Camden Mixed Developments Limited

Grand Union House

Planning Fire Safety Strategy

October 2021
70009120

CONFIDENTIAL

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PROJECT NO.70009120

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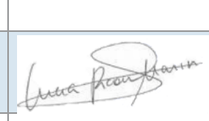
Signature				 Picon Marin, Lucia (UKLPM001) 2021.10.20 17:14:50 +01'00'
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1 INTRODUCTION

1.1 PROJECT DESCRIPTION

Grand Union House is an existing three storey office building in Camden, London which will undergo a significant refurbishment. Certain structural elements will be retained along with the existing north and central staircases which currently serve the building. The south core will be a new core.

The proposed development will consist of a five-storey office plus mezzanine building and a three-storey residential block to the south, as shown in Figure 1below.

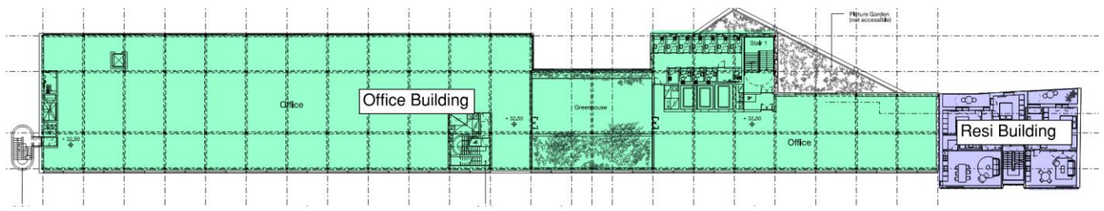

Figure 1: Building footprint

The ground floor will become office space and will also contain the main reception. A mezzanine level will be provided above ground floor, comprising plant rooms and office accommodation. Retail units will be provided to the south of the office building. An additional retail unit will be provided below the residential building. See ground floor plan in Figure 2 below.

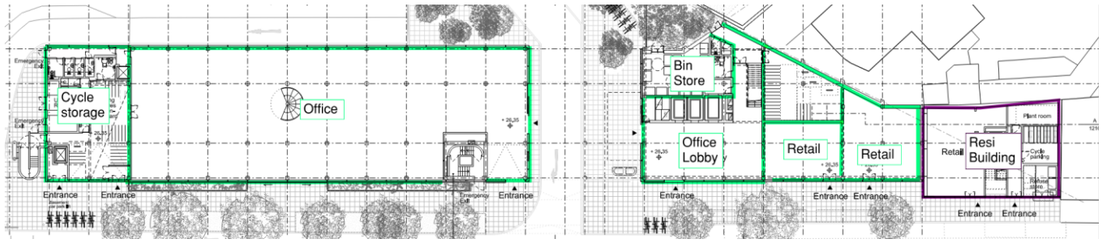

Figure 2: Ground floor layout

The mezzanine level is shown Figure 3 below.

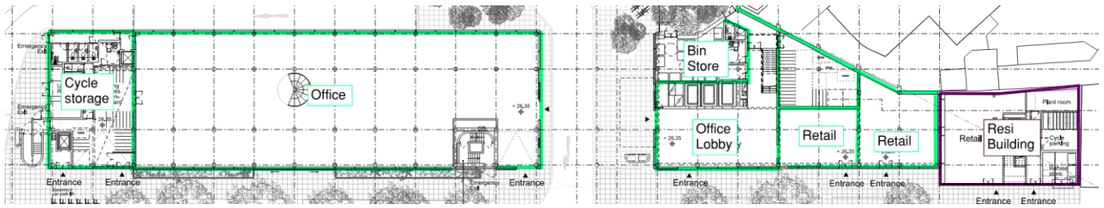

Figure 3: Mezzanine layout

There is an existing basement that is not part of the proposed development and therefore it is not covered in this report. The basement will be fire separated from the proposed development and is provided with independent means of escape.

1.2 PURPOSE OF THE REPORT

RPS Group Plc are making an outline planning application for the proposals described in section 1.1. This Fire Safety Statement report has been prepared by WSP UK Ltd Fire Engineering division in support of a planning application submitted to the London Borough of Camden by Camden Mixed Developments Ltd. The CV's of author and reviewer are included in Appendix A.

The objective of the Fire Safety Statement is to inform the fire safety considerations required for the building to ensure compliance with the Building Regulations. This report outlines the fire safety design requirements that need to be adopted in the proposed Grand Union House development to meet the functional requirements of Part B (Fire Safety) of the England and Wales Building Regulations 2010. The relevant requirements will follow the structure B1 – B5 listed below:

- B1 – Means of warning and escape
- B2 – Internal fire spread (linings)
- B3 – Internal fire spread (structure)
- B4 – External fire spread
- B5 – Access and facilities for the fire service

1.3 SUPPORTING INFORMATION

The report should be read in conjunction with the Architectural GAs prepared by 6a Architects (dated January 2020) listed below:

- Ground Floor Plan_ (ref: 531 A 1101 2 D3)
- Ground Mezzanine & First Floor Plan_ (ref: 531 A 1102 2 D3)
- Second & Third Floor Plan_ (ref: 531 A 1103 2 D2)
- Fourth & Roof Floor Plan_ (ref: 531 A 1104 2 D2)
- Section AA _ (ref: 531 A 1210 2 D1)
- Section BB _ (ref: 531 A 1220 2 D1)
- Section CC _ (ref: 531 A 1230 2 D1)
- Section DD _ (ref: 531 A 1240 2 D1)

REFERENCE DOCUMENTS

The principle guidance documents of the Building Regulations 2010 adopted for the residential scheme is the BS 9991:2015 and the guidance used for the office scheme is the BS 9999:2017 and other associated British Standards. This report gives the relevant details of how the provisions within these standards are applied to this particular design to achieve an acceptable level of fire safety.

Other refence documents cited throughout the report are listed in section 8.

2 B1: MEANS OF WARNING AND ESCAPE

2.1 OFFICE BUILDING MEANS OF ESCAPE

2.1.1 Risk profile

The fire safety design will follow the recommendations of the BS 9999:2017 for the relevant risk profiles. This is based on the occupancy characteristics and the fire growth rate. Where applicable, the fire engineered solutions will be based on BS 7974 guidance as recommended in BS 9999:2017.
Sprinklers are not proposed to the scheme and therefore the risk profiles considered are as follows:

- A2 – Office
- A3/A2 – Plant rooms
- B3 – Retail unit

2.1.2 Fire detection and alarm

Office areas

Automatic Fire Detection and Alarm system (AFDA) to a Category L1 standard is recommended to the office accommodation due to the lack of sprinklers.

The fire detection system will consist of a combination of smoke and heat detectors with manual call points placed at all storey and final exits.

Type A (direct operation) manual call points will be located adjacent to each exit from the ground floor and adjacent to the escape stairs on all other levels, i.e. on the accommodation side of the staircase enclosures. Where necessary, additional call points will be provided to ensure that occupants need not travel more than 45m to reach the nearest manual call point. Manual call points will be provided as per BS 5839-1.

Retail units

Automatic Fire Detection and Alarm system (AFDA) to a Category L1 standard is recommended to the retail units due to the lack of sprinklers.

Each independent retail unit will be provided with its own fire control panel. The systems should be designed to meet the recommendations detailed in BS 5839-1:2017. The floor area of the retail areas is small and therefore voice alarm is not recommended.

2.1.3 Evacuation strategy

Simultaneous evacuation is a common approach adopted in premises where it would be unreasonable to expect the occupants to remain in an affected area for a prolonged time when there is a fire. There are two categories of simultaneous evacuation:

- In a single-staged evacuation, the activation of a call point or detector gives an instantaneous warning from all fire alarm sounders for an immediate evacuation.
- In a two-staged evacuation, there is an investigation period before the fire alarm sounders are activated.

It is recommended to implement a two-staged evacuation i.e. there is an investigation period before the fire alarm sounders are activated. The fire alarm should only be raised when a manual call point is activated, or the fire is confirmed by a member of staff, or the investigation period expires without the false alarm being confirmed, or on coincidence fire detection (i.e. the activation of two or more different fire detectors).

Regarding coincidence detection, it is recommended to provide at least two smoke detectors per room including small rooms. This will reduce the risk as an actual fire can be confirmed very quickly and it is not expected to have significant cost implications.

The retail units at ground floor will evacuate independently from each other and from the rest of the building.

2.1.4 Occupancy Load

The occupancy load has been initially assessed in accordance with the recommendations of BS 9999:2017, based on the recommended floor space factors for different types of occupancy.

Table 1: Proposed floor space factors

Area	Floor space factor (m^2/person)
Office	6
Retail unit	2
Storage	30
Plant	30

The anticipated maximum occupancy in the office floors has been assessed based on a floor space factor of 6m^2/person for office areas. Table 2 shows the occupancy for each floor.

Table 2: Anticipated occupancy office floors

Office	Floor Area	Anticipated Occupancy Load
Ground Floor	721 m^2	121 persons
Mezzanine	374 m^2	63 persons
Level 1	1,224 m^2	204 persons
Level 2	1,222 m^2	204 persons
Level 3	1,055 m^2	176 persons
Level 4	716 m^2	120 persons

The total occupancy for all upper floors is 767 persons.

2.1.5 HORIZONTAL ESCAPE

For any area or room where the anticipated occupancy is expected to exceed 60 persons, doors should swing in the direction of escape.

Depending on the occupancy load, each room / area should be provided with the following minimum number of exits:

- Up to 60 persons – minimum 1 exit.
- Up to 600 persons – minimum 2 exits.
- Above 600 persons – minimum 3 exits.

Each floor above ground will have access to three storey exits, as shown in Figure 4 below, with the exception of the fourth level (See Figure 5):

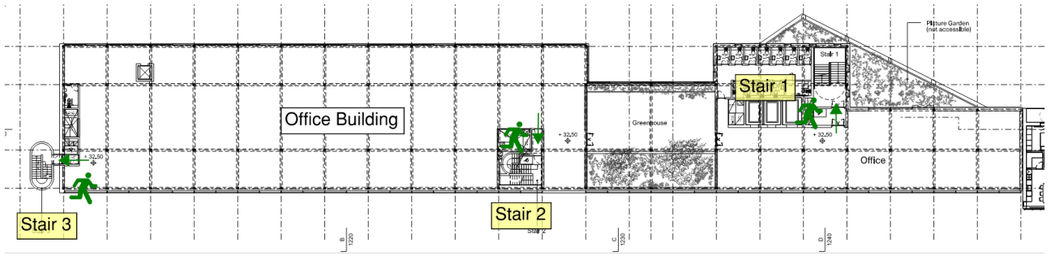

Figure 4: Typical upper floor exit provision

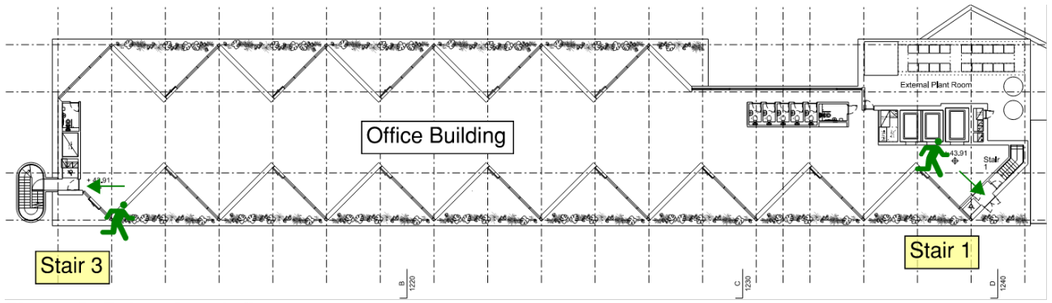

Figure 5: Exit at fourth floor

TRAVEL DISTANCES

Travel distances should meet the recommendations of BS 9999:2017. The guidance allows an increase in travel distances when additional fire protection measures have been provided; in this case, the use of enhanced detection system (Category L1) permits a 15% increase.

The resulting maximum travel distances are listed in the table below.

Table 3: Recommended travel distances

Area	Maximum Travel Distance where Escape is Possible in	
	ONE DIRECTION ONLY	TWO OR MORE DIRECTIONS
Office/ Plant (Risk Profile A2)	25.3m (17.2)	63.25m (42.5)
Retail (Risk Profile B3)	18.4m (12.65)	46m (31.05)

1. *BS 9999 recommends that, when the internal layout is unknown, the "direct distance", which is taken as two thirds of the actual travel distance indicated in brackets, should be used. Internal layouts should adhere to the travel distances outlined within Table 3.*

The maximum distance in a single direction measured directly is 21m from the furthest south corner at first and second floors as shown in Figure 6. Some floor areas (highlighted in red) exceed the recommended limit of 17.25m by circa.3.4m. WSP considers that the proposals are acceptable based on the following:

- Guidance for the fit-out design teams should be provided so that travel distances in a single direction do not exceed 25.3m. A fitout where the travel distances in a single direction are met is quite feasible.
- Open plan offices provide a clear visibility of the space and, in the event of a fire, occupants will be aware of a fire in the early stages. This would allow for reduced premovement times and a prompt evacuation.
- The unimpeded walking speed of the occupants has been assumed to be 1.2m/s, as noted in section G.3 of PD 7974-6. Based on this, the additional time that occupants need to reach the exit would be 2.83 seconds. Extended travel distances pose a higher risk as occupants are exposed to higher smoke toxicity during their evacuation and the longer to reach a place of relative safety the larger the fire grows. However, it is expected that occupants will be able to evacuate under tenable conditions.

  Note: A Fractional Effective Dosage (FED) calculations and RSET comparative analysis has been proposed to demonstrate this. However, it would be carried out at the next stage.
- The doors into the stair are double leaf and will reduce the queuing time.

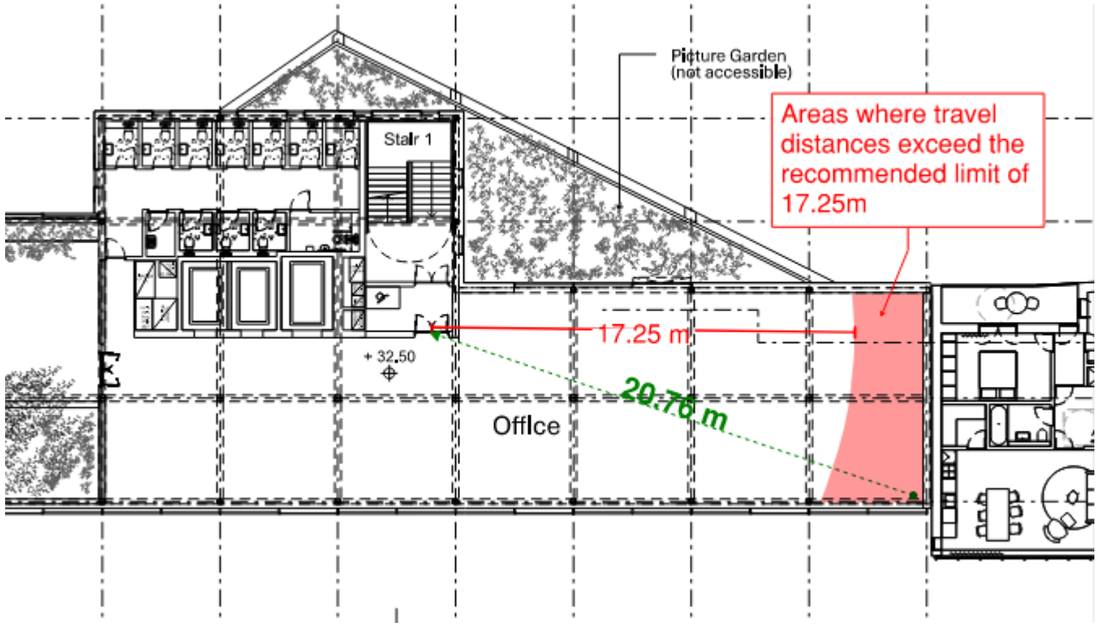

Figure 6: Maximum travel distance in single direction

In other areas, occupants will be available to escape in two directions and therefore travel distances meet the recommended limits of Table 3.

MEZZANINE ESCAPE ROUTES

A mezzanine linking to the ground floor office accommodation is being proposed. The current design proposal has only one means of escape via Stair 2 and via the spiral stair.

BS9999 notes that spiral stairs cannot be the only means of escape and, if used for means of escape, they should be designed in line BS 5395-2.

Travel distances in a single direction from the mezzanine are, generally, compliant. However, an alternative route should be provided, given that the travel distances in a single direction from the toilets exceed the recommended limit by 3m.

Providing access to Stair 3 is not feasible as it is an existing stair and the gap and change in level cannot be resolved. In order to overcome this, it is proposed to provide an evacuation lift to support the proposals as shown in Figure 7 below.

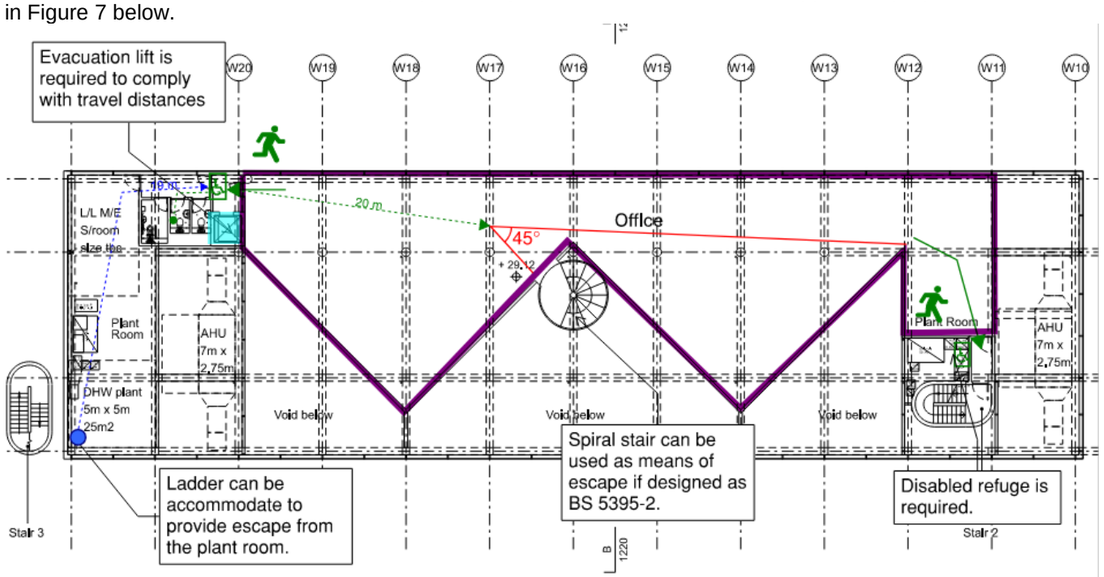

Figure 7: Mezzanine escape routes

It is proposed to use the lift as evacuation lift as a mitigation measure. Occupants in the toilet can quickly evacuate the mezzanine using the lift if their path is blocked. Access to mobility impaired people is provided at mezzanine level. However, the spiral stair cannot be used by mobility impaired people in the event of fire either at ground floor or mezzanine to wait for assistance, making Stair 2 the only escape route from the mezzanine and exceeding the maximum permitted travel distance in single direction. Therefore, the evacuation lift is also proposed to evacuate mobility impaired persons. Occupants will be able to wait for assistance in the protected (fire separated) lobby and evacuate down to a protected escape route that discharges directly to the outside as shown in Figure 8. The lift will need to be provided with all additional safety measures to perform as an evacuation lift and will need to be operated by a trained person from a secure location. More information regarding evacuation of mobility impaired persons can be found in section 2.1.7.

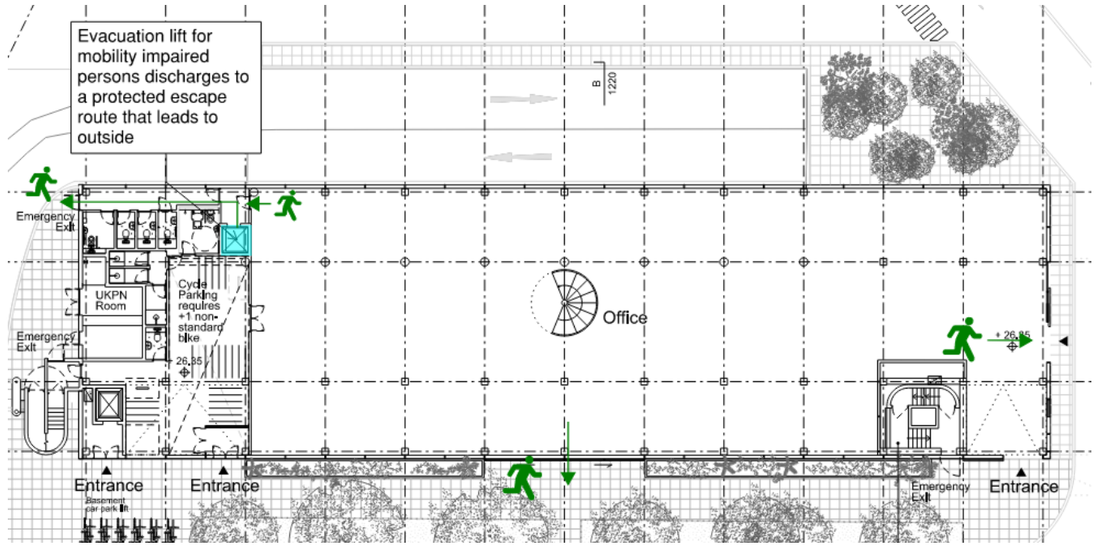

Figure 8: Ground floor escape routes

Travel distances in single direction from the plant rooms exceed the recommendation. It is proposed to provide a fixed ladder to allow escape as shown in Figure 9 below, instead of using the lift to evacuate. It should conform to BS EN ISO 14122-4.

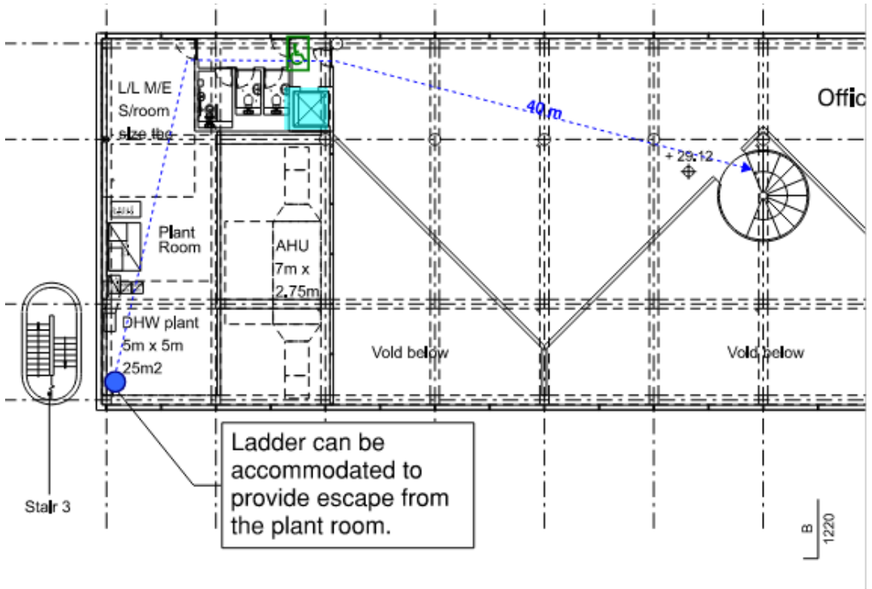

Figure 9: Escape from the plant rooms located at the north side

MINIMUM EXIT WIDTH

The horizontal means of escape are related to the escape from any point in a storey to the nearest storey exit. The minimum width of any door should be not less than 800mm regardless of the risk profile. It should be noted however that BS 9999:2017 recommends a clear door opening of not less than 850mm to enable wheelchair users to manoeuvre.

The minimum clear width of the final exits of any area should be in accordance with the door width factors recommended in BS 9999:2017. These figures incorporate the reduction factor in the minimum exit width per person which are permissible with an enhanced detection and alarm system (-15%).

Table 4: Minimum exit width

Area	Risk profile	Minimum exit width factor (mm/person)
Office	A2	3.06
Plant	A2/A3	3.06/3.91
Retail areas	B3	5.1

As a fire may prevent occupants from using one of the exits, the largest exit should be discounted when defining the minimum door width. For levels 1 to 3, the provision of a minimum clear width of 850mm for exits that lead to Stair 2 and Stair 3 gives an exit capacity for 326 persons which is over the anticipated occupancy at these floors i.e. 204 persons. Level 4 is provided with two exits and, after discounting the largest exit, a clear width of 850mm provides capacity for 163 persons; this is over the anticipated occupancy of 120 persons.

2.1.6 VERTICAL MEANS OF ESCAPE

The office floors are served by three stairs i.e. Stair 1, Stair 2 and Stair 3. As stated above, the north and central stairs are to be retained and the south stair is a new-built stair. The fourth floor is only served by Stair 1 and Stair 3. The stairs are lobby protected. Therefore, no stair is discounting when assessing stair capacity.

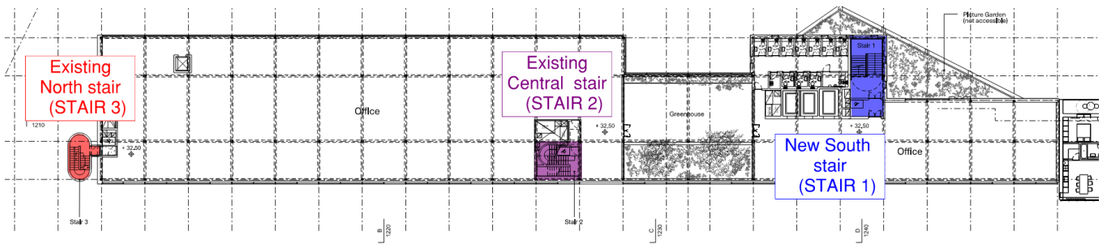

Figure 10: Stairs Serving the building

A stair schematic is shown in Figure 11 below.

Figure 11: Stair schematic

BS 9999:2017 specifies an absolute minimum stair width of 1000 mm for escape purposes. No firefighting stairs are required for the building.

NOTE: Wider stairs might be needed for compliance with Part M.

The width of each individual stair should not be less than the width of any exit affording access to it, and the width should not be reduced at any point, including final exits.

MINIMUM STAIR WIDTH

The minimum stair width per person as specified in BS 9999:2017 is given in the table below considering the number of floors that the stairs serve. As per the schematic, each stair serves four floors. No access is considered from Stair 1 at mezzanine level as it only connects to plant rooms. The minimum stair widths incorporate a 15%, reduction which is permissible as enhanced automatic detection alarm will be provided throughout the building.

The minimum stair width factor is based on the risk profile and the number of floors i.e. four floors. For the office levels (risk profile A2), each stair affords a minimum width per person of 2.34.

Therefore, each stair provides a capacity as shown in Table 5 below

Table 5: stair width factors

Stair	Stair width	Stair capacity
Stair 1	1,400 mm (*)	598
Stair 2	1,000 mm	427
Stair 3	1,000 mm	427

(*) the clear width of Stair 1 is 1.600mm however the final exit width is 1,400mm, as per current drawings.

Stair 1 provides capacity for 598 people and stair 2 and 3 provide a capacity of 427 per stair. Therefore, the overall stair capacity for the building is 1,452 which is greater than the overall expected occupancy load for the upper levels (767 people).

FINAL ESCAPE FROM THE STAIRS

Stairs should discharge directly to outside or via a protected corridor. The existing stairs 2 and 3 discharge directly to the outside.

Stair 1 is a circulation stair and it is accessed from the main reception. In order to give flexibility to the design in terms of fire load permitted in the reception, a rear exit will be provided from the stair to avoid having to pass through the reception. In the event of a fire affecting the reception, a fire and smoke curtain will be dropped to protect occupants that escape via Stair 1. Smoke/fire curtains should be in accordance with the requirements of BS 8524-1 & 2 and BS EN 12101-1. Figure 12 shows the proposed location of the curtain:

Note: This is subject to Building Control approval.

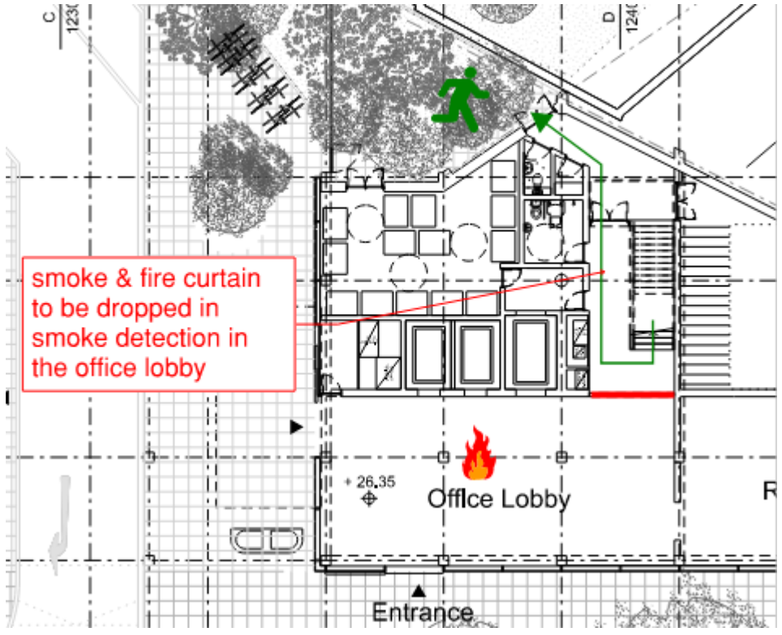

Figure 12: Stair 1 final exit for a fire on the fire lobby

It is noted that in the event of a fire either on the adjacent retail unit or bins store, the final exit from Stair 1 via the reception will be protected by a lobby. Therefore, no additional measures are proposed in this case. See Figure 13 below.

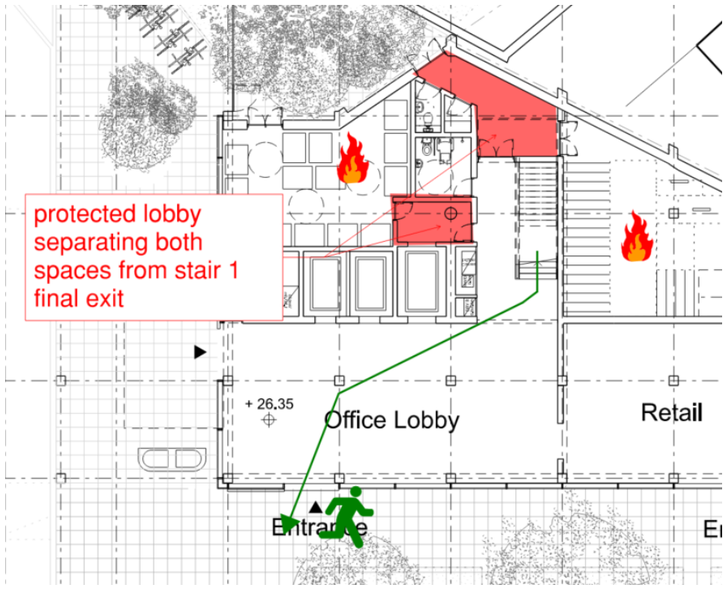

Figure 13: Protection to Stair 1 fire exit

The basement will be evacuated separately from the rest of the building and the final exits are independent from the office floors above, therefore no merging flows are considered.

2.1.7 EVACUATION STRATEGY FOR PEOPLE WITH IMPAIRED MOBILITY

Disabled refuges (minimum 1400mm x 900mm) should be provided within each staircase or lobby on every floor level except where level escape is possible. A disabled refuge should be provided to Stair 2 and the lift lobby at mezzanine level.

An emergency voice communication (EVC) system, designed and installed in accordance with BS 5839-9:2011 should be provided to each refuge. Suitable signs should also be provided to the disabled refuges.

As noted in section 2.1 above, the evacuation from the mezzanine of mobility impaired people will rely on the proposed evacuation lift. A Fire Safety Management plan to oversee the evacuation of mobility impaired persons (MIP) will need to be developed taking into account the use of the lift by the building management and implemented as part of the overall fire safety arrangements.

When the buildings are operational, personal emergency evacuation plans (PEEPs) may be considered for the office levels to ensure an appropriately resourced response, tailored to the individual needs of the mobility impaired person and the specific features of the building i.e. use of evacuation lift. This plan should also consider the evacuation of all mobility impaired visitors. This is part of the tenant's responsibilities under RRO (Regulatory Reform (Fire Safety) Order) obligations for the building.

Mobility impaired persons should also be trained in how to use the evacuation lift so they can evacuate independently.

2.1.8 EXTERNAL PROTECTION TO PROTECTED STAIRWAYS

Protected stairways should be protected from a fire in the accommodation side. The distance between any unprotected area in the external enclosures of the building and any unprotected area in the enclosure to the stairway should be at least 1800 mm as illustrated in Figure 14 below.

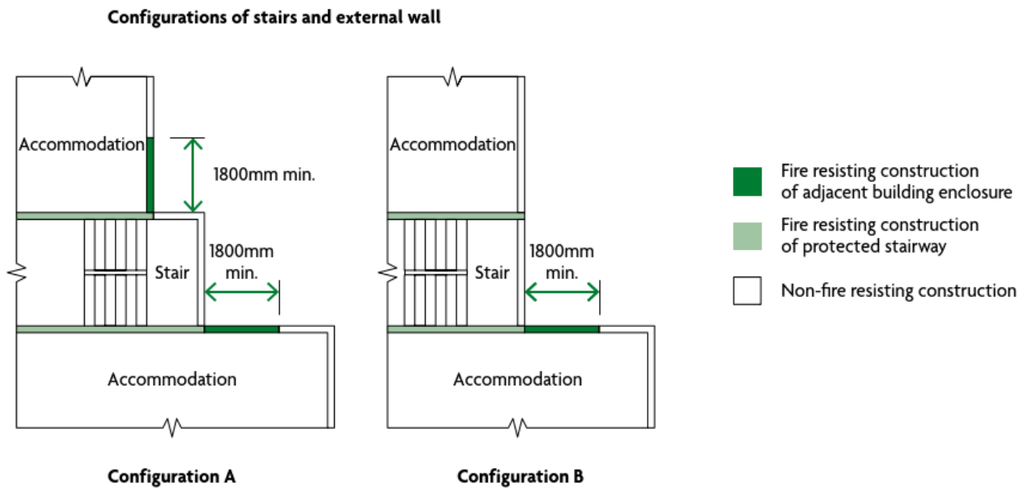

Figure 14: External protection to protected stairways

2.1.9 INNER ROOMS

As per current drawings, it is not clear if inner rooms are proposed in the development i.e. there are no internal partitions shown in the layouts. If inner rooms are provided in the next stages, they will need to comply with the recommendations stated in section 16 of BS 9999:2017.

2.2 RESIDENTIAL MEANS OF ESCAPE

The residential block will be located at 16 Kentish Town Road and it is a three-storey single stair building comprising two apartments per floor. The guidance used is BS9991:2015.

2.2.1 Fire Detection and Alarm

Automatic Fire Detection and Alarm system (AFDA) to a Category LD2 standard (Grade D) to each of the residential apartments. The systems should be designed to meet the recommendations detailed in BS 5839-6.

For the common stair, a smoke detector should be provided at each level which will activate the Automatic Opening Vent (AOV) at the of the stair.

2.2.2 Evacuation Strategy

The residential flats will operate a ‘defend in place’ evacuation strategy. This means that only occupants in the flat of fire origin should leave, on detection within the flat.

2.2.3 Apartment layouts

The proposed apartments are provided with a protected entrance hallway. As set out in Figure 11 of BS 9991:2015 each apartment will contain a protected entrance hall that provides access to every room within a maximum 9m of the apartment entrance. The protected entrance hall enclosure will be designed to achieve 30 minutes fire resistance with FD20 fire doors.

2.2.4 Common Escape Routes

As stated in section 7.5 of BS9991, the block is considered as a small single stair residential building. This is due the following:

- The top floor of the building is not more than 11m above ground floor level.
- There are no more than 3 storeys above ground level storey
- The stair does not connect to a car park

As the building has not more than two apartments per storey and the apartments are provided with protected internal entrance halls as shown in Figure 15, common corridors are not required. The apartments open directly to the stair.

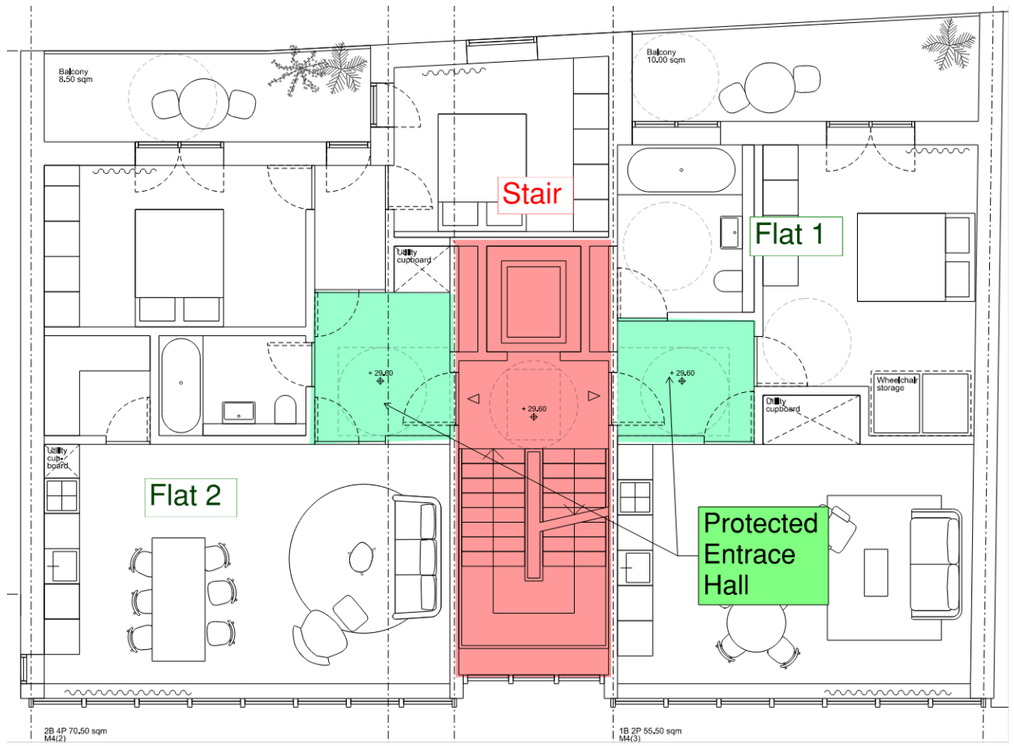

Figure 15: Residential building typical upper floor layout

2.2.5 Stairs

STAIR WIDTH

The minimum clear width of the stair should not be less than 750mm for escape. However, a wider stair might be required for part M or other mobility requirements.

VENTILATION OF STAIRS

An Automatic Opening Vent (AOV) of 1.0m^2 should be provided at the head of the stair connected to the detection system in the stair.

PROTECTION TO THE STAIRS

Stairs should be kept free of potential sources of fire. However, there are certain facilities that can be within the protected stair i.e. no firefighting stair and are the following:

- A lift well.
- Gas services and associated meters.

Figure 16 shows that a lift and service risers will be provided within the stair.

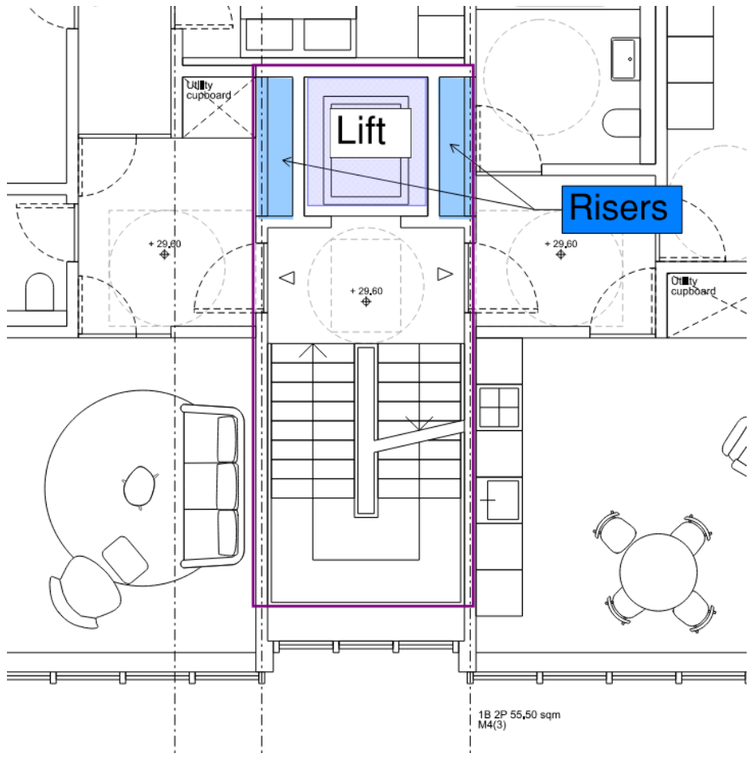

Figure 16: Facilities within the stair

However, the proposed service risers will be accessed from the apartments and therefore they do not pose a risk for escape. The proposed lift is acceptable.

FINAL EXIT FROM THE STAIR AT GROUND FLOOR

Stairs should discharge direct to outside or via a protected corridor. As shown in Figure 17, the stair serving the building discharges directly to the outside at ground floor. However, the stair's final exit also connects to a bike store and plant room.

As noted in BS9991 guidance, the final exit in small residential buildings should be separated from any ancillary rooms by a smoke vented lobby. However, to comply with planning requirements, access to the cycle parking room should involve no more than two set of doors. In order to overcome this, it is proposed to provide a smoke and fire curtain to the bike store door that would be activated on automatic smoke detection within the cycle storage room.

Note: Fire curtains should be provided with emergency retract controls that can be used in the event of anyone is delayed in making their escape from the cycle storage room. The fire curtain will be raised and deploy automatically afterwards.

Also, it is proposed to omit the smoke ventilation to the lobby that separates the plant room and the final exit. the plant room consists of water pumps and tanks. This is considered to have a very low fire risk. The only fire load in the room will be cabling, both for power distribution to the pumps and for signalling. Cables are considered to have

a low fire load, once they start burning, they should reach, relatively quick, a point where the fire is extinguished as the cables themselves have a limited fuel load. It is recommended using only low smoke zero halogen cables and should be put in trunking or metal conduit to further reduce the risk.

Note: This is subject to Building Control approval.

This is shown in Figure 17:

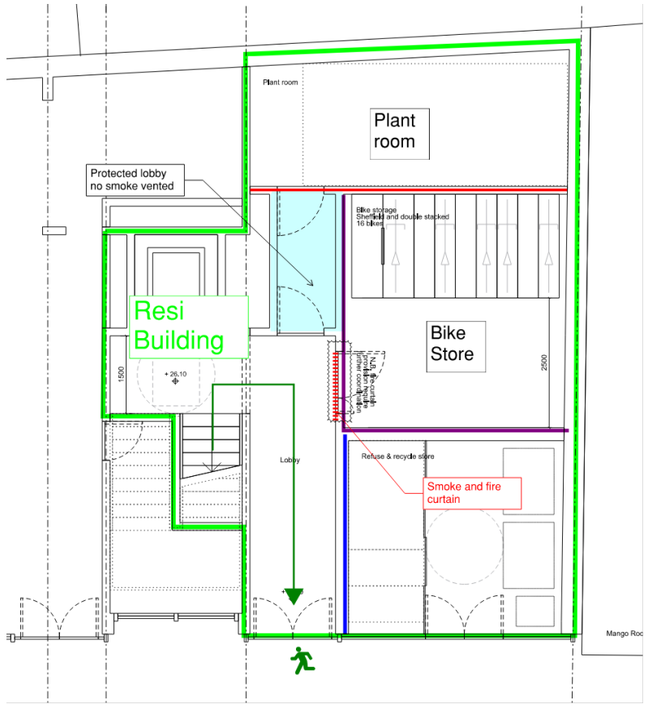

Figure 17: Final exit from the stair

2.3 GENERAL REQUIREMENTS

The escape routes should be provided with a minimum clear height of 2m.

2.3.1 EMERGENCY LIGHTING

An emergency lighting system, designed and installed in accordance with BS 5266-1:2016, should be provided throughout the development.

2.3.2 EXIT SIGNAGE

Every escape should be distinctively and conspicuously marked by the emergency exit signs of adequate size complying with the requirements of BS ISO 3864-1:2011 and BS 5499-4:2013.

These signs should either be internally illuminated or be provided with an emergency luminaire nearby, i.e. 2 metres from the sign. Internally lit or back-lit signs should remain illuminated in the event of a fire.

3 B2: INTERNAL FIRE SPREAD (LININGS)

The internal linings should be provided to meet BS 9999:2017 guidance:

Table 6: Classification of linings

Location	European Class
Small room of area not exceeding 4m² in the residential areas and 30m² in the office areas	D-s3, d2
Other rooms & circulation spaces within dwellings	C-s3, d2
Circulation spaces, including the common areas of blocks of flats	B-s3, d2

Note: These requirements do not apply to the surfaces of floors and stairs since they are not involved in a fire until well developed.

Parts of walls in rooms may be of a poorer performance than specified above, but in no case worse than Class D-s3, d2, provided the total area of those parts does not exceed one-half of the floor area of the room and is less than 60m2.

4 B3: INTERNAL FIRE SPREAD (STRUCTURE)

4.1 STRUCTURAL FIRE PROTECTION

Given that the height of the top-most floor in both the residential block (9.3m) and office building (17.56m) does not exceed 18m, all structural loadbearing elements should be protected with 60 minutes fire resistance.

4.2 FIRE COMPARTMENTATION

It is proposed to provide compartment floors to the office building to avoid restrictions on the amount of unprotected area the east facade. This is explained in more detail in section 5.1.

All residential floors should be designed constructed as compartment floors.

Retail units should be separated from each other and for the rest of the building by 60 minutes fire-resisting construction.

It is expected that a coffee shop will be provided at ground floor. No fire separation is proposed as both the coffee shop and main building will operate under the same management. However, fire separation might be required for business continuity. This can be specified in the next stage.

Table 7: Periods of fire resistance for compartmentation

Element	Fire Resistance (minutes)
Compartment floor	60
Compartment wall (separating different uses)	60
Vertical shafts	60
Protected lobby	30
Protected stair	60
Protected entrance hall	30
Partitions between retail units	60
Low risk plant (e.g. low voltage)	30*

*Table 29 in BS 9999:2017 provides a detailed breakdown of ancillary spaces

4.2.1 FIRE DOORS

All fire doors should be fitted with self-closers except for fire doors to cupboards and service risers, which are normally kept locked shut.

Where a self-closing device is considered of hindrance to the normal use of the building, consideration should be given to the provision of automatic hold-open devices linked to the fire detection and alarm system. Hold-open devices are not considered suitable for doors that lead to stairs.

The rating of fire doors should be as follows:

Table 8: Periods of fire resistance for fire doors

Location	Fire rating
Compartment wall	Same as the wall
Residential stair	FD 30S
Office stairs	FD 30S
Protected lobby	FD 30S
Passenger lifts	FD 30
Services riser	FD 30
Substation	FD240S
Low risk plant (e.g. low voltage)	FD 30S

4.2.2 CONCEALED CAVITIES

Cavity barriers should be provided to any extensive cavities located above ceilings or below raised floors, and at the junction between an external or internal cavity wall and every compartment wall and floor, and to close the edges of cavities, including around openings.

Note: All compartment walls will be carried up full storey height to a compartment floor or to the roof, as appropriate.

All cavity barriers should achieve an integrity rating of 30 minutes fire resistance and an insulation rating of 15 minutes fire resistance (E 30/I 15), and should be tightly fitted to rigid construction and, where possible, mechanically fixed in position.

The maximum dimension of any cavity should not exceed 20m in any direction.

4.2.3 PROTECTION OF DUCTWORK

Fire/smoke dampers operated by a smoke detector should also be provided to any ductwork penetrating a protected escape route where fire-resisting ductwork is not provided and in the residential premises due to the inherent sleeping risk. Elsewhere in those areas/floors, fusible-link fire dampers will be provided to any duct that passes through a fire-resisting construction.

4.2.4 FIRE-STOPPING

All openings for pipes, conduits or cables to pass through any part of a fire separating element will be:

- Kept as few in number as possible; and;
- Kept as small as practicable; and
- Fire stopped (which in the case of a pipe or duct should allow thermal movement).

The fire-stopping will achieve at least the same fire resistance period of the fire separating elements that the pipes, conduits or cables pass through.

4.3 FIRE SUPPRESSION SYSTEM

The buildings will not be sprinklered as sprinklers are not required to meet Building Regulations. The height of the office building is 17.56m and the height of the top storey of the residential building is less than 11m.

4.4 ATRIUM

The office building will contain an atrium. The atrium base is provided above the bridge at level 1 and extends over level 2 and level 3. This is shown in Figure 18below.

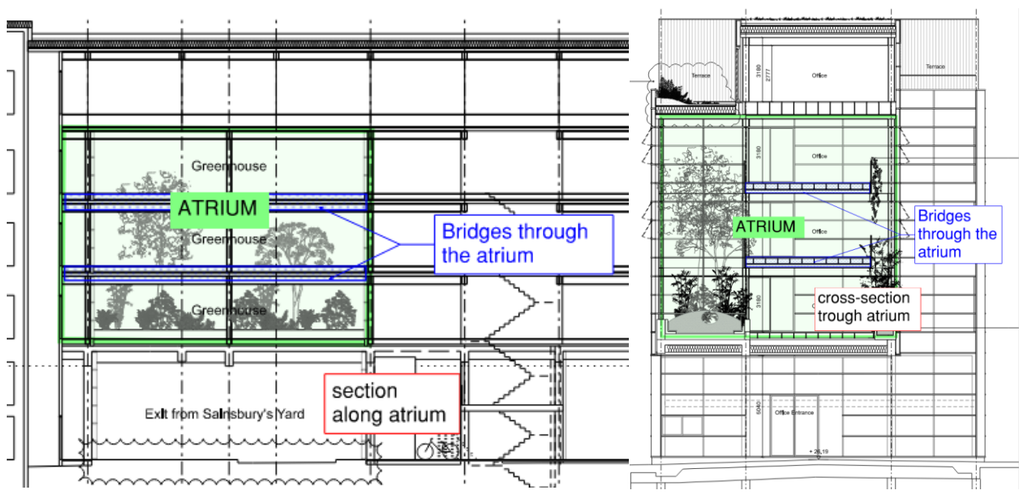

Figure 18: Atrium sections

Annex B in BS 9999 provides guidance for buildings containing atria. It is proposed to generally follow the design principles of Exemplar 1 (occupancy characteristic A, atrium height less than 30m, with simultaneous evacuation) in Annex C of BS 9999.

4.4.1 Atrium enclosure

BS9999 guidance notes that, in an unsprinklered atrium building, space separation in the external fire spread assessment should be calculated on the basis that all storeys are not separated from the atrium by fire-resisting construction and could therefore be involved in the fire. As sprinklers are not provided within the scheme, the provision of a fire-resisting enclosure is needed to maintain compartmentation so that the proposals comply with the external fire spread requirements.

It is proposed to provide fire rated glazing to the atrium enclosure. Fire rated glazing should achieve 60 minutes fire resistance. Either side of the construction should at least be capable of meeting the integrity criterion. Insulation is not considered necessary as there cannot be any fire load in the void side. The proposals are shown in Figure 19 below.

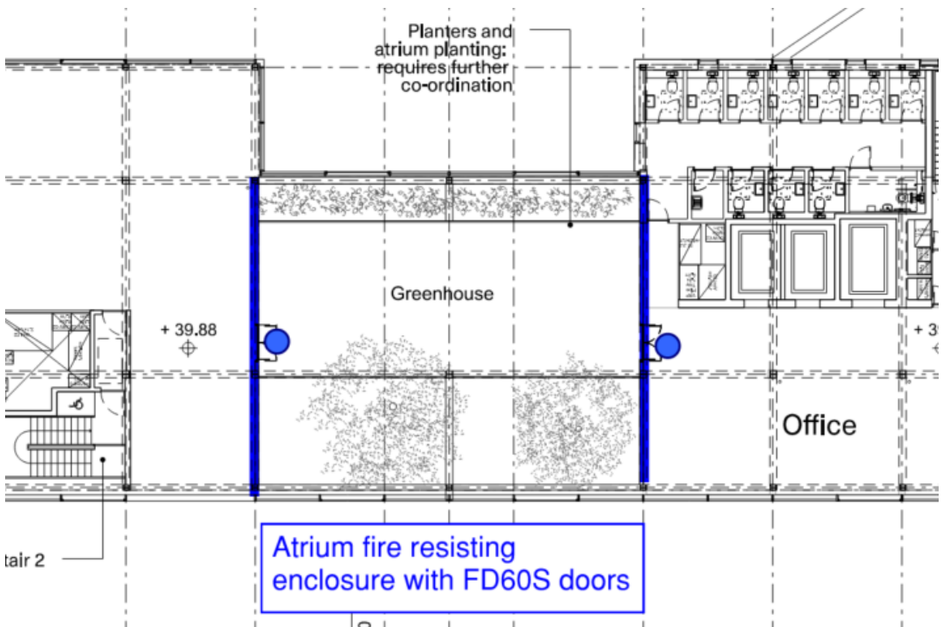

Figure 19: Atrium enclosure

4.4.2 Atrium base

As per BS9999 recommendations, the fire load within the atrium can be comparable to the use and contents within the floors adjoining the atrium. It is proposed to provide a number of planters to the atrium base, which will extend past all floors and embrace the way bridges.

BS9999 recommends controlling the fire load on the atrium base, the objective is to limit the heat output of a fire to less than 2.5MW convective heat flux. This is achieved through either controlling the combustible content or the provision of sprinklers. As noted, sprinklers are not provided, therefore the fire load should be controlled.

Further guidance will be provided to the greenhouse to control the fire risk posed by the planters. it should be intended to produce a fire not greater than 2.5MW.

4.4.3 Atrium ventilation

A smoke clearance system should be provided to assist fire fighters in removing smoke from the building.

As the atrium is less than 30m, it is proposed to use natural ventilation. Natural exhaust vents in accordance with BS EN 12101-2 should be provided in the atrium roof or at high level. The total geometric free area of vents should be not less than 10% of the maximum plan area of the void on the top floor level, subject to a minimum of 1.5 m^2.

The plan area of the atrium at level 3 is circa. 162m^2. Therefore, 16.2m^2 aerodynamic free area is required.

Stand-alone manual override facilities should be provided that afford the fire and rescue service direct control of the smoke control and normal ventilation systems within the building.

5 B4: EXTERNAL FIRE SPREAD

5.1 FIRE PROTECTION TO EXTERNAL WALLS

In line with the Building Regulations, the external walls of the proposed development should have sufficient fire resistance or space separation to prevent fire spread across a relevant boundary.

Note: The relevant boundary is generally the site boundary that is used to determine the extent of unprotected façade permitted. However, if a site boundary faces a roadway or a site where no construction is permitted, it is then permitted to set a notional boundary which would be the middle point between two buildings. It is also permitted to set a notional boundary under a legal agreement of both site owners to allow unprotected facades as long as it is ensured that fire in one building does not spread to the adjacent building.

For part of the east façade of Grand Union House facing Sainsbury's Car Park, it has been confirmed by the client that a legal agreement has been lodged for planning with the landowner by accepting that no building will be built adjacent to GUH building. Sainsbury's should be aware of this condition if future developers acquired the site. In order to have a 100% unprotected façade to the east, a notional boundary would have to set at 9m from the building. This same notional boundary will be the line for planning, if any building will be built on the adjacent site in the future.

Figure 20 shows the site boundary of the building and the notional boundaries taken to the middle of Kentish Town Road and, 9m away of the east façade.

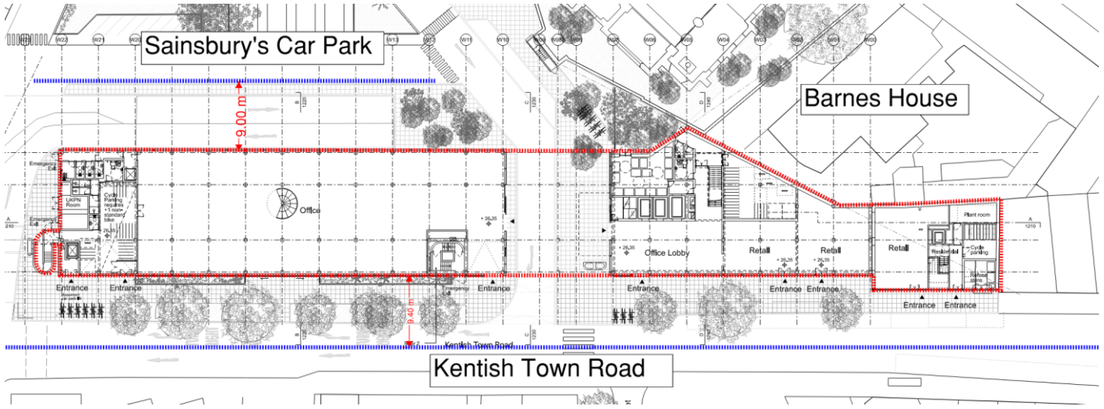

Figure 20: Site Boundary

The external walls located less than 1m from the relevant boundary should be fire protected from both sides achieving 1 hour fire resistance.

The maximum unprotected area of those walls located 1m or more from the relevant boundary will be assessed as the design progresses using the *enclosed rectangle* method detailed in 'BR 187 *Building separation and boundary distances'*.

For each relevant elevation, the worst-case compartment on each façade should be assessed to the closest boundary (either site or notional) distance. Features of the building which affect the method assessment of BR 187 are as follows:

- Internal fire compartmentation.
- If sprinklers are provided
- The separation distance between the facade and the relevant boundary.
- The use of the compartment and risk associated with that space.

Small unprotected areas are permitted within a protected façade according to the constraints illustrated in Figure 21. These areas pose a negligible risk of fire spread.

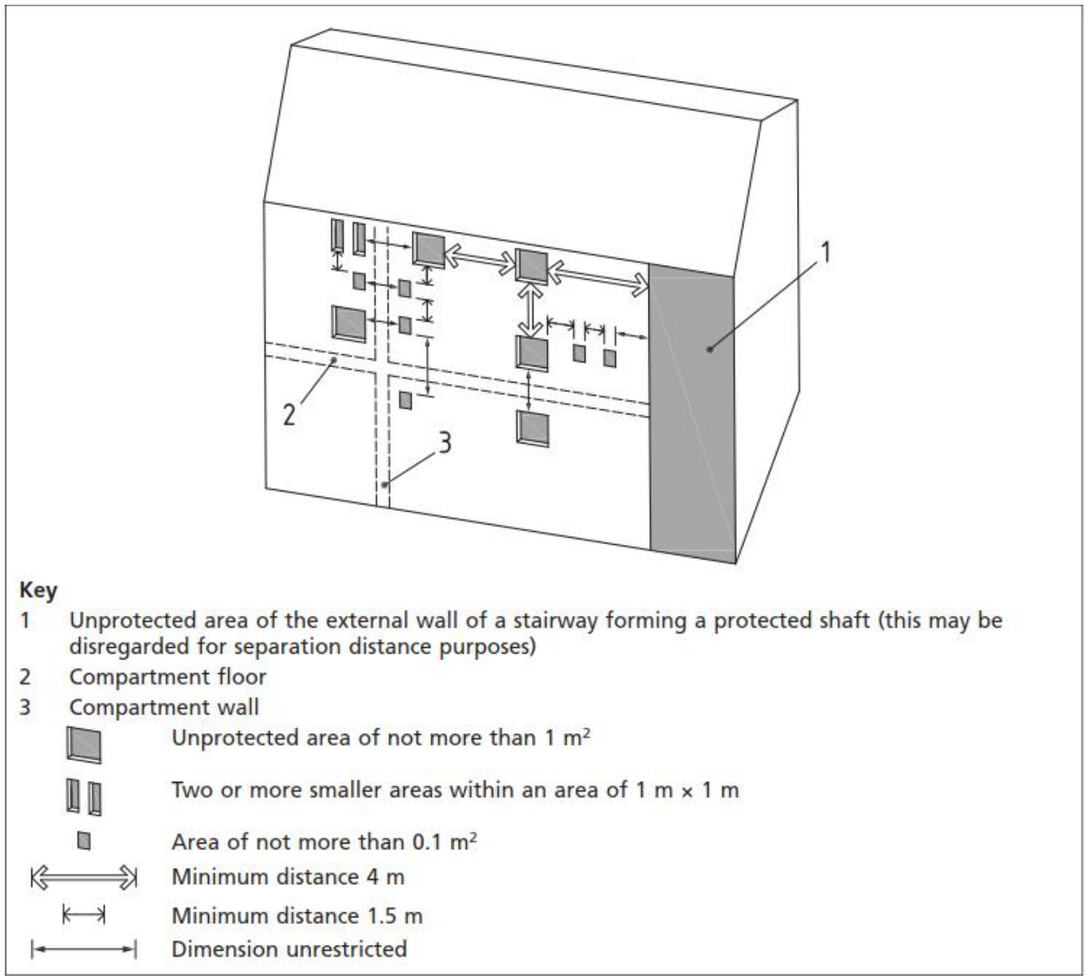

Figure 21: Exclusions from unprotected area calculations

5.1.1 Office Building

West elevation

Given the distance to the notional boundary i.e. middle of the road, there is no restriction of the amount of unprotected areas on the elevation facing Kentish Town Road

East elevation

Given the legal agreement, the notional boundary has been set up 9m away from part of the east elevation that is facing the Sainsbury's car park. Based on this, there are no restrictions on the amount of unprotected areas to this section. However, part of the east elevation that is facing Barnes House is within 1m from the site boundary. It is proposed to extend the solid wall to the north to provide sufficient fire rating and reduce the unprotected area. Therefore, there will be some restrictions on the amount of unprotected areas at level 1 and level 2. The initial results are shown in Figure 22 below:

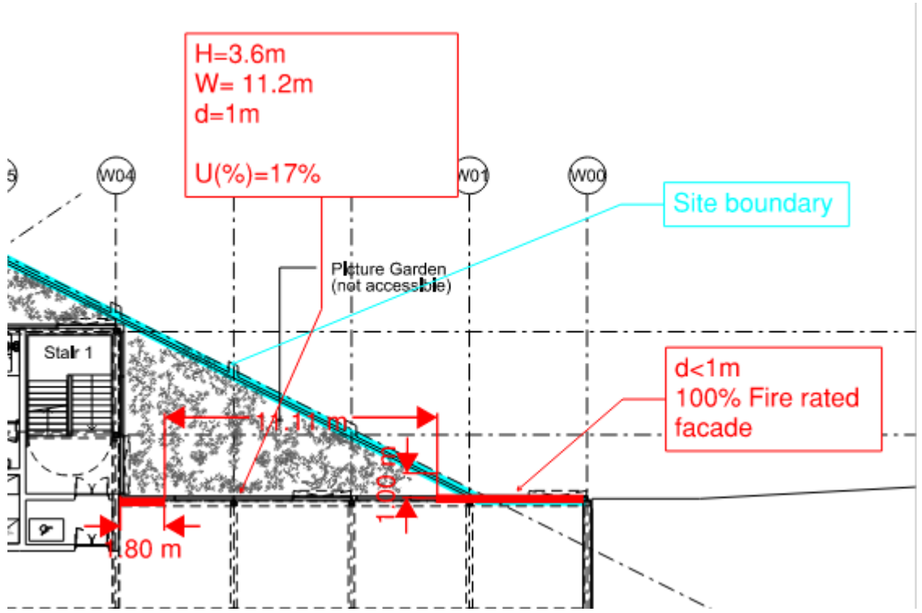

Figure 22: Restrictions on the amount of unprotected areas at level 1 and level 2.

North elevation

It is proposed to provide a small window to the north elevation at level 3. The site boundary of the north façade is just on the façade of the building and therefore fire rated glazing would be required. However, the north façade will be treated the same as the east façade when it comes to the notional boundary agreement with Sainsburys and therefore the proposed window can be unprotected and openable.

5.1.2 Residential Building

There are no restrictions of the amount of unprotected areas on the elevation facing Kentish Town Road. However, there is a restriction on the amount of unprotected area facing Barnes House.

As per guidance, the separation distance to the site boundary should be determined from the edge of the balcony, as the edge of the balcony is less than 2m from the boundary. However, it is proposed to determine the separation to the site boundary from the elevation instead of the edge of balcony based on the following:

- The external balconies will not be provided with storage (unless provided within 30 min fire resisting enclosure) or other fire risk. Residents are to be informed as part of their tenants' packs that the balconies cannot be used for storage.
- The worst-case scenario is given if a fire in the flat affects the contents of the balcony. However, WSP consider that there is no significant risk of a fire spreading to the adjacent building based on the following:
  - The balconies are ventilated spaces. An open balcony is one that could reasonably be assumed to not become smoke-logged in a flat fire situation. In the case of the items in a balcony catching fire, it will unlikely be sustained for a long time as there will be no heat gain feedback due to the lack of a smoke layer. Smoke will be vented, and the fire will be eventually extinguished. The ventilation of the smoke will significantly reduce the temperature of the emitting face and therefore the total radiation received by a nearby target.
  - If a building is built in the future right on the site boundary, the façade adjoining the balconies will be a solid wall and the fire will not spread from one building to the other. If it is built 1m or more, a fire affecting the balconies will not spread to the adjacent building as per item above explanation.
- The external wall of the building is more than 1m away from the site boundary.

On this basis, initials calculations have been carried out and the results give the allowable amount of unprotected areas as shown in Figure 23.

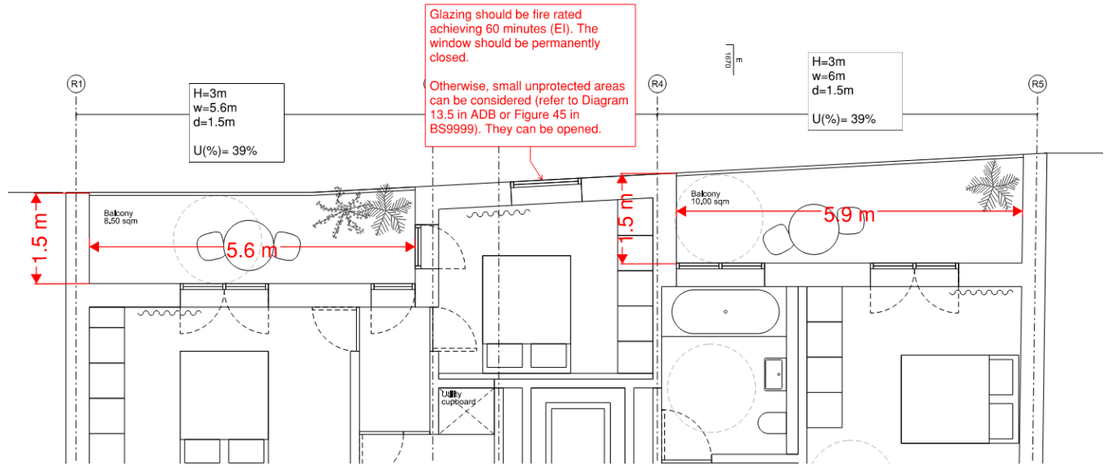

Figure 23: Allowable unprotected areas in the residential building

5.2 EXTERNAL WALL CONSTRUCTION AND INSULATION MATERIALS

The external walls of the proposed buildings should meet the recommendations of BS 9999:2017 regarding surface spread of flame classification. The height of the top most storey is less than 18m; therefore, the external walls should meet the criteria shown in Table 11.

Table 9: Surface spread of flame classification of external walls

Distance of facade from relevant boundary	Height above Street Level	Classification
<1m	-	Class B-s3, d2 or better
≥1m	≤18m	No Provision

According to the relevant guidance, in a building with a storey 18m or more above ground level any insulation product, filler material, etc. used in the external wall construction should be class A2-s3, d2 or better.

As noted in the Building Regulations, the residential building is not classified as a relevant building as the height of the topmost storey is less than 18m. Therefore, the reaction to fire performance of the external surface of the walls and insulation materials should achieve at least Class B -s3, d2.

However, it is recommended to provide only non-combustible materials (A2-s3, d2 or better) to avoid potential mortgage lenders from raising any concerns and also to future-proof against changes in legislation.

5.3 ROOF COVERINGS

Roof coverings will comply with the following designation:

Table 10: Roof covering designation

Designation of covering of roof or part of roof	Distance of roof from any point relevant boundary			
	Less than 6m	At least 6m	At least 12m	At least 20m
BROOF(t4)	Acceptable	Acceptable	Acceptable	Acceptable
CROOF(t4)	Not acceptable	Acceptable	Acceptable	Acceptable

5.3.1 PROPOSED VEGETATION

It is proposed to provide some vegetation along some areas of the building including the external terrace at level 3 and external area at level 4. The use of green areas should be subject to available guidance (Fire performance of Green Roofs and Walls). Advice will be given at the next stage when the proposals are more specific.

6 B5: ACCESS AND FACILITIES FOR THE FIRE SERVICE

6.1 VEHICLE ACCESS AND HYDRANTS

Fire Service vehicle access for a pumping appliance should be provided to within 18m of the fire main inlets. Typically, these inlets should be located on the face of the building, close to the entrances leading to the firefighting shafts. The inlets should also be visible from the fire appliance.

In addition, at least 15% perimeter vehicle access should be provided to the retail units located at ground floor.

Figure 24 shows the proposed dry riser inlet locations and fire vehicle access route.

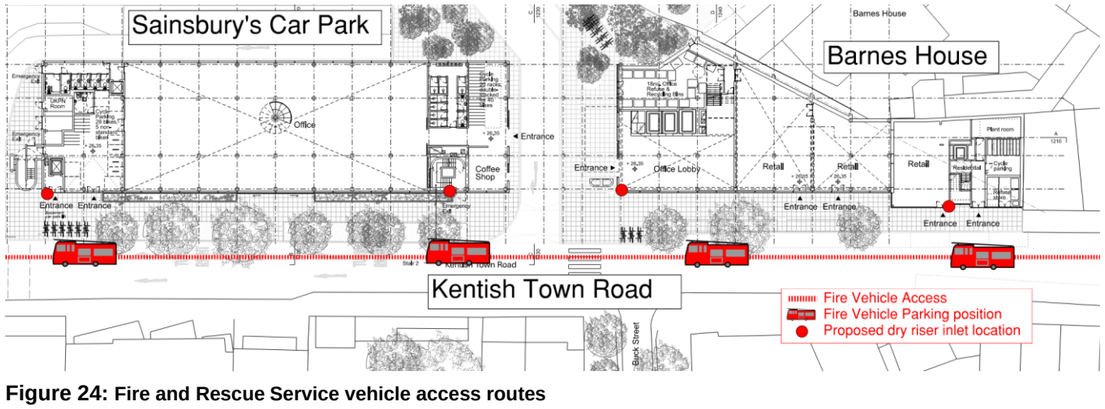

Figure 24: Fire and Rescue Service vehicle access routes

The Fire Service vehicle access routes should meet the following specifications.

Table 11: Vehicle access route specifications

APPLIANCE TYPE	MIN. WIDTH OF ROAD BETWEEN KERBS (M)	MIN. WIDTH OF GATEWAYS (M)	MIN. TURNING CIRCLE BETWEEN KERBS (M)	MIN. TURNING CIRCLE BETWEEN WALLS (M)	MIN. CARRYING CAPACITY (TONNES)
Pump	3.7	3.1	16.8	19.2	14

The building should be located within 100m of an existing fire hydrant. If the distance is exceeded, additional hydrants should be provided within 90m of dry fire main inlets.

6.2 FIRE FIGHTING PROVISIONS

Firefighting shafts should be provided where the height of the topmost storey is greater than 18. The height of the topmost storey in Grand Union House is 17.8m and therefore a firefighting core is not required either to the office building or residential block.

6.2.1 Office

As the office building is more than 11m in height, the building should be provided with protected stairs and protected lobbies with a fire main. It should be note that it is not necessary to provide lobbies to the stairs only to accommodate dry riser outlets. The dry riser outlets may be sited on landing or half-landings to the stairs instead. It is proposed to provide a dry riser to each stair.

Hose Coverage

It is proposed to provide one dry riser for each stair in the building. All areas should be within 45m from the dry riser outlet contained in the protected stair after fit out. As the internal layouts of the office levels are unknown, direct distances from the outlets have been taken as 2/3 of the hose coverage distance limits (45m in the case of protected stairs). Therefore, when applying 30m direct distance, hose coverage for a typical floor and level 4 is illustrated below.

Typical floor

Figure 25 shows that all floor areas are within 30m from the dry riser outlets,

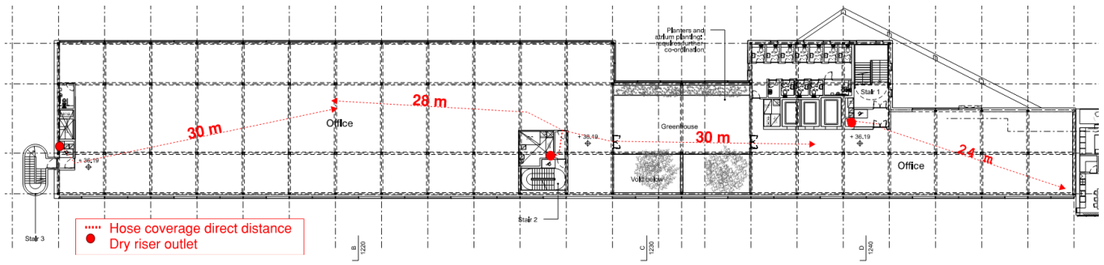

Figure 25: Hose Coverage typical office floor

Fourth floor

Stair 2 will not be extended to level 4. Therefore, only Stair 1 and Stair 3 serve this floor. When applying a 30m direct distance from the dry riser outlets, there are areas that are not covered (highlighted in red). See Figure 26 below.

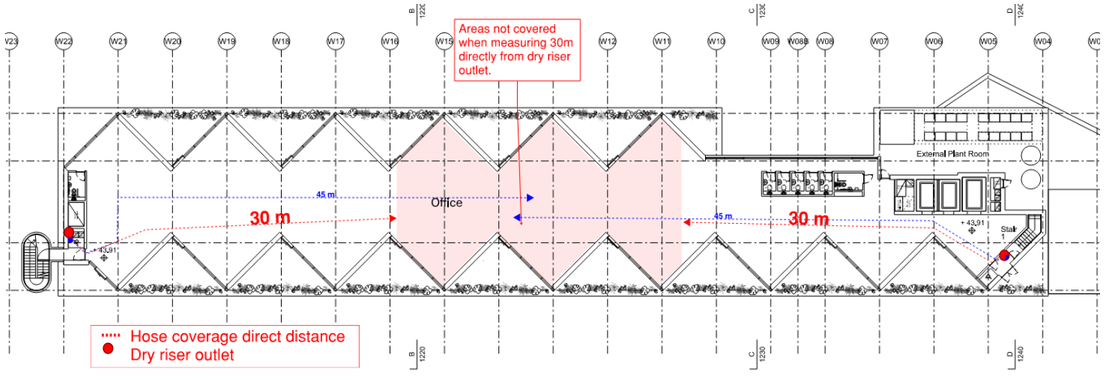

Figure 26: Hose Coverage typical office floor

WSP consider that the proposals should be acceptable based on the following:

- Hose coverage is expected to be compliant after fitout as the 45m hose distance overlaps when measured on a route suitable for laying hose for a typical open office plan (route highlighted in blue). It is encouraged to note in the tenant handbook to create a simple and straight corridor linking the two sides of the building to allow for an egress and firefighting route to be established.
- A 9m jet throw of water from the hose nozzles is normally assumed so that fire fighters are prevented from being in close proximity of the fire. It should also note that fire fighters can approach from both ends of the office floor and therefore the water spray from the hoses would provide additional coverage to cover all floor areas.

Note: This is subject to Building Control approval and LFB Consultation.

6.2.2 Residential block

As all floor areas might not be covered within 45m from the fire vehicle parking position, it is proposed to provide a dry riser to the residential block to ensure that all floor areas are within 45m from the dry riser outlet. The landing valves should be provided within the stair.

7 ADDITIONAL REQUIREMENTS

7.1 EMERGENCY POWER SUPPLY

Emergency power should be provided to all life safety systems in accordance with the relevant design standards for each system, including the following:

- Automatic fire detection and alarm system
- Evacuation lift
- Electrical door locks and hold-open devices
- Emergency lighting system
- Internally illuminated exit signs
- Automatic smoke vents

8 GUIDANCE DOCUMENT CITED

- BS 7974: Application of fire safety engineering principles to the design of buildings- Code of practice
- BR 187 (Second Edition): External Fire spread: Building Separation and Boundary Distances.
- BS 5839-1: 2017 – Fire detection and fire alarm systems for buildings – Part 1: Code of practice for design, commissioning and maintenance of systems in non-domestic premises.
- BS EN 12101-2:2017: Smoke and heat control systems. Natural smoke and heat exhaust ventilators
- BS 5839-6:2019+A1:2020– Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises. Part 6: Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic buildings
- BS 5839-9:2011: Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems
- BS 5395-2:1984: Stairs, ladders and walkways. Code of practice for the design of helical and spiral stairs
- BS ISO 3864-1:2011: Graphical symbols -- Safety colours and safety signs -- Part 1: Design principles for safety signs and safety markings
- BS 5499-4:2013: Safety signs. Code of practice for escape route signing
- BS 5266-1:2016 Emergency lighting. Part 1 Code of practice for the emergency lighting of premises

APPENDIX A

AUTHOR AND REVIEWER CV'S

Lucia Picon

Senior Fire Engineer

CAREER SUMMARY

ucia Picon, with 6 years in the fire industry, has applied Fire Engineering principles and techniques to a broad range of projects. As part of her role, she is responsible for assisting with all aspects of a project from Appraisal and Concept Design through the design process, construction and completion.

Before joining WSP, Lucia was working as a Fire Engineer at Jeremy Gardner Associates (JGA), where she was responsible for the development and management of Fire Engineering projects and carrying out advanced Computational Fluid Dynamics (CFD) studies

4 years with WSP

6 years of experience

Area of expertise

Fire Safety Strategies for buildings

Language

English, Spanish (mother tongue)

EDUCATION

LLP Erasmus, Master Thesis entitled 'analysis of biofilms by using fluid-structure simulations', Technical University of Brunswick, (Germany).	2013
MEng. Industrial Engineering, Polytechnic University of Valencia, Spain	2012
BEng. Mechanical Engineering, Polytechnic University of Valencia, Spain.	2010

ADDITIONAL TRAINING

H&S courses	4 years

PROFESSIONAL MEMBERSHIPS

CSCS	2018
AIFireE	2017

PROFESSIONAL HISTORY

WSP	2017 - present
Jeremy Gardner Associates (JGA)	2015 - 2017

PROFESSIONAL EXPERIENCE

Lucia Picon

Senior Fire Engineer

Fire engineering

Sellar, Paddintong Square, London
Rezo Piano Building Workshop & Adamson Associates International
Consultant Designer
Paddington Square will be a large development comprising an office building with a restaurant at the top. Occupants will have access to the office levels via a reception lobby located at second floor. There will be retail units at ground and first floors. The building is served by two stairs at upper floors.
There will be a two-storey shopping complex below ground and two basement levels below the shopping complex comprising plant rooms, changing rooms and cycle store. The development connects to London Underground (Paddington) station at basement B1. Lucia is responsible for providing Fire Engineering advice during detailed design and construction stages.

Derwent London, Featherstone Building, London
Morris + Company Architects
Consultant Designer
The Featherstone Building is an existing new office building in London. The building will comprise of ground plus 10 storeys, which will be served by two main cores. Open-plan office accommodation will be provided at the upper levels. On the ground floor, there will be additional affordable office space, a café (office users) & reception area to the east, and a loading bay and plant rooms to the west. Lucia is responsible for providing Fire Engineering advice during detailed design and construction stages

Santander UK, Unity Place, Milton Keynes
LOM Architecture and Design
The proposed building consists of seven office floors above ground, a roof plant and two basement levels. There is a food hall open to the public and the main entrances to the building at ground. Also, a number of independent units will be provided. The eight-storey building will provide 5,000 workstations arranged across four blocks. These are connected by three atria to allow natural light into the building and provide views out. Parking for cars and bicycles is located at ground floor level. Lucia is responsible for providing
Fire Engineering advice during detailed design and construction stages

Columbia Threadneedle Investments, 127 Kensington High Street, London
Pilbrow and partners
127 Kensington High Street is an existing three-storey office and retail development adjacent to Kensington High Street Underground with frontages to the High Street and Wrights Lane. The proposed scheme is to provide increased office space at levels 1, 2 and 3 by extending the floor plates, new floors are to be constructed at levels 4 and 5 to support office space with a steel roof structure supporting plant. Two new cores are to be constructed to the east side of the building. There will be an arcade comprising seven retail units at ground floor. Retail unit 1 will be connected to the basement that will consist of retail area and plant rooms. Also, the office reception will be located at ground floor with an adjacent office accommodation. A bike store will be provided to the south which will be linked to the mezzanine comprising changing rooms. A third stair is serving the basement up to the mezzanine given access to plant rooms located at mezzanine level. . Lucia is responsible for providing Fire Engineering advice during detailed design and construction stages.

The Hongkong Shangai Hotels, 1-5 Grosvenor Place, London
Hopkins Architects
Consultant Designer
The proposals for 1-5 Grosvenor Place, in London, consist of a new mixed-use development comprising a luxury hotel, high end apartments, retail areas and two restaurants, as well as a large ballroom that forms part of the hotel. The building comprises nine storeys above ground level, i.e. ground plus first to eighth floors, with a lower ground floor and four basement levels. Lucia is responsible for providing Fire Engineering advice during detailed design and construction stages.

Andres Ortiz

Associate Director

CAREER SUMMARY

Andres is an Associate Director at WSP with a background in the development of fire safety strategies for a variety of sectors including commercial and mixed use building, assembly buildings, residential and development as well as fire risk assessments, fire engineering, blast venting and protection, ATEX & DSEAR regulations, power production and processing industries.

With a strong background in thermodynamics, fluid, dynamics, CFD modelling and evacuation analysis, Andres' experience includes large buildings in the UK and abroad and the development of fire engineered strategies for complex designs requiring unique solutions.

Andres has also worked on a number of residential and hotel developments in London including a prestigious hotel and residential building in central London with a construction cost of over 400M and a 1000 bed student residential building in Westminster, with unique challenges and fire engineered solutions. Andres has also worked on the development of a mixed used office and laboratory building as well as a large stadium and ancillary buildings.

Andres has an excellent working knowledge of the British Codes as well as European and American standards and generally adopted industry guidance such as insurers' recommendations. Andres is the WSP lead for fire in the industrial and power sector for London

<1 year with WSP

9 years of experience

Area of expertise

Fire Engineering

Language

Spanish, English,

EDUCATION

MEng Mechanical Engineering	2009
MSc Fire Engineering	2011

PROFESSIONAL HISTORY

WSP Ltd	2019 - present
Ramboll UK Ltd	2014 - 2019
FERMI Ltd	2012 – 2014
Cadbury Plc	2009 – 2010
P&G	2009

Andres Ortiz

Associate Director

PROFESSIONAL EXPERIENCE

Stansted Airport New Arrivals Building
Lead the fire safety design for the new arrivals building, including extensive use of CFD and a completely fire engineered solution. The building consists of a large single volume with connected spaces and minimal fire separation between areas.

Valencia Arena
Fire engineering lead for a new basketball and multi-purpose arena in Valencia, comprising 15,000 seats and capacity for 18,000 people in event mode. The project is designed to meet Spanish regulations as well as European and British Standards for various sections. Due to the large occupancy, a fire engineered solution was required for most parts of the building.

Jorge Chavez International Airport: Lima
Fire engineering lead for the remodelling and addition of areas to the existing terminal of Lima international airport and the construction of a new terminal, control tower and rescue station buildings. The strategy was developed to meet NFPA codes and local building codes.

British Antarctic Survey
Fire engineering lead for the framework with BAS, projects included a new operations base in Rothera, storage and workshop buildings in Bird Island and the development of a fire strategy for the movable Halley VI Research Station. The Antarctic presents unique design and working challenges not seen in mainland buildings and requires the development of fire engineered solutions and a holistic approach to ensure not only life safety but also business continuity and property protection.

Cambridge Abcam Campus
A large four storey mixed office & laboratory building in Cambridge, which includes voids and penetrations through all floors and open views into the atrium. The project presented unique challenges in the use of spaces and smoke movement and compartmentation, requiring CFD analysis and various active fire safety measures.

Al Rayyan Stadium and Sports Complex
The Al Rayyan development is part of the Qatar World Cup and included a large stadium with capacity for 40,000 people, a mosque, training pitches, connections to train and underground stations and leisure areas. The project involved the assessment of all new building as well as the master plan for the entire development. It was successfully delivered with the approval of the civil protection authorities.

199 Westminster Bridge Road
A nineteen storeys development providing 1,000 rooms of student accommodation and three storeys of higher education facilities as well as a public work space and ancillary facilities. The building presented unique challenges with extended travel distances, atria and fire engineered solutions for firefighting access.

Clapham Park Development
A large residential development project in London comprising more than 50 buildings. The project included many challenges such as penetrations in compartment floors, large travel distances and complex firefighting access. A fully fire engineered solution was developed for at least four of the buildings.

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