards regarding secondary power supplies.*

The primary power source is taken from the public electricity supply, with secondary power being supplied from an alternative supply. The output from the secondary power supply should be enough to satisfy the maximum demands of the system.

5 Horizontal Means of Escape

5.1 Evacuation Strategy

The proposed evacuation strategy is to be confirmed by the design team as a single stage simultaneous evacuation. This means that on the activation of a detector or manual call point the entire occupancy of the building starts its evacuation. The existing evacuation strategy is to be confirmed by the design team.

5.2 Travel Distances

The table below presents the maximum recommended travel distances in accordance with Table 2.1 of Approved Document B.

Table 6: Travel Distances

Area	Single Direction of Travel	Multiple Directions of Travel
Office	18m	45m
Plant Room	9m	35m
Roof	60m	100m

Travel distances within the areas under consideration in this fire strategy are within the above recommendations.The roof terrace doors will need to be available for escape when the building is occupied. See section 5.7.

5.3 Exit Widths

5.3.1 Minimum Number of Escape Routes

The minimum number of escape routes is determined by the number of occupants needing to use the room or storey and outlined within the table below which is in accordance with Table 2.2 from Approved Document B.

Table 7: Absolute Minimum Number of Exits/ Routes

Maximum Number of Persons	Minimum Number of Exits/ Routes
60	1
Up to 600 Note 1	2
More than 600 Note 1	3

Note 1: *Where the occupancy exceeds 60, the exits should open in the direction of escape.*

The minimum number of exits have been achieved.

5.3.2 Minimum Required Widths for Escape Routes

The table below indicates the minimum width for escape routes based on the maximum number of people using them.

Table 8: Door Widths Per Person

Maximum Number of People	Minimum Width (mm)
60	750Note 1
110	850
220	1050
More than 220	5 per person

The width of all fire exits, and routes leading to them, is proportional to the number of persons using that exit. The design parameters used in the development of this design are as follows, subject to an absolute minimum width of 750mm (where occupancy is less than 60).

Note1: *Other parts of the Approved Documents such as Part M may require larger storey exit widths. Helios recommends a minimum width of 800mm.*

5.3.3 Clear Widths

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.

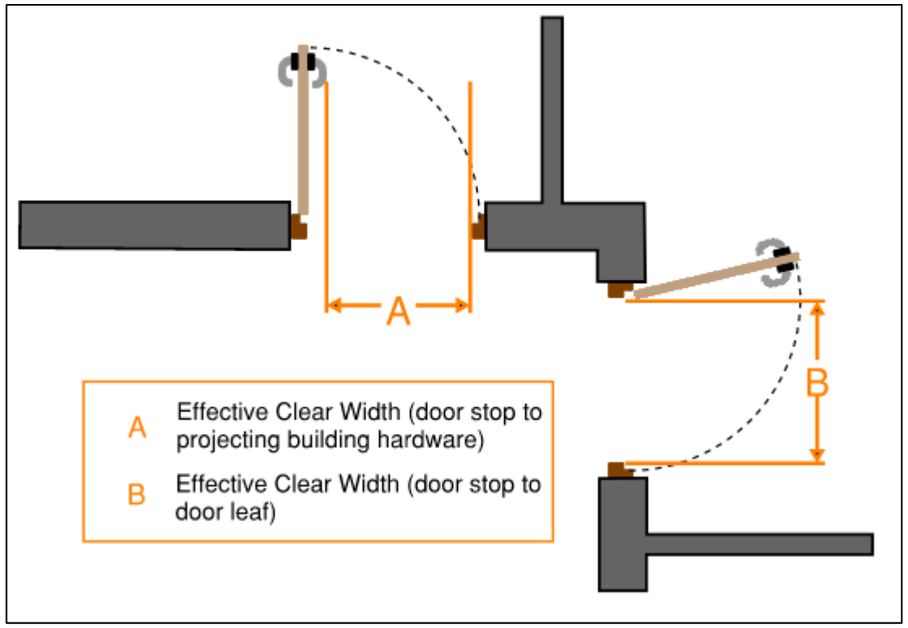


Figure 16: Clear Exit Width Measurements

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 used for escape are to be provided with appropriate ironmongery for escape and should not be locked during material times.

5.3.4 Required Exit Widths

5.3.4.1 Ground Floor – Fourth Floor

See the As-built fire strategy for required widths.

5.3.4.2 Fifth and Sixth Floors

These two floors each have a proposed occupancy of 205 people.

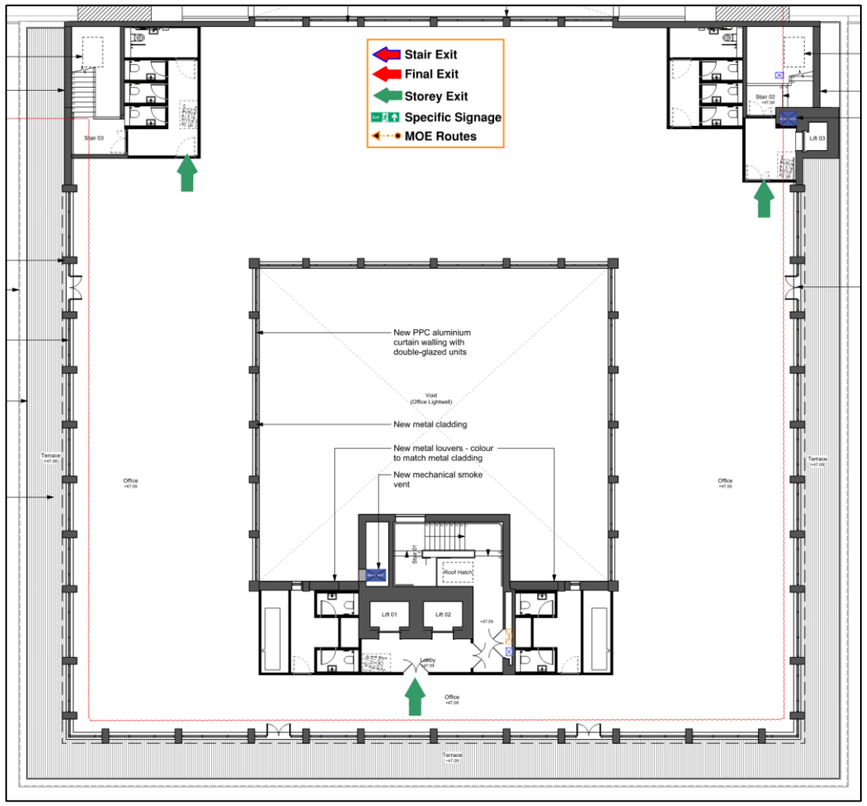


Figure 17: First Floor Exits

The minimum required clear widths are noted below.

Table 9: First Floor Minimum Required Widths

Area	Occupancy	Number of Exits	Exits Required	Clear Width Required Per Exit
Fifth Floor	205	3 outward opening storey exits.	1 exit discounted. 103 per exit	850mm
Sixth Floor	205	3 outward opening storey exits.	1 exit discounted. 103 per exit	850mm
Roof	<60	2 inward opening storey exits.	1 exit discounted. <60 per exit	800mm

5.3.5 Stair Final Exit Widths

The 'As-Built' fire strategy confirms the final exit requirements from the stairs should be at least the same clear width as the stair it serves and identifiers the widths below. The external steps and stairs should also have the same clear width at the base of the stairs until a place of ultimate safety is achieved. Based on the approximate measurements taken from the 'As-Built' fire strategy, the clear stair widths are as follows.

- Stair 1 – 1500mm
- Stair 2 – 1500mm
- Stair 3 – 1500mm

Note: *These measurements should be confirmed by the design team.*

The 'As-Built' fire strategy notes that the merging flow can be ignored as this is an existing condition that cannot be provided due to site constraints when the cores are upgraded.

5.4 Dead-End Corridors

There are no dead ends created at the fifth and sixth floor levels or within the rooftop plant. As per section 5.2 escape from the roof balcony is to be available in more than one direction.

5.5 Inner Rooms

There are no inner rooms being created at the fifth and sixth floor levels or within the rooftop plant. The exception to this are the WC facilities which are low risk spaces with automatic fire detection to the main office area.

5.6 Escape Routes – General

5.6.1 Internal Corridors and Escape Routes

The width of a corridor or escape route should be not less than the calculated width of any door leading onto it, or 1200mm, whichever is the greater. No corridors are currently proposed on the 5th and 6th floors.

5.6.2 Protected Escape Routes

Protected escape routes are used for escape and due the means of escape arrangement the corridor is enclosed within a minimum of 30 minutes fire resistance (REI30). The fire walls and doors should also reduce the likelihood of cold smoke penetrations. The protected escape should be kept free of combustibles. The non firefighting stair is provided with a protected lobby and considered as a protected escape route.

The two firefighting stairs will be provided with firefighting lobbies achieving 120 minutes fire resistance which are considered as protected escape routes.

5.6.3 Non-Protected Corridors

Non-protected corridors are used for means of escape but are not protected corridors. The corridors provide some defence against the spread of smoke in the initial stages of a fire, even though not designated to have fire resistance. The non-fire rated partitions should be taken up to the soffit of the structural floor above, or to a suspended ceiling and openings into rooms from the corridor should be fitted with doors, which need not be fire doors.

5.7 Exits

Doors on escape routes (whether or not the doors are fire doors) should either not be fitted with lock, latch or bolt fastenings, or be fitted only with simple fastenings that can be readily operated from the side approached by all people (including disabled and elderly) making an escape. The operation of these fastenings should be readily apparent and openable without the use of a key and without having to manipulate more than one mechanism.

Similarly, where a secure door is operated by a code, combination, swipe, or proximity card, biometric data, or similar means, it should also be capable of being overridden from the side approached by people making their escape.

Any means of escape door which is provided with electrically powered locks should return to the unlocked position under any of the following conditions:

- On operation of the fire alarm.
- On loss of power or system error.

  On activation of a manual door release unit (Type A) conforming to BSEN 54-11 positioned at the door on the side approached by people making their escape. Where the door provides escape in either direction a unit should be installed on both sides of the door.

5.8 Occupants with Mobility Impairments

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.

For information on mobility impaired escape for upper floors, see Section 6.4.

5.9 Assembly Points

The location of assembly areas should be defined by the end users Fire Risk Assessment, this will consider their management structure, resources, and local restrictions and if they have a current policy that they need to adhere to.

These areas should not be located where they may obstruct fire service operational personnel or their access to the development. As per the ‘As-Built’ fire strategy people should be able to access this location without using stairs or steps.

6 Vertical Escape

6.1 Vertical Clear Widths

The building is provided with three escape stairs, two of which are to be converted into firefighting shafts with firefighting stairs. The two north stairs discharge into the service road before exiting to the main road. The southern stair discharges via a corridor to the service road or through the main entrance lobby to Bernard Street.

The stairs are shown as lobby protected at every floor level and, on this basis, when working out stair capacity no stair needs to be discounted. For means of escape purposes a storey exit is required to be discounted as per Section 5.3.4.2.

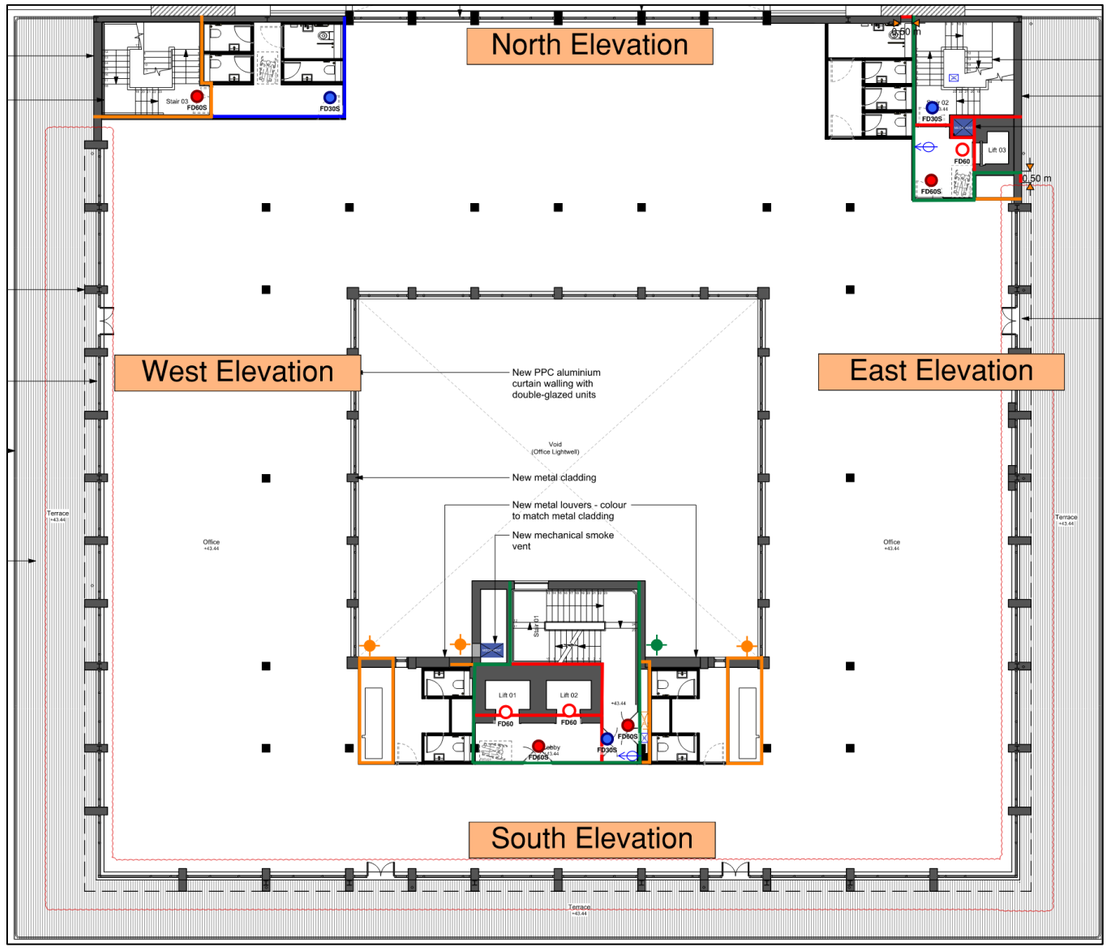


Figure 18: Protected Stairs

The ‘As-Built fire strategy report notes that each of the three stairs is 1500mm in width which serve the first to sixth floors. As per the table below the stairs are therefore considered to be of sufficient width for the proposed capacity.

Table 10: Stair Capacity

Stair	Floors Served	Total Vertical Capacity	Total Vertical Capacity	Occupancy
North West	6	600	1800	1,263
Noth East	6	600		
South	6	600		

6.2 Final Exits from Stairs

The final exit clear widths have been covered within the previous Section 5.3.5.

6.3 Vertical Escape Routes - General

6.3.1 Protected Shafts

For space separation purposes the fifth and sixth floors will need to be compartment floors so that they can be evaluated independently. The North West stairs should be constructed as a protected shaft and be enclosed within 90 minutes fire resistance for means of escape purposes.

6.3.2 Firefighting Shafts

The firefighting stairs to the South and North-East will be incorporated within the firefighting shafts and enclosed with 120 minutes fire resistance. Separation between the stair and the lifts/lift lobby is required so be 60 minutes fire resistant.

6.3.3 Fire Protection to Internal Angles on External Walls

To ensure adequate levels of compartmentation are maintained where an adjacent compartment is recessed or protrudes from the rest of the building elevation and creates an internal opposing recessed angle, suitable fire protection should be provided to the opposing compartment faces to maintain adequate compartmentation.

Where a protected stairway projects beyond, is recessed from or in any way forms an internal angle of not more than 135° to the adjoining external wall of the building, then the distance between any unprotected area in the external enclosures to the building and any unprotected area in the enclosure to the stairway should be at least 1800mm.

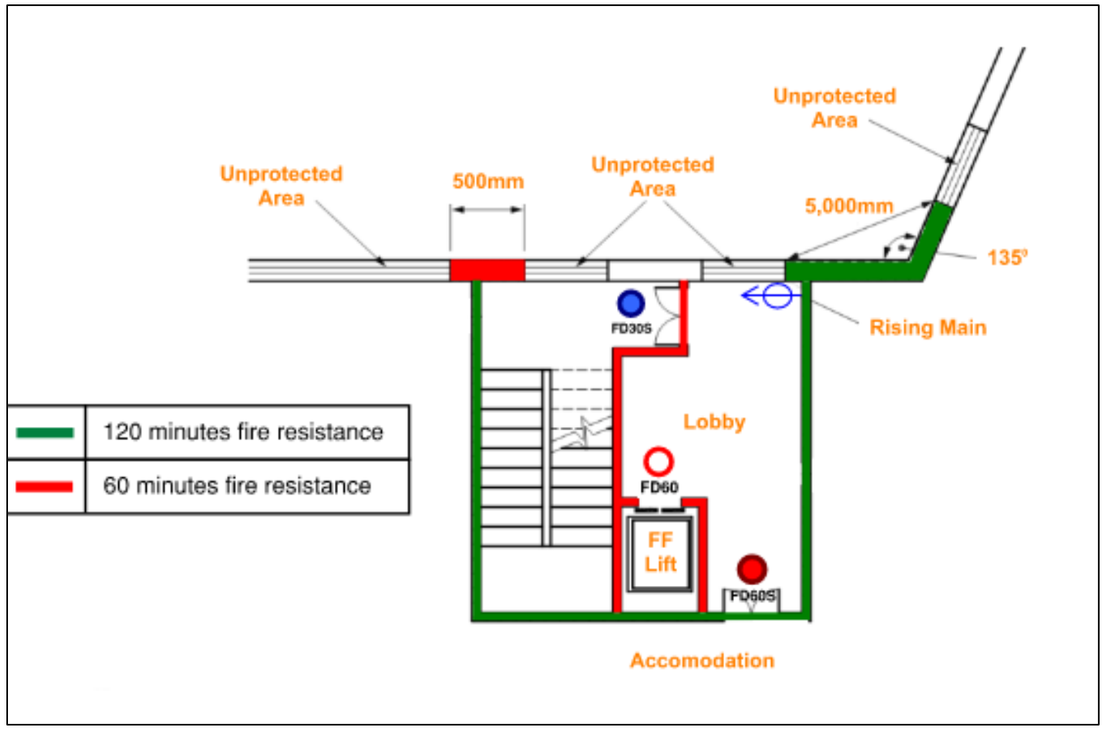


Figure 19: Re-Entrant Corner to Firefighting Shaft

6.4 Escape for People with Mobility Impairments

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.

Guidance recommends that refuges should be provided serving each escape stair at each level (other than ground).

The minimum size of the refuge is 900mm x 1400mm and designed in accordance with Approved Document B.

Each refuge should be fitted with an Emergency Voice Communication (EVC) system. The EVC system should comply with BS5839 Part 9:2003 and consist of Type B outstations which communicate with a master station located in accordance with Clause 12.6 of BS5839 Part 9.

***Note**: Fire alarm sounders should not be positioned close to the EVC communication points.*

***Note:** This evacuation plan should not rely on the assistance of the fire and rescue service. This is a principal factor that should be considered in the building design.*

7 Internal Fire Spread (Linings)

7.1 Wall and Ceiling Lining Requirements

The interior wall and ceiling surfaces in a building may have a significant 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.

For the purposes of classification, the following are deemed to be walls and ceilings.

- Walls:
  - i. The surface of glazing (except glazing in doors).
  - ii. Any part of a ceiling that slopes at an angle of more than 70° to the horizontal
- Ceilings:
  - i. The surface of glazing.
  - ii. Underside of a gallery
  - iii. The underside of a roof exposed to the room below
  - iv. Any part of a wall that slopes at an angle of 70° or less to the horizontal

The surface finishes should satisfy the following classifications shown in the table below when tested under the European Classifications (in accordance with BS EN 13501-1:2002).

Figure 20: Wall and Ceiling Lining Requirements

Location	European Class
Small Rooms not exceeding 4m^2	C-s3, d2
Other circulation spaces, including common areas	B-s3, d2
Other Rooms	B-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.*

7.2 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:

v. Rigid solid PVC sheet.

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

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

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):

ii. 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 11: 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	%	m
TP(a)	Any except protected stairway	No limit [Note 2]	No limit	No limit
D-s3, d2 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: *D-s3, d2 rooflights in industrial and other non-residential purpose groups may be spaced 1800mm apart, on the basis the rooflights are evenly distributed and do not exceed 20% of the area of the room.*

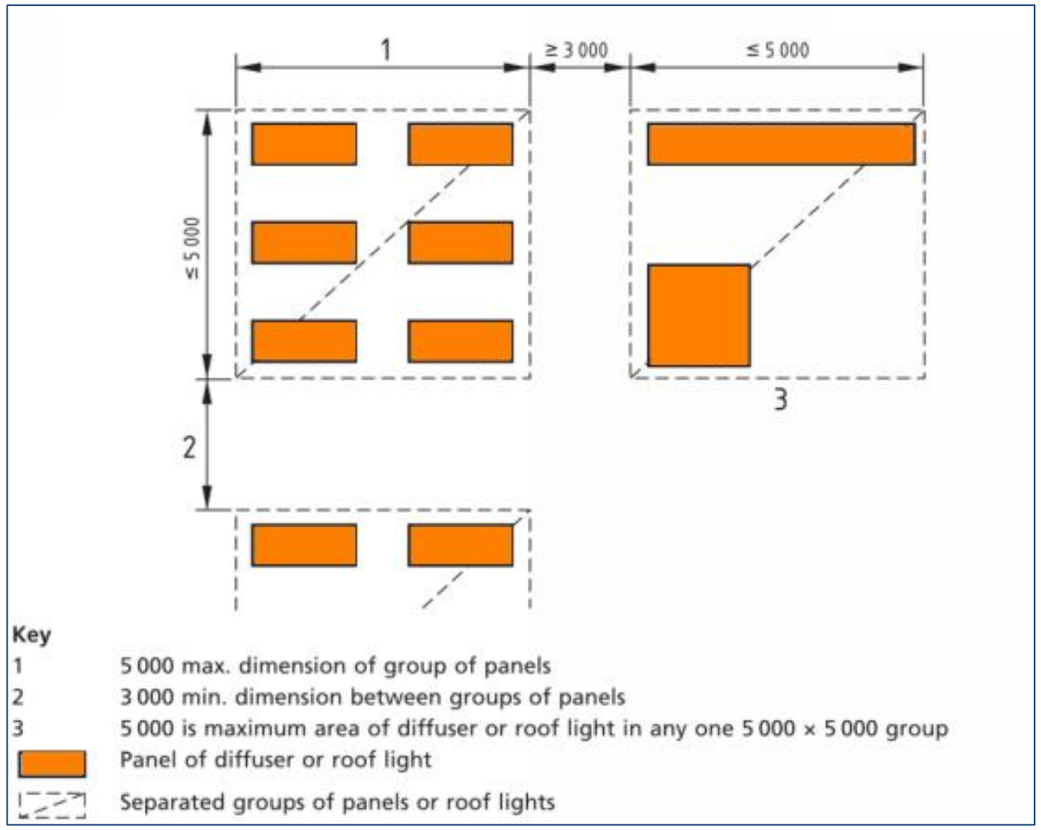


Figure 21: Limitations on Grouping of Rooflights and Diffusers

7.3 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 TP(b) may be used in ceilings to rooms and circulation spaces (but not protected stairways) only if they meet the recommendations provided above.

8 Internal Fire Spread

8.1 Elements of Structure

The top habitable storey height is over 18m and less than 30m. Therefore, in accordance with Approved Document B, the elements of structure for the building require 90 minutes fire resistance.

The following are excluded from the definition of elements of structure.

- Lowest floor of the building
- External walls, such as curtain walls or other forms of cladding, which transmit only self-weight and wind loads and do not transmit floor load.
- Roof, unless
    - Forms a function of an escape route or floor.
    - The structure is essential for the stability of an external wall that needs to be fire resisting due to space separation.

Table 12: Minimum Fire Resistance Requirements

Part of the Building	Minimum Provisions When Tested to The Relevant Parts of BS476 / European Standard (Minutes)			Method of Exposure
	Load-Bearing Capacity [R]	Integrity [E]	Insulation [I]	
Structural Frame, Beam or Column	90	N/A	N/A	Exposed Faces
Load-Bearing Wall	90	N/A	N/A	Each Side Separately
Compartment Walls	90	90	90	Each Side Separately
Floors	90	90	90	From Underside
Compartment Floors	90	90	90	From Underside
Roofs Means of escape from the roof/balcony	90	90	90	From Underside
External Fire Spread Any part less than 1000mm from a point in the relevant boundary Any part more than 1000mm from the relevant boundary Note 1	90 90	90 90	90 15	Each Side Separately From Inside the Building
Firefighting Shafts - Construction separating firefighting shaft from rest of building Construction separating the firefighting lobby and lifts from the firefighting stair	120 60	120 60	120 60	From Side Remote from Shaft Each Side Separately
Protected Shafts (to include risers)	90	90	90	Each Side Separately
Rooms of Special Fire Hazard	30	30	30	Each Side Separately
Protected Escape Routes	30	30	30	Each Side Separately
Cross Corridor Doors Protection	30	30	30	Each Side Separately
Cavity Barriers	N/A	30	15	Each Side Separately
Firestopping	EI equal to the element in which it is fitted.			As per wall or floor exposure

Note 1: *This does not apply to permitted unprotected areas as indicated within Section 12 of this Fire Safety Strategy report.*

8.2 Places of Special Fire Hazard

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

- Boiler rooms.
- Storage space for fuel or other highly flammable substances.
- Kitchen.
- Oil-filled transformer and switch-gear rooms; and
- Rooms housing a fixed internal combustion engine.

These rooms require a minimum of 30 minutes fire resistance (REI30). It is also recommended the cleaners cupboards, stores and server are enclosed within a minimum of REI30.

It is recommended that any life safety equipment is enclosed with 120 minute fire resistant construction.

8.3 Compartmentation

The ‘As-Built’ fire strategy identified the requirement for a compartment floor between the basement and ground floor and compartment walls between the commercial units at ground floor.

Due to the requirements for space separation there is a requirement for the fifth and sixth floors to be compartment floors so that external fire spread can be assessed independently. Compartment walls and floors are required to be provided with 90 minutes fire resistance. Compartment walls and floors are required to be provided with 90 minutes fire resistance.

8.3.1 Junctions with Compartment Walls and Roof

In accordance with Approved Document B Paragraph 8.22 – 8.29, a compartment wall should be taken up to meet the underside of the roof covering or deck, with appropriate fire stopping where necessary at the wall / roof junction to maintain continuity.

To reduce the risk of a fire affecting both compartments a zone of roof 1.5m wide on either side of the wall should have a covering of B_{ROOF}(t4) (European class) on a substrate or deck of A2-s3, d2 or better. If roof supports pass through the wall, fire protection to these may be required for a distance of 1500mm to delay distortion at the junction.

8.4 Limitations of Non-Insulated Fire Glazing

Where fire rated glazing is required as part of a wall or door assemblies on escape routes, they should meet the criteria for both Integrity and insulation [EI] with the exceptions noted below.

Table 1: Table 1: Limitations on Uninsulated Glazing

Limits of Uninsulated Glazing on Escape Routes		
Location of Glazing	**Maximum Total Area of Uninsulated Glazed Elements**	
	Multiple Stairways / Escape Routes	
	Walls	**Door Leaf**
Between a protected stairway and accommodation / unprotected corridor	Unlimited above 1100mm from floor level	50% of door area
Between a protected stairway and protected corridor / lobby	Unlimited above 100mm from floor level	Unlimited above 100mm from floor level
Between accommodation and protected corridor / lobby	Unlimited above 100mm from floor level	Unlimited above 100mm from floor level
Between accommodation and protected corridor forming a dead end	Unlimited above 1100mm from floor level	Unlimited above 100mm from floor level
Between accommodation and any other corridor; or subdividing corridors	Unlimited above 100mm from floor level	Unlimited above 100mm from floor level
Adjacent to an external escape route	Unlimited above 1100mm from floor level	Unlimited above 1100mm from floor level
Adjacent to an external escape staircase or roof escape	Unlimited	Unlimited
Adjacent to a refuge on an external escape staircase or roof escape Note 1	Unlimited above 2000mm from floor level	Unlimited above 2000mm from floor level

Note 1: Based on BS9999 as Approved Document B 2022 remains silent on this area.

8.5 Fire Doors

Fire doors should be provided in all fire rated enclosures in accordance with BS476-22: 1987 and specified with cold smoke seals (only where smoke seals are required [S or Sa]) in accordance with the recommendations of BS476,. The fire resistance requirements for the doors are shown in the table below:

Table 2: Fire Door Requirements

Position of Door	Tested to BS 476-22	Tested to BS EN 1634-1
Riser Cupboard not opening into a protected space	FD 30	E 30
Riser Cupboard forming a protected shaft	FD 60S	E 60 Sa
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)
Protected Shaft	FD 60S	E 60 Sa
Into Firefighting shaft	FD60S	E 60 Sa
Into Firefighting stair	FD 30S	E 30 Sa
Lifts	FD60	E 60
Door within a Cavity Barrier	FD30	E 30
Compartment Line	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)

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 Approved Document B*

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 BS746-31.1 with the threshold taped and subjected to a pressure of 25 Pa: or
- Meet the classification requirement of Sa when tested in accordance with BSEN 1634-3.

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

Threshold gaps for timber doors should be in accordance with BS8214.

Note: *Threshold gaps for all other door types are to be based on the principles set out in BS8214.*

8.5.1 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 route), 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.

8.5.2 Fire Door Signage

All fire doors other than lift entrance doors should be marked with the appropriate fire safety sign confirming to BSISO 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 Fire Rated Elements and Fire-Stopping

9.1 Fire Stopping

Fire stopping is used for sealing gaps, imperfections or design tolerances between fire resisting walls, floors, and ceilings to restrict the passage of both fire and smoke. Fire stopping should achieve the same fire resistance (integrity and insulation (EI)) as the element into which they penetrate.

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.

9.2 Junctions to Fire Rated Elements

All joints between fire rated elements and all openings for penetrations to pass through any part of a fire separating element should be fire-stopped and.

- Kept as few in number as possible.
- Kept as small as practicable; and
- Fire stopped (which in the case of a flue or duct, should allow thermal movement) so that the level of fire resistance of the joint is not less than that of the fire separating element.

9.3 Fire Barriers

If the internal lining of the external wall does not achieve the same level of fire resistance as the required compartmentation; cavity barriers in the external cavity adjacent to compartment walls and floors should be included as fire barriers providing the same level of fire resistance (EI) to maintain the level of compartmentation.

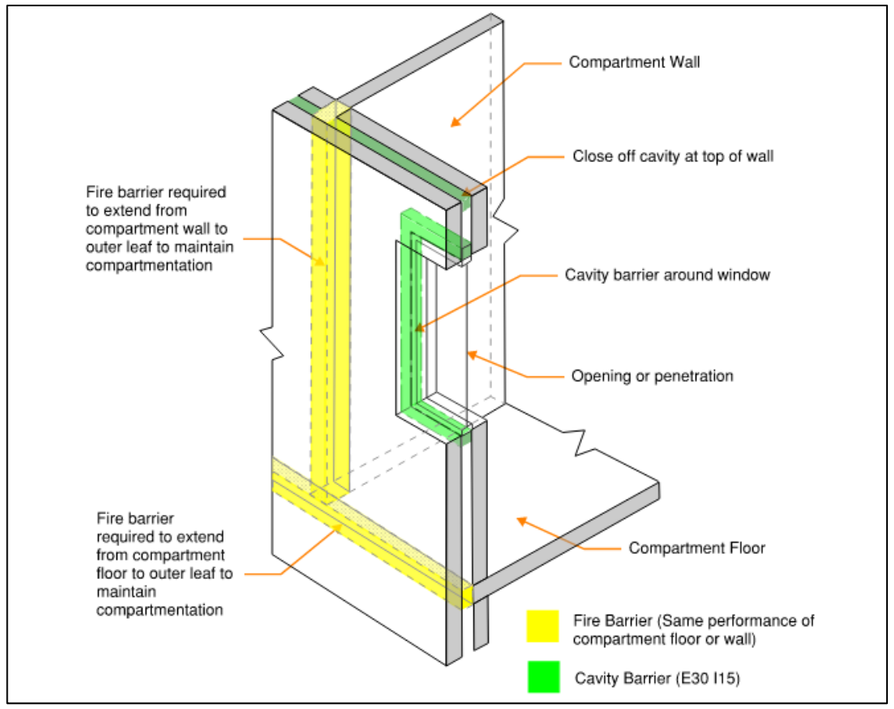


Figure 22: Fire Barrier Example

9.4 Penetrations to Fire Rated Construction

9.4.1 Pipe Penetrations

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.

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 be no less than 1000mm either side of the structure.

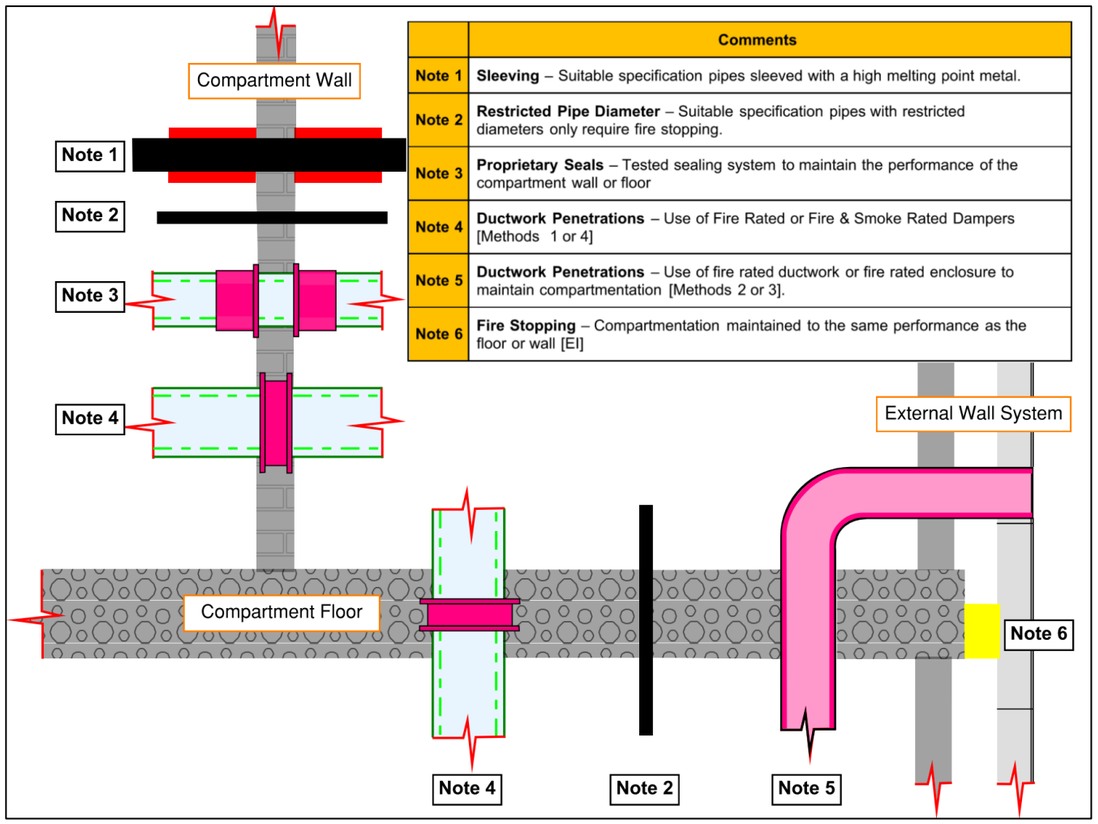
Restricted pipe diameter - Where a proprietary sealing system is not used, fire stopping may be used around the pipe, keeping the opening as small as possible. The nominal internal diameter of the pipe should not be more than the relevant dimension given in the table below.

Table 3: Maximum Nominal Diameter of Pipes Passing Through Compartments

Situation	Pipe Material and Maximum Nominal Internal Diameter (mm)		
	Non-Combustible Material Note 1	Lead, Aluminium, Aluminium Alloy, uPVC Note 2, Fibre Cement	Any Other Material
Structure enclosing a protected shaft which is not a stairway or lift shaft	160mm	110mm	40mm
Any other situation	160mm	40mm	40mm

Note 1: *Any non-combustible material which, if exposed to a temperature of 800^{O}C, will not soften or fracture to the extent that flame or hot gas will pass through the wall of the pipe.*

Note 2: *uPVC pipes that comply with either BS4514: 2001 or BS5255: 1989*



	Comments
Note 1	**Sleeving** – Suitable specification pipes sleeved with a high melting point metal.
Note 2	**Restricted Pipe Diameter** – Suitable specification pipes with restricted diameters only require fire stopping.
Note 3	**Proprietary Seals** – Tested sealing system to maintain the performance of the compartment wall or floor
Note 4	**Ductwork Penetrations** – Use of Fire Rated or Fire & Smoke Rated Dampers [Methods 1 or 4]
Note 5	**Ductwork Penetrations** – Use of fire rated ductwork or fire rated enclosure to maintain compartmentation [Methods 2 or 3].
Note 6	**Fire Stopping** – Compartmentation maintained to the same performance as the floor or wall [EI]

Figure 23: Proprietary Fire Stopping

9.4.2 Ductwork Penetrations

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 four 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 suitable 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 Approved Document B V2 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. For more information on how to protect the ductwork and air transfer grilles see Approved Document B V2 for additional commentary. The requirements for each option are indicated below.

The requirements for each option are indicated below.

9.4.2.1 Method 1 - Protection Using Thermally Actuated Fire Dampers

- This method should not be used where ductwork passes through or serves protected escape routes.
- This method is not suitable for kitchen extract systems.
- Fire dampers should conform to BSEN 15650: 2010 and have an E Classification equal to or greater than 60 minutes.

9.4.2.2 Method 2 - Protection Using Fire Resisting Enclosures

The fire-resisting enclosures should achieve the same fire resistance as the wall/ floor the ductwork penetrates which forms a compartment known as a protected shaft.

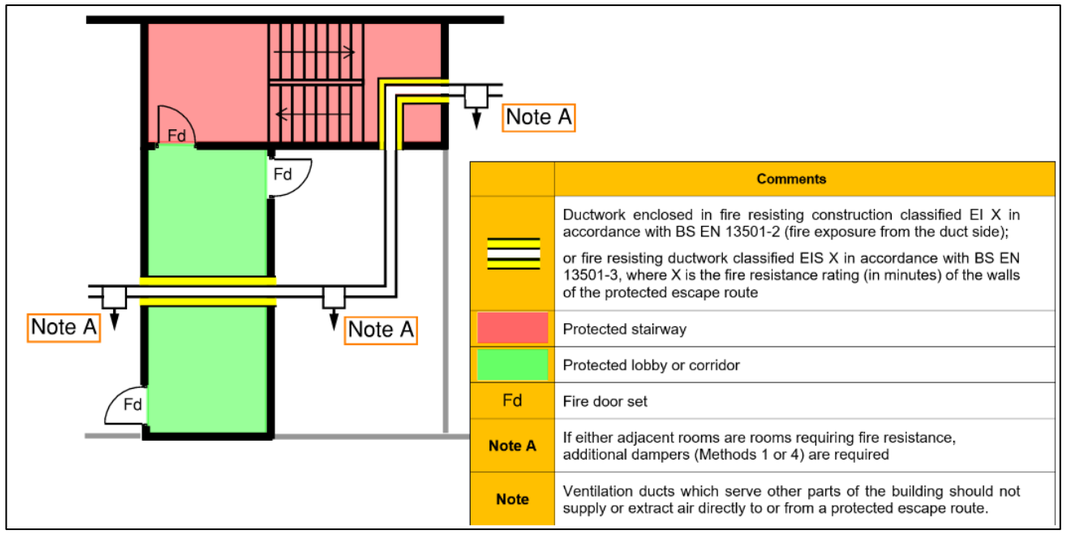
- This method can be used in protected escape routes providing the ductwork does not serve the escape route it passes through.
- If any of the rooms that are being served by the ductwork are rooms requiring fire resistance, additional dampers are required. See Method 1 or 4 for the appropriate damper.
- The fire resisting enclosure should be classified EIX in accordance with BSEN 13501-2: 2016 (fire exposure from the duct side) (where X is the fire resisting rating (in minutes) of the walls of the protected route).

9.4.2.3 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/ floor the ductwork penetrates. The fire resistance can be achieved by the ductwork material itself, or through the application of protective material.

- This method can be used in protected escape routes providing the ductwork does not serve the escape route it passes through.
- If any of the rooms that are being served by the ductwork are rooms requiring fire resistance, additional dampers are required. See Method 1 or 4 for the appropriate damper.
- The fire resisting ductwork should be classified EISX in accordance with BSEN 13501 (where X is the fire resisting rating (in minutes) of the walls of the protected route).

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



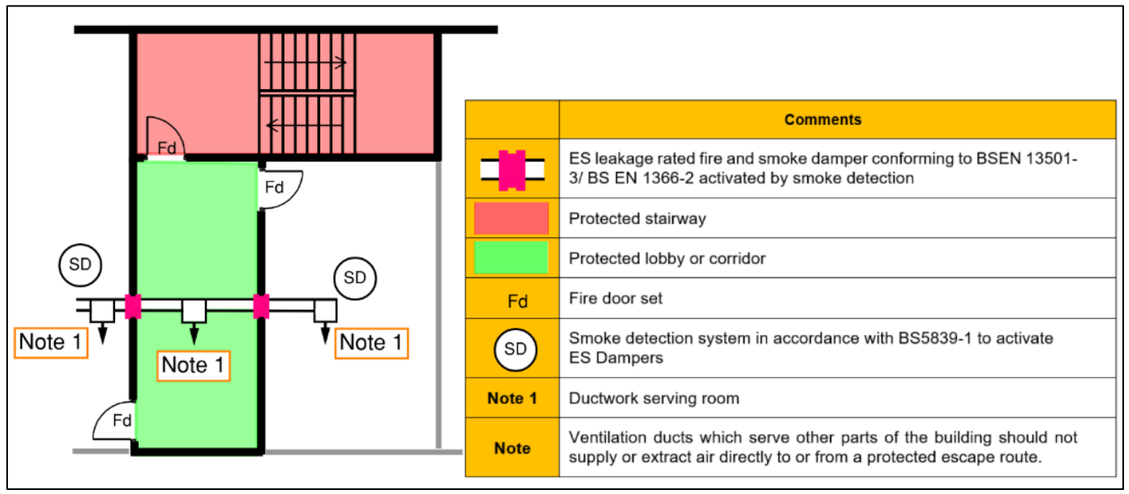
	Comments
	Ductwork enclosed in fire resisting construction classified EI X in accordance with BS EN 13501-2 (fire exposure from the duct side); or fire resisting ductwork classified EIS X in accordance with BS EN 13501-3, where X is the fire resistance rating (in minutes) of the walls of the protected escape route
	Protected stairway
	Protected lobby or corridor
Fd	Fire door set
Note A	If either adjacent rooms are rooms requiring fire resistance, additional dampers (Methods 1 or 4) are required
Note	Ventilation ducts which serve other parts of the building should not supply or extract air directly to or from a protected escape route.

Figure 24: Method 2 or 3 Example

9.4.2.4 Method 4 - Automatically Actuated Fire and Smoke Dampers actuated by Automatic Fire Detection

- This method may be used for extract ductwork passing through protected escape routes where the ductwork does and does not serve the protected escape route.
- This method is not suitable for kitchen extract systems.
- Fire and smoke dampers should conform to BSEN 15650: 2010, they should have an ES classification equal to or greater than 60 minutes.

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



	Comments
	ES leakage rated fire and smoke damper conforming to BSEN 13501-3/ BS EN 1366-2 activated by smoke detection
	Protected stairway
	Protected lobby or corridor
Fd	Fire door set
SD	Smoke detection system in accordance with BS5839-1 to activate ES Dampers
Note 1	Ductwork serving room
Note	Ventilation ducts which serve other parts of the building should not supply or extract air directly to or from a protected escape route.

Figure 25: Method 4

9.4.3 Air Transfer Grilles

In general, the installation of air transfer grilles should be avoided in any construction required to be fire-resisting.

Air transfer grilles generally should not be installed in:

- Elements of construction enclosing compartments or protected shafts.
- Enclosures to protected stairways, protected lobbies, protected corridors, firefighting stairways, or firefighting lobbies.

Air transfer grilles fitted in any construction or door that needs to be fire-resisting should be of the intumescent type or fitted with fire dampers.

Where these grilles are within the enclosure of protected escape routes, they should incorporate fire and smoke shutters operated by adjacent automatic smoke detectors. Fire and smoke dampers should be in accordance with Method 4. Any transfer grilles fitted in fire doors will need to be accompanied by a test certificate provided by the door manufacturer.

10 Concealed Spaces

Where work is undertaken to the existing building under material alterations, then it should be ensured that any changes do not negatively impact on the existing arrangements. However, it is also recommended that where any work is undertaken to the existing building that the following guidance is applied to that work where practicable.

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. For more information on concealed spaces see Approved Document B.

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 such as windows, doors, and service penetrations 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.
- At the junction between every compartment floor and compartment wall.
- Within cavities that exceed the distances set out within the table below.

Note 1: *Steel Framing Systems (SFS) is used, if the steel supports the structure or considered the structure, fire barriers (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.*

The provision above does not apply to the following figure, where two leaves of brick or concrete each at least 75mm thick is provided.

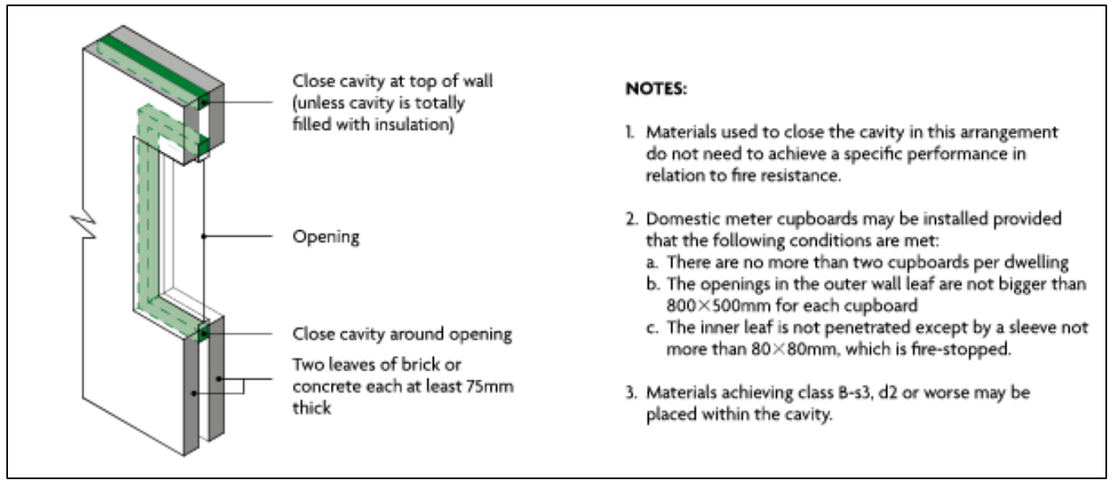


Figure 26: Cavity Walls Excluded from Provisions of Cavity Barriers

Note: *It is recommended that cavity barriers are fitted still to around windows, penetration and to close off the top of cavities in this scenario.*

Cavities that may exist above or below any fire resisting construction because the construction is not carried to full storey height or, (in case of the top storey) to the underside of the roof covering should be either:

Fitted with cavity barriers on the line of the partitions (as indicated within the figure below); or

For cavities above the partitions, enclosed on the lower side by a fire resisting ceiling which extends throughout the building, compartment, or separated part.

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.*

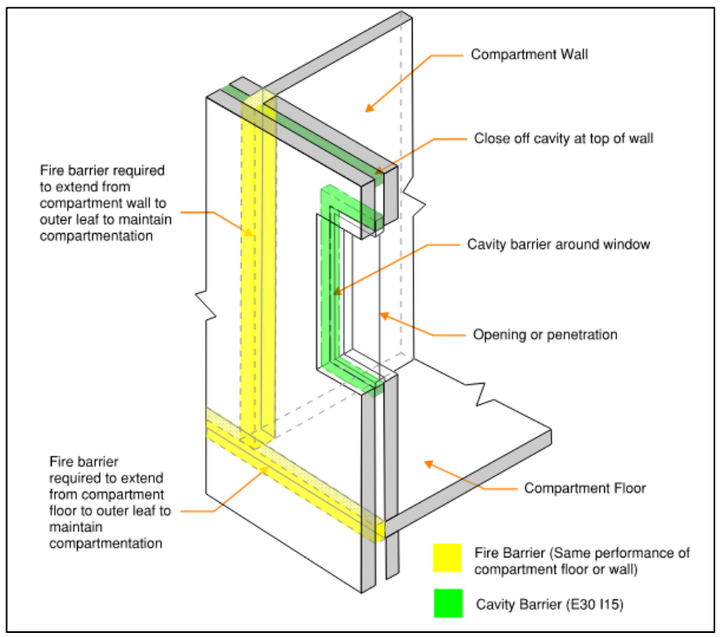


Figure 27: Provisions of Cavity Barriers and Fire Barriers

Cavity barriers will also be used to subdivide any cavity within the external wall or inside the building. The maximum dimensions of concealed spaces are indicated within the table below.

Table 4: 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

Every cavity barrier should be constructed to at least 30 minutes fire resistance as indicated in Section 8.1 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 Approved Document B.

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
- 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. It is possible for door and window frames to be formed as cavity barriers is the frames are constructed of steel of the minimum thickness as appropriate.

11 External Fire Spread - External Wall & Roof Construction

Approved Document B provides specific guidance based on building heights/type of occupancy and proximity to other buildings and outlines the process for assessing the whole wall make-up

External walls should be constructed so that they do not support the spread of fire at a rate that will likely threaten occupants in or around the building. The external wall build-ups should either meet the performance requirements given in BR 135 (for cladding systems using full-scale test data from BS8414-1:2002 BS8414-2:2015) or meet the following recommendations.

11.1 Combustibility of External Walls

As the building height is above 18m, Approved Document B applies restrictions on the use of products within the external walls and surface spread of flame classification. Areas of external wall below the fifth floor are not changing and fall outside the scope.

Regulation 7 of the Building Regulations provides requirements relating to 'Materials and Workmanship' which outlines the general principles of materials being used being appropriate for the circumstances in which they are used and installed.

11.1.1 Materials and Products

In relation to the compliance of the built-up system for combustibility we must assess Approved Document B guidance 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.

When assessing the current wall proposals based on the guidance noted in Approved Document B and Regulation 7, we would recommend that the insulation and filler materials in the external walls above ground floor level should be a minimum Class A2–s3, d2 or better. Further information on filler materials is available in Approved Document B V2.

11.2 External Surfaces – Surface Spread of Flame

The surface spread of flame across the external surface of the external 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 external walls should be constructed such that they will not support fire spread at a speed that is likely to threaten people in or around the building.

Flame spread over or within an external wall construction should be controlled to avoid creating a route for rapid fire spread bypassing compartment floors or walls.

The external wall surfaces near other buildings should not be readily ignitable, to avoid fire spreading between buildings. External walls should either meet the criteria given in BR 135 for cladding systems using full-scale test data from BS8414-1 or 2 or meet the following recommendations:

- Meet the provisions specified within Table 12.1 from Approved Document B.
    - As the Building is more than 18m in height and is less than 1m from the site boundary the fire performance should be B–s3, d2 or better.
- Cavity barriers should be provided in accordance with Section 9 from Approved Document B.

See Section 12 from Approved Document B for more details.

11.3 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 Table 14.1 from Approved Document B and a relevant boundary of less than 6m.

Table 5: 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)

Note 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.*

Note 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 site boundary is at less than 6m and on this basis the roof should achieve:

- **B_{ROOF}(t4).**

11.4 Photovoltaic Panel Arrays

Not specifically mentioned in the Building Regulations, if PV arrays are included on the roof areas (although not generally a controlled item), consideration should be given to:

- Locations of inverters and their installation in proximity to combustibles.
- Localised shut off for the panels as the DC sections will still be live in sunlight and this can cause issues for firefighting.
- Do not allow mounting systems for PV panels to straddle heat expansion joints.
- Careful planning is required and assessment of substrates when mounting arrays over fire separating construction or fire compartment walls.
- The layout of the panels on the roof should be such that areas of panels are separated by panel-free areas so that effective firefighting is possible. This will allow firefighters to open the roof to allow both internal and external attack on a fire.
- PV panels on the roof can prevent the dissipation of heat and smoke; additionally, the spread of the fire may be accelerated by a chimney effect beneath the panels. Careful consideration should be given to breaks within extensive arrays to allow dissipation of heat and smoke.

12 External Fire Spread - Space 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 BR187 (second edition) to assess the space separation requirements.

12.1 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 to 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.

The 'As-Built' fire strategy report covers space separation for the existing floors. This report will cover the proposed fifth and sixth floors.

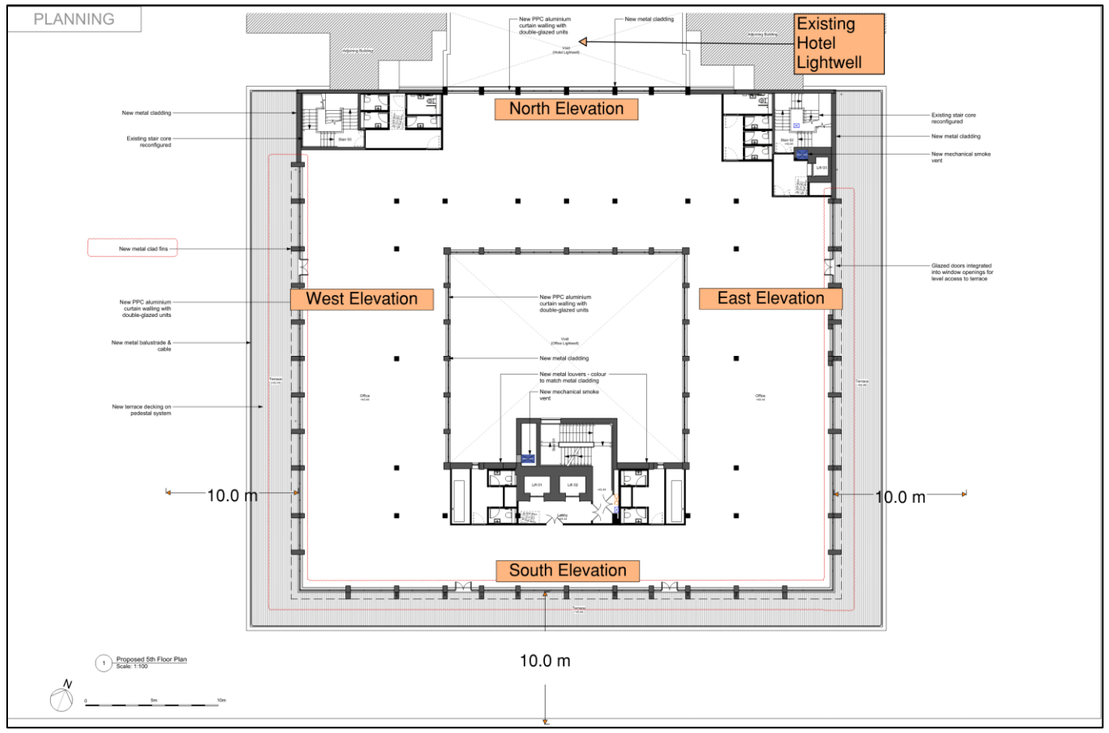


Figure 28: Relevant Boundaries

12.2 Space Separation

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 [90 minutes].
- 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 9.1)
- Small, unprotected areas in a fire rated façade in accordance with Approved Document B.

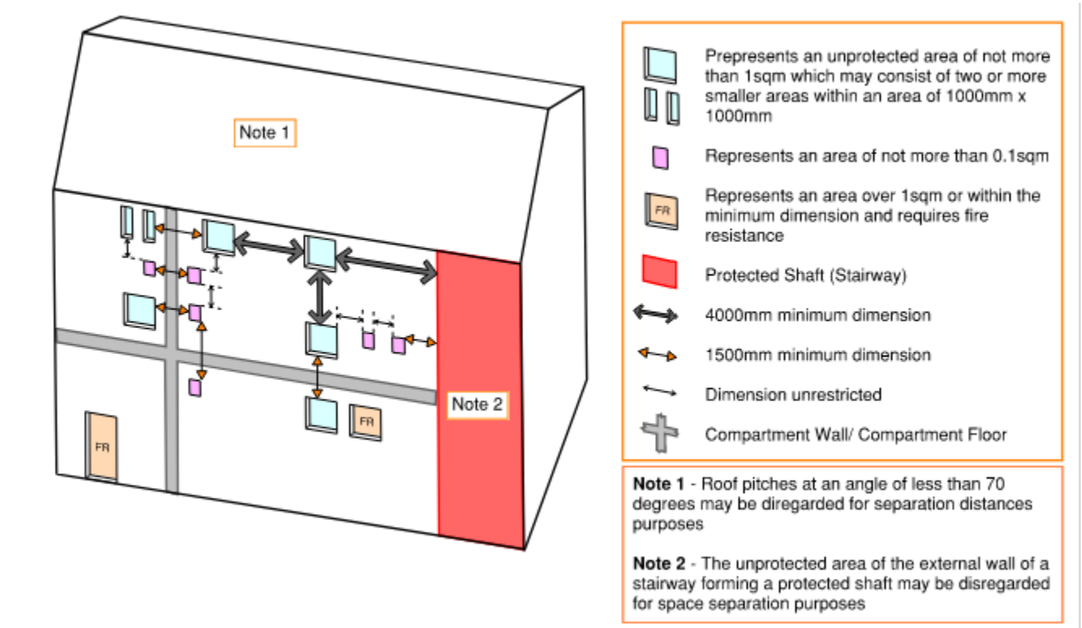


Figure 29: Small Unprotected Area

Space separation calculations have been based on the following assumptions.

- Calculations are based on a radiation intensity of 84 kW/m^2.
- The East, South and West elevations are considered unprotected. Therefore, the whole compartment will be calculated.
- The North elevation enclosing rectangle only takes into account the glazing; it has been assumed that the rest of the elevation will be fire resisting from both sides.
- There are compartment floors provided at the fifth and sixth floors so the height of the compartment will be assessed.
- As the sixth floor is stepped back the worst case elevation/compartment will be on the fifth floor. The fifth floor has therefore been assessed.

12.2.1 Space Separation Calculations

Below are the fifth floor compartments that have been calculated using BR187 to determine the allowable unprotected areas. The South, East and West boundaries in excess of 10m to the centre of the adjacent roads.

Table 6: BR187 Calculations

Elevation/ Compartment Assessed	BR 187 Enclosing Rectangle	Boundary Required for 100% Unprotected	Actual Boundary Distance	Allowable Unprotected Area	Comments
North	6 x 18	6.5m	8m Note 1	100%	No restrictions to unprotected area in regard to boundaries noted
South	6 x 50	9m	>9m	100%	No restrictions in regard to boundaries noted
East	6 x 40	8.5m	>8.5m	100%	No restrictions in regard to boundaries noted
West	6 x 40	8.5m	>8.5m	100%	No restrictions in regard to boundaries noted

Note 1: *The North elevation is opposite the lightwell to the hotel which is owned and operated by the same company as 40 Bernard Street. The new extension is not set back on this elevation, however the 'As-Built' fire strategy notes that this is an existing condition and placed a notional boundary at 8m. By providing the compartment floors at fifth floor and sixth floor using the notional boundary provided by the 'As-Built' report the North elevation can be 100% unprotected.*

Figure 30: East Elevation – Example of Unprotected Area

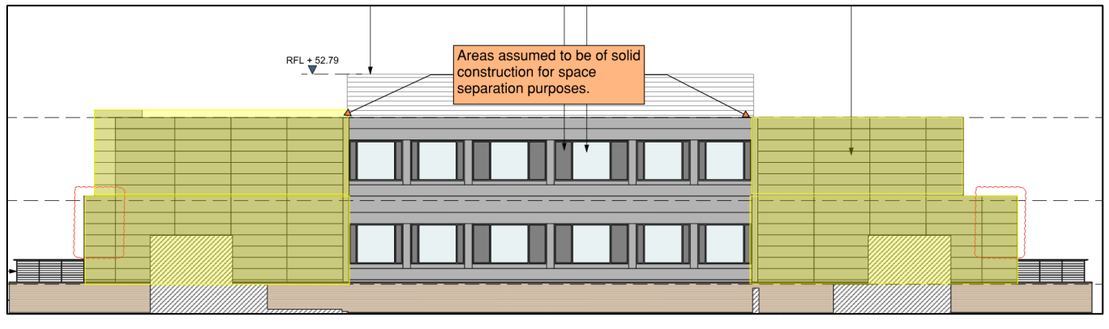


Figure 31: North Elevation – Unprotected and Solid Areas

13 Fire Safety Management

Fire safety management is an essential factor in achieving and maintaining suitable fire safety measures in premises. The fire safety design guidance assumes a suitable level of fire safety management.

Although the Building Regulations do not impose any requirements on the management of the building, BS9999 expects the building to be appropriately managed. Detailed guidance for management is provided within BS9999 *Fire safety in the design, management, and use of buildings – Code of Practice for fire safety management.*

The information below is an overview of the requirements for managing fire safety within the building, for more information see BS9999.

When designing using BS9999 there are two levels of management: adequate (Level 2) and enhanced (Level 1). The management level proposed for this building is Level 2.

It is assumed that as a minimum the end user has adequate management structure which means that the management will conform with the minimum requirements of the legislation. However, fire risk management documentation is likely to exist at two levels:

- Fire risk management at an organisational level.
- Fire risk management at a premises level.

The fire risk management strategy at an organisational level will define the organisation's fire risk management system, and method of implementing policy.

13.1 Fire Risk Management Strategy

The fire safety manager / nominated person to monitor and control management of fire safety should define the organisation's fire risk management system, and method of implementing the overarching policy within a fire risk management strategy. The subsequent bullet points below are not an exhaustive list but highlight some of the key issues that need to be addressed when documenting a fire risk management strategy.

- **Fire Risk Assessment** – Those responsible for the design and construction of the building should provide fire safety information to the responsible person at the completion of the project or when the building or extension is first occupied. A pre-occupation fire safety assessment should be made in identifying the fire safety strategy provisions have been implemented and if the premise is likely to be fit for occupation. Thereafter, regular fire risk assessments should be undertaken, any alterations / refurbishments to the building should trigger a review of a fire risk assessment in determining if the current fire precautions present are adequate in accommodating the change.
- **Resources and Authority** – Any resources necessary to implement, maintain and improve the fire risk management system should be determined. In determining the necessary resources, account should be taken of the organisational hierarchy, the role of the fire safety manager and communication and collaboration with other users of the building. In order to ensure robustness, those with fire safety responsibilities should be empowered and given adequate resources to carry out their duties in maintaining the system.
- **Fire Safety Training** – A sufficient number of staff should be trained in fire prevention, fire protection and evacuation procedures, and be able to use the appropriate extinguishing equipment (and media). This is in order to provide full coverage of the building, with provisions in place for contingencies such as staff absences.
- **Control of Work on Site** – The means by which the end user / occupier will control work on site should be determined, e.g., repairs to structure, and in particular hot work. A work control system should include clear lines of responsibility communicated to contractors; a permit system which takes in account the risks to relevant persons; logging and work control audit processes; and routing checking and supervision.
- **Maintenance and Testing** – Processes should be in place for the maintenance and testing of fire safety systems.
- **Communication** – It is important to determine the need for internal and external communication procedures, this is to ensure that all of those involved in an incident, are provided rapidly and effectively the relevant information. These procedures should include defined lines of communication of significant findings arising from fire risk assessments and should stress the importance of maintaining fire safety information.
- **Emergency Planning** – Procedures for identifying and responding to unplanned events, potential emergencies / disasters should be established, documented, and maintained. Where fire is concerned, liaison with the fire and rescue service should include emergency shutdown of equipment, effective arrangements for notifying the fire and rescue service of changes to the occupancy, periods of abnormal occupancy, fire growth characteristics, and another relevant factor. The arrangements should also consider post-incident plan and contingency plan.
- **Designing fire risk management into buildings** – The management system level proposed should be proportionate to the level of risk arising from the organisation's activities. Confirmation of its suitability should be sought from the owner / end user / nominated representative(s) to ensure that the designer specifies a management system that can be practically and physically managed post-handover.

13.2 First Aid Fire Fighting Provisions

Hand-held first aid firefighting provisions, which are not required under Building Regulations legislation, should be included to satisfy the requirements of the RR(FS)O in accordance with the end user's policies and fire risk assessment. Where provided, a fire point should be located towards each storey exit and suitable facilities associated with identified risks.

For guidance on provision of firefighting equipment reference should be made to BS5306-8:2012.