



Report

Project	Hotspur Press, Manchester
Report Title	Stage 3 Fire Strategy
Our Ref	HM2622/R1 Issue 4

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Report No. HM2622/R1
Issue No . Issue 4
Issue Date. 21/03/2025

	Issue 1	Issue 2	Issue 3	Issue 4	Issue 5	Issue 6
Date	03/06/2024	29/11/2024	05/03/2025	21/03/2025		
By	CJK	CJK	CJK	CJK		
Checked	AA	RW	RW	RW		
Approved	SA	JB	JB	JB		

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1.0 INTRODUCTION

1.1 Description of Building

Hotspur Press is a proposed 37-storey (including basement and ground) Purpose Built Student Accommodation (PBSA) building located in Central Manchester. The building will incorporate an existing structure as a podium from the basement to level 3, with a new recessed structure constructed from Level 4 upwards.

The Hotspur Press basement will consist of refuse, plant/storage space and residential amenities including a large amenity area, laundry, gym and a TV/cinema room. The ground floor will include an independent double height commercial unit, a double height reception foyer with a back of house mezzanine, parcel/post store, bike workshop, refuse holding area and a staff office. The residential part of the building will have a triple-height space in the rear amenity area which will be open from the basement up to the mezzanine level.

Level 3 is proposed to contain a residential amenity event space and a private residential amenity area. There will be terraces connected to the residential amenity event space. Levels 1 to 34 will be residential accommodation only with a mix of studio and cluster flats with accessible studios located on Levels 1 to 3. Level 35 will consist of internal and external plant. There will be minor back of house storages and risers across the residential levels.

The top storey height of the building will be approximately 100.5m above ground. The building's typical proposed residential layouts are shown in Figure 1 and Figure 2, and the proposed west elevation is shown in Figure 3.



Figure 1: Typical Upper Residential Floor Layout



Figure 2: Typical Lower Residential Floor Layout

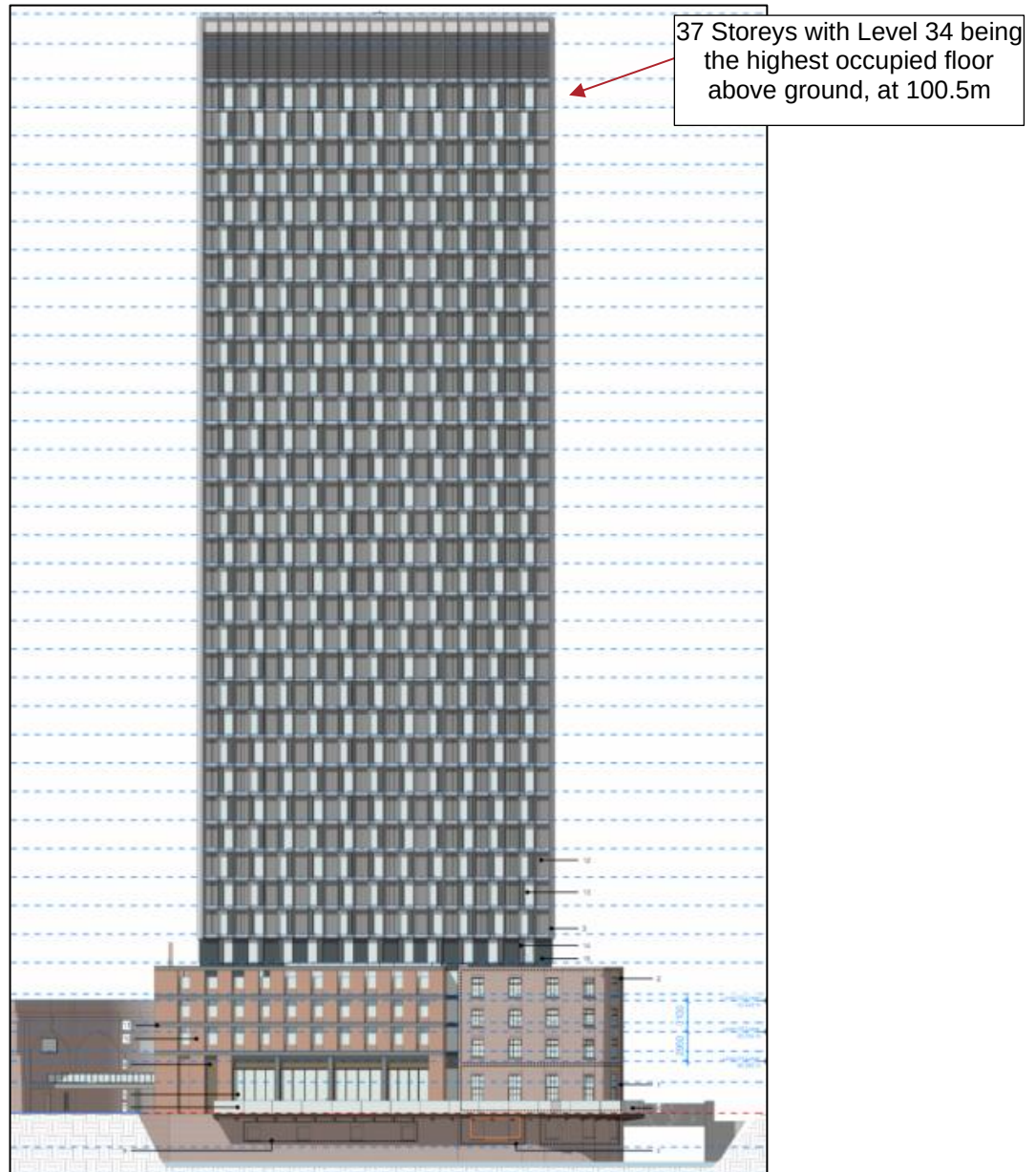


Figure 3: Hotspur Press – Southwest Elevation

1.2 Aim of Report

The report summarises the Stage 3 fire strategy principles for the building to demonstrate compliance with the requirements of the Building Regulations for life safety.

The report is intended for review by the wider design team to ensure the fire strategy principles are applied throughout the building. The report will be updated with further technical detail as the scheme progresses through to Stage 4 and submitted as part of the following Building Safety Regulator and for any consultation with the Local Fire and Rescue Authority to agree the key Fire Strategy principles.

This report addresses life safety only, not property protection. Advice on property protection should be sought from the building's insurers separately.

1.3 Guidance Documents

The highest occupied floor level of Hotspur Press exceeds 100m. Guidance within BS9991:2024 – *Fire safety in the design, management and use of residential buildings – Code of practice* notes that the scope of the document is only up to 100m and therefore the works will be outside the scope of BS9991:2024. However the general framework and principles of the current design has been developed using BS9991:2024 at this stage and will be further reviewed as the scheme progresses, including any enhancements required to support the increased height of the building. Additional measures will be developed in line with BS7974 - *Applications of Fire Safety Engineering Principles to the Design of Buildings* approach.

The commercial area is treated as a separated part of the building that is independent from the residential accommodation. The basement to mezzanine floors will not be independent however will be ancillary to the residential section of the building and will be well separated and protected. The fire strategy for these areas has been developed following guidance given in BS9999:2017 – *Fire safety in the design, management and use of residential buildings – Code of practice*. This fire engineered approach for the basement to mezzanine floors is discussed further in Section 8.0.

Where areas designed to BS9999 and BS9991 interact, the higher standard of protection between the two documents will be provided. An example of this is where the basement level has been designed to BS9999, since the lift shafts serve all levels, BS9991's enhanced smoke control requirements to protect the evacuation lift lobbies are proposed.

Where beneficial to the design, additional fire engineered solutions have been developed and are included within this report. These are detailed in Section 1.6 below.

1.4 BS9999:2017 Risk Profiles

Hotspur Press will have various non-residential areas which have been assessed using BS9999 for the proposed occupancy. Therefore a range of risk profiles has been assigned. The following risk profiles have been used for various parts of the building in line with BS9999 guidance:

- An A1 risk profile for the residential amenity space. This is based on medium fire growth rate with the provision of a BS EN 12845 commercial sprinkler system and occupants that are awake and familiar with the building.^{Note}
- A2 risk profile for low risk stores. This is based on a medium fire growth rate with the provision of a BS EN 12845 commercial sprinkler system and occupants that are awake and familiar with the building.
- An B1 risk profile for the basement plant rooms which largely consists of sprinkler tanks. This is based on a slow fire growth rate and only for maintenance personnel that are awake but unfamiliar with the building.
- A B2 risk profile for the sprinklered commercial units, gym and cycle stores. This is based on a fast fire growth rate, the provision of commercial sprinklers / a BS EN 12845 commercial sprinkler system and occupants that are awake and unfamiliar with the building.

Note: In practice there is likely to be guests in residential areas brought in by building occupants. These guests will form a minority of the amenity area occupancy and will be alongside occupants who are familiar with the building. Therefore the majority of the occupancy in amenity spaces will be familiar with the amenity areas and the overall population will be treated as familiar. The fire strategy is written on this basis.

1.5 Building Safety Act

The building will be classed as a higher risk building (i.e. will be greater than 18m tall or more than 7 storeys and contain at least 2 residential unit) and therefore Part 4 of the Building Safety act will apply and this scheme will undergo the Building Safety Gateways 2 and 3 applications to the Building Safety Regulator.

Prior to construction, a Gateway 2 submission will be sent to the Building Safety Regulator, including sufficient detail so that the Building Safety Regulator can approve that the design will comply with the Building Regulations. The same process will happen after construction as part of the Gateway 3 submission before occupation of the building. It is understood that this will be submitted as a single application.

Any changes that constitute a major or minor change during the construction will undergo the appropriate approval procedures with the Building Safety Regulator.

1.6 Fire Engineered Solutions

Several fire engineered approaches will be being proposed to support departures from the code guidance. These approaches consider a holistic view of the building Fire Strategy. Where relevant, additional justification and analysis has been provided to ensure that a high standard of life safety is met within the building and the functional requirements of the Building Regulations are achieved.

These will be discussed in further detail in the relevant sections of this report, but can be summarised as follows:

- Kitchens will not be enclosed as recommended by BS9991 guidance and will be situated within the 2.7m distance required by BS9991:2024. A radiant heat analysis has been carried out and is described in Appendix B below to support occupant escape past hobs during a kitchen hob fire. This is discussed further in Section 6.4.
- Some private terraces will be located on an escape route which will need to escape past a hob and will be situated within the 2.7m distance required by BS9991:2024. This is discussed further in Section 6.6.
- Stair goings, the design will not align with the guidance stated in BS9991:2024 and will instead achieve the standards set out by the Approved Document K, further detailed in Section 7.3.2.
- A triple height atrium will be provided between the basement and the mezzanine level which will require occupants to escape within 4.5m of the void edge. This is noted in Section 8.0.
- Designing the basement to mezzanine floors, which form amenity use only with no sleeping risk, will be well separated and protected from the studios and clusters above and designed to BS9999. This is discussed in Section 8.0 below.
- The bin store will not be provided with a smoke ventilated lobby on the basis that the bin store will be well ventilated and separated from common escape routes by a 30 minute protected lobby which will be demonstrated by the proposed deterministic computational fluid dynamics model. This is detailed in Section 14.2.

As the scheme progresses, the report will be updated to reflect any enhancements proposed to BS9991 and further outline where fire engineering solutions are proposed, what clause is deviated from BS9991:2024.

1.9 Fire Safety Management

The operator's fire safety management obligations under the RRO 2005 including the requirement to maintain all life safety systems throughout the building's lifecycle will be outlined in Section 15.0.

In the event of a fire safety audit under the Fire Safety Order being undertaken, local authority Fire Safety Inspecting Officers will expect to be able to review management procedures and evidence of staff training, documentation of which will form part of the fire risk assessment for the premises.

2.0 ACTIVE FIRE SAFETY SYSTEMS

2.1 Suppression Systems

2.1.1 General

The building will be fitted with suppression systems throughout given the building will have a top storey height of more than 11m. The following sections discuss the suppression provisions in each area.

2.1.2 Suppression - Residential

A residential sprinkler system will be installed in each apartment, each residential corridor and all communal areas of the building including amenity spaces with the exception of those over 100m² area which will be provided with a commercial suppression system, see Section 2.1.3.

The sprinkler system will be designed as a Category 4 system in line with BS 9251:2021. Sprinklers will be omitted where the following provisions will be met, in line with the guidance in BS9251:2021:

- Bathrooms, shower rooms and Water closets (WC) with a floor area less than 5 m², with linings conforming to BS EN 13501-1:2018 guidance, Class A1, A2-s3,d2 and B-s3,d2 and which will be not prepared for white goods such as washing machines, dryers, electric showers or water heaters; ^{Note}
- Ceiling voids;
- Enclosed vertical shafts containing only materials conforming to BS EN 13501-1:2018 guidance, Class B-s3 or better and B(fl) or better for flooring, including sub-categories such as d0, d1, d2 for construction materials and s1, and s2 for flooring, surface spread of flame and constructed as a fire resistant separation;
- Cupboards and pantries with a floor area of less than 2 m² or where the least dimension does not exceed 1m which will be not prepared for consumer units or electrical equipment (excluding a single light);
- Roof voids
- Crawl spaces
- External balconies permanently open to the outside.

The full system specification and areas of coverage will be detailed by the sprinkler specialist separately as the scheme progresses.

2.1.3 Suppression – Commercial

The scheme will require a commercial standard suppression system in compliance with BS EN 12845:2015, serving the ground floor retail unit, along with non-residential areas that have a floor area greater than 100m² such as the residential amenities, plant spaces and storerooms from basement to the mezzanine level and the level 3 terrace amenity space. The full system specification, category and areas of coverage will be detailed by the relevant suppression specialist as the scheme develops and a commercial system has been accepted.

At this stage the commercial unit and plant spaces are proposed to be provided with an OH3 standard of sprinkler protection, with an OH1 provision in other residential areas in line with the specialist's recommendations. This will be further reviewed within the detailed design of the building as the scheme progresses.

2.2 Residential Fire Alarm

All apartments will be provided with an LD1 fire alarm system, and additional heat detection provided within cluster apartment kitchens. This extends to the bedrooms and kitchen within the cluster apartments. The ancillary and amenity areas will be provided with a fire detection and alarm system to at least an L2 standard. This system will include detection in the common corridors to activate the smoke control systems.

Detection in the ancillary areas will not cause the evacuation of the residential levels but the building management will be alerted.

All studios will be provided with a BS EN 50615 automatic cutoff system to the cooking facilities to support the hob locations, see Section 6.5. The system will automatically disable the power to the cooking equipment (i.e. hob/oven) to slow the development of a cook-top fire. The design and specifications of this system will be provided by the M&E specialist on the scheme.

2.3 Commercial Fire Alarm

The shell and core arrangement of the retail unit will be provided with an independent automatic fire detection and alarm system to at least an L3 standard. The system will be compatible with and linked to the residential fire alarm panel.

A fire in the commercial unit will cause the evacuation of that unit only, it will not cause the evacuation of the residential tower, but the building management will be alerted.

2.4 External Terraces

Beacons and sounders will be provided to private and communal external areas at the upper levels where the proposed alarm coverage will not be sufficient in alerting occupants on the terrace where either the room alarm will not be sufficiently audible or where the access room will not be clearly visible from the terrace.

The locations of any additional beacons and sounders will be subject to fire alarm specialist design.

2.5 Investigation Period

The building will be provided with 24/7 management. Following confirmation from the operator, an investigation period for the amenity and ancillary spaces will likely be provided to investigate detection in a communal area, confirm if a fire is present and raise the alarm if necessary.

The cause and effect of the alarm system and the confirmation of any investigation periods will be assessed as the scheme develops however it is likely this will form a double knock alarm system with a 2-3 minute investigation period. This system will be developed alongside the fire alarm specialist.

2.6 Evacuation Alert System

As the building will be more than 18m in height, an evacuation alert system (EAS) complying with BS8629 will be provided to allow for the Fire Service to evacuate the building should they deem it necessary. This will be achieved by either:

- Providing a domestic stand-alone system to each cluster/studio as well as providing a separate evacuation alert system, or
- Providing an L1 system to cluster flats and studio designed in accordance with BS 5839-1 however it is only programmed for a “defend-in-place” strategy at first. Only when the Fire Service arrives and deem it necessary to evacuate everyone, the same alarm system can help initiate a sitewide evacuation. This provision should not include a master switch that triggers a “full building evacuation” in line with BS 8269 but instead the system should contain a means of evacuating each floor or zone independently which, if all triggered, could initiate a building wide evacuation.

The approach will be confirmed by the fire alarm specialist as the scheme progresses.

2.7 Emergency Lighting

Emergency lighting will be provided in accordance with BS 5266-1.

2.8 Emergency Signage

Emergency signage will be provided in accordance with BS 5499.

As the building will exceed 50m in height, there should low low-mounted wayfinding signage, along the escape route and within the stairs. The provision of the low-mounted wayfinding signage will be detailed by the M&E specialist.

The provisions of wayfinding signage for the Fire and Rescue Service will be discussed in Section 14.7.

2.9 Smoke Control

Any corridor approaching the stair lobby will be provided with a smoke control system as discussed in Section 9.0. The smoke control system will operate upon detection within the common corridor, detection within the apartment or upon sprinkler activation anywhere on the floorplate. Each stair will be provided with an AOV at the head of the stair achieving at least a 0.7m² aerodynamic free area.

The stairs will also be provided with a low-level inlet of air. This will be achieved by either a vent achieving at least a 0.7m² aerodynamic free area or by the doors on the route to the outside, i.e. the final exit door and stair door at ground floor, failing to the open position upon detection. Any vents used, including the doors, will be designed in line with and tested to the relevant parts of BS EN 12101.

Note: Smoke Control design is subject to further design development in accordance with the BS9991:2024 guidance and the ongoing analysis of the Jensen Hughes smoke ventilation study. The report will be updated further as the scheme progresses with the relevant impacts on the smoke control design.

3.0 WIRING REGULATIONS

BS7671 *Requirements for Electrical Installations* prohibits having any electrical cables installed in a firefighting lobby, shaft, or staircase of a protected escape route unless part of:

- An essential fire safety or related safety system
- General needs i.e., lighting
- Socket-outlets provided for cleaning or maintenance.

The restrictions therefore apply to the stairs and also to the final exit corridors extending from the stairs to outside at ground floor. Cabling in these areas that is not listed in the bullet points above will be separated by construction achieving 30 minutes fire resistance.

The firefighting lobby will double up as the evacuation lift lobby. Services running horizontally within the evacuation lift lobbies will either be enclosed in fire-resisting construction or meet all of the following criteria:

- The exposed surface of the material used is Class B-s3, d2 or better;
- The supports and fixings in the cavity are Class A1
- Any pipe insulation system is Class B-s3, d2 or better; and
- Any electrical wiring in the cavity is laid in metal trays or metal conduit

4.0 EVACUATION STRATEGY

Hotspur press will operate on a 'defend in place' evacuation strategy in all residential apartments where only a single studio, or whole cluster flat will evacuate upon detection within the accommodation. Neighbouring studios or clusters will not need to evacuate unless otherwise instructed by the Fire Service. All ancillary or amenity spaces will operate on a simultaneous evacuation.

The commercial unit at ground level will operate on a simultaneous evacuation independently from the rest of the residential building.

5.0 BACK-UP POWER

Secondary power supplies will be provided to all active life safety systems, such as smoke control systems, suppression systems, evacuation lifts and firefighting lifts in line with Section 21 of the BS9991:2024 guidance.

The back-up power supply will be provided by the plant space located at roof level. Other active life safety systems such as AOVs, emergency signage and door access control devices will be provided with a separate secondary power supply, such as backup battery pack.

6.0 APARTMENT LAYOUTS

6.1 Overview

The living arrangement at The Hotspur Press PBSA will largely consist of student residential apartments. However, approximately 10% of the apartments within the building will be interchangeable accommodation for non-student occupants which will live in the building year-round, including outside university termtimes. This arrangement will not affect the fire strategy design throughout the residential levels of the building given that occupants living at in the building presents no further life safety risk than occupants living there during termtime only. The management strategy (e.g. permanent on-site staff presence) of the building will be in effect outside of termtime in line with the fire strategy requirements. All other passive or active fire safety strategy

6.2 Cluster Apartments

The building will be provided with cluster apartments throughout all residential levels. The travel distances in the internal hallway of the cluster apartments will be within 15m in a single direction. Where cluster apartments are provided with a maglock access system or equivalent suitable device for security purposes, these will release on a fail-safe system upon alarm, power failure or device failure to allow for unhindered evacuation. The proposed device will not prop the door open and the door should remain closed in order to maintain the proper compartmentation.

The kitchen will be located at the remote end of the cluster entrance.

A worst case cluster apartment accommodation are shown in Figures 4 and 5

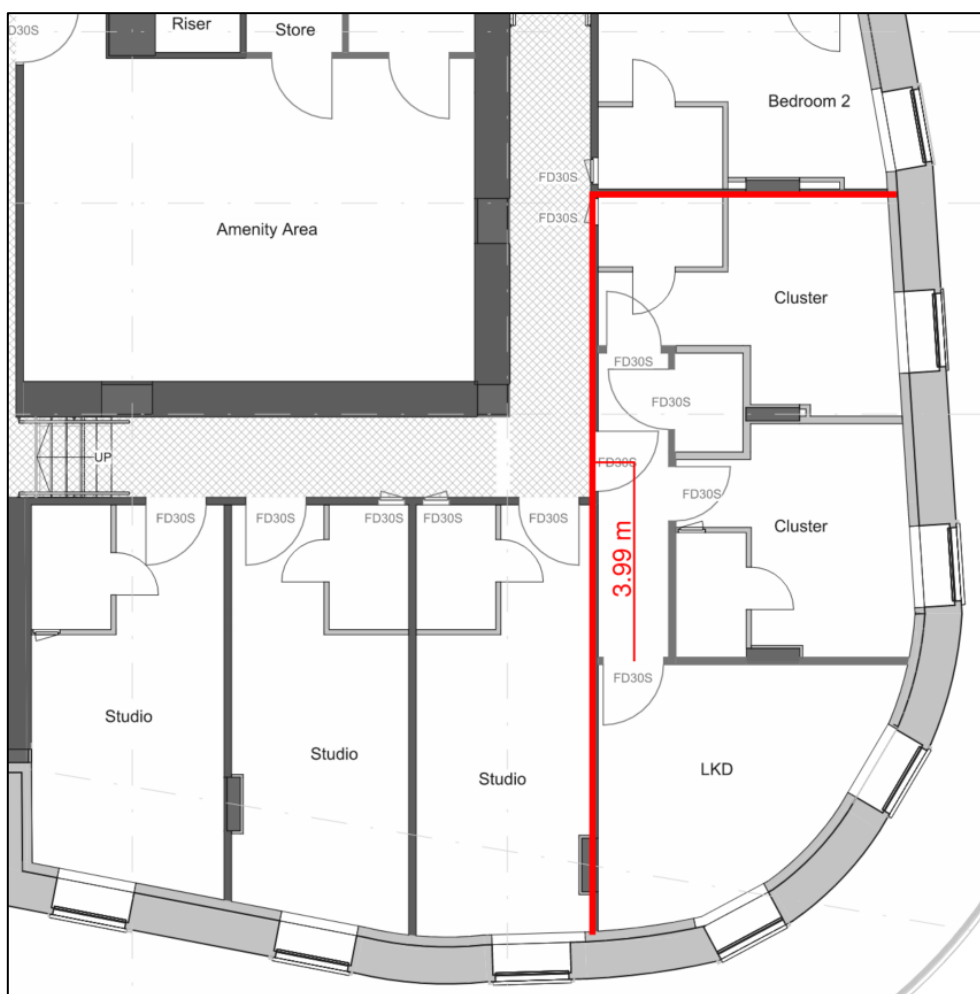


Figure 4: Lower-Level Cluster Accommodation

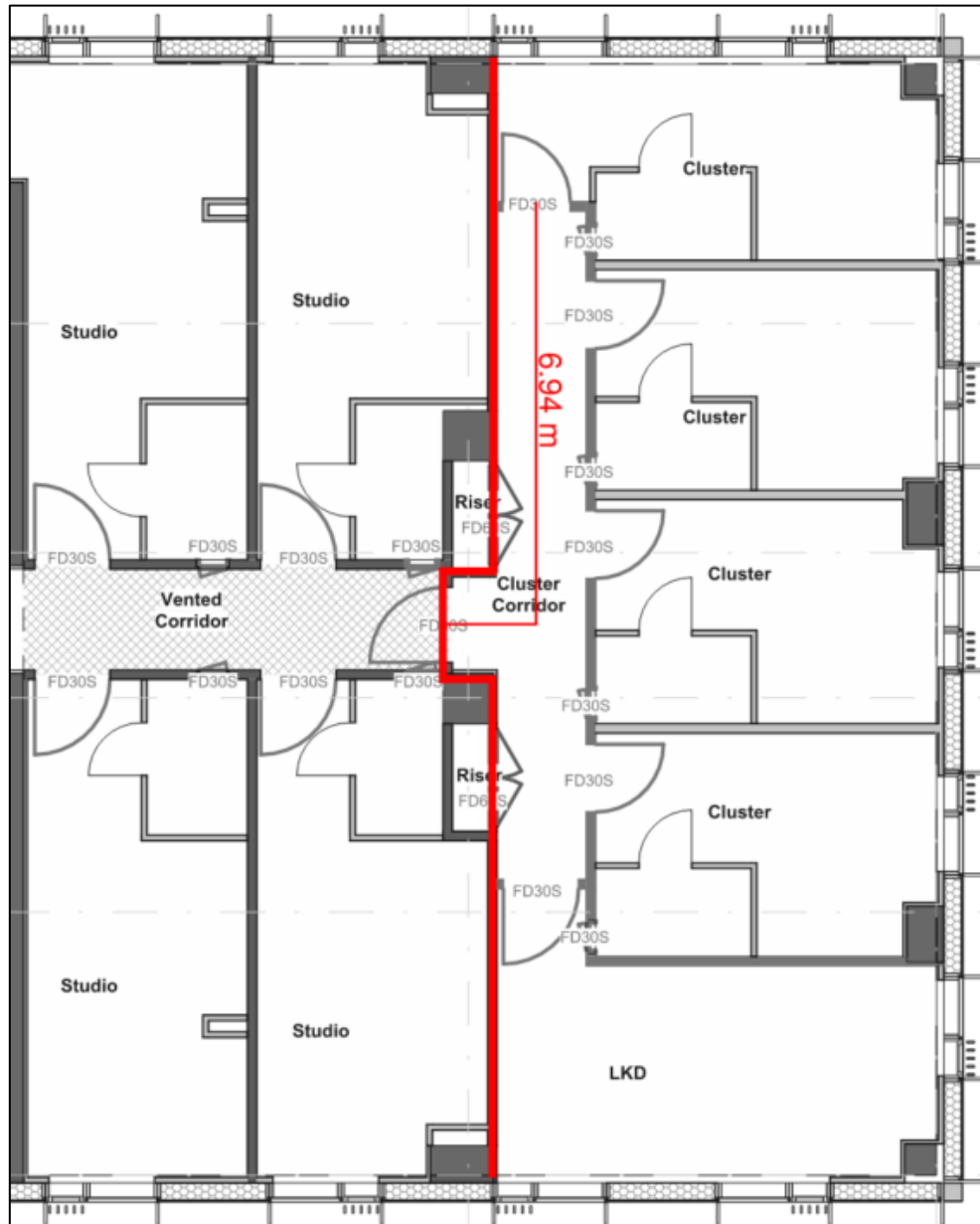


Figure 5: Upper-Level Cluster Accommodation

6.3 Studio Apartments

There will be studio flats throughout all residential levels, including accessible studios for mobility impaired occupants at levels 1 to 3. Studios will have the kitchen and the bedroom located within one space with a ceiling height of at least 2.25m. An LD1 standard alarm and sprinklers will be provided to support this design. The cooking facilities will be located remote from the apartment entrance.

A typical studio layout is shown in Figure 6, Figure 7 and an accessible studio as present on levels 1, 2 and 3

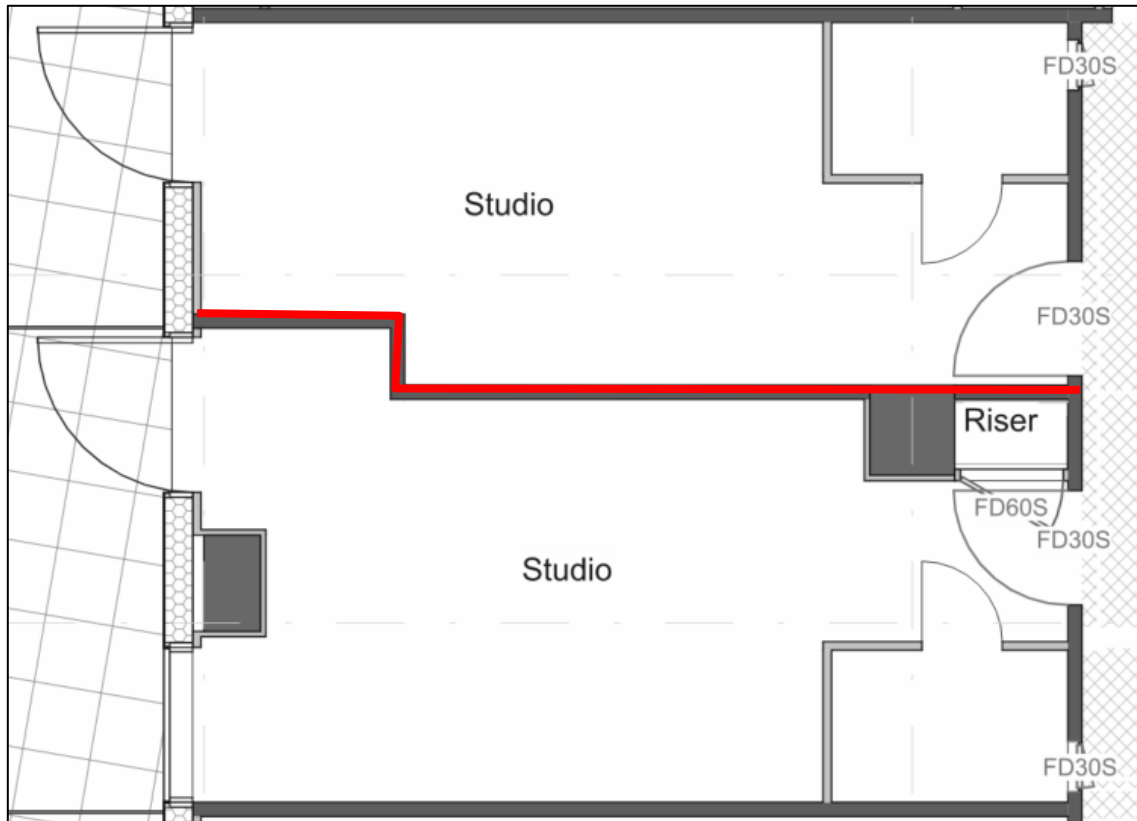


Figure 6: Typical Studio Apartment Layout

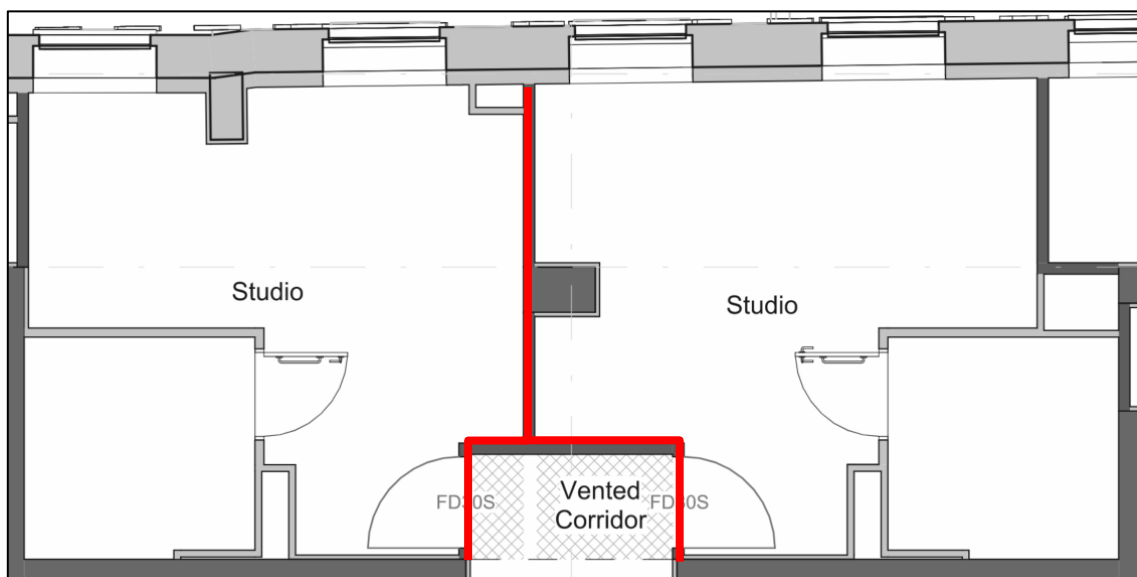


Figure 7: Typical Accessible Accommodation Layout

6.4 Open Plan Apartments

There will be two open plan flat arrangements with habitable rooms being accessed as inner rooms across levels 1-3 and level 34. Open plan apartments are proposed based on the following design criteria being met:

- Apartments will have an LD1 standard of fire alarm and detection,
- Apartments will be provided with sprinklers,
- Apartment dimensions will be within 16m x 12m,
- The ceiling height will be at least 2.25m,
- The escape from the sleeping accommodation will be in line with Section 6.5 below.

The two open plan arrangements are shown in Figure 8 and Figure 9, shown below.

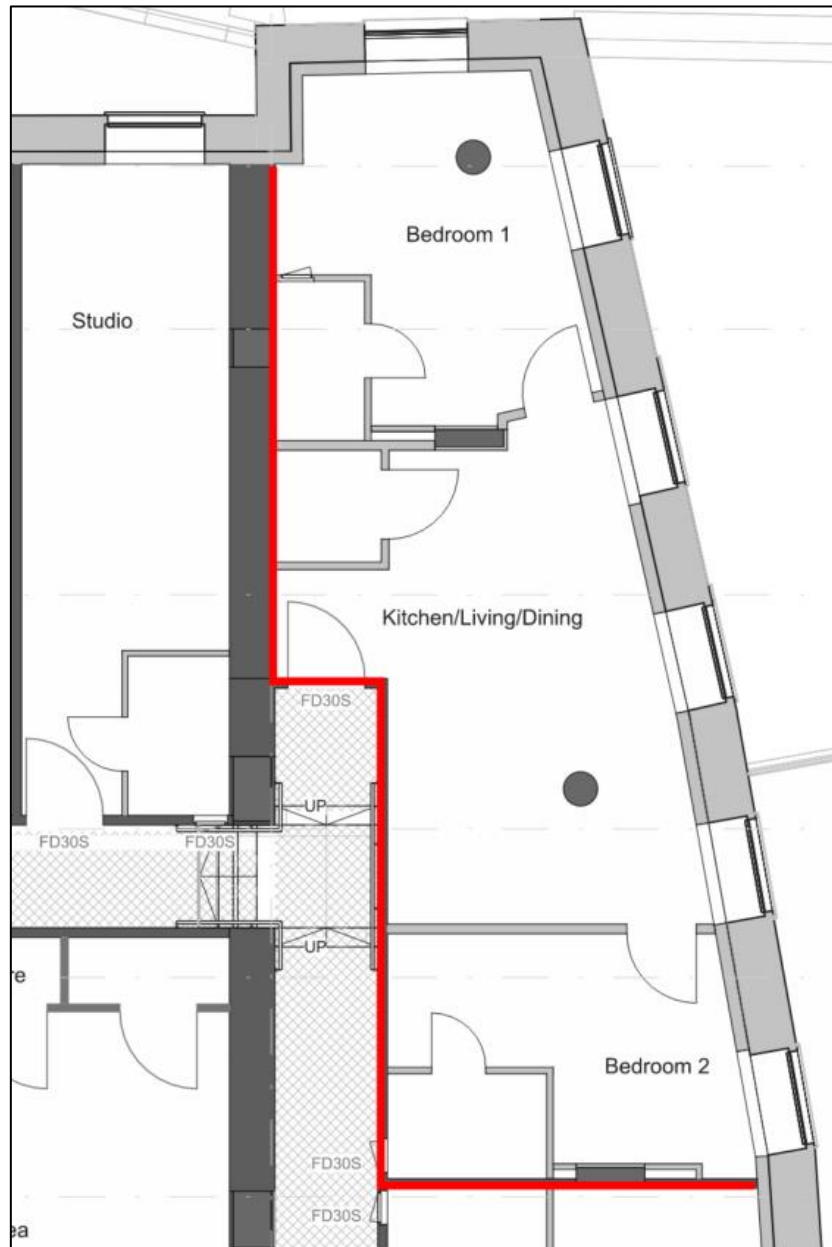


Figure 8: 2 Bed Apartment Arrangement

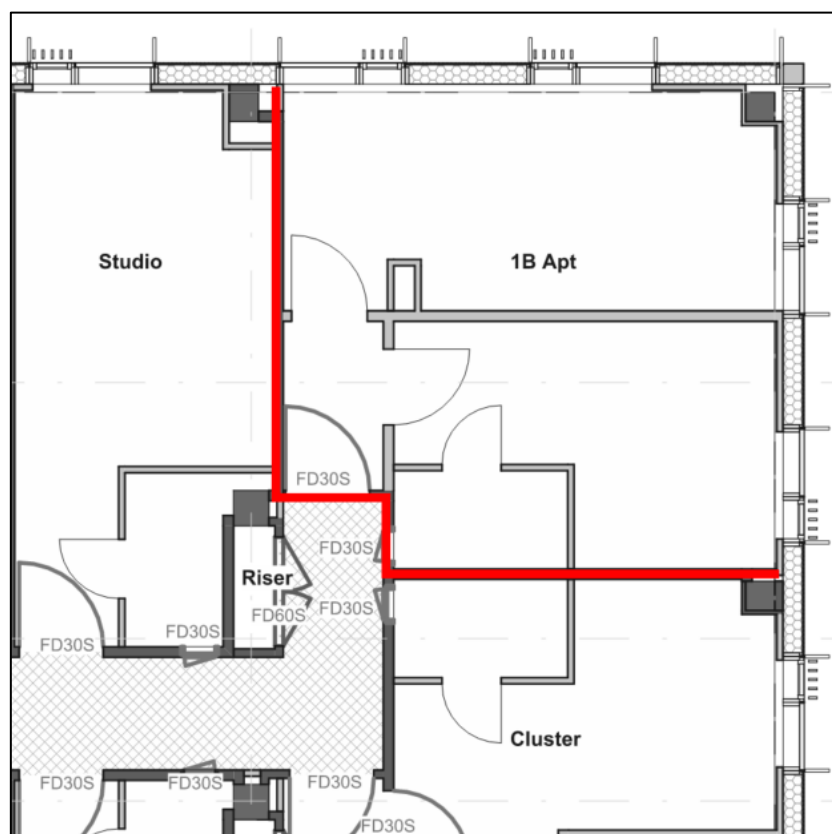


Figure 9: 1 Bed Apartment Arrangement

6.5 Kitchen Locations

The BS9991:2024 guidance recommends that cooking facilities in studios should be located 2.7m away from any opposing wall, consisting of a 900mm wide unobstructed escape route at least 1800mm away from the hob edge. Cooking facilities arranged in line with the final exit will be located at least 2.1m away from the leading edge of the exit door, consisting of a 300mm gap at least 1800mm away from the hob edge. The above separation distances are shown in the figure below.

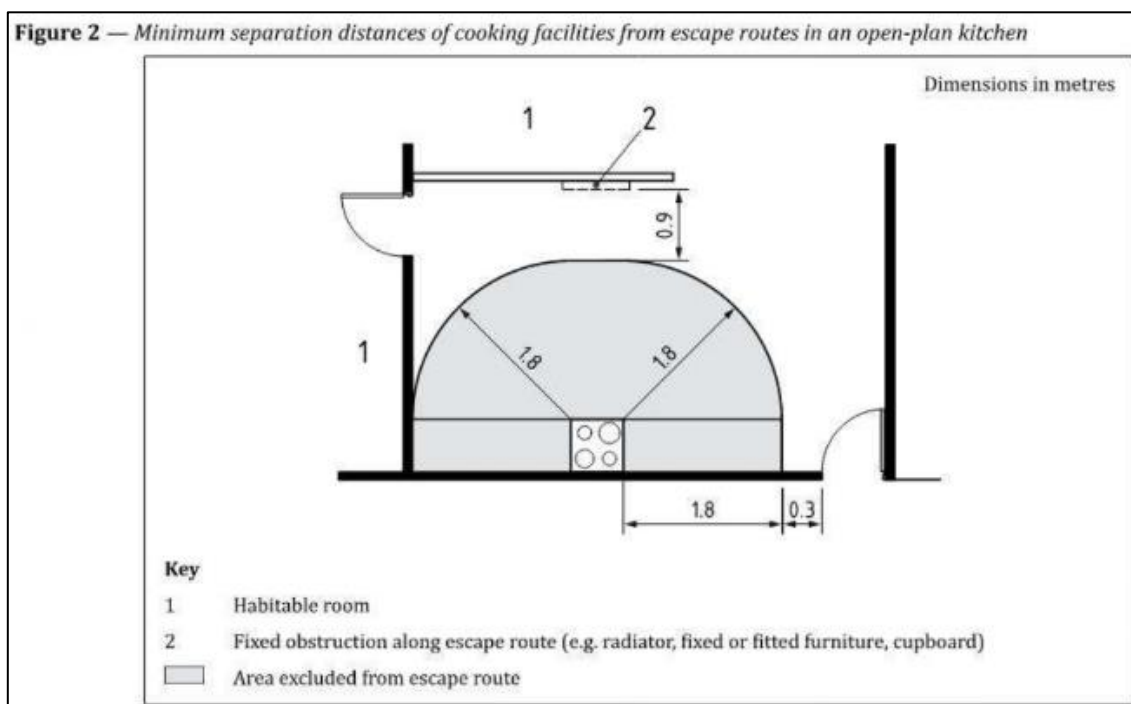


Figure 10: Escape Past a Hob (BS 9991:2024 - Figure 2)

The analysis in Appendix B shows that in the event of a hob fire occupants will not be subjected to untenable conditions provided there they will be 1.1m from the hob. Allowing for the width of the occupant, 0.5m, at least 1.6m should be the minimum provided based on the analysis between the hob and opposing surface, such as a wall or fixed furniture from the bed where an occupant would be asleep.

This will marginally be exceeded in the arrangements as shown in Figure 11 below as the base of the bed will be located approximately 1400mm from the hob edge. To support this arrangement, hob cut off devices are proposed (as per Section 2.2) to reduce the likelihood of a hob fire and reduce the further heat transfer to the fire in the event that one is detected.

Additionally, the occupants will be able to turn their back on the fire directly from the bed and will be located at least 1.8m away from the hob edge once they have stood up. Appendix A provides additional supporting information on the benefits of residential sprinklers provided to support the analysis in Appendix B.

As the scheme develops, the hobs will be located as far away from the beds as possible and at least 1.8m away from the bed where the sleeping risk is present and at least 2.7m away where possible based on the studio floorplan. This is shown in Figure 11 and Figure 12 below. Further commentary on studios which do not achieve the 2.7m hob distance will be provided as the scheme progresses, to support the proposed accommodation layouts.



Figure 11: Sleeping Accommodation within 1.8m of the Hob Edge

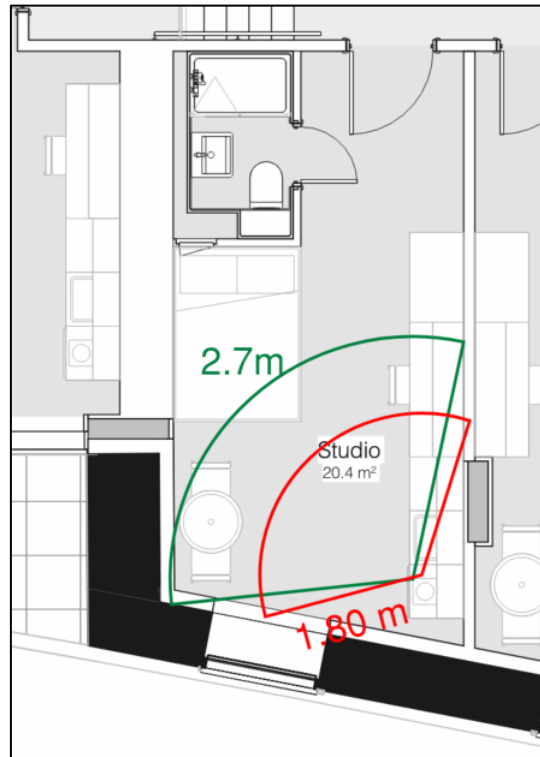


Figure 12: Arrangement with Suitable Hob Separation.

6.6 Private Terraces

Apartments/ancillary spaces that are provided with a private terrace the occupants will not be required to escape through more than one access room before reaching a place of relative safety. As discussed in Section 2.4, a beacon and a sounder will be provided to the terrace unless the internal fire alarm system will be clearly audible from the terrace, or the access room is clearly visible. This will also be provided to the green roof on level 4 which will only be accessible for maintenance personnel.

The terrace accessed from the ancillary space at Level 3 will be an “inner room” where occupants have to escape through an access room, i.e., through ancillary space to reach the protected corridor. This arrangement will be in line with Section 7.8 below.

Appendix E.3 of BS9991:2024 outlines the design requirements for private balconies and terraces. The design at The Hotspur Press for private terraces will achieve the following requirements;

- The evacuation from the private terraces will not require occupants to pass through more than a single access room to reach the common corridor;
- The terraces will generally be small, and the façade design of the building will consist of significant portions of glazed curtain walling. On this basis there will be great visibility of the access room from the terrace;
- An LD1 fire alarm and detection system will be provided within each studio and additional sounders and beacons will be provided on the terrace to alert occupants of a fire within the access room even if the door is in the closed position.
- The travel distance from the furthest point of the each private terrace will be within 7.5m of the access room.

However, across the levels with residential terraces, Section E.3 subclause c), will not always be achieved. This clause requires the means of the escape from these locations to achieve the requirements of an open plan kitchen. This would require any occupants escaping from the terraces present on levels 1, 2 and 3 to not escape within 1.8m of the hob edge. This arrangement will not be achieved in 13 studios across the entire building, with the studios at levels 1 and 2 indicated in Figure 13 below. Where feasible, these doors should be relocated but this will not be possible in all locations due to the size of the balconies, studios and the location of structural beams etc and therefore the design will be a derogation from the Building Regulations guidance.



Figure 13: Escape from a Private Terrace

However, a reduction of the escape distance past the hob should be considered reasonable given the cooking facilities will be clearly visible from the small terraces to allow occupants to clearly see the access room in the event of a fire. The cooking facilities will also be provided with a thermal cut-off system designed to BS EN 50615 which will reduce the risk of ignition, as well as the rate of development for the fire.

The proposed studio designs are currently otherwise code compliant and account for the sleeping arrangement and only the evacuation from the terrace would be a derogation. However, when comparing the means of escape from the terrace to the internal room where a sleeping occupant will have a pre-movement time of approximately 15 minutes in line with BS7974-6, whilst an occupant that is awake and familiar on the terrace will have a pre-movement time of 60 seconds when assessed to the same guidance. In practice, is it likely that due to the small confines of the studio rooms, sleeping occupants would be alerted much quicker than this since the room would quickly become full with smoke and therefore in practice alert times would be closer to 2 to 3 minutes however this still poses a significant betterment compared to the very small private balconies where occupants will have clear views into the access room and be provided with alarm. Therefore the design should be reasonable given that the design achieves all Appendix E.3 requirements with the exception subclause c) in line with BS9991:2024, but occupants will evacuate at an early stage in the fire development therefore the functional requirement of this section should still be achieved.

The report will be updated to reflect the updated arrangements as the scheme progresses, and further reviewed in detail (such as reviewing the proposed escape widths and provide further engineering justification).

7.0 MEANS OF ESCAPE

7.1 Ancillary/Amenity Maximum Occupancy

The expected occupancy of the ancillary/amenity spaces in the building are as follows in Table 1 below. Note that at this stage of the scheme, the ancillary areas are still subject to design development and the table below will be updated as the scheme progresses.

Level	Room	Occupancy Density (m ² /person)	Floor Area (m ²)	Occupancy
Basement	Amenity space	2	133	60 ^{Note 1}
	Plant Space	30	209	8
	Stores	30	169	6
	Laundry	2	23	12
	TV/Cinema Room	5	40	10
	Gym	5	109	22
	Total			118
Ground	Lounge/Winter Garden	2	321	94 ^{Note 2}
	Stores	30	34	2
	Reception / Entrance	-	130	2
Mezzanine	Office	6	32	6
	Mezzanine Amenity	2	176	54
Level 1	Store	30	12	4
	Residential Amenity	2	53	27
Level 2	Store	30	12	4
	Residential Amenity	2	53	27
Level 3	Back of House	30	11	3
	Residential Amenity	2	26.5	14
	Terrace Residential Amenity	2	241	60 ^{Note 3}
Level 35	Plant Space	30	409	14
Total Amenity Occupancy			429	

Note 1: Space limited to 60 occupants on the basis it is an inner room to the base of the atrium.

Note 2: Occupancy limited by the escape capacity of the doors at ground level, occupancy to be managed by a management strategy.

Note 3: Level 3 Terrace Amenity will be used for resident events. The space will be limited to 60 occupants in line with interior design arrangement and the intent to be provided with a single exit which will be updated at the scheme progresses. It should be noted that this occupancy may not be the day-to-day use and reflects the maximum allowable occupancy.

Table 3: Ancillary/Amenity Maximum Occupancy

The above table has assessed residential amenity areas which should be accessible to residents only, e.g. the level 3 terrace amenity area, basement and mezzanine amenities. All ancillary/amenity spaces have been calculated to conservatively account for visitors however in practice a majority of the occupants within the ancillary / amenity spaces will be already accounted for within the residential occupancy.

If the building will be proposed to operate at maximum capacity a reduction of 30 occupants will be required as the total capacity of the building exceeds the available escape capacity. Please see the merging flow assessment in Section 7.2 below.

The building's management plan should include a strategy to ensure that the occupancies across the various amenity spaces are not exceeded. If an event for the building occupants will be held at level 3 a strict management strategy should be in place to assist with controlling the occupancy and in directing occupants to the storey exits.

7.2 Merging Flow

In the event of a confirmed fire, all occupants in the amenity and ancillary areas will evacuate simultaneously. The identified worst case scenario is a fire in the reception at ground level. This scenario will require occupants to escape into the firefighting core to escape which will cause a merging flow to occur at several locations as shown in Figure 15 below.

Occupants at basement level will be able to use Stair 3 and the amenity stair for escape purposes, assuming an even split between the two stairs at basement level will account for 53 occupants per stair in line with the occupancy listed in Table 3.

The upper levels (mezzanine, first, second, and third floor), will have access to both stairs 1 and 2 for escape purposes. Based on the estimated combined occupancy of 199 (as shown in Table 3) across these levels, we have assessed each stair as being evenly occupied during evacuation. Therefore, for the purpose of the merging flow assessment 100 occupants will utilise stair 2, when merging at ground floor. Note that the merging flow equation used in BS9991 accounts for the full capacity of the stair to be utilised (292 occupants) which does not accurately reflect the conditions at the Hotspur Press as only approximately 100 occupants will need to escape per stair and as such the merging flow within the Stair 2 final exit enclosure will present a better escape capacity than calculated.

For the purpose of the merging flow assessment, we have assessed the final exit as achieving 1800mm clear width assuming the doors ironmongery (i.e. door handles, push bars etc.) protrudes a maximum of 50mm per leaf.

An initial merging flow assessment carried out with an escape capacity of 4.1mm/person in line with BS9991:2024 provides:

$$W_{FE} = NX + 0.75S_{UP}$$

W_{FE} = Width of the final exit door – 1800mm (as described above)

N = Occupants escaping from ground floor

X = Minimum door width per person (BS9991:2024 - section 5.1.2. c) 2)) – 4.1mm

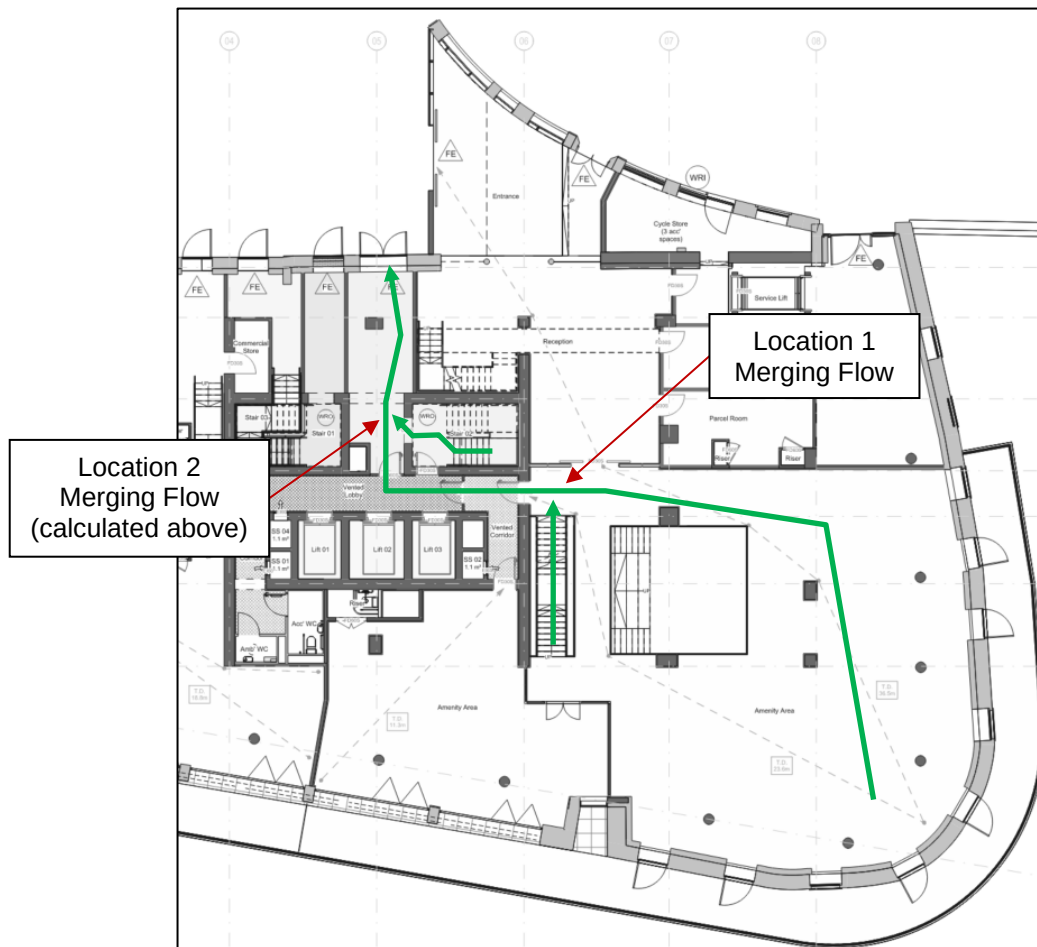
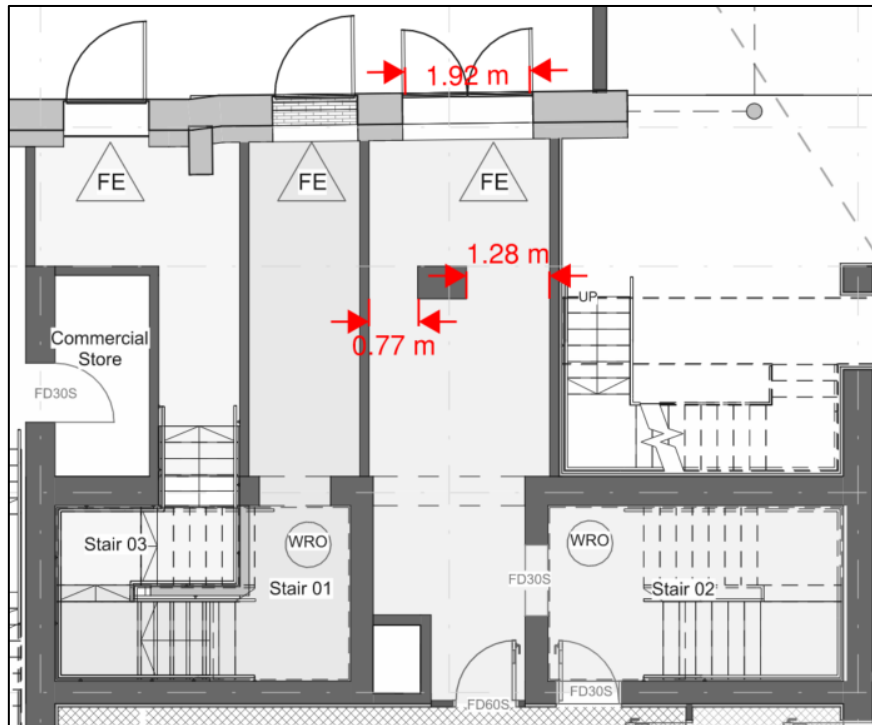
S_{up} = Stair width for flights going up – 1200mm

Rearranging the equation to account for the available occupancy escaping from ground floor we get the following:

$$\frac{W_{FE} - 0.75 * S_{up}}{X} = N$$

$$\frac{1800 - (0.75 * 1200)}{4.1} = 219 \text{ occupants}$$

This presents a surplus of 68 occupants for the worst-case occupancy of the building with approximately 151 occupants merging into the Stair 2 final exit corridor from basement (53) and ground level (98) and therefore this arrangement is considered reasonable. When assessing the merging flow only the final exit is accounted for when determining the escape capacity at this level, it should be noted that the structural column within the final exit corridor creates a pinch point, and we have not accounted for any occupants evacuating around the narrow side of the pillar given it measures less than 750mm wide. However, despite this narrowing of the escape route, all occupants will be located in a place of relative safety achieving at least 120 minutes fire resistance, the calculations account for the stair being at full capacity when it will at most likely achieve approximately 30% capacity and the occupants in this space will be exiting to a place of ultimate safety and as such we believe the arrangement is considered reasonable.



7.3 Stairs

7.3.1 Provision

The building will be provided with two protected stairs serving the residential levels.

Stair 2 as seen in Figure 16 below will be the main firefighting stair and the stair will serve ground floor to level 33. All lifts serving both stairs will be dual-purpose firefighting and evacuation lifts in line with BS9991:2024 which requires lifts in buildings over 50m to be dual-purpose. The arrangement is detailed further in Section 7.10. Stair 1 will be a protected stair and serve all upper levels, however the fire strategy provisions of the stair will achieve the same standard as that of a firefighting stair, except from serving basement in order to meet the requirements of BS9991:2024 for stairs serving basement. Both stairs will be at least 1200mm wide, measured between the handrails.

There will be a third stair, Stair 3, which will independently serve the basement level next to the Stair 1 core which will discharge directly to the outside. All protected stairs will be accessed via a protected lobby at all levels.

There will be two open accommodation stairs with one serving basement to mezzanine level and one serving reception to mezzanine level. The accommodation stairs will generally not be used for escape given there is good separation of protected escape routes; only the stair serving basement to ground floor will be used for evacuation to provide occupants in the basement with a choice of escape routes. These travel distances are taken to the storey exit of the floor above / below in either case and will comply with Section 7.6 and 7.7.

The basement plant space will only be provided with stepped access given the floor within this space will be recessed to provide appropriate spacing for the sprinkler tank. Given the space will be accessible for maintenance only this arrangement is considered reasonable.

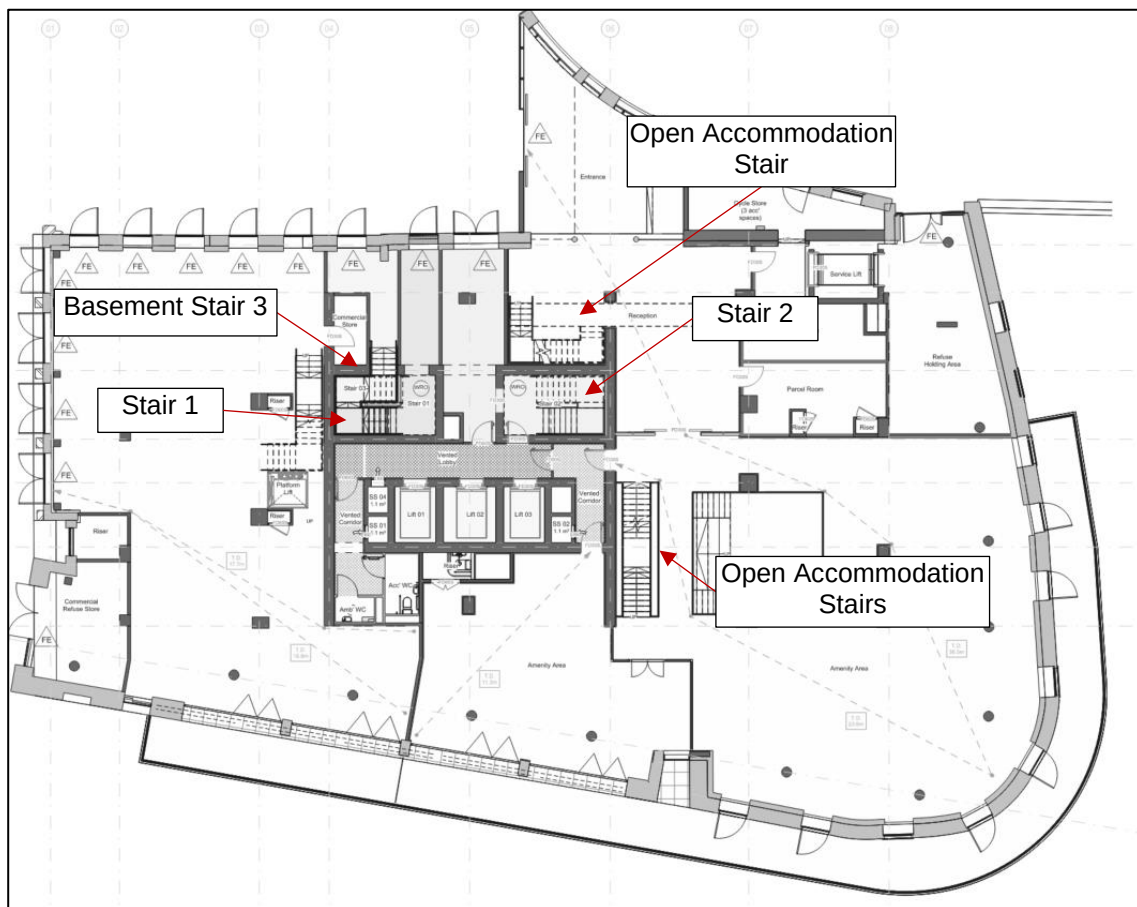


Figure 16: Stair Locations

7.3.2 Evacuation Stair Design

BS9991:2024 guidance provides reference to BS5395-2010 stair requirements which conflicts with the current guidance in the Approved Document K. The stair will be provided with a goings depth of 250mm in line with

Approved Document K contrary to BS9991's referenced guidance which requires a going depth of 300mm. This will mean that the arrangement is a derogation from the BS9991:2024 guidance, however the change in the standard is considered a change to align BS9991:2024 with other British Standard and not that the 250mm goings are considered insufficient. Given that 250mm goings could be supported in residential buildings designed to the Approved Document B, or other buildings design to BS9999 and have no significant impact to the overall fire strategy, it is considered reasonable for the goings to achieve 250mm within the Hotspur Press.

7.4 Final Exit

All three stairs will discharge into independent final exit corridors and the final escape routes at the base of the stairs will be protected to the same standard as the stairs at the upper levels. There will be no access from the accommodation / ancillary spaces onto final escape routes unless it is accessed via a smoke vented protected lobby.

The firefighter access corridor to Stair 2 will be 500mm wider than the width required for means of escape to allow for counterflow during firefighting operations.

7.5 Storey Exits – Amenity Areas

The building will be provided with storey exits at least 850mm wide for each amenity room. Any exit less than 1050mm will be assessed at 500/m where m is the minimum exit width in line with the BS9999 risk factors. The following table provides the storey exit capacity for rooms provided with two exits. Where rooms are only provided with one exit, these rooms will be limited to 60 occupants.

Location	Risk Factor	Available Width (mm)	Exit Width (mm/person)	Escape Capacity
Residential Amenities	A1	850	3.3	151
Level 3 Terrace	A2	850	3.6	60 ^{Note 1}
Stores, including Cycle Store	A2	850	3.6	138
Basement Sprinkler Plant	B1	850	3.6	138
Other Plant	B2	850	4.1	121

Note 1: Level 3 terrace limited to 60 occupants on the basis of only having a single exit.

Table 4: Storey Exit Capacity

7.6 Travel Distances – Residential

Travel distances within the common corridors at residential level will be within 15m for single direction travel and 45m where there is a choice of escape routes on the basis that the building is sprinklered and common corridors are provided with smoke venting.

Where the common corridor is unvented and there is a choice of escape routes, travel distances will be no more than 30m.

The internal travel distance within the cluster corridors will not exceed 15m in a single direction.

7.7 Travel Distances – Ancillary/Amenity

Travel distances within ancillary/amenity space will be limited as follows:

Location	Risk Profile	Single Direction (m)	More than One Direction (m)
Plant rooms	B1	24	60
Stores (low risk)	B2	20	50
Amenity (study, lounge, gym etc)	A1	26	65

Table 5: Travel Distance in Ancillary/Amenity Space

The higher risk plant spaces the basement plant will be enclosed in fire resisting construction and fitted a smoke sealed fire door set (detailed in Section 11.2 and 11.3). These spaces will be provided with a suitable suppression system detailed by the sprinkler specialist and an L2 automatic fire detection and alarm system.

7.8 Inner Rooms

There will be some inner rooms such as the basement amenity space, gym and the buildings terraces. There will also be inner rooms in the basement plant. Inner rooms will comply with the Building Regulations guidance as:

- The doors will be provided with a vision panel achieving at least 0.1m².
- The fire alarm will be audible within the inner room, otherwise an alarm will be fitted in the room to alert occupants of a fire within the access room.
- Travel distances will be within the recommended limits.
- The room will have no more than 60 occupants.
- The ancillary/amenity rooms inner rooms will not be used for sleeping.

7.9 Door Devices, Access Control and Sliding Doors

7.9.1 Hold Open Devices

Some doors may be provided with hold open devices to improve day-to-day circulation. Doors on hold-open devices will fail to the closed position on fire detection, power failure, or device malfunction.

Should this be necessary, these doors will be held open on electrically operated door-release mechanisms and the following criteria will be satisfied:-

- The door-release mechanism will conform to BS 5839-3 and BS 7273-4:2015
- will fail safe in the event of a fault or loss of power the release mechanism will be triggered automatically;
- All doors fitted with automatic doors releases will be linked to the fire detection and alarm systems;
- All automatic door releases within a component / sub compartment will be triggered by all of the following:-
 - The actuation of any automatic fire detector within the compartment;
 - The actuation of any manual fire-alarm call point within the compartment;
 - Any fault in the fire warning system within the compartment;
 - Any loss of power to the fire warning system;
- Automatic door releases will be provided with a ready means of escape manual operation from a position at the door;

7.9.2 Access Controls

Doors along escape routes, including dwelling entrances / exits, may be fitted with locks for security purposes. However, these doors will be designed to be easily openable from the escape side without the need for a key or the need to manipulate more than one simple mechanism.

7.9.3 Sliding Doors

The sliding doors in the reception will open in the event of fire detection, power failure or device malfunction to support escape.

7.10 Disabled Occupants Escape

7.10.1 Waiting Space

The building will be provided with temporary waiting spaces in front of each of the dual-purpose evacuation lifts on all floors in line with the BS9991:2024.

The evacuation lift lobbies will be provided with visually contrasting floors, walls and lift walls/doors in line with BS8300-2. The floor area (at least 1500mmx1500mm wide) in front of the lift's doors will contrast visually as part of the wider lobby which will achieve at least a 1500mmx2100mm dimension. The space in front of each lift will be provided with a two-way emergency voice communication system. If there will be a floor-by-floor evacuation carried out by the fire-service, occupants will be able to defend in place until alarm and then escape to the protected lobbies. In the event the fire started in their apartment, occupants would be able to escape to the protected lobbies and use the emergency voice communication system and call the evacuation lift.

For the common corridors, based on a standardised wheelchair spacing of 850mm, this would leave approximately 1250mm for other occupants to escape in the event a fire, much more than the 750mm required for ambulant occupants meaning that there would be sufficient room for occupants to escape past a wheelchair located within the evacuation shaft lobby for the evacuation lift. This would also double up for additional wheelchair spaces, with space for several more wheelchairs per level, which is considered sufficient for the proposed occupancy. The Building Management should ensure that disabled occupants are spread evenly

across the floor plate during the occupation of the building to prevent any single floors lobby becoming over-occupied by disabled occupants needing to escape via the evacuation lift in the event of a floor evacuation.

A robust management plan will be developed as the scheme progresses to manage any occupants needing specific assistance in the event of a fire in their flat or in the event that the fire service call for an evacuation of a floor. The management plan will include management practices to assist in the evacuation of disabled occupants within the 24/7 cycle and seasonal use of the building. This will be further addressed in the Fire and Emergency File report. This will include the provision of personal emergency evacuation plans (PEEPs) where appropriate as part of the Gateway 3 submission process which will be strictly managed by the building operator and management team. It will be the duty of the responsible person to ensure that this care is provided throughout the lifespan of the building.

7.10.2 Evacuation Shafts

As discussed above, evacuation shafts will be provided to the building which will consist of a protected lift lobby, evacuation lift and protected stair. The lobby will primarily provide a refuge area for those waiting for the evacuation lift, have direct access to a protected stairway and not be directly accessible from any flat, maisonette, storage room or electrical equipment room.

The current provision of evacuation lifts and associated emergency communication point will support disabled escape from the upper level accessible accommodation in the event of a fire.

Note that the BS9991:2024 guidance makes reference to the BS EN 81-76 evacuation lift guidance. This document is currently out for public consultation and in process of being updated. Therefore, the release of this document is expected to be after the programme deadline for the Gateway 2 submission for this scheme. On this basis the scheme will reference Annex G of BS9999:2017 for the standards and requirements for evacuation lifts as the relevant guidance.

8.0 RECEPTION AND LOUNGE SPACE

8.1 Arrangement

The Hotspur Press is proposed to be provided with a triple height space open from the basement to the mezzanine level. This arrangement will connect residential amenities at these levels and may be continuously occupied by the residents or visitors of the building. As such the simultaneous escape of basement to mezzanine levels need to be considered. The lower levels of the podium, part of the triple height space, will be separated from the residential levels (first floor and above) by construction achieving at least 120 minutes fire resistance and therefore the triple height space will be assessed as an independent building from a fire strategy perspective which is detailed below in Section 8.2. There will be no unprotected openings between the amenity and sleeping risk parts of the building.

8.2 Deviations from Guidance

8.2.1 Design of Basement to Mezzanine in line with BS9999

The design will comply with Clause 4.4 of BS9991:2024 which states the following:

“Mixed-use residential buildings that are partly residential should wherever practicable be designed such that from the standpoint of fire safety the residential and non-residential uses are compartmented and independent of each other.

NOTE If this can be achieved, BS 9991 and BS 9999 may be applied independently to the parts of the building within their respective scopes.

Where the fire safety of the residential parts relies upon the performance of the non-residential parts then the most onerous recommendations of the two standards, BS 9991 and BS 9999, should be implemented.

The means of escape strategy for the residential parts of the building should not be based being evacuated simultaneously with the non-residential parts, and the escape routes should be independent”.

This will be achieved between the commercial use and residential use. The above clause supports that independent uses with no internal access can be designed to differing British Standards.

It is proposed to apply the same principles of this approach to support a derogation where the residential amenity areas and back of house will be treated similarly to “non-residential use” to support designing the basement to mezzanine in line with BS9999. The supporting measures for this approach are detailed below:

- The basement to mezzanine areas will form a single 120 minute fire resisting compartment triple height space. This is the same standard required for between uses.
- The residential amenity space will be protected with a commercial sprinkler system designed in line with BS EN 12845.
- The residential amenity areas and the residential studios / flats will evacuate in separate escape phases as per the means of escape strategy with amenity areas evacuating simultaneously and the sleeping accommodation will defend in place. There would be no significant risk for a typical design fire (i.e. suppressed medium fire growth rate fire) where the mezzanine to basement levels would need to evacuate simultaneously with the residential floors above. The residential levels are separated from the lower level residential amenities spanning from basement to mezzanine level by construction achieving at least 120 minutes fire resistance. Additionally, all areas of the building will be supplied with a sprinkler system. This will therefore result in a suppressed fire which is unlikely to spread any further, in a highly compartmented building, reducing the likelihood of any internal fire spread within the building. When reviewing external fire spread, the external wall build-up will be non-combustible and provided within cavity barriers to subdivide cavities and at compartment floors and walls. , therefore the propagation of fire through the building envelope is unlikely. In the event of a severe fire scenario where the Fire Service need to evacuate the building, the evacuation could overlap, however this would not form the typical means of escape practices. It would also be likely that the lower levels will have evacuated at an earlier stage whilst the residents of the upper levels defend in place.
- The only sharing of escape routes which will make the basement to mezzanine and the upper residential levels not independent of each other will be the final exit from Stair 2. The mezzanine will also have access to stair 1 however we have accounted for the entire occupancy (60) to evacuate through Stair 2. This final exit will be:
 - A sterile space, with no risk of fire within the shared space.
 - The shared escape route will either be access by the Stair or Evacuation Lift Shaft. These areas will be protected from smoke which will be demonstrated by the CFD analysis as the

scheme progresses. This would also mean that the final escape route will be robustly protected and would be smoke free in the event of a fire in either area.

- The means of escape provided by the final exit from Stair 2 will support a surplus in capacity and occupant flow rates as described in Section 7.2 above. This would support either a quicker evacuation than a worst case code compliant scenario, or provide flexibility for additional escapees as part of the means of escape arrangement.
- Where the lower levels (basement to mezzanine) interact with the shared evacuation routes (stairs/evac lifts) the principles of BS9991:2024, being the more onerous standard, has been applied to the design requirements. This provides a continuous level of protection to the escape routes at the upper levels and further supports firefighter provisions.

8.2.2 Void Edge Escape

When assessed to BS9999 the triple height space design will deviate from guidance as occupants will be required to escape within 4.5m of the void edge with the approximate walkway width at ground floor measuring 1800mm and between 1000mm and 2000mm at mezzanine level.

The void opening for the triple height space is located at the floor plate where there is no residential use hence, the requirement compartment floor to extend to these areas can be omitted as discussed in Section 8.2.1 above and the space will therefore not be designed as an atrium. This will result in no compartmentation between the basement, ground and mezzanine levels. This is reasonable on the following basis.

- All areas of these floors will be provided with an L2 alarm system. This will result in an evacuation during the initial phases of fire development and an earlier response than the minimum required (L3).
- All the ancillary spaces evacuate simultaneously.
- The travel distances are within the recommended limits and all spaces have a choice of escape routes.
- The provision of a commercial sprinkler system will inhibit the fire growth, potentially extinguishing the fire during development.

At mezzanine level the escape routes have been subdivided by smoke retarding glazing allowing occupants to essentially evacuate into a separate compartment, therefore avoiding any smoke effects on the escape route as highlighted in red below.

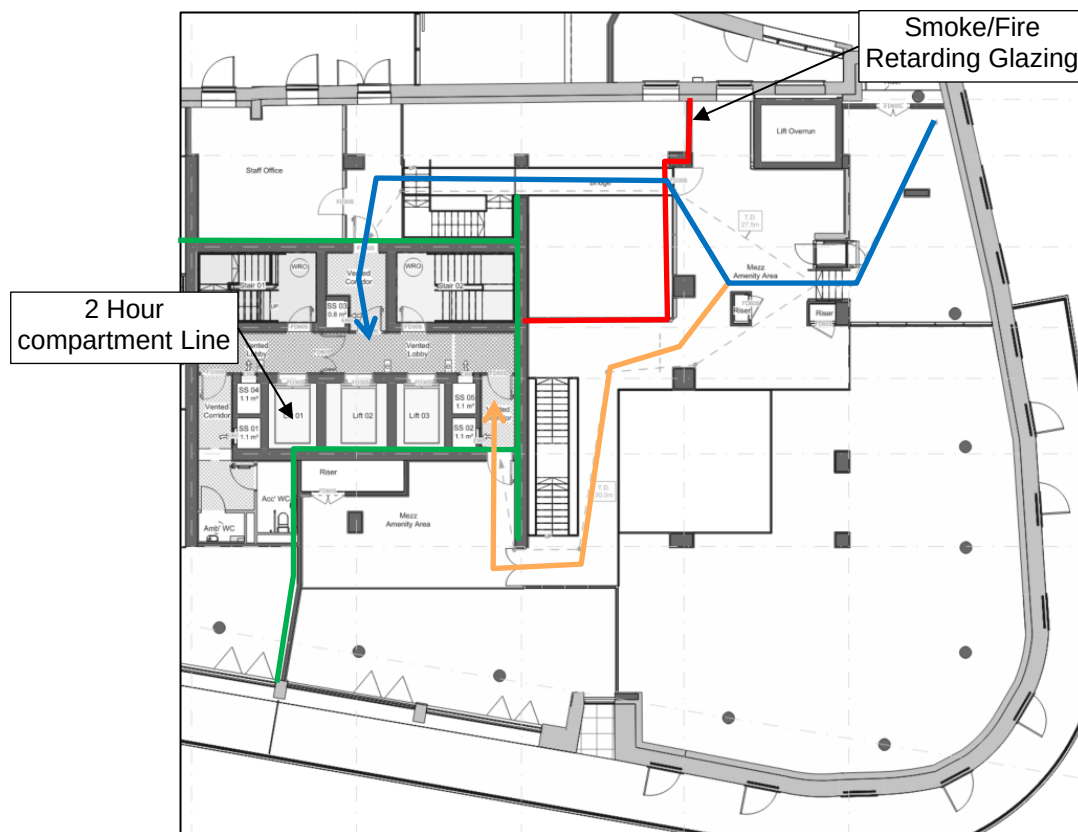


Figure 17: Mezzanine Escape routes

The proposed smoke control arrangement is yet to be determined however the proposed arrangement is considered reasonable at this stage however more detailed calculations regarding smoke behaviour and occupant escape will be carried out as the scheme develops into Stage 4.

8.2.3 CFD Modelling

8.2.3.1 Non-residential

As part of the analysis of the residential amenities at the lower level a CFD assessment is being carried out to simulate a fire located at the base of the triple height space, as well as within the reception. This will simulate the smoke propagation throughout the compartment in the two identified worst-case scenarios and provides results of the tenability conditions in an evacuation scenario. By assessing the two scenarios we will be able to identify whether there are any shortfalls in the protection to either of the escape routes along the building. The details of the models will be provided in the dedicated CFD report.

8.2.3.2 Residential

Given the building will have a racetrack layout at the podium level residences a CFD assessment is being carried out a CFD assessment is being carried out to simulate a fire located within the fire room identified as most likely to negatively affect the evacuation lobby. A similar exercise is carried out in the identified worst case apartment locations in the tower. These exercises will simulate the smoke propagation throughout the common corridors and the evacuation lobby which should be protected to the same standard of the stair, i.e. have no smoke allowed within the lift lobby. The results will be for several tenability conditions in an evacuation scenario. Details of the residential model will be provided in the dedicated CFD report.

9.0 SMOKE CONTROL AND VENTING

9.1 General

Travel distances within the residential corridors will be less than 15m a single direction. At this stage, the common corridor lobbies smoke control arrangement will be three mechanical smoke extract shafts that will serve all upper levels of the building. The shaft will achieve a total free area of 0.8m^2 . The evacuation lift lobbies will be provided with two mechanical inlet shafts to positively pressurise each lobby. Where only one lobby will be provided (i.e. basement and ground) a single mechanical inlet will serve this level.

The opening into the shaft at each level will be located at a high level within the stair lobbies. The extract rates will be determined by the specialist designer and by the Jensen Hughes CFD analysis as the scheme develops. The extract rates are likely to be between 3.5 and $5\text{m}^3/\text{s}$, with a lower inlet rate of 3 to $4.5\text{m}^3/\text{s}$. Initial CFD results indicate that the required extract rates may be closer to $5\text{m}^3/\text{s}$ at this stage.

Stairs 1 and 2 will be provided with an AOV at the head of the shaft achieving at least 0.7m^2 aerodynamic free area (Aa). The racetrack layout at levels 1, 2 and 3 may potentially require additional smoke extract at the far end of the corridor to achieve the Smoke Control Association (SCA) requirement for the corridors to clear within 2 minutes of the doors closing during evacuation. Given the podium is less than 18m above the lowest adjacent ground level it may be possible to provide a natural ventilation shaft, subject to confirmation of suitability by CFD.

The above is subject to further assessment of the updated corridor layouts.

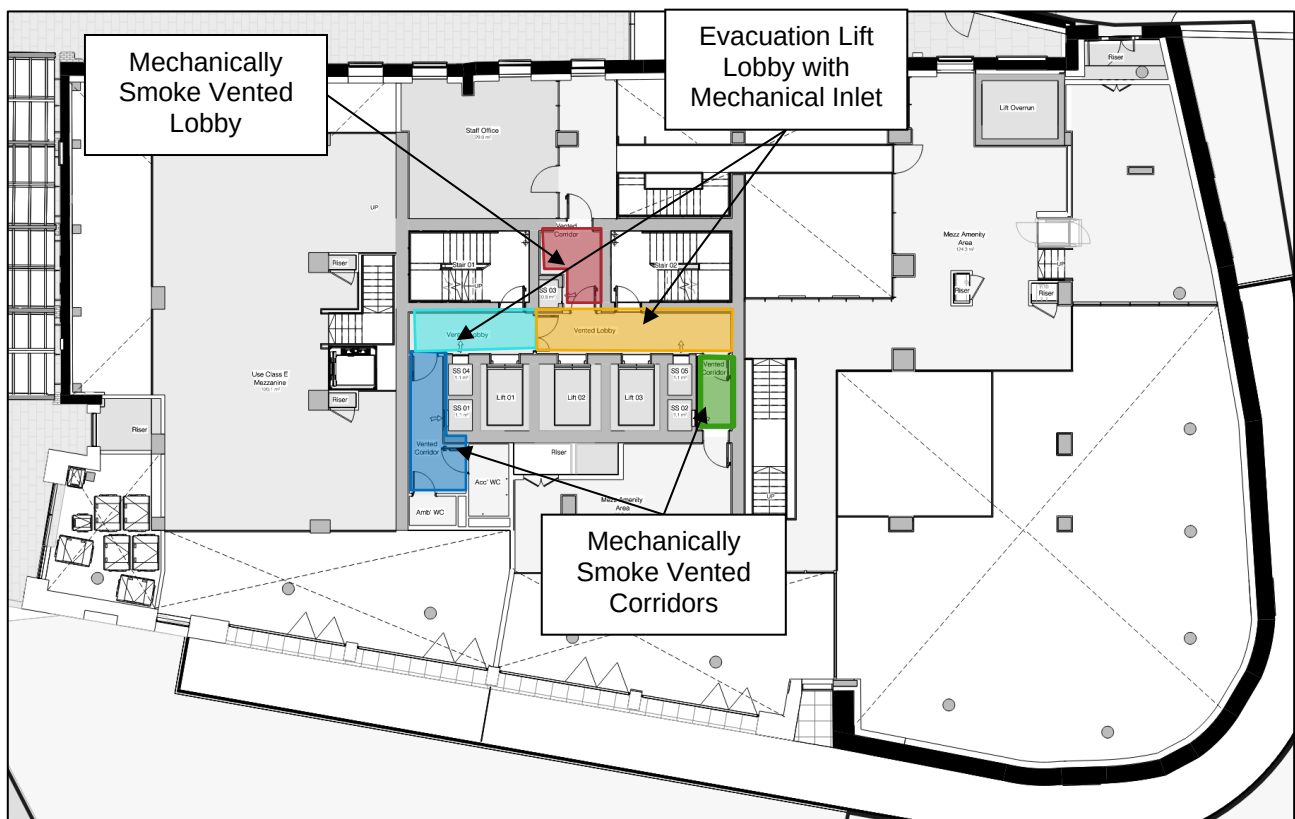


Figure 18: Mezzanine Level Smoke Extract Layout

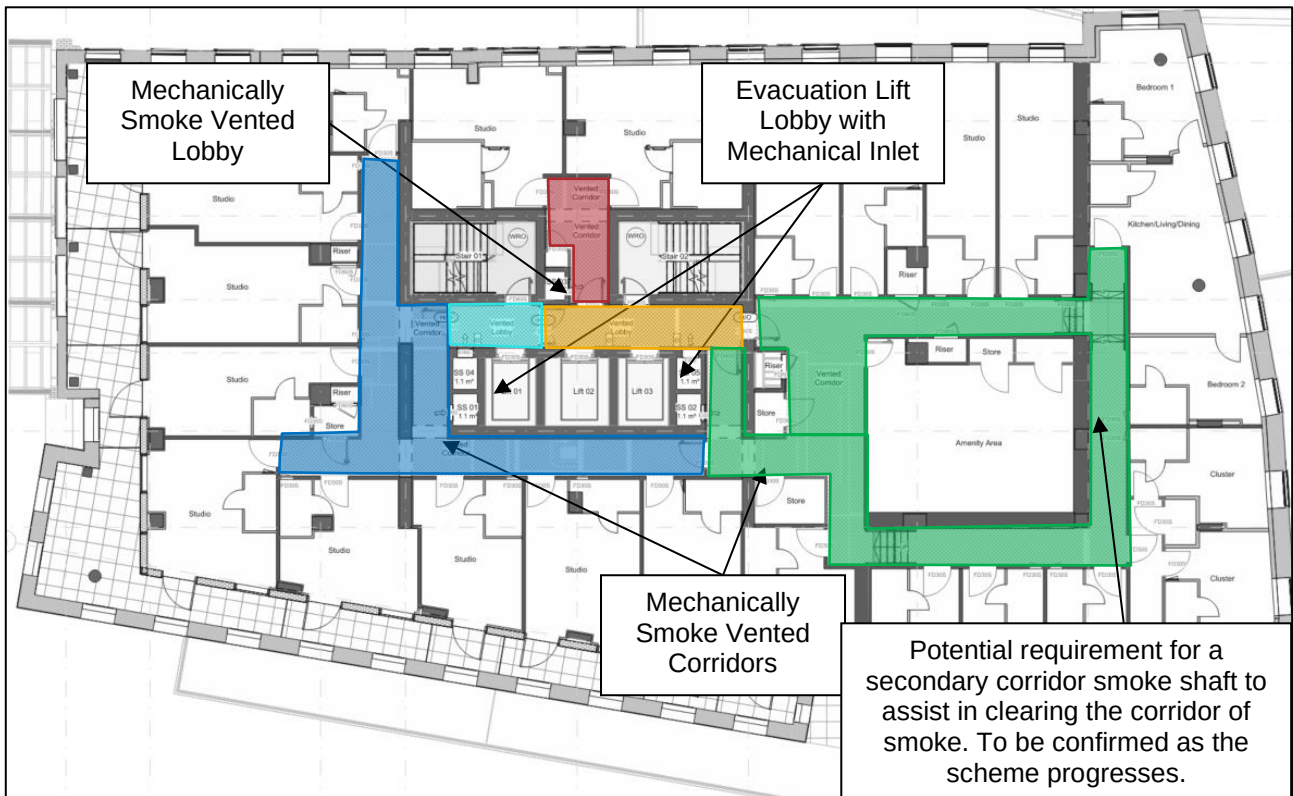


Figure 19: 1st and 2nd Floor Smoke Vented Corridors

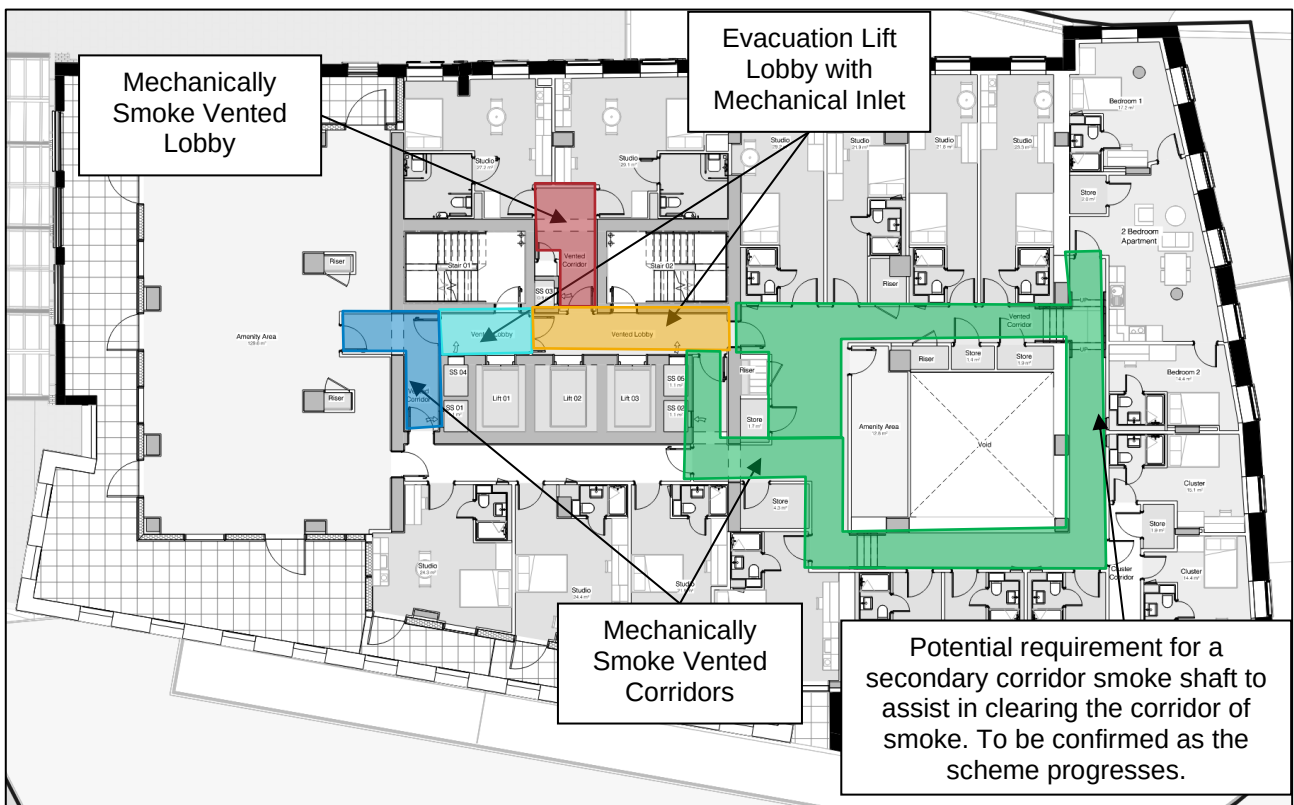


Figure 20: 3rd Floor Smoke Vented Corridors

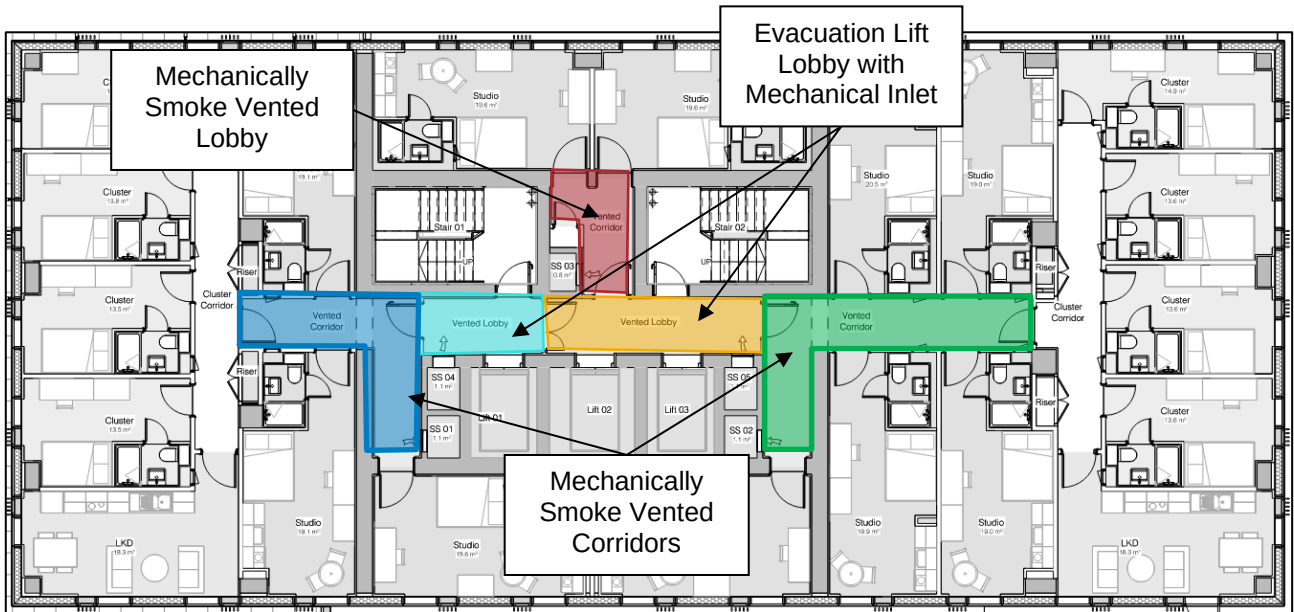


Figure 21: Tower Smoke Vented Corridor Arrangement

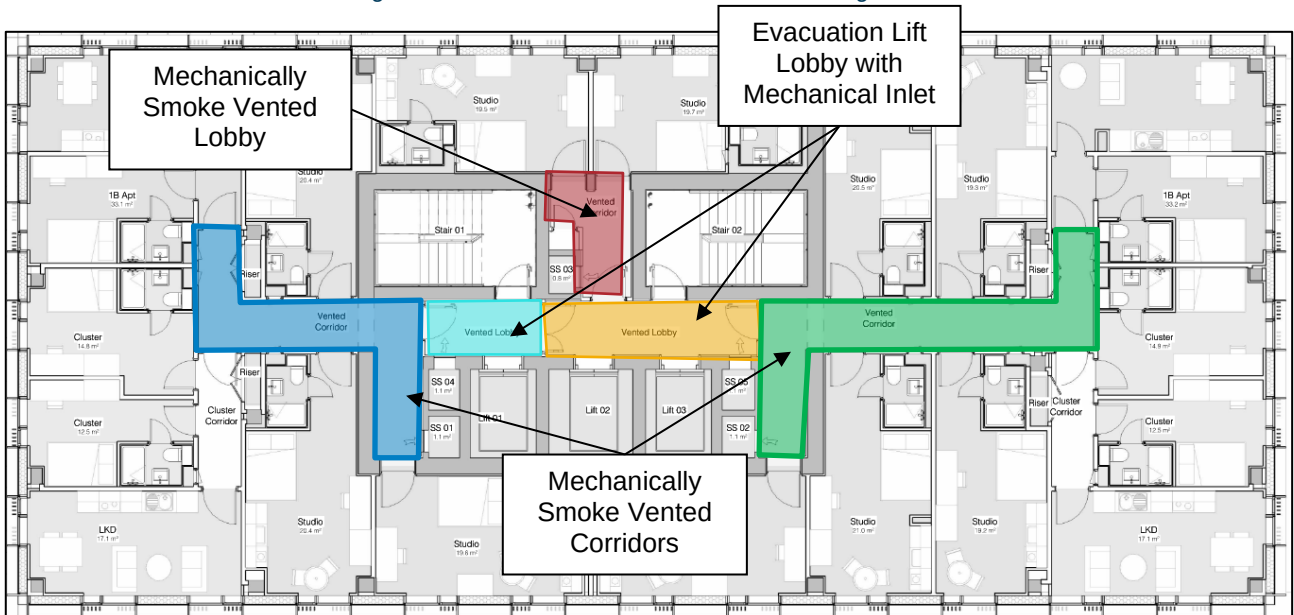


Figure 22: Level 34 Smoke Ventilation Arrangement

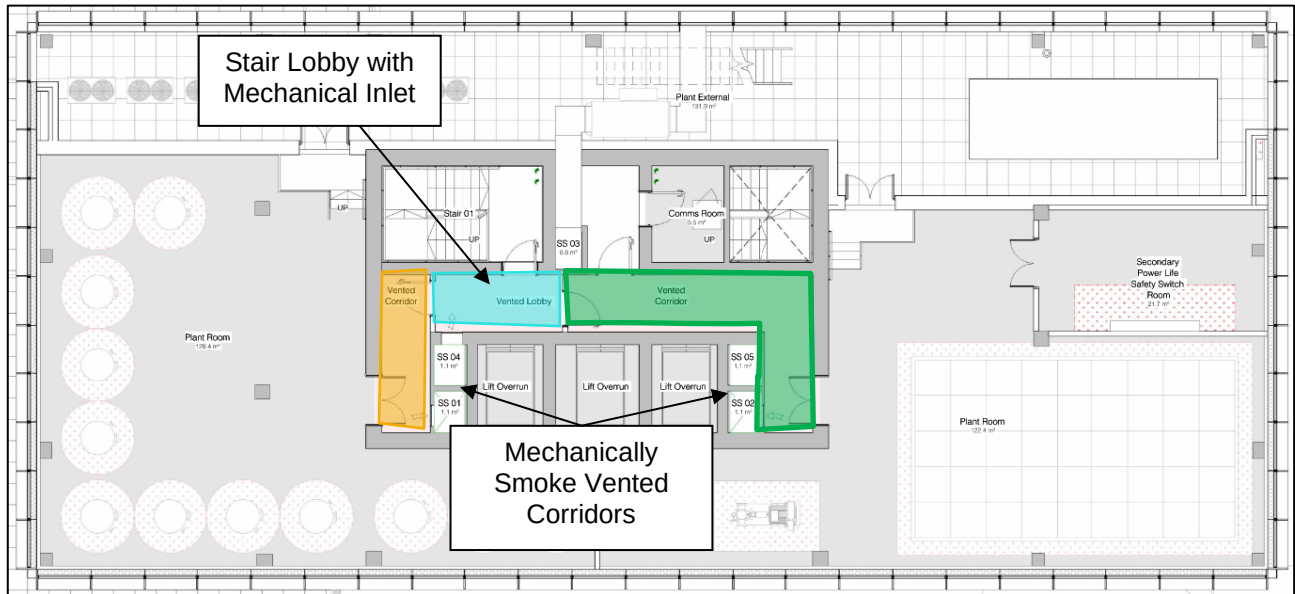


Figure 23: Level 35 - Plant - Smoke Venting Strategy

9.2 Basement Smoke Venting

The venting strategy for the basement is further detailed in Section 14.3

10.0 COMMERCIAL UNIT

10.1 Overview

There will be a double height commercial unit at ground floor. This report provides the shell and core recommendations only, with the fitout to be submitted as a separate Building Regulations application.

There is no connection from these areas to the rest of the building and future tenants will adhere to this requirement as part of any future works.

10.2 Shell and Core

The provision for the commercial unit will also provide a back of house storage and refuse space.

The shell and core fire strategy for the unit will achieve the following.

- The unit will be separated from the rest of the building by 120 minutes fire resisting construction.
- The unit will have an independent L3 standard of fire detection and alarm system and a commercial sprinkler system.
- The shell and core unit will evacuate independently to the residential section of the building. This evacuation strategy will be retained upon fit-out of the unit.
- Travel distances will be no more than 18m in a single direction and 45m from a choice of escape routes.
- Based on a retail floor space factor of 2m²/person the commercial shell and core unit will have a design occupancy of 119 occupants. This will be reasonable as there is a significant excess in escape capacity to accommodate this arrangement.
- There will be a disabled refuge measuring at least 900x1500mm, which will be provided with a two-way EVC system at the mezzanine level. Either a protected compartment will be provided to protect the refuge, or smoke vents will be provided within the mezzanine to support a tenable smoke layer whilst the occupant in the refuge waits for assistance.

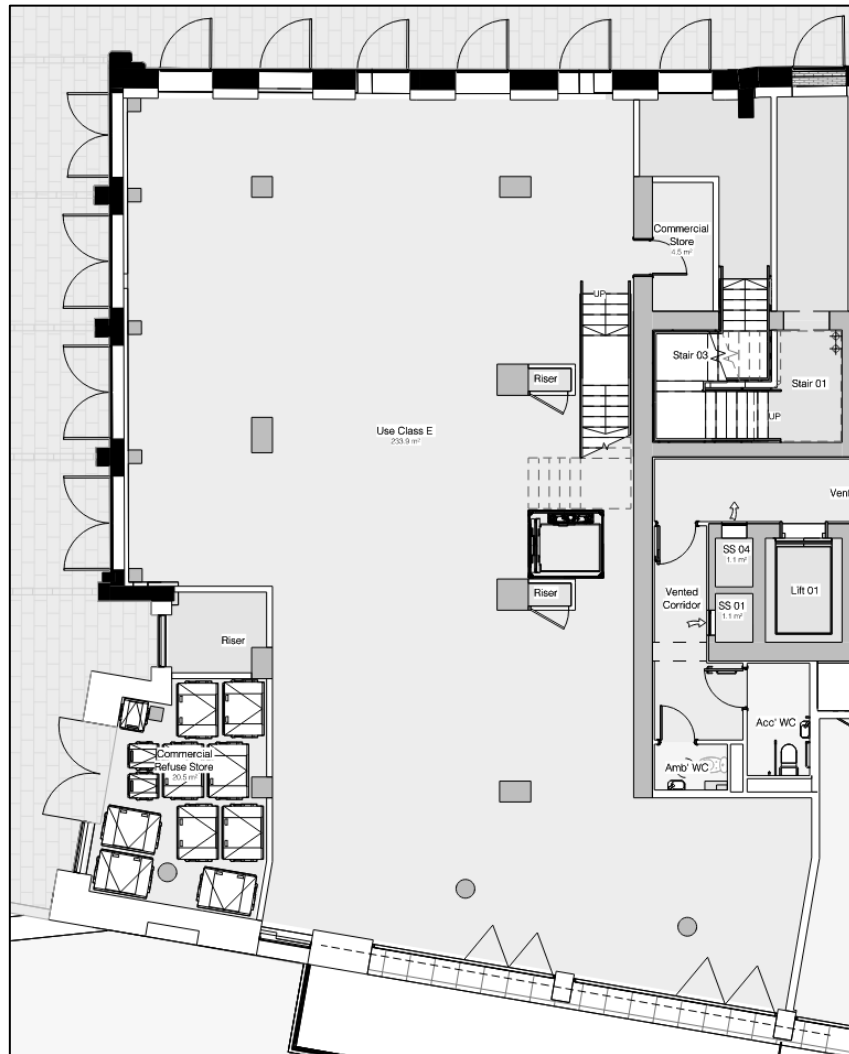


Figure 24: Commercial Unit

The fit-out of this unit will be subject to a separate Building Control application and will not be addressed in this report.

11.0 STRUCTURE AND COMPARTMENTATION

11.1 Structure

As the building will have a top storey more than 30m above ground, to comply with current Building Regulations guidance, the building's structural elements including floors will achieve 120 minutes structural fire resistance.

Structure supporting only the roof where the roof is not a floor, does not need to be fire resisting, unless the structure has a secondary role e.g. supporting other structural elements, internal fire compartmentation, supporting fire resisting external walls etc.

11.2 Compartmentation

The following will be enclosed in 120 minutes fire resisting construction:

- Floors (constructed as compartment floors).
- Firefighting shaft, consisting of the firefighting stair, lift and lobby.
- Protected stairs and lift enclosure.
- Stair final exit/firefighter access route.
- Life Safety Plant rooms.
- Walls/floors between commercial units and residential enclosures.
- Walls/floors between the residential triple height space and the sleeping risk areas of the building.
- Service riser shafts if not fire stopped at every floor level.

- Smoke shaft and smoke shaft vents.

The following will be enclosed in 60 minutes fire resisting construction:

- Apartment enclosures (such as cluster flats and studios).
- Walls separating the stair and lobby within the firefighting shaft.
- Where the firefighting shaft meets the external wall, a section of the wall at least 500mm on either side of the junction.
- Common corridors.
- Bin Stores.
- Plant space (not including life safety).
- Residential ancillary/amenity space under 100m².
- Post/Parcel Room.

The following will be enclosed in 30 minutes fire resisting construction:

- Cluster apartments kitchen
- Cluster apartment Corridor.
- Stores other than bin stores.
- Service riser shafts where fire stopped to 120 minutes at every slab level.

External walls will not need to be fire resisting see Section 13.1.

11.3 Fire Doors

Fire doors are summarised below and in line with the recommendations of BS 9991 Table 12:

- Residential entrance doors (Studios / Clusters / Flats) – FD30S or E30 S_a.
- Firefighting Stair doors – FD60S or E60 S_a.
- Firefighting Shaft doors – FD60S or E60 S_a
- Escape Stair doors – FD30S or E30 S_a.
- Firefighting lobby door at ground floor – FD30S or E30 S_a.
- Service riser doors – FD30S or E30 S_a where firestopped at slab level, otherwise FD60S or E60S_a.
- Lift doors – FD60 or E60.
- Cross corridor doors – FD30S or E30 S_a.
- Protected Lobby doors – FD30S or E30 S_a.
- Plant (Life Safety) – FD60S / E60 S_a where opening into a protected escape route, otherwise FD60 / E60.
- Plant (Non-life Safety) – FD30S / E30 S_a where opening into a protected escape route, otherwise FD30 / E30.
- Stores – FD30S / E30 S_a where opening into a protected escape route, otherwise FD30 / E30.
- All other doors – FD30S / or E30 S_a where opening into a protected escape route, otherwise FD30 / E30.

Where doors open directly to the outside, the doors will be not proposed to be fire doors.

11.4 Cavity Barriers

Cavity barriers will be provided in line with Section 25.1 of BS 9991. Reproduced in Figure 25 below.

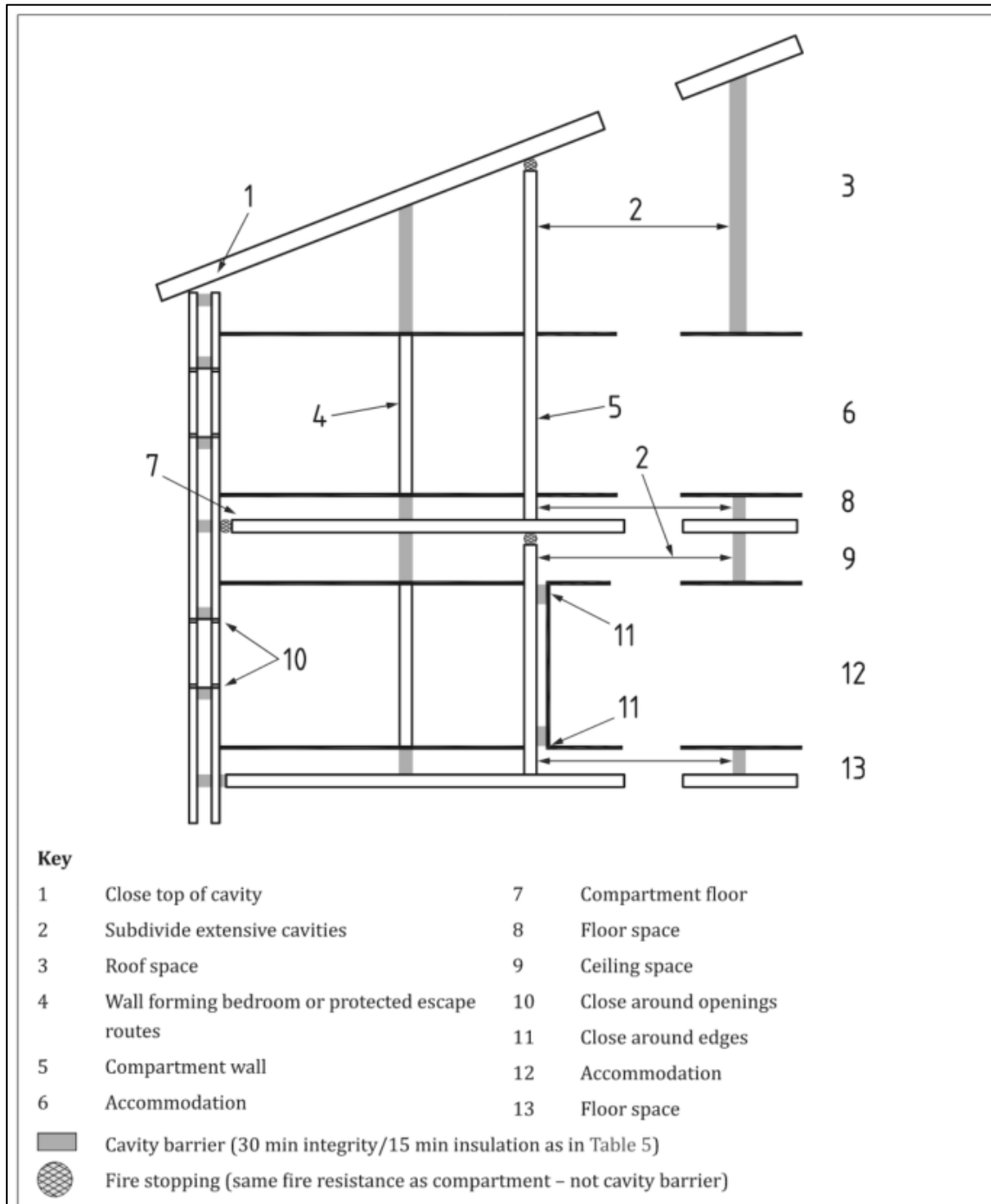


Figure 25: Figure 24 – Cavity Barrier Provisions, Reproduced from BS9991

Cavity barriers will achieve 30 minutes fire resistance for integrity and 15 minutes for insulation. See Section 13.4 for external wall cavity barriers.

11.5 Fire Stopping and Fire Dampers

Services/risers will not be accessed from the stair or stairs final escape routes, except services specific to firefighting and/or escape i.e. smoke control ducts and wet risers.

Where services pass through compartment lines, they will either be fully enclosed in fire resisting construction to the same period as the compartment, or fire stopped to the same period as the compartment itself at the compartment line.

The provision of fire stopping and fire dampers will comply with BS 9991. Where ductworks serves more than one compartment and/or a common access corridor it will be required to be provided with fire and smoke (ES)

dampers. Thermally actuated dampers will only be considered suitable within the lower level residential amenities where services pass through a compartment wall not leading onto a protected escape route. Where dampers are provided these will achieve at least the same level of fire resistance as the compartment wall they are in.

11.6 Internal Wall and Ceiling Linings

All new wall and ceiling linings provided as part scheme, will achieve at least the following classifications:

- | | | |
|---|---|----------------|
| • Circulation areas | - | Class B-s3, d2 |
| • Other rooms | - | Class C-s3, d2 |
| • Residential small rooms of not more than 4m ² | - | Class D-s3, d2 |
| • Non-residential small rooms of not more than 30m ² | - | Class D-s3, d2 |

All materials as part of the evacuation stair, landings and enclosure should achieve at least A2-s1, d0 or A1.

12.0 EXTERNAL WALLS - FIRE SPREAD

12.1 Calculation

An assessment has been carried out using the enclosing rectangle method as described in BR187: External fire spread – Building separation and boundary distances to assess the permitted area of non-fire-resisting construction on the external elevations.

Typically, boundary distances are measured to the site boundary or halfway into Gloucester St/Cambridge St. Where an external elevation faces a public road, Building Regulations guidance allows the boundary distances to be measured to the centreline of the road on the basis it is unlikely to be developed in future. The worst-case compartment size and boundary distances for each elevation has been summarised in the table below. Compartment sizes have been measured from Ground to Level 3 and at Level 35. The named elevations are shown from Figure 26 to Figure 31. The arrangement at level 34 has a higher standard of subdivision and does therefore not present a worse case to the lower towers levels and has not been shown on this basis.

The table shows that there is no restriction on the amount of unprotected area on the external elevations based on the boundary distances used and therefore no requirement to make these external walls/or openings fire resisting.

Level	Elevation	Compartment Dimensions		Boundary Distance (m)	Minimum Boundary Distance to Achieve 100% Unprotected Area	Permitted Amount of Unprotected Area
		Width (m)	Height (m)			
Ground	Elevation 1	12.2	5.9	>10	4.1	75.33m ² (100%)
Ground	Elevation 2	26	5.9	8.4	3.8	165.5m ² (100%)
Ground	Elevation 3	12.8	5.9	8.6	4.2	79.4m ² (100%)
Ground	Elevation 4	11.85	5.9	9.4	4.2	72.5m ² (100%)
Mezzanine	Elevation 5	21.4	6	9.2	3.4	132.7m ² (100%)*
Mezzanine	Elevation 6	26.7	6	6.2	3.8	160m ² (100%)**
1 st /2 nd	Elevation 7	9.5	2.6	>10	1.5	26.92m ² (100%)
1 st /2 nd	Elevation 8	14.9	2.6	>10	1.8	38.74m ² (100%)
1 st /2 nd	Elevation 9	7.4	2.6	>10	2	19.24m ² (100%)
1 st /2 nd	Elevation 10	4.7	2.6	>10	1	12.22m ² (100%)
1 st /2 nd	Elevation 11	4.8	2.6	>10	1	13.7m ² (100%)
Third	Elevation 12	5.7	2.9	>10	1.3	16.53m ² (100%)
Third	Elevation 13	8.4	2.9	>10	1.6	24.36m ² (100%)
Third	Elevation 14	15.1	2.9	>10	1.8	43m ² (100%)
4 th to 33 rd	Elevation 15	9.2	2.9	>10	1.5	26.69m ² (100%)
4 th to 33 rd	Elevation 16	5.9	2.6	>10	1.3	15.34m ² (100%)
4 th to 33 rd	Elevation 17	10.9	2.6	>10	1.6	29.64m ² (100%)
4 th to 33 rd	Elevation 18	5.5	2.6	>10	2	15.6m ² (100%)
4 th to 33 rd	Elevation 19	5.9	2.6	>10	1.4	16.8m ² (100%)

4 th to 33 rd	Elevation 20	11.4	2.6	>10	1.7	29.64m ² (100%)
35 th	Elevation 21	6.5	3	>10	2.1	19.5m ² (100%)
35 th	Elevation 22	12.1	3.5	>10	3.3	56.1m ² (100%)
35 th	Elevation 23	11.5	3	>10	2.1	34.5m ² (100%)

* Measured to the middle of Cambridge Street

** Measured to the middle of River Medlock on the basis the area opposite may be developed in the future.

Table 6: Unprotected Areas



Figure 26: Double Height Ground Floor Elevations

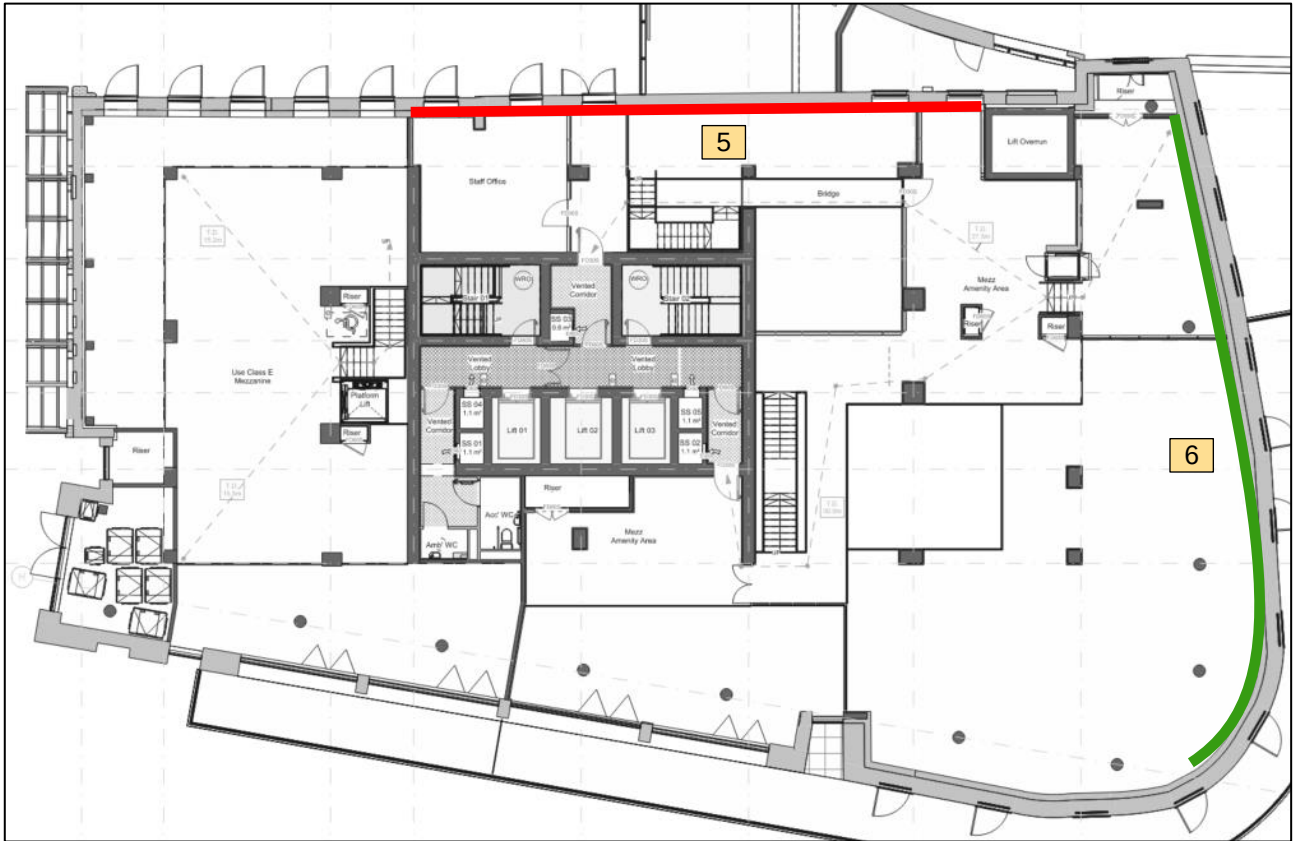


Figure 27: Double Height Mezzanine Level Elevations



Figure 28: 1st and 2nd Floor Elevations



Figure 29: Level 3 Elevations

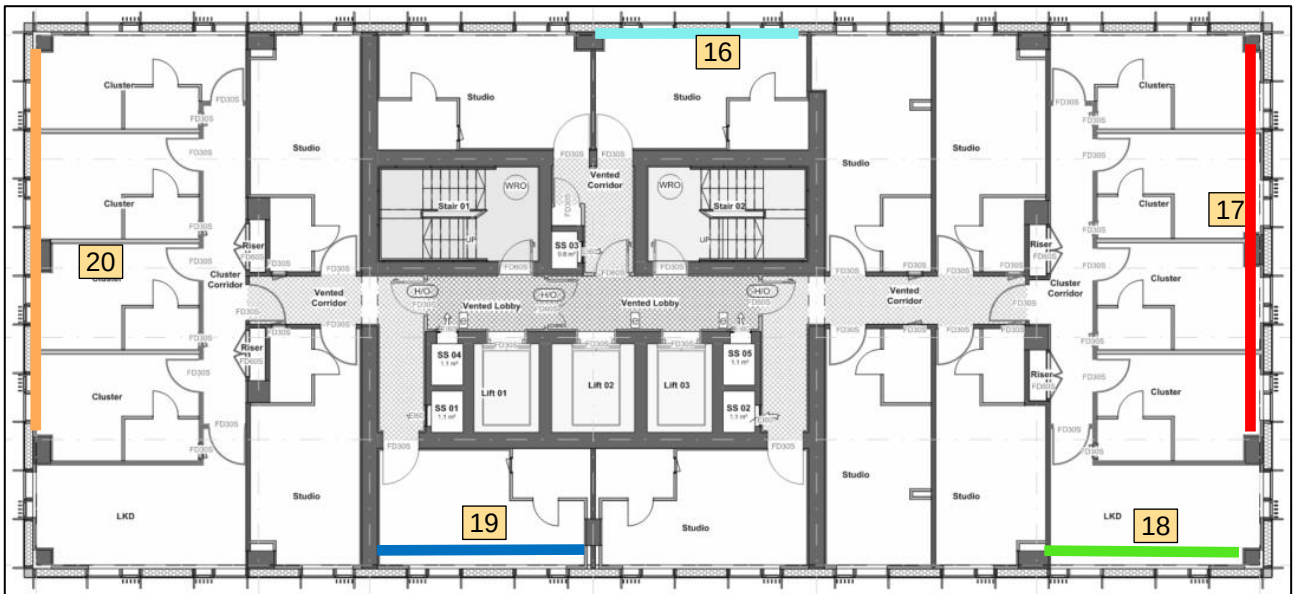


Figure 30: Levels 4-33 Elevations

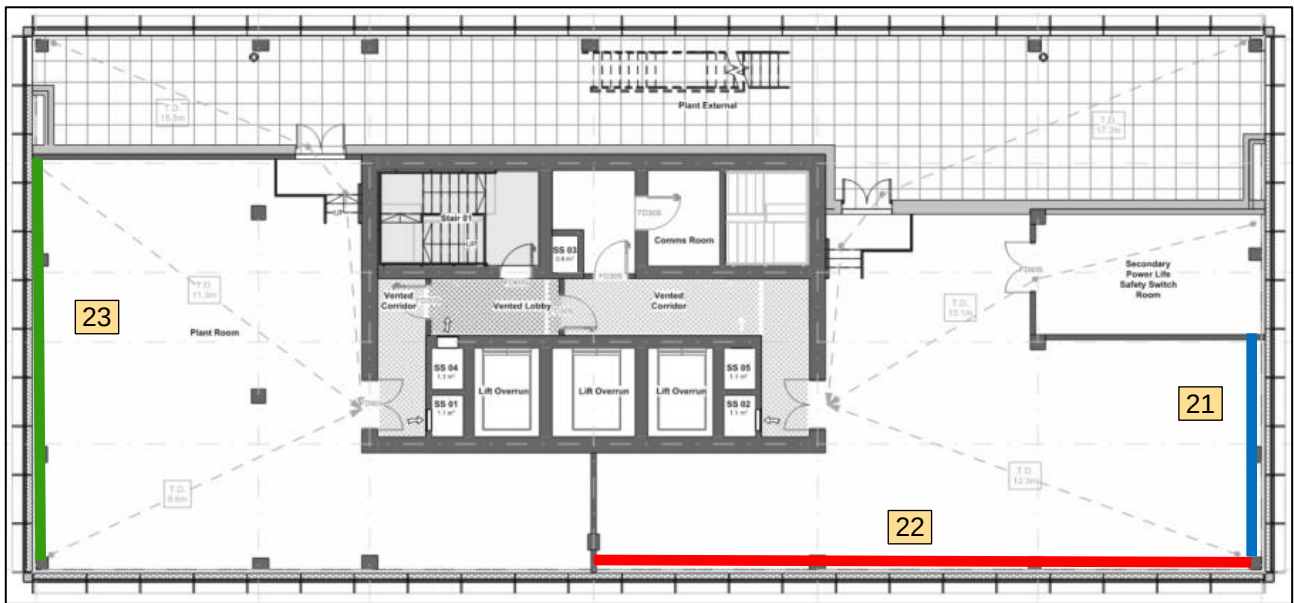


Figure 31: Level 35 Plant Space

13.0 EXTERNAL WALLS – CONSTRUCTION

13.1 Combustibility of External Wall Construction

The building will have a top floor height more than 18m above ground level and, therefore, the external wall materials in the building will comply with Regulation 7(2). All materials used in the construction of the external wall build-ups (including existing construction) therefore achieve either European Class A2-s1, d0 or Class A1. This includes “specified attachments” including: balconies, solar panels and solar shading devices attached to the external wall. See Regulation 7(3) for the full list of materials that will be exempted from meeting Regulation 7(2).

The podium levels will retain the existing brick faced façade. The external wall materials will be upgraded to comply with Regulation 7(2) as part of the works. This will include the removal of timber lintels to the existing external wall structure.

Membranes within the external wall will achieve a minimum Class B-s3, d0.

13.2 Roof Coverings

Roof coverings will achieve Class B_{roof}(t4) where they are within 6m of the relevant boundary or at least Class C_{roof}(t4) where the roof is greater than 6m from the relevant boundary. Alternatively, the roof can be a product (and/or materials) defined in Commission Decision 2000/553/EC of 6 September 2000, implementing Council Directive 89/106/EEC, that can be considered to fulfil all of the requirements for the performance characteristic ‘external fire performance’ without the need for testing, such as 50mm thick gravel or 40/50mm thick cast stone or mineral paving slabs.

Any roof coverings beneath the solar panel array will be non-combustible.

13.3 PV Panels

There will be an array of photovoltaic (PV) solar panels on the roof. If these will be above a concrete structural deck and non-combustible roof materials, with no significant risk of fire spreading down into the building, they are not considered to present any significant life safety concern. However, the manufacturer of the solar panels should be consulted for input on any associated fire risk with their products and suitable mitigation measures to reduce the risk and impact of a solar panel fire.

Property protection recommendations for PV panels and installations can be found in *RC62: Recommendations for fire safety with PV panel installations*.

Following its release in May 2024, the published guidance document, Fire Safety Guideline for Building Applied Photovoltaic Systems on Flat Roofs also recommends the following to aid firefighting operations that will be provided as part of the works:

1. *No PV panels next to the edge of the roof on any side, and aisles free of PV panels to enable uninterrupted walking path from any access point on the roof.*
2. *Extension of firewalls to avoid unexpected fire development, sufficiently strong roof construction, and main system shut-off to reduce electrocution concerns.*
3. *The successful application of extinguishing medium requires proximity, as the PV panels will otherwise block the application stream and are thus linked to the two previous requisites. If environmental concerns are of particular importance, this becomes even more crucial, as the amount of water used should be limited.*

Upon activation of the fire alarm system, the PV Panels will either automatically isolate or alternatively a fireman’s switch will be provided to trigger the isolation of the PV panels.

13.4 External Wall Cavity Barriers

Cavity barriers in the external wall will be provided in line with the recommendations of BS 9991 Section 25 and are generally summarised below:

- At all compartment lines – walls and floors.
- Around all openings in the external wall (e.g. windows, doors, ducts, etc).
- To close the edges of cavities (e.g. the top and bottom of the wall).
- To divided extensive cavities (typical cavities longer than 20m in any direction).

Cavity barriers will achieve at least 30 minutes fire resistance for integrity and 15 minutes for insulation. BS9991:2024 guidance does not permit for non-proprietary cavity barriers in the external wall and all cavity barriers will be tested to BS13501-2:2023.

Where the cavity barrier will be acting as a fire stop, the product will achieve the same fire performance as one (discussed below).

13.5 External Wall Fire Stopping

Where compartment walls and floors meet the external wall, a fire stop is required which will achieve the same standard of performance as the compartment wall or floor (i.e. 60 minutes or 120 minutes performance for integrity and insulation).

14.0 FIREFIGHTING

14.1 Firefighting Facilities

The new building will have a building height more than 18m and will therefore require a firefighting shaft. The podium will have a floorplate exceeding 900m² and would require two firefighting shafts for code compliance. However, as this podium only covers three upper levels which are well below 18m, the proposed firefighting arrangement is considered reasonable as all levels at least 18m above ground level will have a floorplate of less than 900m². The proposed firefighting shaft will be located in Stair 2 and will consist of:

- A firefighting stair, at least 1.1m wide,
- Two dual purpose evacuation / firefighting lifts, within 7.5m of the firefighting stair.
- A 0.7m² (aerodynamic free area) automatically opening vent at the head of the stair.
- A smoke vented lobby or corridor to provide access to the stair and lift at each level.
- A communications extension system achieved with a radiating cable, distributed antennae system or fire telephones.

The building will be provided with a wet riser in both the firefighting stair and protected stair, Stair 1, as the top storey height is over 50m to support firefighting operations and provide redundancy. The wet risers will serve all levels including ground floor and basement. The lift within Stair 1 will also double up as a dual purpose evacuation and firefighting lift.

Both stairs will be accessible directly from outside and will be provided with independent access routes.

The fire alarm panel and premises information pack will be located in the building's reception.

Stair 2 will not serve the basement amenity spaces or level 34 which will consist solely of plant space. Where firefighters will need to access the basement for firefighting there will be access directly from outside via the basement stair or lobby, the basement access route will be clearly signed from the outside.

Where firefighters will need to access level 34, they will be able to use the firefighting lift to level 33 and establish a bridgehead before proceeding to level 34 via Stair 1 which will be provided with a wet riser and accessed via a 120 minute smoke vented lobby and therefore achieve a similar standard of protection compared with a firefighting stair.

The firefighter entry points and fire main inlet locations will be provided with a canopy to provide protection from potential falling debris.

14.2 Bin Store Lobby – Venting Principles

For code compliance, the bin store should be accessed via a protected lobby with at least 0.4m² permanent ventilation or mechanical equivalent as it will be provided with a sprinkler system. However, the bin store is proposed to be well ventilated via a mechanical smoke ventilation system as described in Section 14.3 below and so it is proposed for the lobby provided access to the bin store will not be directly ventilated.

The provision of a 0.2m² permanently ventilated lobby is in line with BS5906 to prevent the passive buildup of odorous and flammable gases and is not provided to directly ventilate the bin store in the event of a fire. Regardless, given the location of the bin store, the main access doors could be propped open to provide additional ventilation in the event of a large bin store fire. It may be necessary for the doors providing access to the bin store from the evacuation lift lobby to be pulled open by the pressure differential to provide (fresh) make-up air for the mechanical extract system.

Given the bin store will also be compartmented from escape areas by fire resisting construction achieving 120 minutes protection, this approach is considered reasonable.

14.3 Basement Smoke Venting

The mechanical smoke vents serving the upper levels will extend down to the basement level to serve as protected lobbies to the stairs. These mechanical shafts will achieve at least a 0.8m² cross sectional area.

All spaces at basement level will be provided with a mechanical smoke venting system which will achieve at least 10 air changes per hour. The design will be developed by the smoke venting specialist as the scheme develops.

14.4 Fire Vehicle Access – Residential

Fire vehicle access will be provided on Cambridge Street within 18m and in sight of the inlet serving the wet riser top-up point. The wet-riser top-up point being shown indicatively on the figure below.

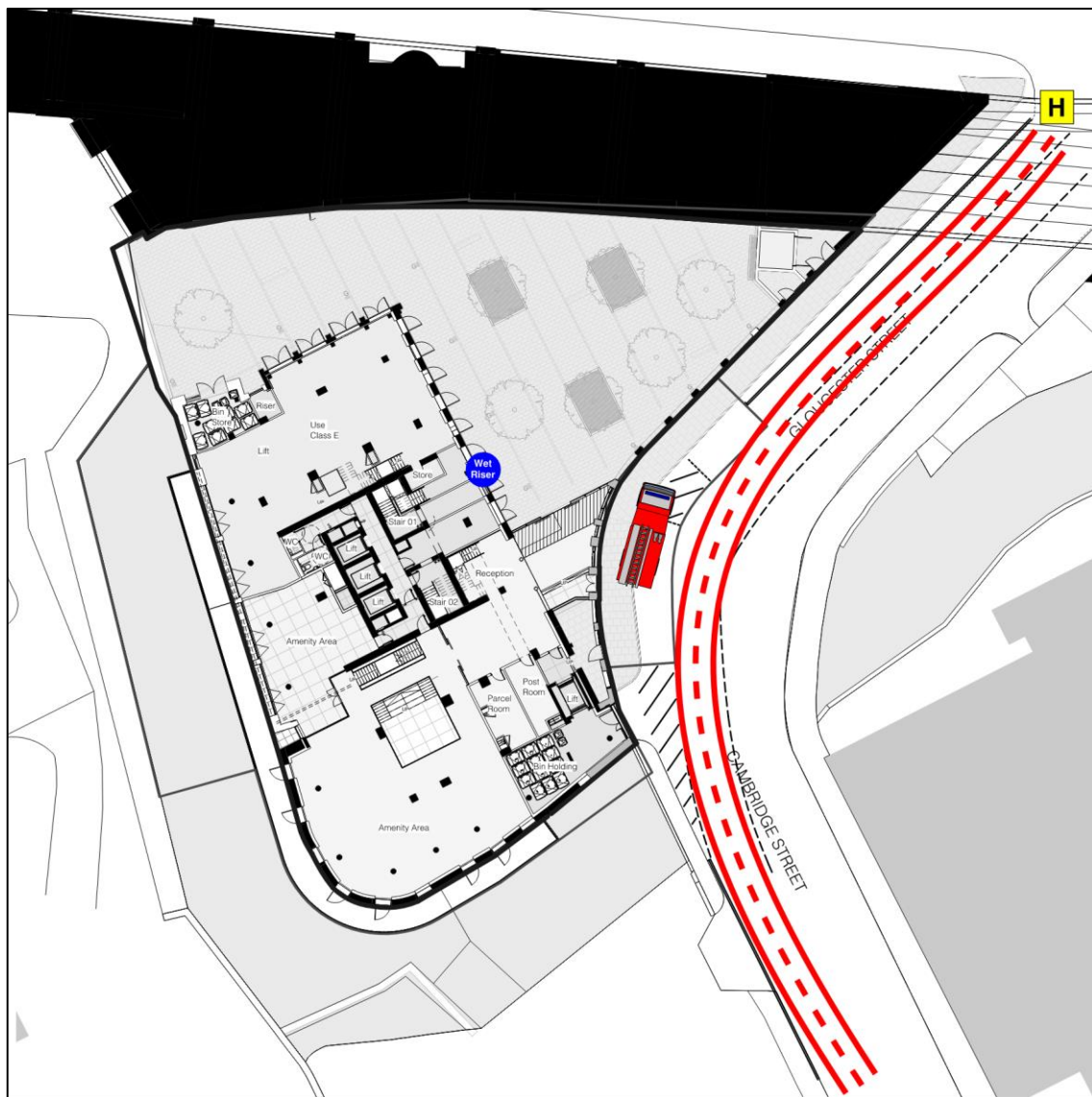


Figure 32: Firefighter Vehicle Access

14.5 Fire Vehicle Access – Commercial Perimeter Access

A fire vehicle will be able to park on Cambridge Street with direct access to the commercial units. Hose coverage from the parking position to the furthest part of the unit will be within 45m, measured along a route suitable for laying a hose.

14.6 Hydrants

There will be existing fire hydrants within 90m of the wet riser top-up point which will be retained as part of the works. It will be confirmed separately if the existing fire hydrants are suitable for use.

14.7 Wayfinding Signage

Firefighting wayfinding signage will be provided at each level to comply with the recommendations in BS9991:2024

15.0 FIRE SAFETY MANAGEMENT

15.1 General

Once the building is occupied, it is the responsibility of the management and/or responsible person to ensure that all fire safety systems are tested and maintained to ensure their continuous effectiveness. The management should: -

- Be aware of all the fire safety features provided and their purpose
- Where required ensure a competent person is present in the building during occupied times
- Liaise with and seek the advice of the fire authority

15.2 Staff

Staff should receive training from competent individuals. This training should occur at regular intervals and ensure all staff understand how to respond to a fire, including the appropriate actions upon discovering a fire, the correct response to hearing a fire alarm, and the proper escape procedures from all parts of the building.

A management structure should be established to ensure staff are aware of their responsibilities in the event of a fire, with these responsibilities clearly defined. A chain of command should also be implemented, delineating clear lines of responsibility, authority, and accountability.

15.3 Fire Safety Information

Regulation 38 of the Building Regulations in England and Wales sets out to ensure that crucial fire safety information is provided to the responsible person or building owner upon completion of a new building or a significant renovation project.

Regulation 38 stipulates that the person undertaking the construction work must compile and provide fire safety information about the building to the responsible person. The responsible person is typically the building owner or manager who will be in charge of the building's ongoing fire safety management.

The aim of Regulation 38 is to ensure that the person responsible for the building has all the information to enable them to carry out their duties under the Regulator Reform (Fire Safety) Order including all of the following.

- Understand and implement the fire safety strategy of the building.
- Maintain any fire safety system provided in the building.
- Carry out an effective fire risk assessment of the building.

The purpose of the fire safety manual is to clearly define the nature of the fire safety systems provided for the building. It should include: -

- An explanation of the overall fire safety strategy
- Evacuation procedures
- Design documentation to describe the use of each fire safety system
- Staff roles in the event of a fire: their responsibility, authority and accountability
- A detailed maintenance routine

This fire strategy report will form a key part of the fire safety manual for the building but should be supplemented with other essential fire safety information which is to be handed over to the responsible person when the project is complete or when the building or extension is first occupied. Details of the suggested contents of the fire safety manual are provided in Section 19 of the Approved Document B and Annex H of BS 9999 Code of practice for fire safety in the design management and use of buildings.

The Fire Safety Manual and fire safety information contained within should be reviewed periodically and when any alterations are made to the building. BS 8644-1: *Digital management of fire safety information - design, construction, handover, asset management and emergency response - code of practice* published by the British Standards Institute provides guidance on how to manage fire safety information digitally across the life of a built asset.

15.4 Maintenance and Housekeeping

It is the role of management to ensure that maintenance is carried out in accordance with the relevant British Standards, so that all fire safety systems are operational in the event of a fire. It is also important that good housekeeping practices are followed. The building management should be aware of any hazardous substances or practices within the building, which increase the risk of fire.

15.5 The Regulatory Reform (Fire Safety) Order 2005 and Fire Safety Act 2021

This Order places a duty on the 'responsible person' to ensure, 'as far as is reasonably practical' the safety of his employees and to take such general fire precautions as may be reasonably required to ensure that the premises are safe [i.e. for non-employees]. The 'Responsible Person' is defined in Article 3 of the Fire Safety Order as:

- (a) in relation to a workplace, the employer, if the workplace is to any extent under his control;
- (b) in relation to any premises not falling within paragraph (a)—
 - (i) the person who has control of the premises (as occupier or otherwise) in connection with the carrying on by him of a trade, business or other undertaking (for profit or not); or
 - (ii) the owner, where the person in control of the premises does not have control in connection with the carrying on by that person of a trade, business or other undertaking.

The Fire Safety Act 2021 clarifies the scope of the Fire Safety Order to make clear it applies to the structure, external wall construction and flat entrance doors in buildings containing 2 or more sets of domestic premises. The Fire Safety Act amends article 6 of the Regulatory Reform (Fire Safety) Order Act 2005 in this regard and requires responsible persons to ensure that these elements are included in their fire risk assessments.

Under the Order, there is a requirement to carry out and continually update an assessment of the risk of fire to people in and around the premises/building, and to assess and maintain the measures to reduce those risks to an acceptable level. A Responsible Person is able to update the fire risk assessment themselves, however where the update requires an assessment of materials which make up a building's external wall system the Responsible Person may need to contract a suitably competent fire risk assessor to undertake that assessment for them.

A Fire Risk Assessment should be carried out:-

- On completion of the building fit out, and strictly before first occupation of the building.
- Regularly, particularly if there is reason to suspect that it is no longer valid, or there has been a significant change in the matters to which it relates. where any changes occur such as changes in the use of the building, the number or nature of occupants, or building works.
- We would recommend that a fire risk assessment is carried out at least annually.

Other legal duties include (item 3 to 5 and 7 not applicable to all residential buildings): -

1. Keeping a record of the Fire Safety Arrangements. These are the preventative and protective measures for the building.
2. A person must be nominated for any special role identified in an emergency plan.
3. Employees must be consulted about nominations to perform special roles, and about any proposals for improving the fire precautions.
4. Other employers in the building must be informed about any significant risks, which might affect the safety of their employees, and there must be co-operation with them in measures to reduce the risk.
5. Those having control over the workplace have a responsibility to ensure compliance with the regulations in those parts of the building over which they have control.
6. A suitable and readily available method of calling the emergency services must be established.
7. Employees are required to co-operate in ensuring that the workplace is safe from fire.

The order also adopts 'Principles of Prevention'. These include:-

- Avoiding risks;
- Evaluating the risks which cannot be avoided;
- Combating the risks at source;

- Adapting to technical progress;
- Replacing the dangerous by the non-dangerous or less dangerous [particularly with respect to hazardous substances];
- Developing a coherent overall prevention policy which covers technology, organisation of work and the influence of factors relating to the working environment, and;
- Giving appropriate instructions to employees.

The intention for inclusion of 'structure' within the Fire Safety Act is that there should be a visual inspection of the construction and layout of the building on the basis that it will have been built to resist early structural collapse in the event of a fire.

15.6 Fire Safety (England) Regulations 2022

The Fire Safety (England) Regulations 2022 are made under article 24 of the Fire Safety Order 2005 and came into force on 23 January 2023. These introduce new regulations and extend the duties of the responsible person imposed by the Regulatory Reform (Fire Safety) Order 2005 and apply to all buildings in England that comprise two or more domestic dwellings.

The Responsible Person is defined in Article 3 of the Fire Safety Order and has various duties related to fire safety in residential buildings, the duties vary depending on the building height.

In all residential buildings, fire safety instructions, including evacuation strategies and fire reporting procedures, must be prominently displayed within the building and issued annually or as soon as residents move in. Additionally, information about fire doors, especially flat entrance doors, should be provided to residents.

For buildings over 11m, extra duties include fire door checks in the flat entrance doors and communal areas. For high-rise buildings consisting of 7 storeys or more or are at least 18m above ground level, in addition to the above, electronic information sharing with the fire and rescue service, wayfinding signage, a secure information box, external wall construction details, and regular checks of lifts and firefighting equipment is also required. Any faults must be promptly rectified and reported.

15.7 Building Safety Act 2022

The Building Safety Act 2022 overhauls existing regulations and creates three new bodies: the Building Safety Regulator, the National Regulator of Construction and the New Homes Ombudsman. The provisions in the Act will be implemented over 2024 and 2025 through a programme of secondary legislation.

The Act has 6 parts:

1. Part 1 of the Building Safety Act 2022 provides a general overview of the act.
2. Part 2 focuses on the building safety regulator and its functions in relation to buildings in England.
3. Part 3 amends the Building Act 1984, designating the regulator as the building control authority for higher-risk buildings in England and requiring the establishment of registers for building control approvers and inspectors.
4. Part 4 addresses occupied higher-risk buildings in England, imposing duties on accountable persons:
 - A "higher-risk building" means a building in England that is at least 18m in height or has at least 7 storeys and contains at least 2 residential units.
 - The "accountable person" is determined by legal estate or repairing obligations. Key provisions include regular risk assessments, preventive measures, and the creation of safety case reports. Accountable persons must engage residents, maintain information, and notify the regulator promptly. The legislation emphasizes accountability, prevention, and resident involvement in building safety decisions, establishing a comprehensive framework for risk assessment and management.
5. Part 5 encompasses various provisions, including remediation and redress, a new homes ombudsman scheme, regulations on construction products, additional fire safety measures, regulations for architects, and provisions for housing complaints.
6. Part 6 comprises general provisions, including powers for the Secretary of State to make consequential provisions, and extents of the Act.

The "Accountable Person" under the Building Safety Act 2022 must register a Higher-Risk Building (HRB) with the Building Safety Regulator before it is occupied. This registration involves submitting a Safety Case Report to demonstrate compliance with safety standards. Further information on the requirements for registration can be found at <https://www.gov.uk/guidance/applying-to-register-a-high-rise-residential-building>.

16.0 INFORMATION, LIMITATIONS AND ASSUMPTIONS

The information limitations and assumptions used in the preparation of this report are noted below: -

Drawings

This report is based on drawings issued to us. Dimensions have been taken from these drawings. The following drawings were used: -

No.	Drawing No	Drawing Title	Revision
1	0655-HOD-THP-B1-DR-A-29200B	Fire Strategy Plan - Level -01	P03
2	0655-HOD-THP-00-DR-A-29200	Fire Strategy Plan - Level 00	P03
3	0655-HOD-THP-M1-DR-A-29200M	Fire Strategy Plan - Level Mezzanine	P03
4	0655-HOD-THP-XX-DR-A-292002	Fire Strategy Plan - Level 01-02	P02
5	0655-HOD-THP-03-DR-A-29203	Fire Strategy Plan - Level 03	P02
6	0655-HOD-THP-04-DR-A-29204	Fire Strategy Plan - Level 04	P03
7	0655-HOD-THP-XX-DR-A-29205	Fire Strategy Plan - Level 05-15 (odd floors)	P02
8	0655-HOD-THP-XX-DR-A-29206	Fire Strategy Plan - Level 06-14 (even floors)	P02
9	0655-HOD-THP-XX-DR-A-29216	Fire Strategy Plan - Level 16-24 (even floors)	P02
10	0655-HOD-THP-XX-DR-A-29217	Fire Strategy Plan - Level 17-25 (odd floors)	P02
11	0655-HOD-THP-XX-DR-A-29226	Fire Strategy Plan - Level 26-32 (even floors)	P02
12	0655-HOD-THP-XX-DR-A-29227	Fire Strategy Plan - Level 27-33 (odd floors)	P03
13	0655-HOD-THP-34-DR-A-29234	Fire Strategy Plan - Level 34	P03
14	0655-HOD-THP-35-DR-A-29235	Fire Strategy Plan - Level 35	P02
15	0655-HOD-THP-B1-DR-A(--)LG	Proposed Level -01	P06
16	0655-HOD-THP-00-DR-A(--)00	Proposed Level 00	P07
17	0655-HOD-THP-M1-DR-A(--)00M	Proposed Level - Mezzanine	P06
18	0655-HOD-THP-02-DR-A(--)002	Proposed Level 01 & 02	P05
19	0655-HOD-THP-03-DR-A(--)003	Proposed Level 03	P06

20	0655-HOD-THP-04-DR-A(--)004	Proposed Level 04 Plan	P04
21	0655-HOD-THP-XX-DR-A(--)005	Proposed Level 05-33 (odd floors)	P04
22	0655-HOD-THP-XX-DR-A(--)006	Proposed Level 06 - 32 (even floors)	P04
23	0655-HOD-THP-34-DR-A(--)034	Proposed Level 34 Plan	P01
24	0655-HOD-THP-35-DR-A(--)035	Proposed Level 35 - Plant	P04
25	0655-HOD-THP-36-DR-A(--)036	Proposed Level Roof	P04
26	0655-HOD-THP-00-DR-A(--)852	Site Location Plan and Planning Boundary	P05
27	0655-HOD-THP-XX-DR-A(--)201	South Elevation	P04
28	0655-HOD-THP-XX-DR-A(--)202	North Elevation	P04
29	0655-HOD-THP-XX-DR-A(--)203	West Elevation	P04
30	0655-HOD-THP-XX-DR-A(--)204	East Elevation	P04
31	0655-HOD-THP-XX-DR-A(--)301	Proposed South-North Section	P02
32	0655-HOD-THP-XX-DR-A(--)302	Proposed North-South Section	P02
33	0655-HOD-THP-XX-DR-A(--)303	Proposed West-East Section	P02

Table 7: Project Drawings

Building Regulations

This report considers building regulations, which deal with life safety. The impact on property protection, including the way recommendations in this report could affect insurance premiums should be consulted with insurers.

Other Limitations

Complying with the recommendations of this report should not guarantee that a fire should not occur.

Unless otherwise described in this report, the fire strategy assumes that the building design, the mechanical and electrical systems, construction methods and materials specifications should comply with current Building Regulations guidance, and relevant British Standards and Codes of Practice. The design of mechanical and electrical systems such as fire alarm and sprinklers is a specialist area. Fire Strategy recommendations are given in this report, however, the design and specifications need to be developed at the appropriate stage in consultation with the specialist designers of these systems.

This report has been prepared for the sole benefit, use and information of Manner and the liability of Jeremy Gardner Associates Limited, its directors and employees in respect of the information contained in the report should not extend to any third party.

APENDIX A - RESIDENTIAL SPRINKLERS

BRE Project Report 204505

In 2004 the Building Research Establishment carried out a study into residential sprinkler systems and published the report '*Effectiveness of Sprinklers in Residential Premises: BRE Project Report 204505*'.

The pilot study carried out by the BRE as part of this project concluded that the combination of sprinklers and linked smoke alarms in the rooms and circulation spaces would reduce deaths by 83% and injuries by up to 85%.

The report describes experiments carried out by the BRE on eight sprinklered and unsprinklered lounge fires in a two-storey dwelling house with a loft conversion. The duration of each house fire test was 30 minutes.

The experiments demonstrated the following:

Unsprinklered lounge fire

- Without sprinklers, conditions in the lounge became unsurvivable within 15 to 20 minutes.
- Visibility in the room of origin was reduced to less than 2m within 5 to 7 minutes.
- With an open plan lounge, or a standard lounge with the doors open, fires without sprinklers would eventually cause untenable conditions in all open spaces throughout the house.

Sprinklered lounge fire

- The sprinklers controlled all fires.
- The sprinklers extinguished some of the fires.
- For sprinklered fires, the fire-damaged area was less than when unsprinklered.
- With sprinklers, the fire gases were cooled sufficiently so that the occupants of the room of origin would not have experienced extreme pain due to convected heat.
- Sprinklers significantly reduced the Fractional Effective Dose (FED) in the room of origin. In all but one test sprinklers maintained tenable conditions in the room of fire origin in terms of toxic effects. In the other test unconsciousness due to asphyxiants was estimated to have occurred approximately 25 minutes after ignition.
- Visibility in the room of origin was reduced to less than 2m within 5 minutes.
- Tenable conditions (apart from visibility) were achieved throughout the house in the sprinklered tests.

These tests demonstrate that sprinklers are effective in providing more time for occupants to escape. Not only would tenable conditions be maintained within the remainder of the house but also occupants of the room of fire origin would not have died.

As part of the same research project the BRE carried out 29 further fire tests considering a series of three adjacent compartments. Fires in beds, sofas, televisions and tables were modelled. The conclusions from these fires are broadly similar to those from the house fire tests:-

- Conditions became unsurvivable in all unsprinklered tests.
- Sprinklers significantly reduced temperature in the room of fire origin.
- Sprinklers maintained tenable conditions in terms of toxic effects for television and bed fires.
- Untenable conditions in terms of toxic effects did occur in the sprinklered table fires. The time to unconsciousness varied between 5 and 10 minutes. Sprinklers reduced temperatures such that these were tolerable for a significant period of time (>30 minutes). In contrast, in the unsprinklered tests occupants would have experienced extreme pain after 2.5 to 3 minutes.

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THE FPA were commissioned to carry out research into providing a low cost residential fire suppression system for the UK housing sector. As part of this project a series of practical fire trials were carried out to demonstrate and assess the effectiveness of sprinkler systems under realistic conditions.

Bedroom & Lounge Fires

The bedroom tests were based on a fire occurring in a wastepaper bin adjacent to the bed and bookcase, which contained books and other combustibles. The arrangement of the fuel in relation to the fire was intended to encourage rapid fire spread to challenge the sprinkler system.

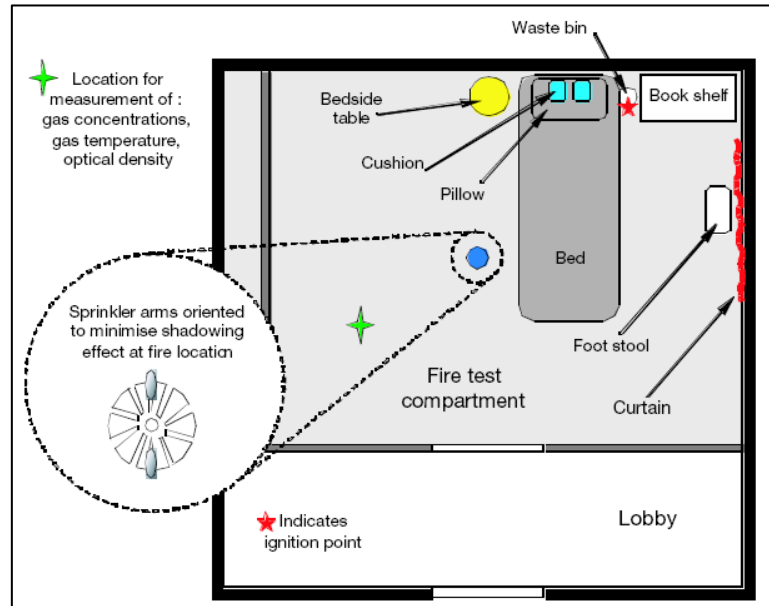


Figure A1: Bedroom Fire

In the lounge the fire started on a sofa immediately adjacent to a bookcase. The sofa padding was constructed from non modified foam.

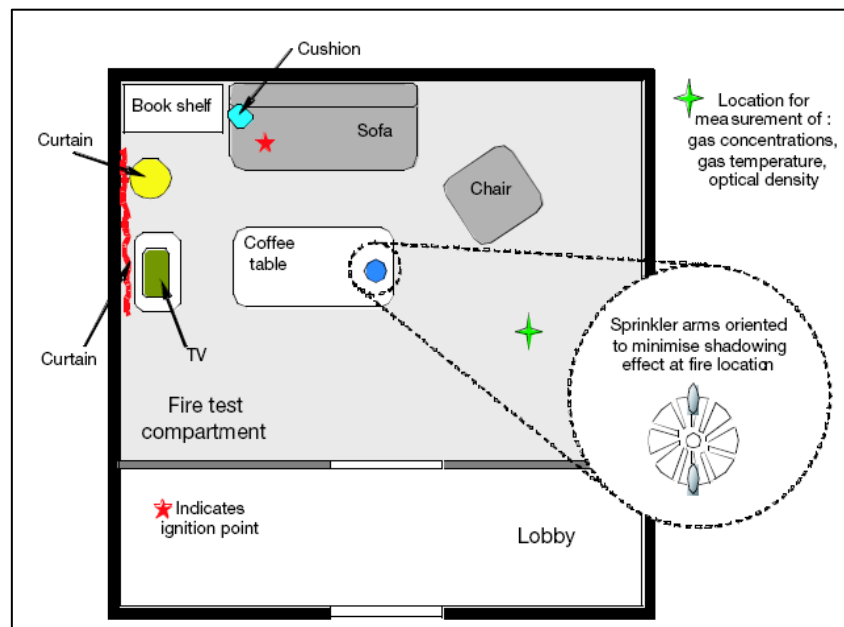


Figure A2: Lounge Fire

A concealed sprinkler was used in the tests. The results are summarised below:-

Unsprinklered Rooms

- Rapid fire development occurred in the unsprinklered bedroom and lounge.
- Flashover occurred after 2 mins 30 secs in the bedroom and 3 mins and 15 secs in the lounge.

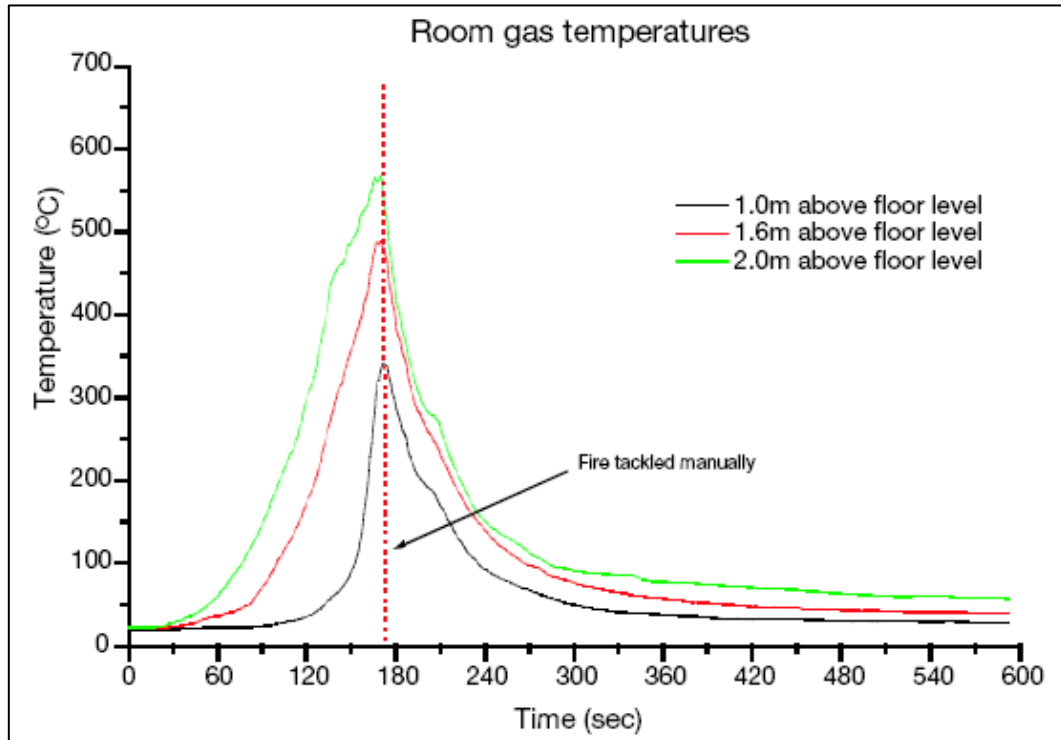


Figure A3: Unsprinklered bedroom fire

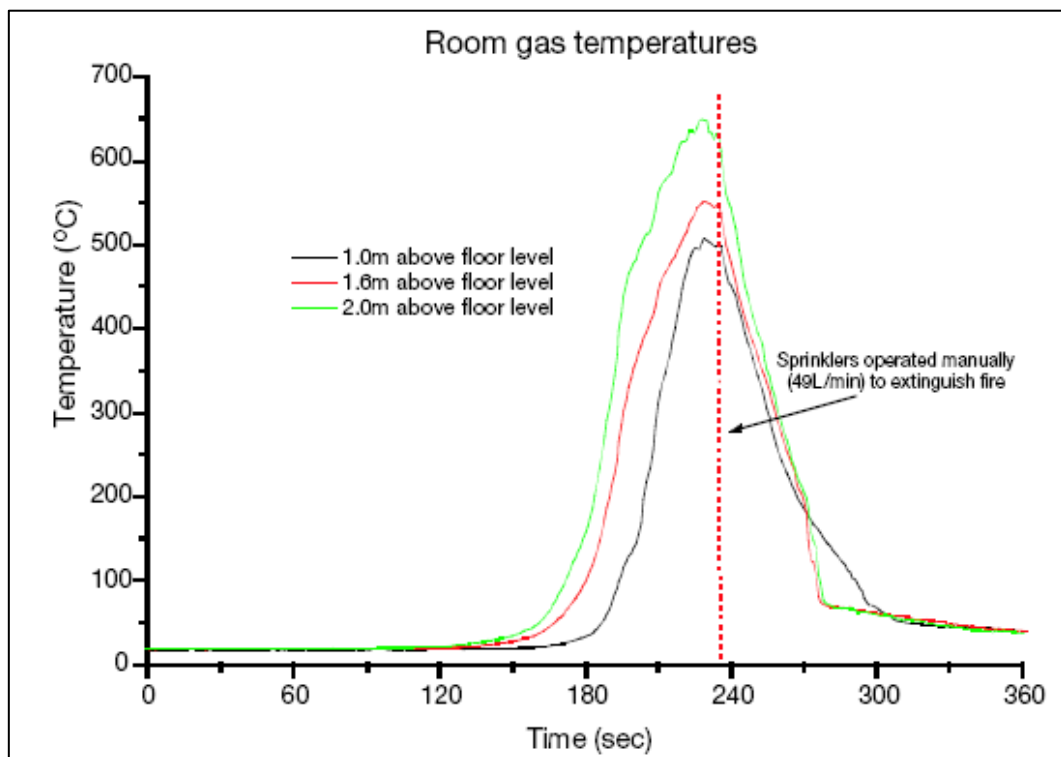


Figure A4: Unsprinklered lounge fire

Sprinklered Bedrooms

- In both sprinklered bedroom tests the sprinklers activated after approximately 2 minutes.
- Fire was controlled and mostly suppressed although there is still some limited burning on the shelves.
- Room gas temperatures peaked at 125 deg C at 2m above floor level. At head height temperatures in the room were a maximum of approximately 60 deg C.

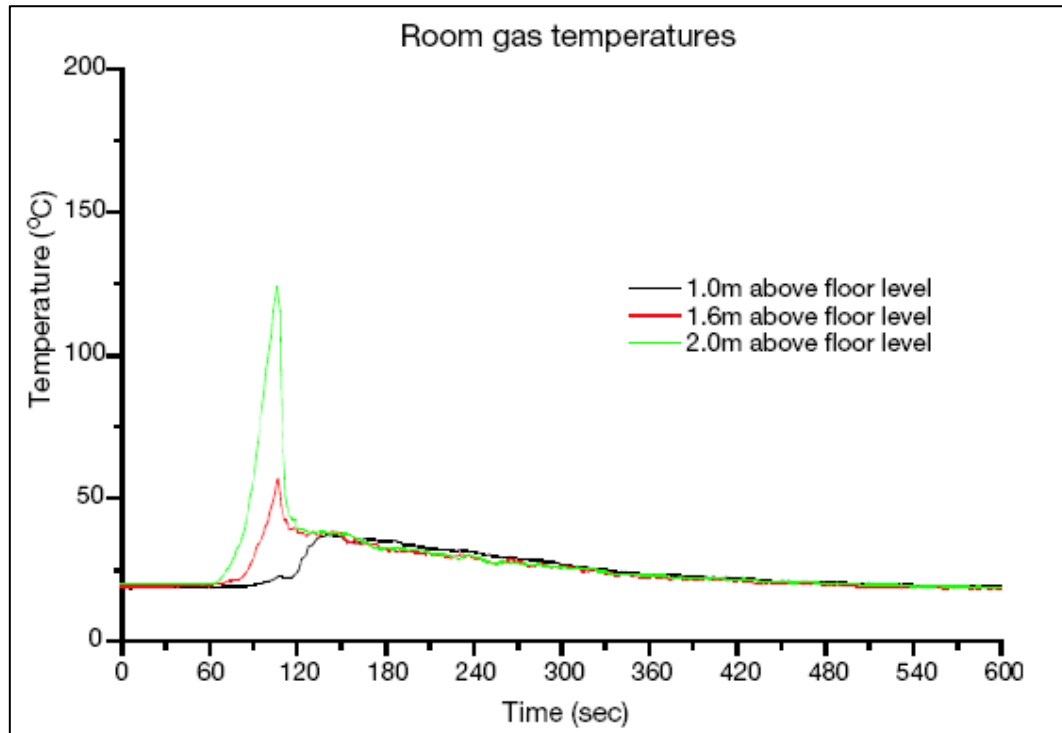


Figure A5: Sprinklered Bedroom Fire

Sprinklered Lounge

- In both sprinklered tests the sprinklers operated after approximately 3 minutes.
- The fires were controlled and mostly suppressed although there was some residual burning on the sofa cushions.
- Temperatures in the room peaked at approximately 120 deg C (2m above floor level) prior to sprinkler activation. At head height temperatures of up to 90 deg C occur. These were quickly reduced once sprinklers activated.

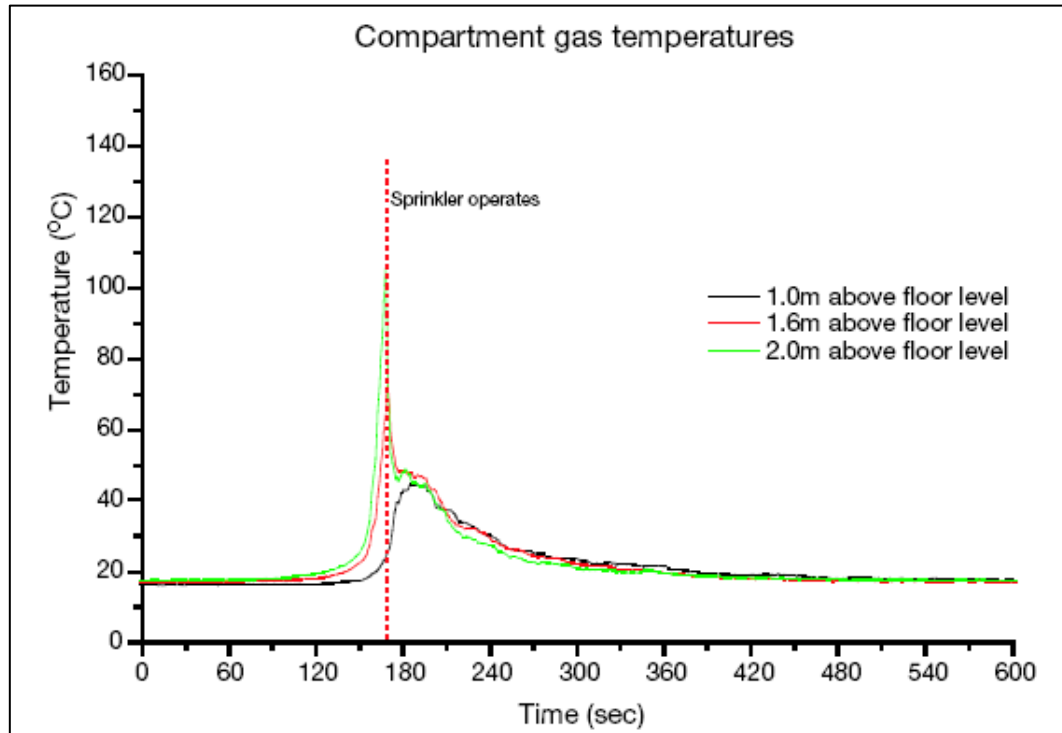


Figure A6: Sprinklered Lounge Fire

Kitchen Fire Scenario

The kitchen fire tests were based on a chip pan fire. A two litre pan was used filled with one litre of pure vegetable oil. Several tea towels were draped over the top of the cooker grill pan to provide an opportunity for flame spread from the chip pan (layout shown below). The pan was left on a lit stove to reach its auto ignition temperature. This occurred after approximately 50 minutes.

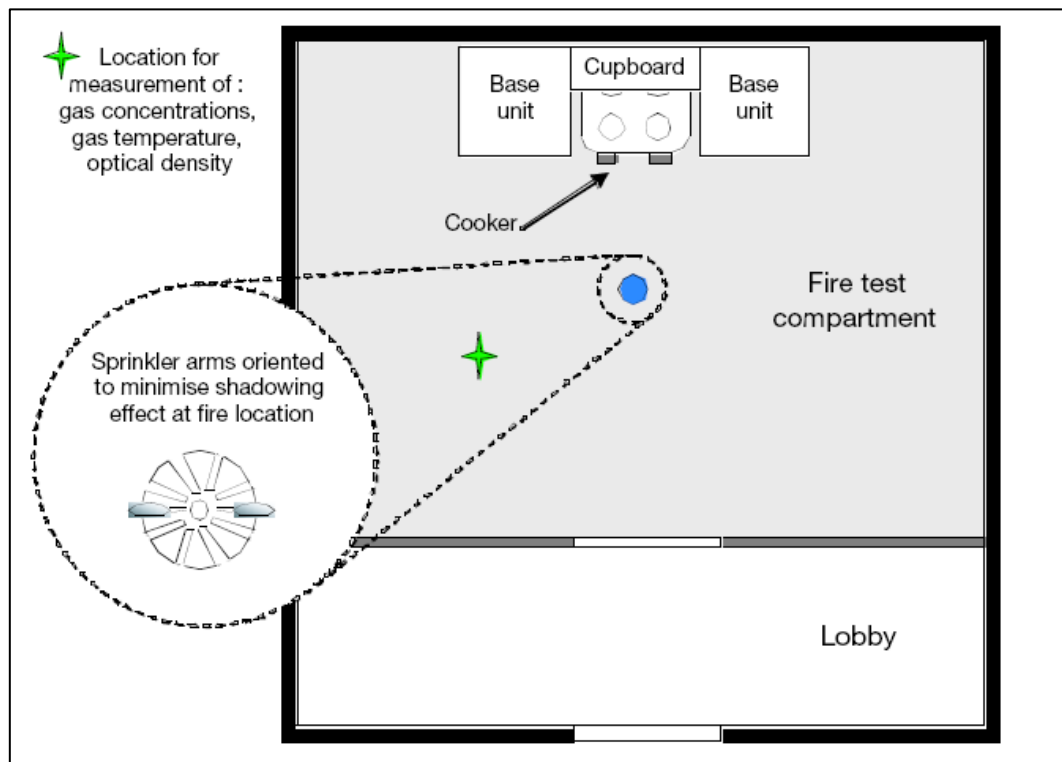


Figure A7: Layout of Kitchen Fire Scenario

Test observations and results for the unsprinklered test are shown below: -

Table 44 Test details and observations for 1st kitchen test		
Test No	K1	
Scenario	Kitchen	
Sprinklered?	No	
Test details	Chip pan heated on gas cooker until 1 minute after auto-ignition of oil occurs. Tea-towels paced on cooker hood, above chip pan to propagate flames.	
Time	Event	
Minutes	Seconds	
-24	0	Lobby smoke alarm activated
0	0	Ignition (@ oil temperature of 361°C)
1	12	Towels ignite
1	33	Front towels fully burning
3	09	Burning of front of towels decreases
3	43	Side towels start burning
5	09	Burning of front of towels ceases
6	48	Sporadic flaming of towels ceases
Post test damage assessment		
Cooker	Grill pan cover scorched	
Tea towels	All towels fully burned	
Cupboards	Smoke damage and some charring of underside of cupboards	
Work surfaces	No damage	

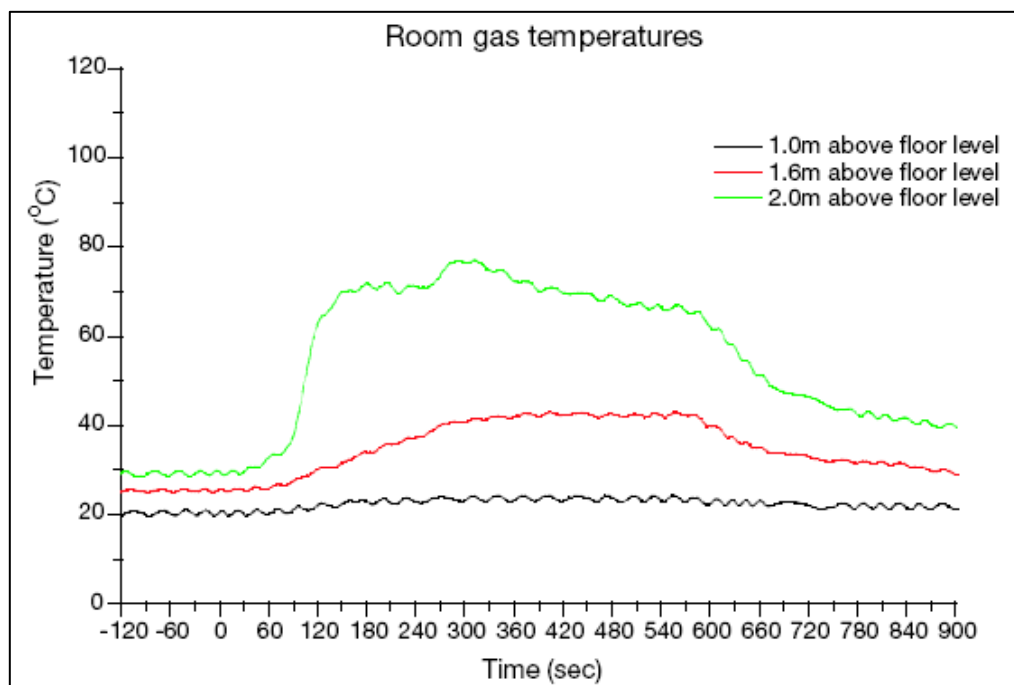


Figure A8: Unsprinklered Kitchen Fire

Test observations and results for the sprinklered test are shown below: -

Table 45 Test details and observations for 2nd kitchen test		
Test No		K2
Scenario		Kitchen
Sprinklered?		Yes @ 60Lpm
Test details		Chip pan heated on gas cooker until 1 minute after auto-ignition of oil occurs. Tea-towels paced on cooker hood, above chip pan to propagate flames.
Time		Event
Minutes	Seconds	
0	0	Ignition (@ oil temperature of 355°C)
1	08	Tea-towels ignite
1	17	Tea-towels fully burning
2	12	Sprinkler operation
2	58	Flames extinguished
Post test damage assessment		
Cooker		Grill pan cover scorched Main cooker surface covered with water and blackened cooking oil.
Tea towels		Front facing towels partially burnt, side towels slightly charred
Cupboards		Smoke damage to wall cupboards.
Work surface		Spattered with water and blackened oil

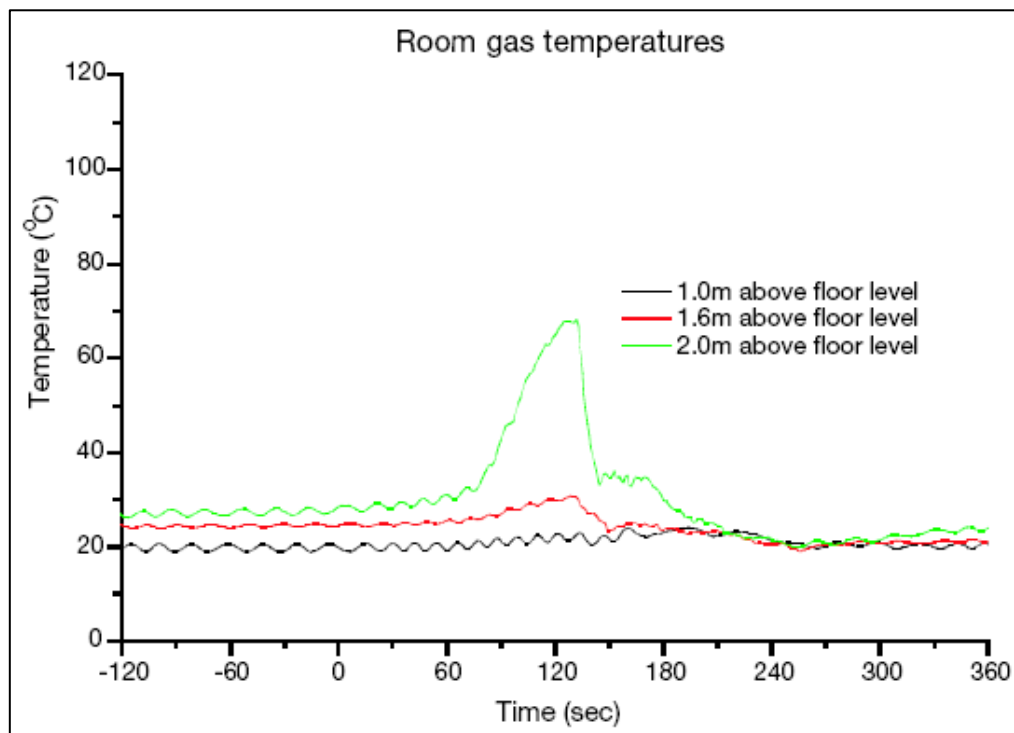


Figure A9: Sprinklered Kitchen Fire

APPENDIX B - COOKING HOB FIRE RADIANT HEAT CALCULATIONS

The analysis is for a sprinkler controlled fire that limits the fire to the cooking pan, which is in line with results of BRE sprinklered test. The time for occupants to escape past the hobs is solely that for movement past the hob, in order to demonstrate that occupants would not be harmed in passing the hob.

BS 7974 “*Applications of Fire Safety Engineering Principles to the Design of Buildings*” states that at a point where the radiant heat flux is 10 kW/m^2 tenable conditions are maintained for 4 seconds and where the radiant heat flux is 2.5 kW/m^2 they are maintained for 30 seconds. This is a reasonable time to escape past a fire on a hob. The radiant heat flux is a function of the heat release rate of a fire and the distance from the fire (see Figure B1).

A research study carried out by IIT Gandhinagar and Underwriters Laboratory Inc. (“*Report of research on detection of kitchen fire*”, 8 July 2010) shows that the peak heat release rate of a cooktop fire is 86.9 kW . Another research study carried out by Hyeong-Jin Kim and David G. Lilley and published by the American Institute of Aeronautics and Astronautics (“*Heat release rates of burning items in fires*”, January 2000) gives a heat release rate for a 12 inch pan fire of 116 kW . Both of these fire sizes were not controlled by sprinklers and represent the worst case scenario as the fire was fed by constantly burning oil.

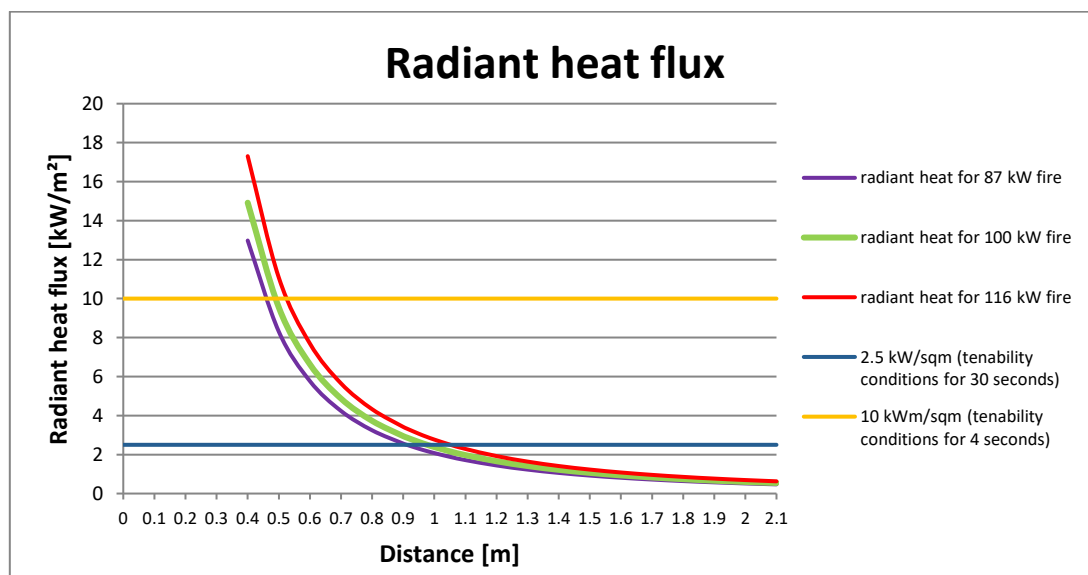


Figure B1: Radiant Heat Flux

The hob fire sizes within a range between 87 kW and 116 kW are modelled, as shown in Figure B1. To keep tenable conditions for 30 seconds the distance from the hob fire should not be less than 1.1 m . To keep tenable conditions for 4 seconds the distance from the hob fire should not be less than 0.53 m .

Assuming occupants have a shoulder width of 0.5 m a gap of at least 1.6 m is needed between a hob and any opposing wall on a route needed for escape.

The analysis takes no account of the effect of sprinklers in controlling the hob fire, or of the radiation absorption and cooling of the occupants' skin by the water spray. Therefore, in the event of a hob fire occupants should be able to escape safely from the flat.

A method of calculating the separation between a fire and a combustible material is described in NFPA92b, which assumes a point source, and measures the separation distance from this point.

The method relates the radiant heat flux (RHF), q , at a distance r from the centre of a fire to the total of heat release rate (HRR) of the fire, Q_t .

The equation is:

$$q = \frac{0.3Q_t}{4\pi r^2}$$

Where 0.3 is the fraction of heat emitted as radiation.

The distance, r , from the centre of fire can be calculated from the following equation:

$$r = \sqrt{\frac{0.3Q_t}{4\pi q}}$$

Therefore, the distance for 2.5kW/m² RHF at 116kW HRR would be:

$$r = \sqrt{\frac{0.3 \times 116}{4\pi \times 2.5}}$$
$$r = 1.1m$$

The distance for 10kW/m² RHF at 116kW HRR would be:

$$r = \sqrt{\frac{0.3 \times 116}{4\pi \times 10}}$$
$$r = 0.53m$$

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