Fire Safety Overview for Acorn House, London

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Type of building work(s):	New build	X
	Extension	
	Material alterations	
	Change of use	

Comments based on:	AD B	
	BS 9991: 2015	X
	BS 9999: 2017	X
	Engineered Solution	

1 Executive Summary

The proposed development at Acorn House has been assessed in line with the current guidance. The guidance used is BS9991:2015 for the residential areas, and BS 9999:2017 for the commercial areas. The information within this document is considered sufficient at this stage of design and can be progressed as the design continues.

The following items will be considered at the next stage of detailed design post planning to ensure compliance or provide adequate mitigation measures, subject to consultation with the Statutory Approvers:

- Open plan flat layout: escape to be done remotely from the cooking facilities
- Internal protected hallway: extended travel distance
- Stair from office not discharging directly to the external
- Ventilation of fire-fighting lobby for a building over 30m
- Final means of escape: ancillary accommodation to be provided with smoke ventilated lobbies at access level
- Final means of escape from firefighting shafts: lifts opening into escape route to be provided with fire curtain or localized suppression; risers not opening into access level
- Escape from common terrace to be done remote from cooking facilities

2 Introduction

Alford Hall Monaghan Morris (AHMM) are designing the Acorn House development located in London, which consists of one residential building which includes commercial units, plants, and ancillary accommodations at basement, lower ground floor and ground floor. The top storey height for the block is 31.5m and the depth of the basement level is 7.8m below ground. The residential upper floors consist mostly of open plan flats and flats with internal protected hallways. At sixth floor, there is a children's play space accessed via the common corridor, and at ninth floor there is a community terrace accessed via a community room.

The figures below show the general arrangement plans, as well as a section through the building.

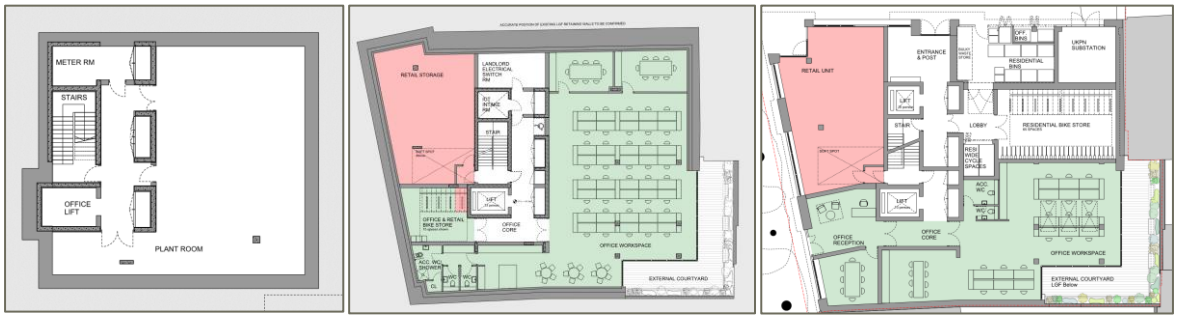

Figure 1: Basement (left), lower ground floor (middle; retail area in red, office area in green), ground floor (retail area in red, office area in green)

Figure 2: Floors 1-4 (left) and fifth floor (right)

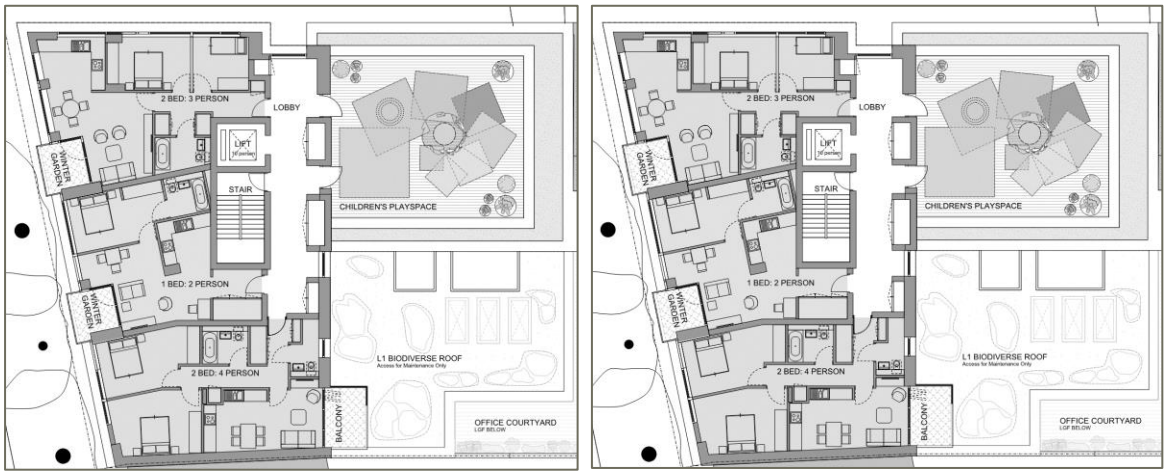

Figure 3: Sixth floor (left; seventh and eighth floor are similar) and ninth floor (right)

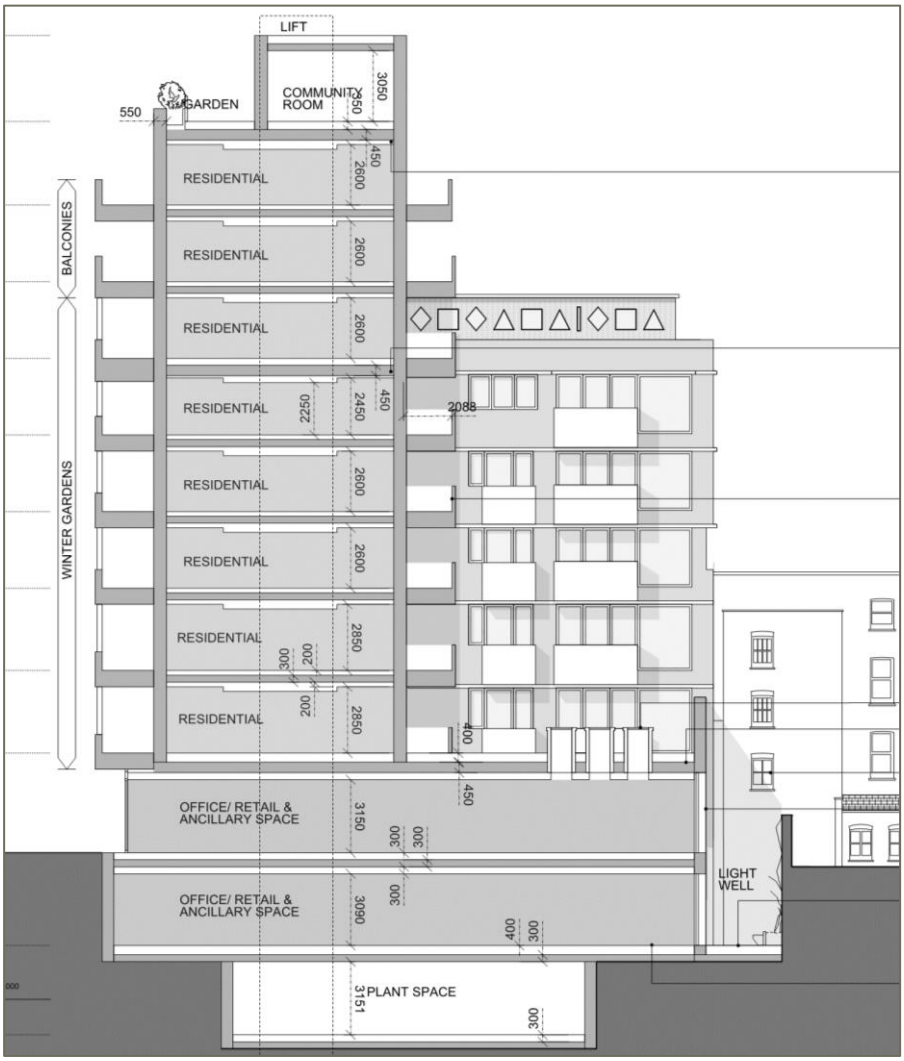

Figure 4: Section through the Acorn House development

2.1 Guidance

This document will provide design advice in accordance with BS 9991:2015 and BS 9999:2017 and is to act as a guide to the Design Team. In any case, due to the preliminary stage of design, where general requirements have been stated and addressed to specific elements of the design, the design team should ensure this is correctly being referenced.

2.2 Purpose of the Document

The information within this document is considered sufficient at this stage of design and can be progressed as the design continues. However in any case, a more detailed Fire Safety Strategy report will need to be produced at a later design stage post planning.

2.3 Compliance with the New Draft London Plan

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

1) identify suitably positioned unobstructed outside space:

a) for fire appliances to be positioned on

b) appropriate for use as an evacuation assembly point

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

3) are constructed in an appropriate way to minimise the risk of fire spread

4) provide suitable and convenient means of escape, and associated evacuation strategy for all building users

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

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

B All major development proposals should be submitted with a Fire Statement, which is an independent fire strategy, produced by a third party, suitably qualified assessor. This fire statement details how the development proposal will function in terms of:

1) the building's construction: methods, products and materials used, including manufacturers' details. **Please see Sections 5, 6 and 7.**

2) the means of escape for all building users: suitably designed stair cores, escape for building users who are disabled or require level access, and associated evacuation strategy approach. **Means of escape is discussed in Section 4. Travel distances and exit widths in particular are assessed in Sections 4.6 and 4.7. Evacuation strategy of residential development is "stay put", and of the offices is simultaneous. This is found in Section 4.1.**

3) features which reduce the risk to life: fire alarm systems, passive and active fire safety measures and associated management and maintenance plans. **Please see Sections 4.2, 4.3, 4.4, 4.6.6.**

4) access for fire service personnel and equipment: how this will be achieved in an evacuation situation, water supplies, provision and positioning of equipment, firefighting lifts, stairs and lobbies, any fire suppression and smoke ventilation systems proposed, and the ongoing maintenance and monitoring of these. **Please see Sections 4.2, 4.3, 4.4, and 4.6.6 for passive and active fire safety systems, and Section 8 for provisions for firefighting.**

5) how provision will be made within the curtilage of the site to enable fire appliances to gain access to the building. **The development has good road access throughout, therefore firefighter access is compliant with the requirements. This has to be confirmed through vehicle tracking.**

3 Risk Profile

The commercial accommodation is defined under appropriate risk profiles in accordance with BS 9999, where the risk profile is a measure of the potential for fire risk to people. This reflects the occupancy characteristics and the fire growth rate for the building, and is derived as described within the subsequent sections below:

The residential aspect of the development and any associated plant and ancillary areas shall be designed in accordance with BS 9991 (as opposed to BS 9999) and therefore risk profiles do not apply to these areas.

3.1 Occupancy Characteristic

The commercial units are analysed as offices and retail area. However, if the use will be changed in the detailed design stage, this might require a full reassessment. The offices are expected to have occupants who are awake and familiar with the building and therefore will be defined by occupancy **Characteristic A**. The retail unit is expected to have occupants who are awake and unfamiliar with the building and therefore will be defined by occupancy **Characteristic B.** The retail unit has a storage space at lower ground floor, which is expected to have occupants awake and familiar with the unit, therefore will be defined by occupancy **Characteristic A.**

3.2 Fire Growth Rate

For the offices, a fire growth rate of Medium (Category 2) is applicable. The retail unit is assigned a fire growth rate of Fast (Category 3). However, as a sprinkler system will be installed in the office and retail areas, the fire growth rate is changed to **Slow (Category 1)** for the offices and **Medium (Category 2)** for the retail unit**.**

3.3 Risk Profile

The risk profile for various areas of the building is tabulated below. If the commercial spaces will have any other use, the risk profile and the subsequent analysis of the means of escape has to be re-evaluated.

Table 1: Risk Profiles

Accommodation	Risk Profile
Offices	A1
Retail	B2
Retail storage	A2

4 Means of Escape and Warning

4.1 Evacuation Approach

A 'defend in place' evacuation procedure shall be in place in the residential accommodation whereby only the occupants in the flat of fire origin shall evacuate. Occupants in other flats will remain in place unless instructed to evacuate by the attending Fire Service or evacuate of their own free will.

This approach reflects the high degree of compartmentation present in these types of buildings and minimises the impact of false alarms.

The evacuation approach for the areas described in Table 1 and other areas of residential plant / ancillary accommodation shall be simultaneous evacuation and shall be independent from the remainder of the building.

4.2 Fire Detection and Alarm Systems

4.2.1 Residential

The fire alarm and detection system for the residential areas is summarised in Table 3 below.

Table 2: Fire Alarm and Detection System

Accommodation		Fire Alarm and Detection System
Residential Apartments	Open-Plan	LD1 – Grade D(1)
	Protected Hallways	LD2 – Grade D(1)
Residential Common Areas		L5(2)
Residential Plant and Ancillary		L2 as(2)

Note:

1) *Fire alarm and detections system should be designed in accordance with BS5839-6: 2013.*
2) *Fire alarm and detections system should be designed in accordance with BS5839-1: 2013.*

The minimum acceptable detection and alarm system for the non-residential accommodations along with the recommended system is summarised in the table below. Using an L2 system throughout the non-residential areas is an enhancement that would allow for a 15% increase in travel distances and decrease in stair/exit widths.

Table 3: Fire Detection and Fire Alarm System

Accommodation	Minimum Acceptable System	Recommended System
Offices	M	L2
Retail	M	L2

Note:

1) *Alarm systems should be designed and installed in accordance with BS 5839: Part 1: 2013, with manual call points.*
2) *Areas which are to be designed as shell and core only need to be maintained as sterile until tenant fit-out and can be fitted with a single detector.*

4.3 Suppression Systems

4.3.1 Residential Accommodation

As the building is over 11m in height measured from access level to the highest occupied floor, there is a requirement to provide automatic water fire suppression system (AWFSS) due to the building height.

A sprinkler system conforming to BS 9251:2014 (Category 2 or better) will be installed throughout the apartments on this development.

4.3.2 Commercial Areas

A commercial sprinkler system conforming to BS EN 12845 will be installed in the offices, retail and ancillary spaces.

4.4 Emergency Lighting & Signage

Emergency lighting will be provided in the areas indicated in Table 8 of BS 9999 and the system should comply with the recommendations given in BS 5266-1:2013 and BS 5266-4:2013.

Escape and other fire safety signage will be provided in accordance with the recommendations of BS 5499-1:2013 to every escape route.

4.5 Occupancy - Offices

The approximate occupancy for the offices has been estimated based on a typical open plan floor space factor of 6m^2/person, as recommended in BS9999:2017. The shops have been assessed using a typical floor space factor for a supermarket, which is 4m^2 per person, as recommended in BS 9999:2017. **If higher occupancies are desired, these calculations have to be revisited.**

The estimated occupancies are summarized below. The occupancy of the retail storage unit has been included in the occupancy of the retail unit at ground floor, as the users of the storage units will typically be the retail unit staff.

Table 4: Estimated occupancies for commercial areas

Accommodation	Floor	Expected occupancy
Offices	Lower Ground	45 people
Offices	Ground	34 people
Retail	Ground	23 people

In accordance with BS9999:2017 for the of purposes occupancy analysis the following should also be noted:

- Where a space is provided with alternative escape routes / exits for the purposes of occupancy analysis the largest escape route / exit is to be discounted (assumed blocked by the fire);
- Where a space is provided with only a single exit the occupancy capacity of the space is to be limited to 60 persons only regardless of the size of the exit. Where a space is accessible to disabled occupants and there is only a single disabled means of escape route the space should be considered to be provided with only one means of escape route for the purposes of occupancy analysis even if the space is provided with alternative escape routes for able-bodied occupants;
- Where a means of escape door does not open in the direction of escape or if the door is a single means of escape, the maximum occupancy permitted to be served by the door is limited to 60 persons regardless of the size of the door;
- All doors are to have an absolute minimum width of 800mm (or 850mm if the door provides access to a disabled refuge area).

4.6 Escape from Residential Areas

4.6.1 Open-Plan Apartments

The majority of flats are designed as open plan flats.

Open-plan apartment design in accordance with BS 9991 (definition – where bedrooms are accessed from another habitable room e.g. living/dining areas) should comply with the following requirements:

- Open-plan apartments should be situated on a single level only (excluding those with galleries).
- The fire alarm and detection system is to be an LD1 Standard – Grade D.
- The apartment should include for a form of suppression system designed and installed in accordance with BS 9251 (Category 2 system).
- The size of the open-plan apartment should not exceed 16m x 12m where an enclosed kitchen exists.
- The size of the open-plan apartment should not exceed 8m x 4m where an open kitchen exists – the kitchen hob location should be **remote** from the means of escape of occupants within the apartment.
- The ceiling within the open-plan apartment should have a minimum height of 2.25m.

It should be noted, there is no strict definition given as to '**remote**' and as such the following options can be taken in allowing flexibility to kitchen hob locations as below. Otherwise provide them to the other end of the apartment entrance door and completely clear of any escape routes from within the apartment – particularly those from the bedrooms.

a) Provide fire suppression devices e.g. cut-off timers.

b) The undertaking of radiation calculations in assessing a safe passable distance for occupants – this is however subject to additional analyses. **This will be considered at the next stage of the detailed design post planning to ensure compliance or provide adequate mitigation measures, subject to consultation with the Statutory Approvers**

The proposed open plan flats exceed the 8m x 4m (32m^2 total area) recommendation for open plan flats with open kitchen, having sizes between approx. 38 to 123m^2. However, the majority of flats have the hob located remotely from the escape route and/or should be provided with a cut-off timer for the hob. The ones that have hobs located

close to an escape route should be changed at the next stage of design. The maximum travel distance of 20m from the furthest location in the flat to the flat entrance door is not exceeded. **This will be considered at the next stage of the detailed design post planning to ensure compliance, provide adequate mitigation measures, or undertake advanced fire engineering analysis to prove conditions in the flat, subject to consultation with the Statutory Approvers.**

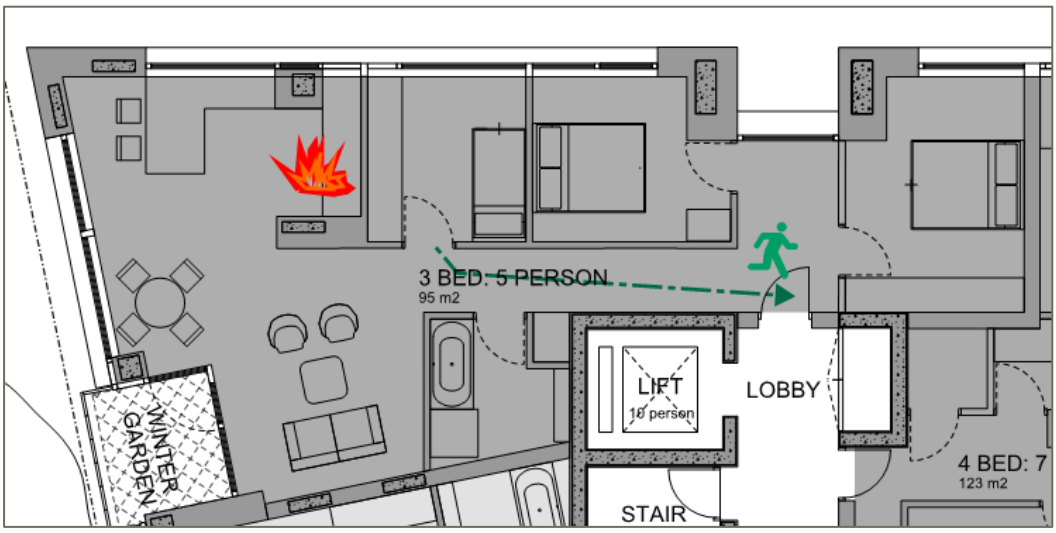

Figure 5: Example of open plan flat layout: kitchen is remote from escape route

4.6.2 Flats with Internal Protected Hallways

There are a few flats that are designed as flats with internal protected hallway. They should meet the following recommendations:

- The protected internal hallway that leads off to all habitable rooms should have a maximum travel distance of 9m from the flat entrance door to the door of any habitable room
- The protected internal hallway should be enclosed in 30 min fire rated construction and FD30 doors.

There is an instance of extended travel distance in the internal protected hallway (10.3m). **This will be considered at the next stage of the detailed design post planning to ensure compliance.**

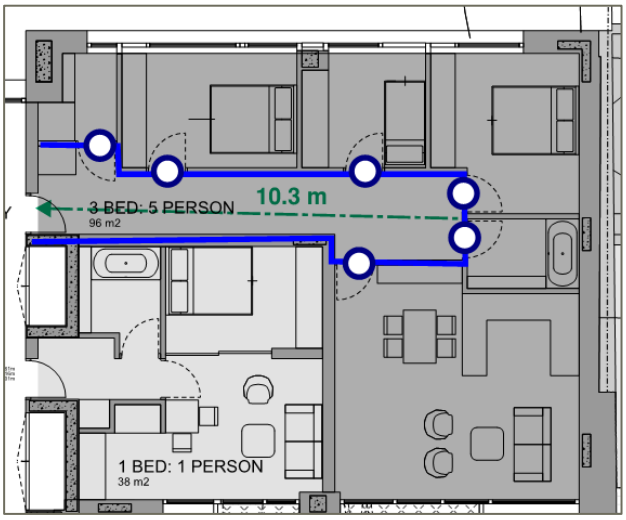

Figure 6: Extended travel distance in internal protected hallway

4.6.3 Private Balconies

Balconies that are accessed from flats more than 4.5m above ground floor level should meet the following provisions.

- The escape route from the balcony should not pass through multiple access rooms.

- The interior of the access room should be clearly visible from all parts of the balcony unless provided by a fire detection and alarm system in accordance with BS 5839-6.
- Any cooking risk in the access room should be enclosed with fire-resisting construction (30 minutes with FD30 doors – no self-closers) unless:
    - The cooking hob location should be **remote** from the means of escape of occupants escaping from the balconies.
    - The fire alarm and detection system within the access room is interlinked with an alarm system on the balcony i.e. beacon or sounder.
- Where the travel distance from the balcony access door to the furthest point on the balcony exceeds 7.5m, it should be provided with an alternative escape route without going via the same access room, or the access room should be provided with automatic smoke detection.

The private balconies in this development are designed in line with the requirements above.

4.6.4 Community Terrace and Play Space

The children's play space at sixth floor is served by two exits which swing opposite the direction of escape, therefore it should serve no more than 60 people.

The community terrace at ninth floor has a single exit, therefore it should not serve more than 60 people. Escape from the community terrace is done via the community room, therefore the single direction travel distance from the terrace to the lobby door should be no more than 18m.

The community terrace should be provided with an alarm system and sounder, and the community room should be provided with LD1 detection. Additionally, the cooking facilities should be situated remotely from the escape route.

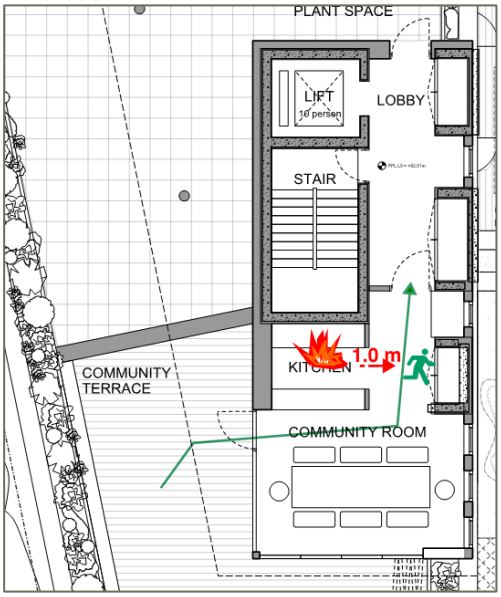

Figure 7: Escape past the cooking facilities in community room

This will be considered at the next stage of the detailed design post planning to ensure compliance or provide adequate mitigation measures, subject to consultation with the Statutory Approvers.

4.6.5 Travel Distances

The maximum travel distances within the residential areas in accordance with BS 9991 are tabulated below.

Table 5: Travel Distance Requirements

Area	Single Direction of Escape	Multiple Directions of Escape
Firefighting Lobby	7.5m	-
Internal Protected Hallways	9m	-
Open Balconies	No Limit	No Limit
Plant / Ancillary Areas	18m (9m within the room itself)	45m (18m within the room itself)
Common terrace	18m	45m

Travel distances in this development are compliant with the requirements set out in guidance.

4.6.6 Smoke Ventilation of Firefighting Lobby

A 1m² AOV is required to the head of the stair.

For the firefighting lobbies for buildings over 30m, the smoke control should have one of the following:

- A smoke shaft in the protected lobby enclosed in 30 min FR walls located as far away from the stairway as possible, with a minimum cross-sectional area of 1.5m^2, and an AOV on the top of the stairway, having a minimum free area of 1.0m^2;
- A mechanical smoke ventilation system (pressurization) in the lobby, and an AOV on the top of the stairway, having a minimum free area of 1.0m^2;

It should be noted, the aforementioned sizes for all ventilation types mentioned are free area sizes and thus careful consideration should be made to the opening of dampers, grills/louver porosities etc.

If a mechanical smoke ventilation system is proposed, the performance of the system should be demonstrated through CFD analysis with the principle objective to maintain the stair relatively free of smoke.

For this development, a mechanical smoke shaft will be provided to ventilate the firefighting corridor, and an AOV on the top of the stairway, having a minimum free area of 1.0m^2. **The performance of the system will be assessed using CFD analysis at a later stage of design.** The only exception to this is the fifth floor, where the firefighting lobby is vented using AOVs to the exterior of the building with a minimum free area of 1.5m^2, fitted in the common lobby directly adjacent to the stair, as shown below.

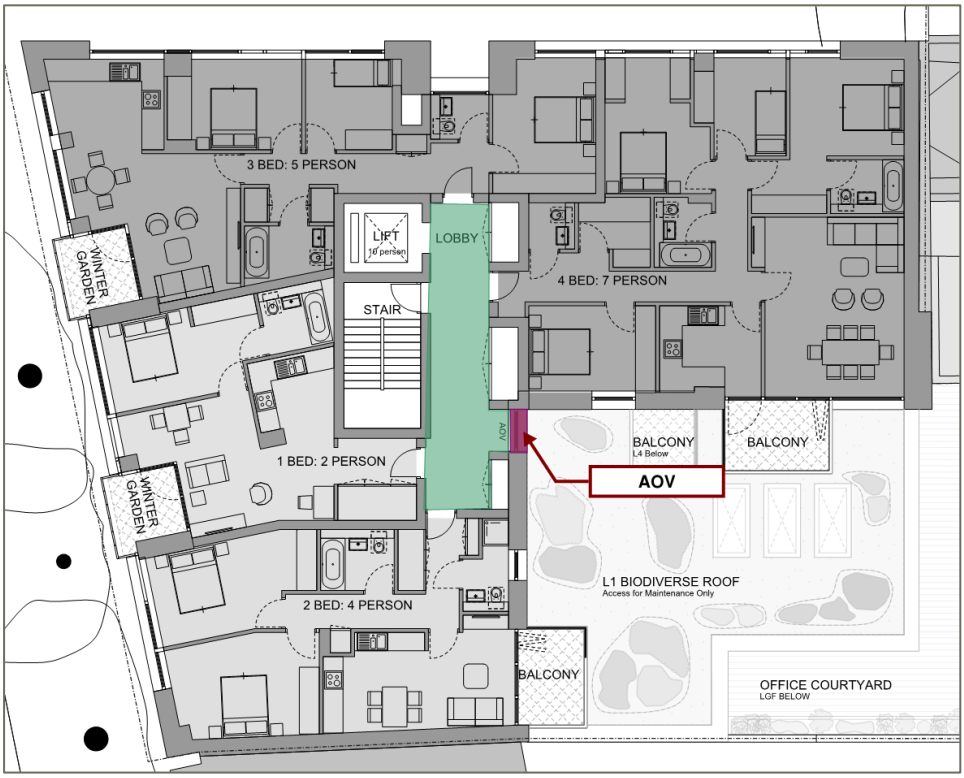

Figure 8: Proposed ventilation for the firefighting lobby (fifth floor)

4.6.7 Exit Requirements

The stairs thus are required to be designed for firefighting. A summary of the various width requirements for the scheme are described below.

Table 6: Residential Staircase Widths and Storey Exit Widths

Staircase Width(2)	Storey Exit Width	Final Exit Widths(1)
1100mm	850mm	1100mm

Note:

1) *Inclusive of the discharge staircase door and all subsequent exits leading to the final exit. Should the staircase be made for fire fighting, then this requirement pertains to the discharge staircase door and all subsequent exits leading to the final exit along the internal fire service access route on ground floor level.*

2) *Staircase widths are measured inclusive of the balustrade on either side provided they do not protrude more than 100mm into the staircase.*

4.6.8 Final Exits

The final means of escape from the residential staircases should be by ways of a protected route to outside or direct discharge to outside – with no fire load or combustible materials within the path nor any access rooms discharging into this route. As this is the access level of a firefighting shaft, no service risers should open into this space, as they represent a fire risk. **This will be considered at the next stage of the detailed design post planning to ensure compliance or provide adequate mitigation measures, subject to consultation with the Statutory Approvers**

The block has ancillary accommodation opening into the final means of escape, which does not comply with the recommendations in the guidance. Ventilated lobbies are proposed to all ancillary accommodation, with 1m^2 permanent ventilation or 0.4m^2 permanent ventilation if the ancillary accommodation is sprinklered to BS EN 12845. **This will be considered at the next stage of the detailed design post planning to ensure compliance or provide adequate mitigation measures, subject to consultation with the Statutory Approvers.**

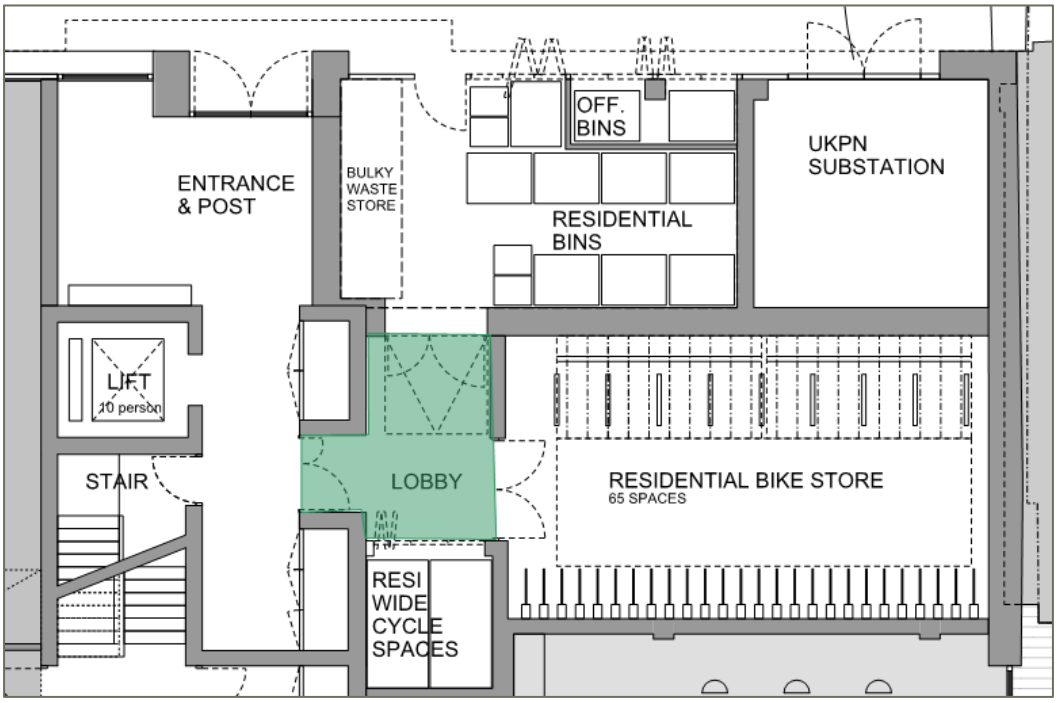

Figure 9: Ventilated lobby between ancillary accommodation and final exit shown in green

The residential staircases should not descend to serve the basement levels. In the proposed design, the residential staircase and the basement/lower ground floor staircase are fully separated.

For the residential stair core which is designed to have a fire-fighting shaft, the final means of escape from the stair, passes by the lifts. In order to mitigate this, it is proposed that fire curtains with 120 min fire resistance are provided to seal off the potential fire load. Alternatively, a localized suppression system should be provided in the lift shaft to minimize the fire risk within the lift shaft itself. **This will be considered at the next stage of the detailed design post planning to ensure compliance or provide adequate mitigation measures, subject to consultation with the Statutory Approvers.**

4.7 Escape from Non-Residential Areas

4.7.1 Travel Distances

Travel distances are outlined with the table below. As the layouts are known for the offices, the actual travel distances are considered. The retail unit and storage does not have detailed layouts yet, therefore the direct travel distance is considered (2/3 of the actual travel distance).

Figure 10: Travel Distance Requirements

Area	Risk Profile	Two-way Travel (minimum fire safety measures provided)	Two-way Travel (enhanced fire safety measures provided)	One-way Travel (minimum fire safety measures provided)	One-way Travel (enhanced fire safety measures provided)
Offices	A1	65m (actual)	74.75m (actual)	26m (actual)	29.9m (actual)
Retail	B2	33m (direct)	37.95m (direct)	13m (direct)	14.95m (direct)
Retail Storage	A2	37m (direct)	42.55m (direct)	15m (direct)	17.25m (direct)

The proposed travel distances in this development are compliant with the requirements set out in BS9999:2017.

4.7.2 Inner Rooms

An inner room can be at risk if a fire starts in the access room. In this development, there are inner rooms designed as meeting rooms or facilities on both office floors.

This arrangement is acceptable provided the following conditions are met:

- The occupant capacity of the inner room does not exceed 60 people;
- The travel distance from any point in the inner room to the exit from the access room does not exceed the allowable one-way travel distance;
- The access room is not a place of special fire hazard;
- A suitably sited vision panel not less than 0.1 m^2 is located in the door or walls of the inner room, to enable occupants of the inner room to see if a fire has started in an out room; or the access room is protected by an automatic smoke detector designed to BS 5839-1:2013.

The proposed inner rooms comply with these requirements.

4.7.3 Escape Door Widths

Any room serving less than 60 occupants can be provided with one exit with a minimum clear width of at least 800mm. All rooms are assumed to be serving less than 60 people.

Where floors are expected to have more than 60 occupants they should have more than one exit, with the doors opening in the direction of the escape, and a clear width representative of the occupancy.

As there are not expected to be more than 60 people per floor, the escape door widths of the commercial areas comply with the requirements above.

4.7.4 Escape Stair Widths

Staircase widths are calculated using the calculated or expected occupancy by using the staircase width multiplied by the minimum width of stair per person served over a total number of floor levels taken from Table 13 in BS 9999.

Where downward travel is necessary, the minimum staircase width should be 1000mm in accordance with BS 9999:2017.

Where upward travel is necessary, the minimum staircase should be 1200mm in accordance with BS9999:2017.

Where only a single stair serves the upper or lower level, the upper or lower level requires being limited to 60 occupants.

As there are not expected to be more than 60 people per floor, the office stair core complies with the requirements above.

The exit route from a stairway should be at least as wide as the stair leading to it. Where an exit route from a stairway also forms the escape route from the ground and/or basement the exit route might need to be increased accordingly, see section below.

Every protected stairway should discharge:

- Directly to a final exit; or
- By way of a protected exit passageway to a final exit

4.7.5 Final Exit (Merging Flow at Ground Floor)

The final exit at ground level from the basement and lower ground floor stairs discharges towards the final exit from the office at ground floor, or towards the retail unit. As it is not clear whether the exit through the retail unit is available to the office users, it is assumed that the only exit available for the office users through the office reception area. Therefore the exit from the basement stair must discharge directly to the external via a protected corridor, as shown below. Therefore the reception area should not contain combustible materials, as it a sterile circulation space.

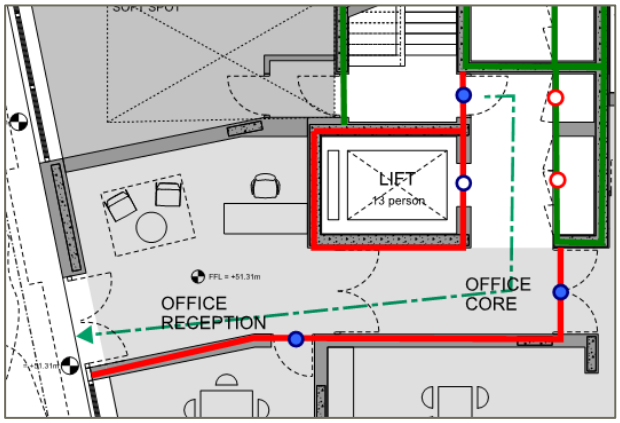

Figure 11: Final exit from offices

This will be considered at the next stage of the detailed design post planning to ensure compliance or provide adequate mitigation measures, subject to consultation with the Statutory Approvers.

Because the stair from basement/ lower ground floor discharges into the ground floor final exit, a merging flow calculation has to be undertaken. As BS9999:2017 does not present a scenario where the stair from below and ground floor share an exit, the equation from Approved Document B vol. 2 is used.

W= (N/2.5+60S)/80

Where W is the width of the final exit in metres

N= number of people served by the ground floor storey exit (in this case 34 people from the office)

S= stair width in metres (in this case 1.2m).

Therefore the minimum final exit width should be 1.07m. The proposed final exit width is 2m wide, therefore the exit width is compliant with the requirements set out in guidance.

4.8 Disabled Means of Escape

The residential accommodation endorses a ‘defend in place’ / ‘stay put’ evacuation strategy, this along with the high level of compartmentation are adequate provisions in not including the means of disabled refuges.

The commercial spaces, which are designed to have a simultaneous evacuation strategy, have wheelchair access on the lower floors, therefore disabled refuges are required.

Disabled refuges should be included within protected stairs and are to be provided with an area accessible to a wheelchair of at least 900 mm x 1400 mm and be designed to comply with Annex G of BS 9999:2017. The refuge should not reduce the width of the escape route and access to the space should not obstruct the flow of persons escaping. The refuge should be clearly identified by a blue mandatory sign worded “Refuge – keep clear”.

An emergency voice communication system (EVC) should be provided in each refuge to allow contact with building management. This EVC system should comply with BS 5839-9:2003 and consist of Type B outstations which communicate with a master station located in the building control room or adjacent to the fire alarm panel or an alternative approach such as wireless technology.

5 Internal Fire Spread (Linings)

The interior wall and ceiling surfaces in a building may have a significant influence on how fast a fire may develop.

Building Regulations requires that internal linings should adequately resist the spread of flame over their surfaces and, if ignited, have either, a heat release rate or a rate of fire growth, which is reasonable in the circumstances.

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

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

Table 7: Wall and Ceiling Lining Requirements

Location	National Class	European Class
Small rooms not more than $4m^2$	3	D-s3, d2
Circulation spaces within dwellings	1	C-s3, d2
Other circulation spaces including common areas	0	B-s3, d2

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

The surface linings of the walls and ceilings should generally conform to the classification recommended above for the appropriate location. However, parts of walls in rooms may be of a lower class but not lower than Class 3 (or European Class D-s3, d2) provided that the total area of those parts in any one room does not exceed one half of the floor area of the room, subject to a maximum of $20m^2$.

6 Internal Fire Spread (Structure)

6.1 Elements of Structure

The height of the building is the determinant for the standard of fire resistance to the elements of structure. This building is over 30m, there the structural fire resistance is 120min.

6.2 Compartmentation

Limitations of a compartment size for within the building are tabulated below;

Table 8: Compartmentation Limits

Accommodation	Risk Profile	Height	Limit (m^2)
Office	A1	<18m	No Limit
Retail	B2	<18m	No Limit

Compartment floors are not required for the office units.

Additional compartmentation requirements are listed below, however detailed compartmentation information will be provided in later design stages post planning.

- Compartment floors are required to the upper residential levels to a fire resistance not less than that required for the building, similarly separation to the basement levels and between ground and basement level to 120 minutes is also required.
- All non-residential accommodations should be separated from the residential accommodations to a minimum of 120 min
- Fire fighting stairs and lifts should be enclosed with at least 120 minutes of fire resistant construction and 60 minutes therein.
- Escape stairs and protected lobbies serving non-residential accommodations only should be enclosed with at least 60 minutes of fire resistant construction.
- Any dead end corridors exceeding 4.5m (where only a single direction of escape is permitted) should be protected to 30 minutes.
- Flats should be enclosed in 60min compartments.
- Internal hallways should be protected to 30 minutes fire resistance.

6.3 Ancillary Accommodations

Ancillary accommodations should be separated from other parts of the building in accordance with BS 9999 and BS 9991 as shown in the table below.

Table 9: Ancillary Accommodation

Area	Minimum Fire resistance (minutes)
Store rooms	30
Cleaner's stores	30
Plant rooms	30/60 (depending on voltage)
Refuse stores	60
Life Safety Equipment	120
Substation	240

6.4 Fire Doors

Table 10: Fire Door Requirements

Location	In accordance with BS 476-22	In accordance with BS EN 1634-1
Into Fire-Fighting stairs	FD60S	E60Sa
Fire-Fighting Lifts	FD60	E60
Into escape stairs/lobby	FD30S/FD60S	E30Sa/E60Sa
Doors to internal protected hallway	FD30	E30
Lift doors	FD30	E30
Plant / Ancillary accommodation	FD30S	E30Sa

Detailed Compartmentation information will be provided as the design progresses post planning.

6.5 Cavities, Openings and Fire Stopping

Details of cavity barriers, openings in compartmentation and fire stopping will be covered at the next stage of design post planning.

7 External Fire Spread

The external envelope of a building should not provide the medium for fire spread if it is likely to be a risk to health or safety. The use of combustible materials in the cladding system and extensive cavities may present such a risk in tall buildings.

Both the criteria for surface spread of flame and combustibility of the elevation construction should be met independently, as the acceptability of the surface spread of flame criteria does not necessarily ensure acceptability of the combustibility criteria for tall buildings.

7.1 Combustibility of Wall Construction

The most up to date guidance for external fire spread is Approved Document B volume 2, 2019. This guidance refers back to Regulation 7(4), which requires all residential blocks with an occupied storey over 11m to have all materials which become part of an external wall or specified attachment (e.g. balconies) to achieve class A2-s1,d0 or class A1. Therefore the external walls of the block, including balconies, winter gardens, children's terrace and roof garden, proposed in this development should achieve class A2-s1,d0 or class A1.

The design team to confirm the external wall build-up at the next stage of design.

7.2 Surface Flame Spread

The external walls of the block over 11m will be made of non-combustible materials.

7.3 Space Separation between Neighbouring Buildings

A space separation calculation is required. The Enclosing Rectangles method from BR 187 would be used to determine if external fire spread is an issue to neighbouring buildings. The methodology in which the worst case compartment is considered where glazing is shown (assuming the remaining wall construction is protected), in

addition a compromise made between compartment size and distance to site boundary line/adjacent building or to the point of half way along a public road / walkway is also considered.

This will be done post planning.

8 Access and Facilities for Fire Fighting

8.1 Fire Service Access

The building is accessible by fire service access along adjacent public roads, namely Swinton Street and Gray's Inn Road.

The access road for Fire Service vehicles to reach the dry riser inlets should conform to the requirements in the table below.

Table 11: Vehicle Access Road Specification

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

Note:

1) *Dead end fire service access roads may be up to 20 meters long without being provided with a turning bay (A fire service vehicle should not have to reverse further than 20m).*

As residential stair for this block serves floor levels exceeding 18m in height (measured from access level), this stair core is to be designed as firefighting shafts. Fire fighting shafts include a ventilated common corridor, firefighting lift and fire main outlet located to the full landing of the stair serving all floor levels such that there is 45m coverage to every part of the floor plate (along a suitable path of laying hose).

The fire fighting lift as part of the fire fighting shaft is required to open into a ventilated corridor and to be within 7.5m from the fire fighting stair door.

Fire service access is required for a pumping appliance to within 18m of the dry fire main inlet point. The inlet point is proposed to be on the face of the stair core and should be visible from a suitable appliance parking location.

8.2 Basement Smoke Ventilation

A system of smoke and heat ventilation should be provided from every basement level except for any basement storey that has:

- A floor area of not more than 200m^2; or
- A floor level not more than 3m below the adjacent ground level.

Natural ventilation will be provided in the form of smoke outlets which should be no less than 2.5% of the floor area of each storey, should be sited as high as practicable (ceiling or wall of the space thy serve) be evenly distributed around the perimeter of the building to discharge into the open air outside of the building, and be located such that they would not prevent the use of escape routes from the building.

The design team to provide details of the ventilation system for the basement post-planning.

8.3 Fire Hydrants

Hydrants are required to be within 90 metres of each dry riser inlet position.

If the existing local fire hydrants do not meet this requirement new hydrants may be required. Hydrants should be capable of supplying at least 1500 l/min in accordance with the recommendations of BS 9990.

Each hydrant should be clearly indicated by a plate affixed nearby in a conspicuous position in accordance with BS 3251.

Where it is not possible to provide a piped water supply or there is insufficient pressure, an alternative source should be provided in accordance with the following recommendations;

- A charged static water tank of at least 45,000 litre capacity;
- A spring, river or canal capable of providing 45,000 litres of water at all times of the year, to which access, space and hard standing are available for a pumping appliance;

- Any other means of providing a water supply for firefighting operations considered appropriate by the fire and rescue authority.

If an alternative to fire hydrants is to be proposed early consultation with the local Fire & Rescue Service should be undertaken. **The design team to confirm the location of hydrants at the next stage of design.**

9 Conclusion

The proposed development at Acorn House has been assessed in line with the current guidance. The guidance used is BS9991:2015 for the residential areas, and BS 9999:2017 for the commercial areas. The information within this document is considered sufficient at this stage of design and can be progressed as the design continues.

The majority of the development complies with the requirements set out in the guidance documents. A number of items will be addressed at the next stage of design to either achieve compliance or provide adequate mitigation measures, subject to consultation with the Statutory Approvers.