Developed for:
Bellway Homes Limited (North London)

Outline Fire Safety Strategy

Campus East Welwyn Garden City

Hertfordshire

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Outline Fire Safety Strategy

Campus East Welwyn Garden City
Hertfordshire

Project Reference: AF2859

Client: Bellway Homes Limited (North London)

Issue	Date	Description	Author	Checked	Approval
Issue 01	04.10.2022	First issue for design team review	CMC	GT	GT
Issue 02	06.10.2022	Update based on comments received	CMC	GT	GT
Issue 03	16.11.2022	Update based on new drawings received	CMC	GT	GT

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The checker has provided an internal review of the technical content of the report.

The approver confirms the report has received quality assurance in accordance with the principles of ISO 9001 and authorises external release of the document on behalf of Ashton Fire.

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1. INTRODUCTION

1.1 General

1.1.1 Ashton Fire have been commissioned by Bellway Homes Limited (North London) to provide fire safety consultancy services on Campus East Welwyn Garden City development in Hertfordshire.

1.1.2 This document is confidential and for the exclusive benefit of Bellway Homes Limited (the Client). It may not be assigned to or relied upon by a third party without agreement of Ashton Fire Ltd (Ashton Fire) in writing. Ashton Fire retains all copyright and other intellectual property in the document and its contents unless transferred by written agreement between Ashton Fire and the Client.

1.1.3 This report outlines the minimum fire safety provisions required for the proposed Campus East development to be compliant with the Functional Requirements of the Building Regulations 2010 (as amended).

1.1.4 This document is an outline document only and is not to be submitted as a complete fire strategy document for completion. The fire strategy is required to be developed during the proceeding design stages. A Detailed Fire Safety Strategy is required to be developed during the proceeding design stages to support.

1.2 Fire safety guidance

1.2.1 The principal guidance document being used to demonstrate compliance with the requirements of the Building Regulations shall be:

- Approved Document B, Volume 1: Dwellings – 2019 edition incorporating 2020 and 2022 amendments [1] (ADB Vol. 1);
- Approved Document B, Volume 2: Buildings other than dwellings – 2019 edition [2] (ADB Vol. 2);
- Other supplementary BS guidance.

1.2.2 For areas that fall outside the scope of ADB Vol. 1, the recommendations contained within ADB Vol. 2 shall be followed. It is noted that this guidance document does not set out statutory requirements; they are intended to provide guidance only for generic building designs. Unless specifically covered in this report please refer to the adopted design guidance for further details. An alternative solution can be applied to achieve an acceptable level of safety commensurate with the function requirements of the Building Regulations 2010 (as amended).

1.2.3 On the basis that recommendations made within the guidance documents are followed, it is considered that the Requirements of the Building Regulations 2010 (as amended) will be fulfilled; and that an adequate level of fire safety will be provided throughout the premises.

1.3 Alternative fire engineering solutions

1.3.1 Fire engineering principles are employed to support alternative solutions where strict adherence to the codes would conflict with the wider aspirations for the scheme. The use of a fire safety engineering approach is recognised within ADB as an acceptable means of complying with the Functional Requirements.

1.3.2 Apart from where noted in this report, the design will be in accordance with the recommendations of ADB. Departures from the code guidance are identified and alternative solutions proposed following the methodology outlined in PD 7974 [3].

1.3.3 In accordance with the fire safety engineering principles detailed in the PD 7974 codes of practice, all fire precautions are determined based on there being one seat of fire, as considered suitable for accidental fires.

1.4 Reference information

1.4.1 This outline fire strategy is based on information provided by the design team to Ashton Fire as listed in Table 1. Additional contradictory information or subsequent design variations to the information supplied may render the findings and recommendations of this report invalid.

Table 1 – Project documentation referenced

Description	Reference	Author	Revision
Proposed site layout Level 0	8375/P111	Saunders Architecture + Urban Design	A
Flat Block A Level -1&0	8375/P150.1		B
Flat Block A Level 1&2	8375/P150.2		-
Flat Block A Level 3&4	8375/P150.3		-
Flat Block A Level 5 & Roof Plan	8375/P150.4		A
Flat Blocks B1&B2 Levels 0,1&2	8375/P151.1		A
Flat Blocks B1&B2 Levels 3,4& Roof Plan	8375/P151.2		-
Flat Blocks B3&B4 Levels 0,1&2	8375/P152.1		A
Flat Blocks B3&B4 Levels 3,4& Roof Plan	8375/P152.2		-
Flat Blocks C&D Levels 0,1,1& Roof Plan	8375/P153.1		A
Flat Blocks E&F Levels 0,1&2	8375/P154.1		-
Flat Blocks E&F Levels 3,4& Roof	8375/P154.2		-
Flat Blocks G&H Levels 0,1&2	8375/P155.1		-
Flat Blocks G&H Levels 3,4& Roof	8375/P155.2		-

1.5 Project description

1.5.1 This outline fire safety is concerned with Building A (Blocks A1,A2,A3&A4) Building B (Blocks B1,B2,B3&B4), Building C&D, Building E&F and Building G&H of the Campus East Welwyn Garden City development located in Hertfordshire.

1.5.2 Building A has four single stair cores and an evacuation lift at each core. The stair cores are A1,A2,A3&A4. Cores A1&A2 are six storeys (G+5) over basement car park. Cores A3&A4 are five storey (G+4) over basement carpark. Cores A3 and A4 have direct access to outside from the basement level as the building sits on a sloping site. Residential accommodation consists of single storey flats with entrance halls. Ancillary accommodation is provided at basement level and consists of plant rooms, bin stores and cycle store. The block has a podium at ground floor level open to the air which all cores connects to.

1.5.3 Building B -Block B1&B2 are two adjacent blocks of flats separated by a party wall. The blocks are five storey (G+4) and are each served by a single stair and evacuation lift. Residential accommodation consists of single storey flats with entrance halls. Ancillary accommodation is provided at ground floor and consists of cycle stores and bin stores.

1.5.4 Building B - Blocks B3&B4 are two adjacent flat blocks separated by a party wall. The blocks are five storey (G+4). Residential accommodation consists of single storey flats with entrance halls. Ancillary accommodation is provided at ground floor and consists of a bin store, cycle stores and a concierge/lounge.

1.5.5 Building C&D are two adjacent flat blocks separated by a party wall. The blocks are three storey (G+2). Residential accommodation consists of single storey flats with entrance halls. Ancillary accommodation is provided at ground floor and consists of bin and cycle stores.

1.5.6 Building E&F are two adjacent blocks separated by a party wall. The blocks will be five storey (G+4). Block E will step back at 3rd floor however both stairs will rise up to 4th floor. Residential accommodation consists of single storey flats with entrance halls. Ancillary accommodation is provided at ground floor and consists of bin and cycle stores.

1.5.7 Building G&H are two adjacent blocks separated by a party wall. The blocks are five storey (G+4). Residential accommodation consists of single storey flats with entrance halls. Ancillary accommodation is provided at ground floor and consists of bin stores.

1.5.8 The no. of storeys and the height of each core is shown in Table 2. Indicative layout of the development are illustrated in Figure 2 to Figure 14.

Table 2 - No. of storey and height of cores

Core	No. of storeys	Height of topmost storey above access level
A1&A2	7(B,GF+5)	19.5m
A3&A4	6(B,GF+4)	15.7m
B1&B2	5 (GF+4)	12.8m
B3&B4	5 (GF+4)	12.8m
C&D	3 (GF+2)	6.5m
E&F	5 (GF+4)	13.2m
G&H	5 (GF+4)	12.8m
Note: The height of Core A1&A2 is measured from the lowest point at ground floor level given that the building sits on a sloping site. See Section 6.4 for different height measurement for fire fighting facilities.		

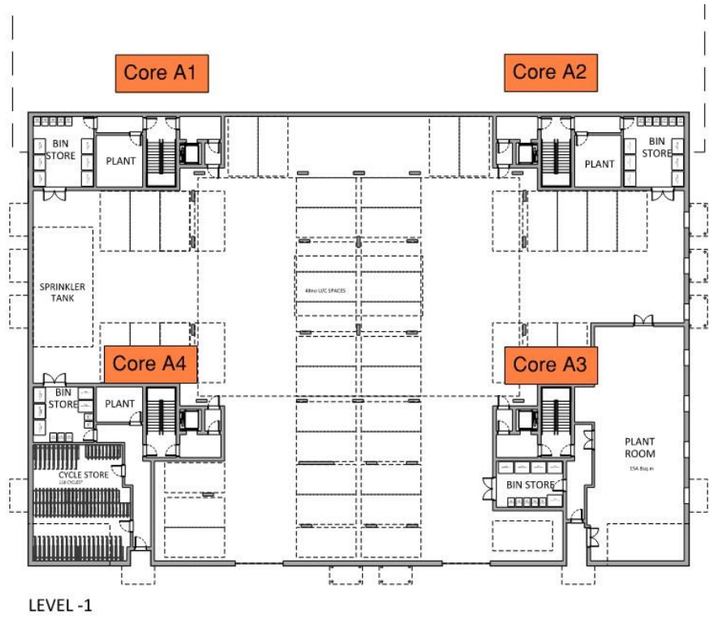

Figure 1 - Indicative Basement Level

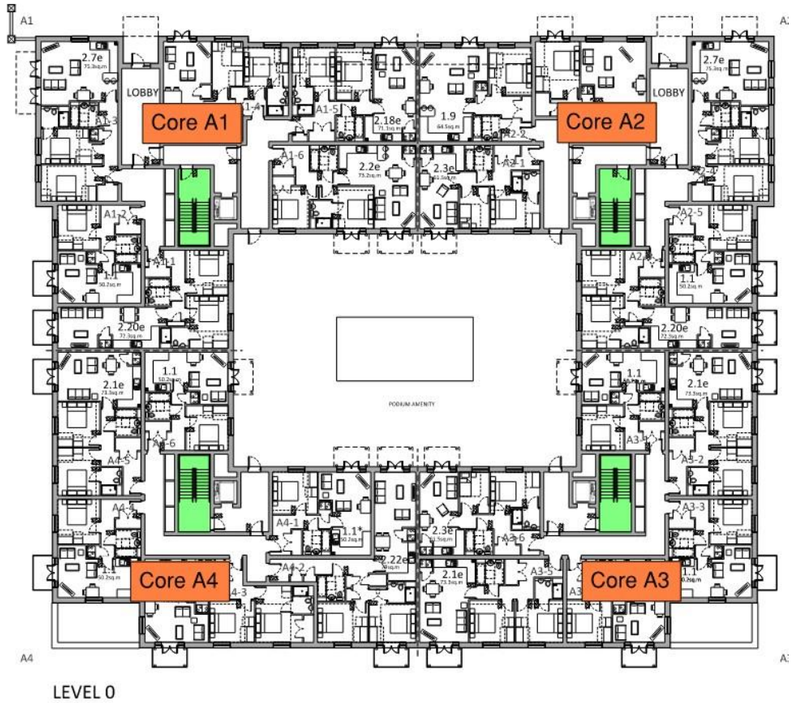

Figure 2 - Indicative Ground Floor Block A

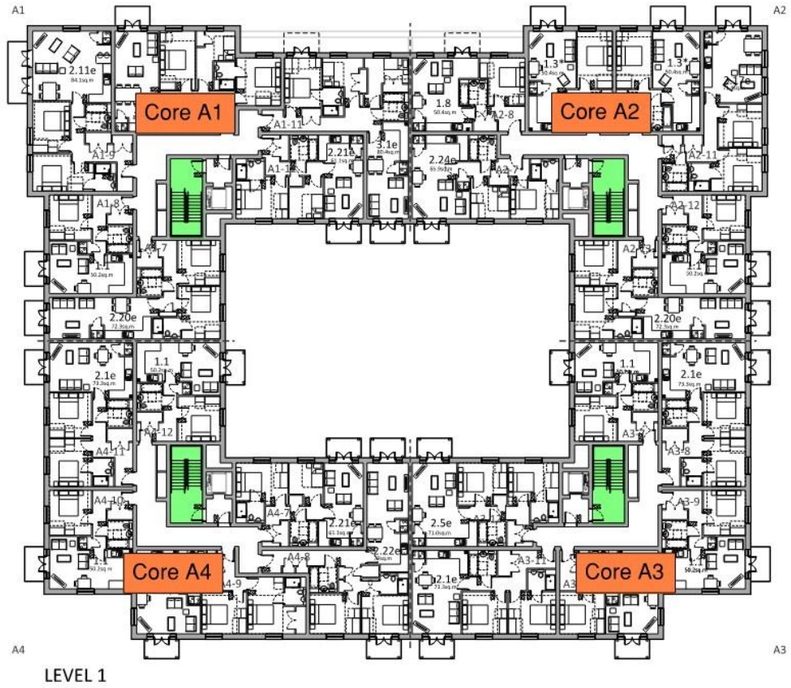

Figure 3 - Indicative Upper Floor layout Block A

Figure 4 - Indicative 5th Floor Cores A1&A2

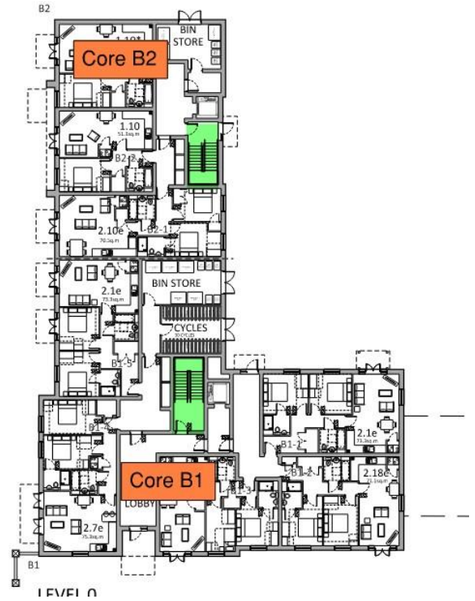

Figure 5 - Indicative ground floor layout Block B1&B2

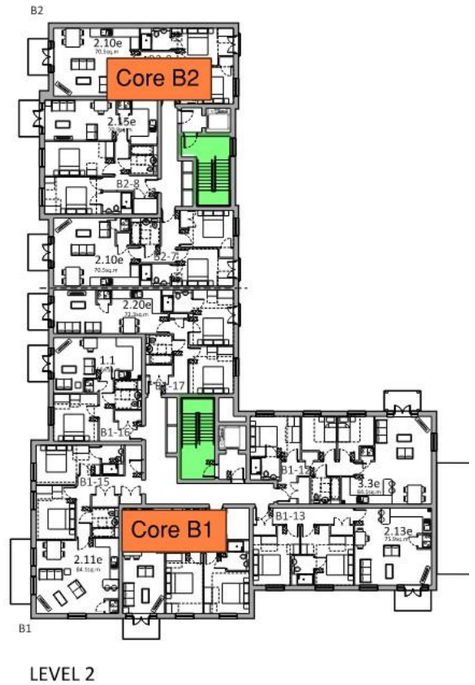

Figure 6 - Indicative upper floor layout Block B1&B2

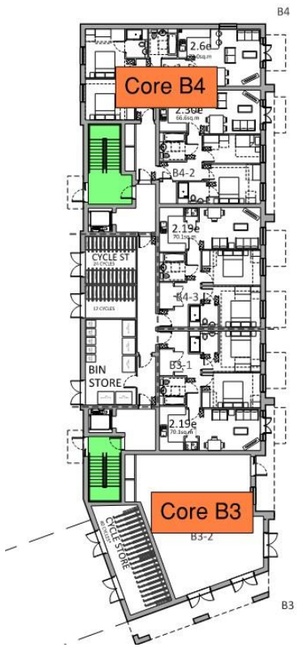

Figure 7 - Indicative ground floor layout Block B3&B4

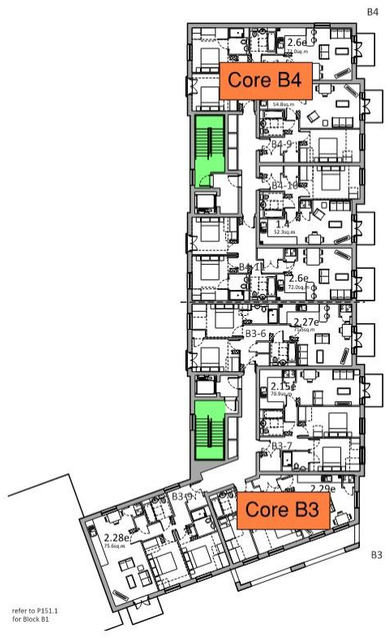

Figure 8 - Indicative upper floor layout Block B3&B4

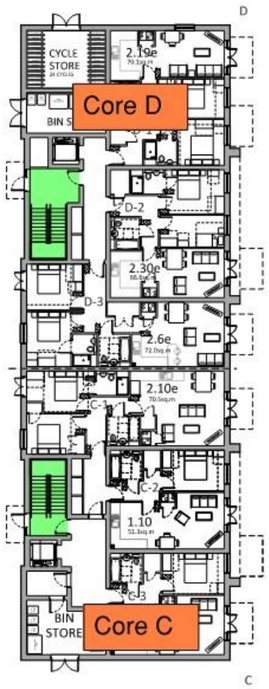

Figure 9 - Indicative ground floor layout Block C&D

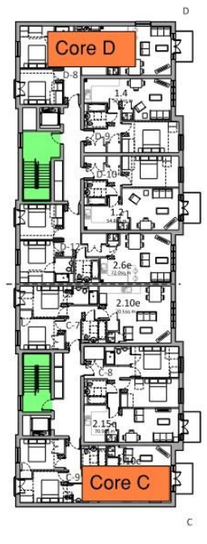

Figure 10 - Indicative upper floor layout Block C&D

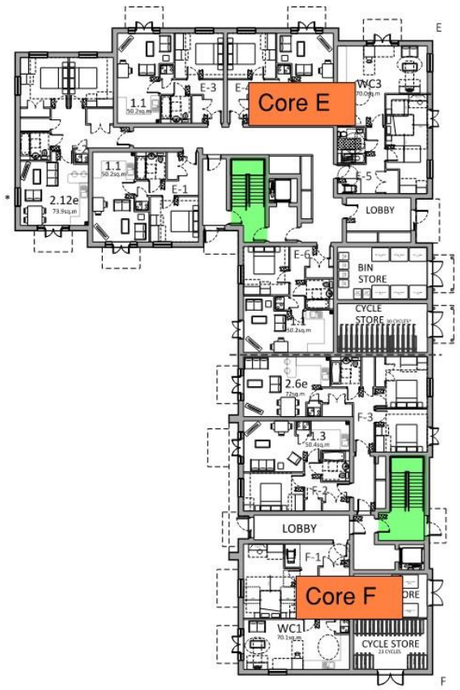

Figure 11 - Indicative ground floor layout Block E&F

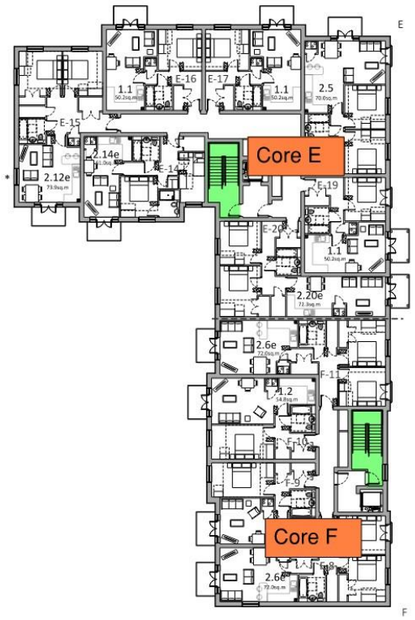

Figure 12 - Indicative upper floor layout Block E&F

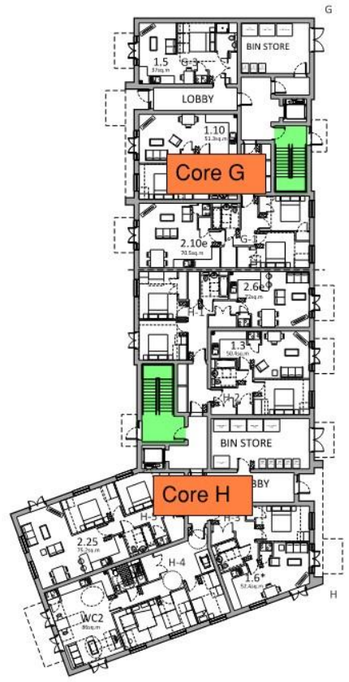

Figure 13 - Indicative ground floor layout Block G&H

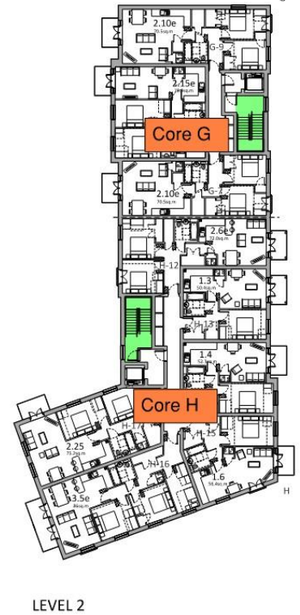

Figure 14 – Indicative upper floor layout Block G&H

1.6 The non-residential areas and the car park – Purpose Group

1.6.1 The ancillary areas and car park areas shall be designed in accordance with the guidance contained in ADB vol 2.

1.6.2 As per the guidance contained in ADB vol 2, each area will be provided with a purpose group in accordance with Table 0.1 of ADB vol 2..

1.6.3 The Purpose groups of the different non-residential areas are summarised in Table 3.

Table 3 – Purpose Group summary

Areas	Purpose group
Car park	7(b)
Bin store, cycle store	7(a)
Concierge	3

1.7 Occupant numbers

1.7.1 The design of the fire strategy for the residential areas is not led by number of occupants in the building, where this is based upon a defend-in-place procedure where only one apartment will escape at a time.

1.7.2 The number of occupants expected in the non-residential areas is necessary to be calculated to ensure that the number and width of exits have sufficient capacity for means of escape purposes.

1.7.3 The maximum occupant numbers noted in table below has been calculated based on the floor space factors provided in ADB vol 2 or 60 occupants based on a single route of escape or an inward opening exit, and for the car park based on 2 person/ parking space.

Table 4 - Design occupancy

Room / Space	Area	Floor space factor	Maximum design occupancy
Bin, cycle stores and plant rooms	N/A	N/A	60 persons(1)
Concierge	82m^2	6m^2 per person	13 persons
Car park	46 parking spaces	2 person/ parking space	92 persons

Note:

1. Based on these spaces having a single exit route of escape as referenced in Section 1.7.3.

2. ACTIVE FIRE SAFETY SYSTEMS

2.1 Means of detection and alarm

2.1.1 The fire detection and alarm system requirements within the development are summarized in Table 5.

Table 5 - Minimum fire detection and alarm system

Accommodation	Minimum requirement
Residential flats	Grade D, Category LD2 conform to BS 5839-6 [4].
Residential communal corridors	L5 system conform to BS 5839-1 [5]. The purpose of this system is to activate the smoke ventilation systems within the communal corridors and lobbies where provided only, i.e. it will not provide an audible alarm within the building. It is recommended that the detector head spacing for the L5 system within the corridors is in accordance with the recommendations for a category L4 system.
Ancillary	L2 system conform to BS 5839-1.
Car park	M (manual) system conform to BS 5839-1. However, an L3 system conform to BS 5839-1 is recommended to be provided as a minimum.

2.2 Automatic suppression system

2.2.1 In accordance with ADB vol 1 all building >11m high shall be provided throughout with a sprinkler system. Building C&D are <11m and therefore shall not be provided with a sprinkler system. Sprinkler systems shall be provided as follows:

- A sprinkler system designed and installed in accordance with BS 9251:2021 [6] for the residential areas in all relevant cores;
- A sprinkler system in accordance with BS EN 12845 [7] for the enclosed car park and ancillary areas.

2.2.2 Building A will have a top floor height greater than 18m and therefore will be provided with a Category 4 sprinkler system conforming to BS 9251:2021

2.2.3 Blocks B1&B2, B3&B4, Building E&F and Building G&H require sprinklers and, as all have a top floor height below 18m, a Category 2 sprinkler system conforming to BS9251:2021 should be provided throughout all residential areas.

2.2.4 The ancillary areas and the car park should be provided with a sprinkler system designed and installed in accordance with BS EN 12845. In accordance with BS EN 12845, ancillary areas should be provided with a Category OH3 sprinkler system and the car park should be provide with a Category OH2 sprinkler system.

2.2.5 An extension of the residential system is permitted where the floor area of ancillary does not exceed 72m^2 or 100m^2 for plant rooms.

2.2.6 The design of the sprinkler system shall be carried out by a sprinkler specialist.

2.3 Smoke ventilation system – General

2.3.1 A smoke ventilation system is required to be provided within each protected residential stair, and to the residential common corridors in accordance with Diagram 3.7 in ADB. These are discussed below.

Residential stairways

2.3.2 All escape stairs serving the upper floors within the development are required to be provided with a 1.0m^2 AOV at the head of the stairway.

Residential communal corridors & Evacuation lift lobbies

2.3.3 In accordance with Diagram 3.7 in ADB vol. 1, the stair lobbies / portion of corridor in front of the stair should be provided with a smoke ventilation system. This may be provided by either one of these options in corridors where the travel distance in a single direction does not exceed 7.5m:

- A 1.5m^2 natural smoke shaft (see Section 2.3.5); or
- A mechanical smoke ventilation system (MSVS).

2.3.4 Corridors having a single directional travel distance greater than 7.5m to the storey exit should only be provided with an MSVS, where it is recommended the system consists of a dedicated extract remote from the stair, and an inlet air source provided either by an external wall AOV or by a dedicated inlet air shaft. The functionality of the MSVS will need to be assessed through the use of CFD modelling which will also determine the minimum required size of the MSVS shafts, though these are typically expected to have a free area of 0.6-0.8m^2. The CFD model shall be carried out by an appointed specialist and captured in a separate report. The design and performance of the system will be subject to approval by Building Control.

2.3.5 The natural smoke shaft should adhere to the following provisions:

- Have a minimum cross-sectional area of 1.5m^2 (minimum dimension 0.85m in any direction);
- Open at roof level, minimum 0.5m above any surrounding structures within 2m of it horizontally;
- Extend a minimum of 2.5m above the ceiling of the highest storey served by the shaft;

2.3.6 In accordance with the above, the smoke shaft should extend 2.5m above the ceiling of the highest storey served. However, as an alternative, the AOV opening into the smoke shaft at the highest floor level and the AOV located at the head of the smoke shaft is to have a free area of not less than 1.5m^2 (an increase from the recommended 1.0m^2). The 2.5m clearance at the head of the shaft can then be measured from the floor below the top floor. This is to be discussed and agreed with Building Control. Please see the indicative Figure 15.

2.3.7 This approach reflects the acceptable alternative arrangements as highlighted within the Building Control Alliance (BCA) guidance note 8 – Smoke shaft termination at roof level [8].

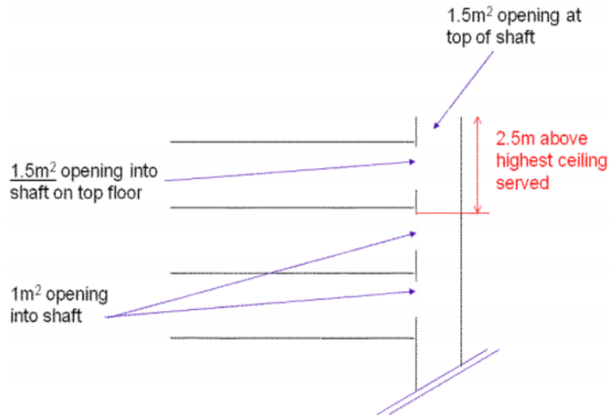

Figure 15 - Top of smoke shaft detail

2.3.8 Ashton Fire recommends that aa separate protected lobby is provided in front of the evacuation lift, where this should also be provided with a smoke ventilation system. This is intended to afford adequate protection to residents awaiting the lift car to arrive, as well as to protect the residential common areas where evacuation lifts will continue to operate during a fire. Due to the height of the building being 6.5m Building C&D do not require lift lobbies

2.3.9 Given there is limited guidance for the protection of evacuation lifts within ADB vol. 1, the following additional provisions are proposed in order to ensure adequate protection is afforded to occupants awaiting for the lift car to arrive while attempting to escape via the evacuation lift, and to ensure that adequate protection is also afforded to the residential common corridor where evacuation lifts will continue to operate during a fire:

- A lobby will be provided in front of the evacuation lift, where this should only connect to the common stair and corridor. The lobby shall offer a place of refuge whilst occupants await the lift;
- The lobby in front of the evacuation lift should be protected from the ingress of smoke. In addition to the smoke ventilation system provided in the common corridor / stair lobby, the evacuation lift lobby should be provided with its own smoke ventilation system, where it is recommended this is provided using a smoke shaft having a free area of at least 0.6m^2. This may also be provided using a 1.5m2 AOV on the external wall only if the residential common corridor connecting to the evacuation lift lobby is ventilated using a mechanical smoke ventilation system provided with its own dedicated inlet air source.

Other areas

2.3.10 In addition to the above, lobbies connecting the single stair cores with ancillary areas should be provided with a protected lobby, fitted with a mechanical smoke ventilation system and justified with CFD modelling.

2.4 Smoke Control System – Car park Building A

2.4.1 In accordance with ADB vol 2 guidance, the car park shall be provided with a natural or mechanical smoke ventilation system, as follows:

- Natural ventilation system by permanent openings. The free area of the openings should be at least 1/40th of the car park floor area, half of which is required to be split and provided equally between opposing walls (i.e. 1/160th on each side); or
- A mechanical smoke ventilation system designed and installed in accordance with BS 7346-7 [9].

2.4.2 Notwithstanding the information above, the single stair cores in block A will provide access to the basement car park. As such, in support of this arrangement a mechanical smoke control system shall be provided which shall be assessed to justify this connection to the single stair via CFD modelling. The purpose of this system is to protect the residential single stair escape routes from a potential fire in the basement car-park.

2.4.3 To support this approach all lobbies providing connection to the car park should be provided with a 0.4m^2 vent.

2.4.4 See further details in Section 3.2 of the report.

2.5 Evacuation lifts

2.5.1 Due to emerging updates to current guidance, consideration should be given on how all building occupants, including those with reduced mobility / wheelchair users can evacuate in an emergency. As it can be difficult for people with disabilities to navigate the escape stairs, it is typically recommended that occupants are provided with use of suitable lifts in an emergency.

2.5.2 Where evacuation lifts are to be provided, the evacuation lift should be a lift routinely used as a passenger lift. The lift should be designed and installed in accordance with relevant provisions of BS EN 81-20 [10] and BS EN 81-70 [11]. It is recommended that the minimum lift car size should be type 2 in accordance with Table 3 of BS EN 81-70:2021, having minimum dimensions of 1,100 x 1,400mm.

2.5.3 The evacuation lift would be required to be provided with a secondary power supply.

2.5.4 The cause and effect of any evacuation lift is to be discussed and agreed.

2.5.5 Suitable management procedures will be required to ensure suitable operation of the evacuation lift in the event of an emergency.

2.5.6 The management for the building shall need to ensure that any resident that requires special assistance to evacuate the building has a suitable Personal Emergency Evacuation Plan (PEEP) in place.

2.6 Electromagnetic locking / hold-open devices

2.6.1 Where doors are provided with electromagnetic locking or hold-open devices, these devices are to operate (either release the door to close normally, or release the door to be opened) upon:

- Activation of the detection and alarm system;
- Failure of the power supply;
- Operation of a hand operated switch located to the side of the door;
- Malfunction.

2.7 Emergency lighting

2.7.1 Emergency lighting will be installed to provide temporary illumination in the event of failure of the primary power supplies to the normal lighting system. As part of the emergency lighting system, escape lighting will be provided to ensure the escape routes are illuminated at all material times. Adequate artificial lighting will be provided in all common escape routes and will be of a sufficient standard to enable persons to see to escape.

2.7.2 Emergency lighting will be installed in accordance with the recommendations of BS 5266 [12], BS EN 1838 [13] and BS EN 60598-2-22 [14].

2.7.3 Emergency lighting will illuminate all occupied areas, common evacuation routes (internal and external as necessary) and essential areas including plant areas. It will also illuminate a safe exit route including fire exits, fire alarm call points, changes in level or direction and fire-fighting equipment. Lighting to escape stairs should be on a separate circuit from that supplying any other part of the escape route.

2.7.4 Primary and emergency lighting will be required for any external escape routes that will not be lit by surrounding street lighting.

2.7.5 Discharge lighting installation may operate at voltages that are a hazard to firemen. An exterior discharge lighting installation, or an interior discharge lighting installation operating unattended, operating at a voltage exceeding low voltage (as defined in Statutory Instrument number 1018, part of the Building Regulations), should be controlled by a fire-fighter's emergency switch.

2.8 Fire safety signage

2.8.1 Fire safety signs will be installed where necessary to provide clear identification of fire precautions, fire equipment and means of escape in the event of fire. All parts of the development will be fitted with appropriate fire safety signage to comply with The Health and Safety (Signs and Signals) Regulations 1996, i.e. signage to be specified in according to BS ISO 3864-1 [15], BS 5499-4 [16]and BS 5499-10 [17].

2.8.2 The purpose of fire signs is to direct persons towards fire exits, or to provide specific information or warning about particular equipment, doors, rooms or procedures. They should be recognisable, readable and informative, as they convey essential information to regular and infrequent users of the premises, and the fire and rescue service.

2.8.3 Fire notices should be permanently displayed in conspicuous positions throughout the building, including storey exits, and should be specific to it.

2.8.4 All fire doors, other than bedroom doors and lift landing doors, will be marked with the appropriate fire safety sign conforming to BS 5499-1 [18] (white on blue) according to whether the door is:

- to be kept closed when not in use ('FIRE DOOR - KEEP SHUT');
- to be kept locked when not in use ('FIRE DOOR - KEEP LOCKED'); or
- held open by an automatic release mechanism ('AUTOMATIC FIRE DOOR - KEEP CLEAR').

2.8.5 Any emergency securing device fitted to doors on escape routes are to be provided with instruction notices, adjacent to the device, indicating the method of operation.

2.8.6 Each core shall be provided with floor identification signs and flat indicator signs located on every landing of a protected stairway and every protected corridor/ lobby, including balcony/ deck access.

2.8.7 The text should be on a contrasting background, easily legible and readable in low level lighting conditions or when illuminated with a torch. The wording used on each floor identification sign should take the form of '*Floor X*', with X designating the floor number. Additionally, each floor identification sign shall be provided with information relating to the flats accessed on each storey.

2.9 Emergency (life-safety) power supplies

2.9.1 All life-safety systems shall be provided with robust power supplies in accordance with BS 8519 [19].

2.9.2 The following fire safety systems shall comply with their respective British Standards regarding secondary power supplies:

- Emergency lighting and signage;
- Automatic fire detection and alarm system;
- Automatic smoke ventilation systems;
- Emergency Voice Communication system;
- Evacuation lifts;
- Sprinkler pumps.

2.9.3 There must be a minimal delay in change over if the main power fails and it must occur automatically.

3. MEANS OF WARNING AND ESCAPE

3.1 Evacuation philosophy

3.1.1 A 'stay-put' (also known as 'defend-in-place') strategy will be implemented in all residential units, whereby, in the event of fire, only the unit of fire origin will receive a signal to evacuate. Further evacuation of other units may be enacted by the fire and rescue service, as needed depending on the development of the fire.

3.1.2 The car park will operate completely independently from the rest of the cores. Evacuation from these areas shall be based upon simultaneous evacuation, whereby, upon activation of the detection, all areas within the relevant demise shall receive a signal to evacuate. The alarm signal shall not extend to any other areas.

3.1.3 The areas of ancillary accommodation shall operate a local simultaneous evacuation, whereby upon activation of the detection and alarm system, ancillary accommodation areas shall receive a signal to evacuate. All other area shall not receive a signal to evacuate.

3.1.4 The automatic fire detection and alarm system shall be configured to support the evacuation philosophy discussed above.

3.2 Horizontal means of escape – Residential areas

Internal flats

3.2.1 In accordance with ADB, flats should be provided with an internal entrance hall.

3.2.2 Therefore, all flats across the development shall be provided with entrance halls. The entrance halls shall be enclosed in 30 minutes fire resisting construction which shall serve each habitable room. Due to the low risk associated with WCs and bathrooms, these may be located within the protected hallway.

3.2.3 Travel distance within the entrance halls shall not exceed 9m.

Communal corridors - Upper Floors

3.2.4 On the upper floors, it is recommended that the stair within each core shall be separated from the communal corridor serving the flats by a protected lobby. In accordance with Diagram 3.7 b) of ADB, the maximum permitted travel distance within the communal corridor to the protected lobby is limited to 7.5m. Where these are exceeded a fire engineered approach utilising a mechanical smoke ventilation system assessed using CFD modelling is recommended as discussed in Section 2.3 of this report and in Table 6.

3.2.5 The provision of an evacuation lift is recommended in each core to provide equal opportunities for occupants to escape.

3.2.6 ADB does not provide guidance in regard to protection of the evacuation lift. However, additional fire safety provision shall be provided in support of this arrangement.

3.2.7 In support of the evacuation lift arrangement, it is recommended that the following shall be included in the design:

- The communal corridor serving the flats shall be provided with a smoke ventilation system in in accordance with Section 2.3 of this report.
- The protected lobby providing access to the evacuation lift should not access anything other than:
    - The staircase;
    - The lifts;
    - The adjoining ventilated corridor;
    - Service riser if they are providing ventilation to the lift lobby.
- The travel distance across the protected lobby should not exceed 7.5m.
- The protected lobby shall be provided with a smoke ventilation system in accordance with Section 2.3 of this report.
- The protected lobby shall include an emergency voice communication system and sufficient space for a disabled person to be able to seek refuge while awaiting the lift car without encroaching on the clear escape route.

3.2.8 A review of the floors in terms of means of escape within the communal areas is shown in figures below. Key fire safety challenges are highlighted are summarised in Table 6 below.

3.2.9 The horizontal means of escape for the non-residential areas are summarised in Section 3.10 & 3.11 of this report.

Table 6 - Key fire safety challenges

Item	Description	Reference
Excessive travel distance – typical upper floors – Building A, Blocks B1,B3, Building E & H	In accordance with ADB, the maximum permitted travel distance within communal corridor serving the flats is limited to 7.5m. Upon review, in some circumstances the travel distance within the communal corridors exceeds the maximum permitted travel distance of 7.5. A fire engineered solution would be employed in support of the excessive travel distance. The communal corridor shall be provided with an mechanical smoke ventilation system (MSVS) which shall consist of two smoke shaft system. The functionality of the MSVS system shall be demonstrated through CFD modelling. The CFD modelling will be subject to Building Control and local Fire and Rescue Service review.	Figure 16

Item	Description	Reference
Residential means of escape connecting with ancillary areas – Building A, Blocks B1,B2,B3, Building C,G&H	In accordance with ADB recommendations, the residential areas with a single means of escape should not connect with ancillary areas (such as refuse stores, cycle stores, etc), or extend to basement level. As such, ancillary areas should not connect with any residential single means of escape (e.g. single stairs). Alternatively, to support the proposed arrangement, the following additional fire safety measures could be employed in the design subject discussion and agreement with building control body: The ancillary area shall be separated from the residential core by a lobby provided with mechanical smoke ventilation system and CFD modelling carried out to ensure the single escape route is adequately protected. The ancillary areas shall be provided with a sprinkler system. The above arrangement constitutes a project risk until discussed and agree with Building Control.	Figure 17
Final escape route connecting via lobbies with the car park – Building A	In accordance with ADB recommendations, single stair escape routes should not connect with any ancillary accommodation, such as a car-park, or extend to a basement level. To support the proposed connection of the car-park to the single stairs at basement level, the following additional fire safety measures could be employed in the design subject to discussion and agreement with building control body: The car park shall be provided with a mechanical smoke ventilation system which shall keep the residential core free from smoke ingress; The mechanical smoke ventilation system in the car park will require to be assessed using CFD analysis to determine whether the arrangement is sufficient to provide protection to the single stairs; In addition to the above, the car park shall be separated from the residential core by two lobbies. The lobby next the car park shall be provided with 0.4m^2 permanently open vent; The car park shall be provided with a sprinkler system. These proposals constitutes a project risk until discussed and agreed with Building Control.	Figure 18
Lobby to evacuation lift Building C&D	It is recommended that lifts are accessed via a protected lobby. In Block C&D the evacuation lifts are accessed directly from a ventilated corridor at all levels. Though Block C&D only rises two floors above ground and as such the risk to the escape of occupants is generally considered to be low it is recommended that lobbies are provided in front of the evacuation lift.	Figure 19
Wheelchair access required in lift lobbies – Blocks B2 & B3	Lift lobbies are required to be large enough to accommodate a wheelchair. In the current design the lift lobby in Block B2 & B3 needs to be increased in size to provide a refuge of 1400mmx900mm.	Figure 20

3.2.10 Indictive layouts of typical upper floors are shown in Figure 16 to Figure 19

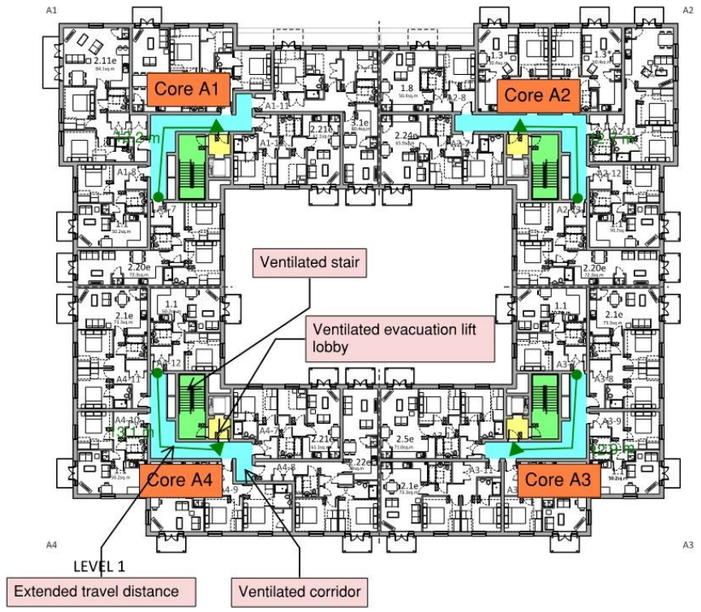

Figure 16 - Means of escape – indicative upper floors Block A

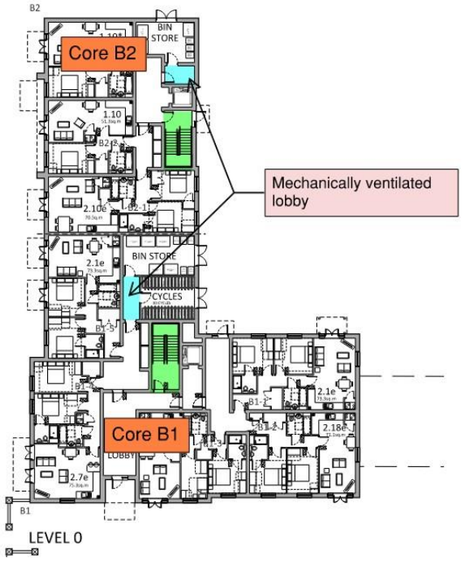

Figure 17 - Means of escape – Ancillary connecting to final escape route B1&B2

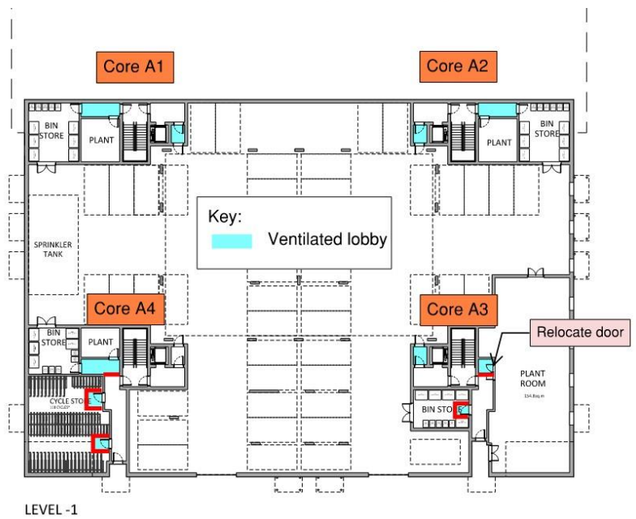

Figure 18 - Means of escape – car park and ancillary connecting with residential core

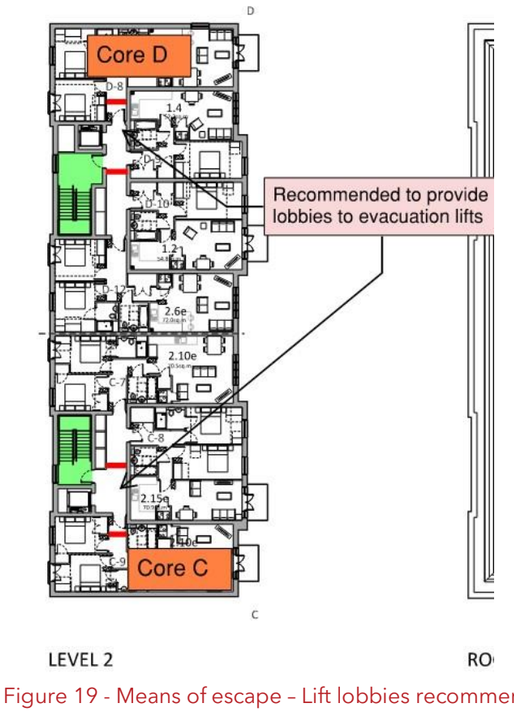

Figure 19 - Means of escape – Lift lobbies recommended C&D

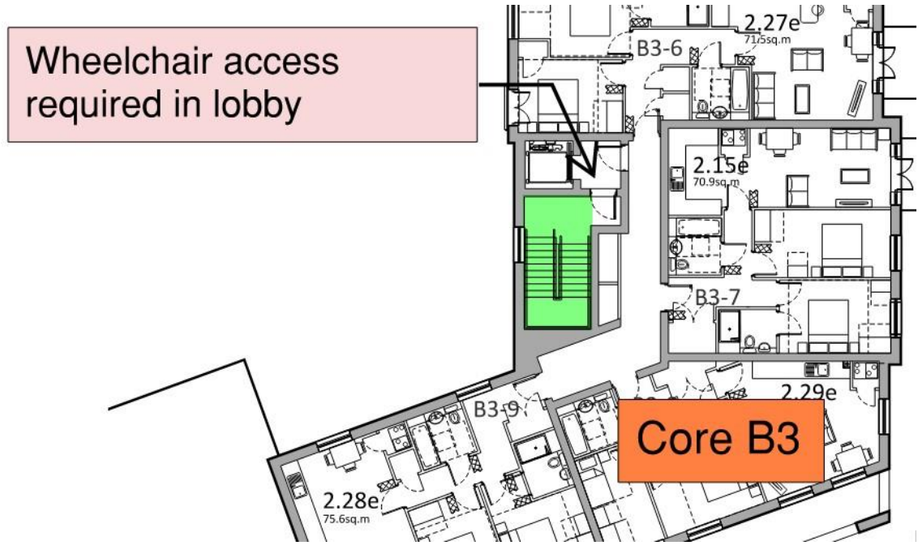

Figure 20 - Means of escape - wheelchair access required in lift lobby B3

3.3 Means of escape from the common areas – Building A

3.3.1 Building A consists of four cores, Core A1 (B,G+5), Core A2 (B,G+5), Core A3 (B,G+4) and Core A4 (B,G+4). Access to each cores is via the common corridors. There are no fire fighting shafts given there are no floors more than 18m above fire service access level (though the building height measured

from the lowest point at ground level is >18m and considered for other elements of this fire strategy such as suppression see Section 2.2.2 and external walls see Section 5.2 .

3.3.2 The common corridors serving each core will be mechanically ventilated. Where extended single travel distances (exceeding 7.5 m) are present in the corridors these will be supported by a two-shaft mechanical smoke ventilation system to be assessed using CFD analysis.

3.3.3 Discharge from Core A1 and A2 is via an exit passageway at ground level. The passageway should be ventilated and lobby separated where flats connect to it. Where ancillary accommodation connects to the exit passageway provide lobby separation with mechanical ventilation. This will have to be justified with CFD analysis. Discharge from Core A3 and A4 is via an exit passageway at basement level for which exits to outside are provided as the site is sloped.

3.4 Means of escape from the common areas – Block B1 and B2

3.4.1 Block B1 and B2 are two adjacent building separated by a party wall. Each core is five storeys high (G+4) and is served by a single stair. Access to each core is via the common corridors. There are no fire fighting shafts as none of the buildings are over 18m.

3.4.2 The common corridors serving each core will be naturally or mechanically ventilated. Where travel distance is <7.5m natural ventilation can be provided. Where extended single travel distances (exceeding 7.5 m) are present in the corridors these will be mechanically ventilated and will be supported by a fire engineering justification and CFD analysis.

3.4.3 Discharge from Core B1 is via an exit passageway at ground level. The passageway should be ventilated and lobby separated where flats connect to it. Where ancillary accommodation connects to the exit passageway provide lobby separation with mechanical ventilation. Discharge from B2 is from the stair direct to outside.

3.5 Means of escape from the common areas – Block B3 and B4

3.5.1 Block B3 and B4 are two adjacent buildings separated by a party wall. Each core is five storeys high (G+4) and is served by a single stair. Access to each core is via the common corridors. There are no fire fighting shafts as none of the buildings are over 18m.

3.5.2 The common corridors serving B4 will be naturally or mechanically ventilated with a single smoke shaft with travel distances in accordance with ADB (7.5m or less). The common corridor serving B3 has extended travel distances (more than 7.5m) and therefore will be mechanically ventilated using two smoke shafts in a push pull system. This shall be justified using CFD analysis.

3.5.3 Discharge from both cores is from the stair direct to outside. Escape from the evacuation lift is via an exit passageway. The passageway should be ventilated and lobby separated where flats connect to it. Where ancillary accommodation connects to the exit passageway provide lobby separation with mechanical ventilation.

3.6 Means of escape from the common areas – Building C and D

3.6.1 Building C and D are two adjacent buildings separated by a party wall. Each core is three storeys high (G+2) and is served by a single stair. Access to each core is via the common corridors. There are no fire fighting shafts as none of the buildings are over 18m.

3.6.2 The common corridors serving each core will be naturally or mechanically ventilated with a single smoke shaft with travel distances in accordance with ADB (7.5m or less).

3.6.3 Discharge from both cores is from the stair direct to outside .Escape from the evacuation lift is via an exit passageway. The passageway should be not connect directly with adjacent flats or other accommodation. Where ancillary accommodation connects to the exit passageway provide lobby separation with mechanical ventilation.

3.7 Means of escape from the common areas – Building E and F

3.7.1 Building E and F are two adjacent buildings separated by a party wall. Each core is five storeys high (G+4) and is served by a single stair. Access to each core is via the common corridors. There are no fire fighting shafts as none of the buildings are over 18m.

3.7.2 The common corridors serving Building F will be naturally or mechanically ventilated where travel distance is within 7.5m.. Where extended single travel distances (exceeding 7.5 m) are present in Block E these corridors shall be mechanically ventilated and will be supported by a fire engineering justification and CFD analysis

3.7.3 Discharge from Core E is via an exit passageway at ground level. The passageway should be ventilated and lobby separated where flats connect to it. Where ancillary accommodation connects to the exit passageway provide lobby separation with mechanical ventilation. Discharge from Core F is from the stair direct to outside. Discharge from the evacuation lift is via an exit passageway. The passageway should be ventilated and lobby separated where flats connect to it. Where ancillary accommodation connects to the exit passageway provide lobby separation with mechanical ventilation

3.8 Means of escape from the common areas – Building G and H

3.8.1 Building G and H are two adjacent buildings separated by a party wall. Each core is five storeys high (G+4) and is served by a single stair. Access to each core is via the common corridors. There are no fire fighting shafts as none of the buildings are over 18m.

3.8.2 The common corridors serving Building H will be mechanically ventilated.. Where extended single travel distances (exceeding 7.5 m) are present in the corridors these will be supported by a fire engineering justification and CFD analysis. The common corridors in Block G will have travel distances within 7.5m and therefore will be naturally or mechanically ventilated.

3.8.3 Discharge from both cores is from the stair direct to outside. Discharge from the evacuation lift is via an exit passageway. The passageway should be ventilated and lobby separated where flats connect to it. Where ancillary accommodation connects to the exit passageway provide lobby separation with mechanical ventilation.

3.9 Private balconies & terraces

3.9.1 Private balconies should meet the following recommendations:

- The escape route from the balcony should not pass through more than one access room;
- A fire detection and alarm system in accordance with BS 5839-6 is provided to the access room with an alarm system on the balcony;
- Maximum permitted travel distance from the balcony access door to the furthers point on the balcony is 7.5m.

3.9.2 Balconies and terraces should be designed in accordance with BS 8579:2020 [20]. In accordance with BS 8579, vertically stacked balconies and any balconies within buildings with a top floor located above 11m are to be constructed of materials class A2-s1, d0 or better. Terrace build-ups should achieve B_{ROOF}(t4).

3.9.3 Cooking facilities should be sited a minimum of 1.8m from the escape route from the balcony to outside the kitchen taking a 900mm wide escape route into account.

3.10 Horizontal means of escape – Ancillary areas

3.10.1 Ancillary accommodation is located at basement level in Building A and at ground floor level in the remaining blocks and consists of refuse stores, cycle stores and various plant rooms.

3.10.2 Where a single exit is available, the number of occupants within these areas, or where there is an inward opening exit, shall not exceed 60 persons at any time. The maximum permitted travel distance for ancillary areas are summarised in Table 7.

Table 7 - Maximum permitted travel distances within ancillary rooms

Space	Maximum travel distance in single direction [m]	Maximum travel distance in multiple directions [m]
Plant rooms	18m	45m
Bin store and cycle store	25m	45m
Notes: Where the internal layout is unknow, the travel distance allowance should be assumed to be two-thirds of the above figures.		

3.10.3 Upon review, the travel distances within the ancillary areas appears to be within the permitted limits.

3.10.4 The exit doors are required to have a minimum clear width of 750mm, or 850 mm where unassisted wheelchair users are expected. The minimum clear width should be measured in accordance with the Figure 21.

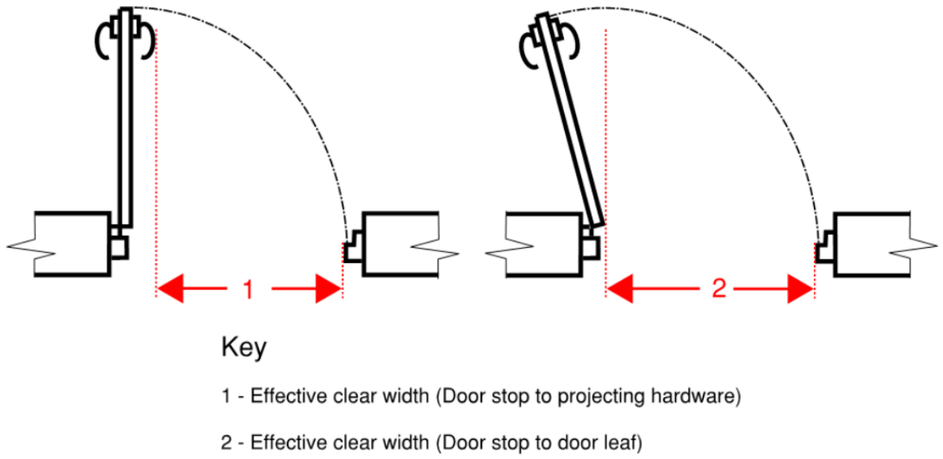

Figure 21 - Measurement of clear width

3.11 Horizontal means of escape – Car Park

3.11.1 The car park is located at basement level in Building A. In core A1 & A2 egress is via the stair core to ground level. In cores A3 & A4 egress is provided via a route to outside from the stair core at partial basement level.

3.11.2 The maximum permitted travel distance is limited to 45m in multiple directions and 18m in single direction. Based on the estimated occupancy as detailed in Table 4, and the number of available exits, each exit should have a minimum clear width of 850mm. The philosophy of discounting the largest storey exits has been applied. An indicative car park layout is shown in Figure 22.

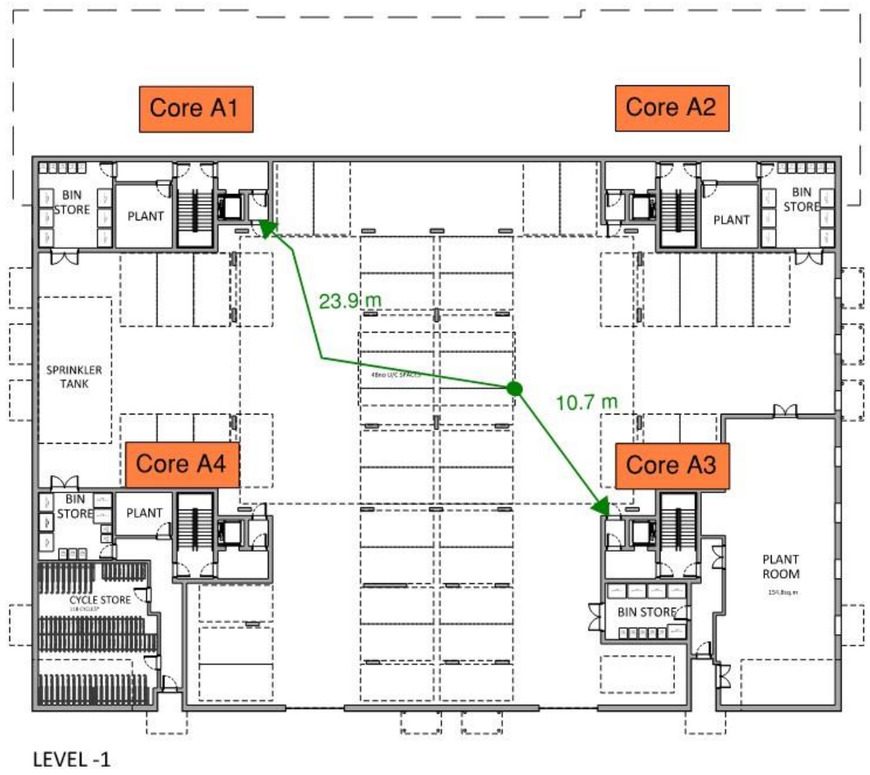

Figure 22 - Car park means of escape

3.12 Evacuation of disabled and mobility impaired persons (MIPS)

3.12.1 To ensure an inclusive design, it is recommended that evacuation lifts are provided adjacent to each protected stair. Suitably sized refuge areas should be provided in the evacuation lift lobbies to ensure there is adequate room for a disabled occupant to remain in a place of relative safety while awaiting the lift. The refuge should be 900mm x 1400mm

3.12.2 As occupants using the evacuation lift will be required to wait for a short period of time for the lift to be called and land at the floor, adequate protection to the lift and refuge / waiting area is required to be provided. This report is primarily concerned with ensuring suitable protection to the evacuation lift and associate refuge area(s). Each evacuation lift should be provided with a protected lobby which gives access to both the evacuation lift and the stair. A method of preventing smoke ingress into the lobby is required. More information on the ventilation requirements is given in Section 2.3.

1.1.1 Generally, evacuation lifts should be manually operated by a suitably trained, competent person, however it is recognised that a competent person may be absent in residential premises. In this instance, one of the following operation methods may be adopted:

- Automatic evacuation operation.
- Building Management System (BMS) interface (automatic evacuation operation).
- Remote assisted evacuation.
- Remote building management evacuation (remote assisted evacuation operation).

1.1.2 Confirmation from the client / end user on the preferred operating sequence is required. The operation requirements and cause and effect arrangements may require consultation with a specialist vertical transport consultant.

3.13 Vertical means of escape

3.13.1 The topmost storey within each core is located at less than 18m above ground floor access level. Therefore, no firefighting shaft has to be provided. The stair is required to be designed with a minimum clear width of 750mm.

3.13.2 Vertical means of escape should be supported by an evacuation lift to reflect emerging guidance. The final escape route from the evacuation lift should have the same level of protection at ground floor as the evacuation lift on the upper floors.

3.13.3 Where the handrails intrude 100mm or less, these can be ignored when assessing the clear width of the stair. The stair width should be kept clear for a vertical distance of 2m.

3.14 Escape beyond final exits

3.14.1 Travel beyond the building final exit must be away from the building, towards a place of safety, and not be jeopardised by unprotected openings of the building.

3.14.2 In general, the building should be provided with escape routes, upon exiting the building that are either directly away from the building or alternate paths along the building façade. Where the external escape route continues in a single direction along the façade, the external wall adjoining the escape route should have a minimum of 30 minutes fire resistance (integrity and insulation).

4. PASSIVE FIRE PROTECTION SYSTEMS

4.1 Internal linings

4.1.1 All wall and ceiling linings within the building should meet the recommendations of ADB when tested under either the National Classification (in accordance with BS 476-7 [21]) or the European Classification (in accordance with BS EN 13510-1 [22]) as summarised in Table 8.

Table 8 – Surface spread of flame requirements

Location	Euro Class
Small rooms ≤ 4m² (residential and ancillary)	D-s3, d2
Small rooms ≤ 30m² (non-residential areas)	D-s3, d2
Circulation spaces (communal)	B-s3, d2
Circulation spaces (within dwellings)	C-s3, d2
Other rooms	C-s3, d2

4.2 Structural fire resistance

4.2.1 The required period of fire resistance of the structural elements has been based upon the based on the top floor height of each building measured from the lowest point at ground level. The structural elements required to be fire resisting should achieve at least a minimum rating of 90 minutes for Block A and 60 minutes for all other blocks.

4.2.2 Where a construction element with lower fire resistance supports or provides stability to another element of structure, then the protection to the supporting structure should be at least the same as the structure it is supporting.

4.3 Compartmentation

4.3.1 All floors within each block are required to be built as a compartment floor with at least 90 minutes fire resistance for block A and 60 minutes fire resistance for the remaining blocks. The walls separating the flats from all other areas are required to have a minimum of 60 minutes fire resistance.

4.3.2 All shafts (e.g. service risers, lifts, shafts) are to be constructed as protected shafts achieving the same fire resistance as the structure.

4.3.3 The non-residential areas shall be separated from the rest of the building by compartment walls and floors achieving at least 90 minutes fire resistance for Block A and 60 minutes fire resistance for the remaining blocks.

4.3.4 All protected entrance halls shall achieve 30 minutes fire resistance.

4.3.5 The key fire resistance requirements applicable to this development are summarised in

4.3.6

4.3.7 Table 9 below:

Table 9 – Fire resistance requirements for the block of flats

Part of Building	Minimum Fire Resistance rating when tested to the relevant part of BS 476 (mins)		Methods of Exposure
	Block A	All other blocks	
Structural elements	90R	60R	Exposed Faces
Compartment floor	90REI	60REI	From underside From all exposed sides for loadbearing
Walls separating flats	90REI	60REI	Each side separately
Compartment walls separating non-residential areas	90REI	60REI	Each side separately
External walls: Any part less than 1,000 mm from a point in the relevant boundary Any part more than 1,000 mm from the relevant boundary Any part adjacent to an external escape route or stair	 90REI 90RE 15I 30RE	 60REI 60RE 15I 30RE	 Each side separately From the inside From the inside
Protected shafts (risers, lifts)	90REI	60REI	Each side separately
Separating the stair and lift from the rest of the building	90REI	60REI	Side remote from shaft
Protected enclosure Not forming part of a compartment wall or shaft to a lobby or corridor	30REI	30REI	Each side separately

Part of Building	Minimum Fire Resistance rating when tested to the relevant part of BS 476 (mins)		Methods of Exposure
	Block A	All other blocks	
Cavity barriers	30E 15I	30RE 15I	Each side separately
Note: R – Load bearing, E- Integrity, I – Insulation			

4.4 Ancillary accommodation

4.4.1 The degree of separation required depends on the contents of the room / enclosure and is summarised in the Table 10 below.

Table 10 - Ancillary accommodation fire protection requirements

Ancillary accommodation	Minimum fire resistance
Concierge and Storage areas not greater than 450m^2	30 minutes
Refuse storage areas	90 minutes for Block A, 60 minutes for remaining blocks
Plant rooms	60 minutes
Car park	90 minutes

4.5 Fire doors

4.5.1 Fire doors should be provided as summarised in Table 11, in accordance with the recommendations of ADB.

4.5.2 Fire door assemblies shall comply with BS 476-22 [23] or BS EN 1634-2 [24] for fire resistance; and where applicable, BS 476-31 [25] or BS EN 1634-3 [26]for smoke leakage.

Table 11 – Fire Doors

Position of Door	Tested to BS 476-22	Tested to BS EN1634-2
Enclosing ancillary accommodation	As per the wall it is fitted in	As per the wall it is fitted in
Enclosing the smoke shaft	FD 60 S	E 60 S_a
Enclosing service risers	FD 30 S	E 30 S_a
Flat entrance doors	FD 30 S	E 30 S_a
Enclosing a lift shaft	FD 30	E 30
Enclosing a stair	FD 30 S	E 30 S_a
Enclosing the protected lobby in front of the stair/lift	FD 30 S	E 30 S_a
Door to internal protected entrance halls / internal stairway (not self-closing)	FD 30	E 30
Notes: Smoke seals are indicated by the suffix 'S' (to BS 476-31) or 'S_a' (to BS EN 1634-3) and are required in all doors which form the enclosure to protected escape routes.		

4.6 Fire-stopping and penetrations through fire-resisting construction

4.6.1 Fire-stopping should be provided at the junction of fire-separating walls and external walls in order to maintain the fire resistance period of fire-separating walls, and thereby prevent a fire from travelling around the junction and into the neighbouring space. Penetrations through lines of fire-resisting separation should be fire-stopped using a system which will achieve the same fire resistance rating as the penetrated wall or floor.

4.7 Cavity barriers and concealed spaces

4.7.1 Cavity barriers are provided to prevent the rapid spread of unseen fire or smoke in voids, and to prevent the spread of fire around compartmentation via voids. Extensive internal concealed cavities (e.g. roof voids or the void between suspended ceilings and the soffit of the floor above) generally require cavity barriers to sub-divide them.

4.7.2 All cavity barriers should have a fire resistance rating of at least 30 minutes for integrity (E) and 15 minutes for insulation (I). In general, cavity barriers should be at 20 m centres in cavities with exclusively Class C-s3, d2 linings or better. For other linings, the spacing between cavity barriers should be reduced to 10 m.

4.7.3 Cavity barriers provided around openings within the external wall may be formed of:

- steel at least 0.5mm thick or timber at least 38mm thick; or
- polythene-sleeved mineral wool, or mineral wool slab under compression when installed cavity; or
- calcium silicate, cement-based or gypsum-based boards at least 12mm thick.

5. EXTERNAL FIRE SPREAD

5.1 General

5.1.1 To prevent the spread of flame across the external surfaces of the building, materials forming part of the external wall of the building should be in accordance with Section 10 of ADB Vol.1. Further restrictions are placed on buildings classified as 'relevant buildings'.

5.1.2 The definition of external walls contained within the Building Regulations also includes windows and door within the wall and any decorations applied to the external surface of the walls.

5.2 External wall construction – 'Relevant buildings'

5.2.1 As the building will contain one or more dwellings, an institution or a room for residential purposes and will have a floor at a height greater than 18m above ground level, it will be classified as a 'relevant building' under Regulation 7(4) of the Building Regulations.

5.2.2 The building will comply with the requirements of Regulations 7(1) and 7(2), which state that:

5.2.3 […] "(1A) building work shall be carried out so that relevant metal composite material does not become part of an external wall, or specified attachment, of any building."

5.2.4 "(2) building work shall be carried out so that materials which become part of an external wall, or specified attachment, of a relevant building are of European Classification A2-s1, d0 or A1 (classified in accordance with the reaction to fire classification)."

5.2.5 In accordance with Regulation 7(3) the following items are exempt from Regulation 7(2):

- Cavity trays when used between two leaves of masonry;
- Any part of a roof (other than any part of a roof which falls within paragraph (iv) of regulation 2(6)) if that part is connected to an external wall;
- Door frames and doors;
- Electrical installations;
- Fibre optic cables;
- Insulation and water proofing materials used below ground level or up to 300mm above that level;
- Intumescent and fire stopping materials where the inclusion of the materials is necessary to meet the requirements of Part B of Schedule 1;
- Membranes;
- Seals, gaskets, fixings, sealants and backer rods;
- Components associated with a solar shading device, excluding components whose primary function is to provide shade or deflect sunlight, such as the awning, curtain or slats;
- Thermal break materials where the inclusion of the materials is necessary to meet the thermal bridging requirements of Part L of Schedule 1;
- Window frames and glass; or
- Materials which form the top horizontal floor layer of a balcony which are of European classification A1fl or A2fl-s1 (classified in accordance with the reaction to fire classification) provided that the entire layer has an imperforate substrate under it.

5.2.6 In addition to the recommendations set out by Regulations 7(1) and 7(2) above, the building should also comply with requirement B4 of the Building Regulations and the external walls of the building should meet the following recommendations:

- External surfaces should meet the recommendations in Table 10.1 of ADB Vol.1 reproduced in Table 12 below; and
- Cavity barriers should be provided in accordance with Section 4.7 of this report.

5.2.7 The provisions in Table 12 apply to each wall individually in relation to its proximity to the relevant boundary.

Table 12 - Reaction to fire performance of external surface of walls

Building type	Top storey height	Less than 1m from boundary	More than 1m from boundary
Relevant buildings as defined in Regulation 7(4)		Class A2-s1, d0[2] or better	Class A2-s1, d0[2] or better
All residential purpose groups (purpose groups 1 or 2)	More than 11m	Class A2-s1, d0[1] or better	Class A2-s1, d0[1] or better
	11m or less	Class B-s3, d2[1] or better[1]	No provisions
Note 1: Profiled or flat steel sheet at least 0.5mm thick with an organic coating of no more than 0.2mm thickness is also acceptable. Note 2: The restrictions for these buildings apply to all the materials used in the external wall and specified attachments. Although external walls will meet the Regulations 7(2) requirements, certain exempt items may be subject to additional controls as set out in this table (see para. 5.1.2).			

5.2.1 Particular attention is drawn to the following points:

- Membranes used as part of the external wall construction above ground level should achieve a minimum of class B-s3, d0. Roofing membranes do not need to achieve a minimum of class A2-s1, d0 when used as part of a roof connecting to an external wall;
- Internal linings should comply with the guidance provided in Section 4.1
- Any part of a roof should achieve the minimum performance as detailed in Section 5.5
- As per Regulation 7(3), window frames and glass (including laminated glass) are exempted from Regulation 7(2). Window spandrel panels and infill panels must comply with Regulation 7(2);
- Thermal breaks are small elements used as part of the external wall construction to restrict thermal bridging. There is no minimum performance for these materials. However, they should not span two compartments and should be limited in size to the minimum required to restrict the thermal bridging (the principal insulation layer is not to be regarded as a thermal break);
- Regulation 7(2) only applies to specified attachments. Shop front signs and similar attachments are not covered by the requirements of Regulation 7(2), although attention is drawn to the point below;
- While Regulation 7(2) applies to materials which become part of an external wall or specified attachment, consideration should be given to other attachments to the wall which could impact on the risk of fire spread over the wall;
- Any material achieving class A1fl or A2fl-s1 in accordance with BS EN 13501-1 is exempted when it meets both of the following conditions:

- It forms the top horizontal floor layer of a balcony; and
- It is provided with an imperforate substrate under it which extends to the full size of the class A1fl or A2fl-s1 material.

5.2.2 Curtains and/or slats of solar shading devices should achieve a class A1 or A2-s1, d0 in accordance with Regulation 7(2), where installed more than 4.5m above ground. The curtain of a solar shading devices cannot be classified as a membrane in accordance with Regulation 7(3).

5.3 External wall construction – Buildings with a top floor between 11m and 18m above ground

5.3.1 As the building will contain one or more dwellings, an institution or a room for residential purposes but will not have a floor at a height greater than 18m above ground level, it is not considered to be a 'relevant building' under Regulation 7(4) of the Building Regulations.

5.3.2 The external walls within buildings with a top floor height between 11m and 18m above ground should achieve either of the following:

- Meet the performance criteria given in BRE report BR 135 [27] for cladding systems using full-scale test data from BS 8414-1 [28] or BS 8414-2 [29]; or
- Meet the following recommendations:
- External surfaces should meet the recommendations in Table 10.1 of ADB Vol.1 reproduced in Table 13 below; and
- Cavity barriers should be provided in accordance with Section 4.7of this report.

Table 13 - External surface of walls

Building height	Top storey height	Less than 1m from boundary	More than 1m from boundary
All residential purpose groups (purpose groups 1 or 2)	Between 11m and 18m	Class A2-s1,d0 (1) or better	Class A2-s1,d0 (1) or better

Note:
1) Profiled or flat steel sheet at least 0.5mm thick with an organic coating of no more than 0.2mm thickness is also acceptable.

5.3.3 Any insulation product, filler material (such as the core materials of metal composite panels, sandwich panels and window spandrel panels but not including gaskets, sealants and similar), etc. used in the construction of the external walls should be specified to achieve a class A2-s1, d0 or better in accordance with BS EN 13501-1. This restriction does not apply to masonry cavity wall construction in accordance with Diagram 8.2 of ADB Vol.1.

5.3.4 Any balconies should be specified to meet either of the following conditions:

a) Only contain materials achieving class A1 or A2-s1, d0, except for any of the following:

- Cavity trays when used between two leaves of masonry;
- Intumescent and fire-stopping materials where the inclusion of the materials is necessary to meet the requirements of Part B of Schedule 1 to the Building Regulations 2010;
- Membranes;
- Seals, gaskets, fixings, sealants and backer rods;
- Thermal break materials where the inclusion of the materials is necessary to meet the thermal bridging requirements of Part L of Schedule 1 of the Building Regulations 2010;
- Any material achieving class A1fl or A2fl-s1 when it forms the top horizontal floor layer of a balcony and is provided with an imperforate substrate under it which extends to the full size of the class A1fl or A2fl-s1 material;
- Electrical installations; and
- Fibre optic cables.

b) Achieve both of the following conditions:

- Have an imperforate soffit which extends to the full area of the balcony, achieves a minimum REI 30 rating and is constructed of materials achieving class A2-s1, d0 or better; and
- Materials achieving class B-s1, d0 or worse extending beyond the boundary of a single compartment should include a band of material rated class A2-s1, d0 or better, a minimum of 300mm in width centred on that boundary line.

5.3.5 Regulation 7(1A) prohibits the use of relevant metal composite materials in the external walls of all buildings of any height. The definition of a relevant metal composite material is given in Regulation 2(6)(c) and reproduced in Clause 10.12 of ADB Vol.1

5.4 External wall construction – Buildings with a top floor less than 11m above ground

5.4.1 As the building will contain one or more dwellings, an institution or a room for residential purposes but will not have a floor at a height greater than 18m above ground level, it is not considered to be a 'relevant building' under Regulation 7(4) of the Building Regulations.

5.4.2 The external walls within buildings with a top floor height less than 11m above ground should achieve either of the following:

- Meet the performance criteria given in BRE report BR 135 [27] for cladding systems using full-scale test data from BS 8414-1 [28] or BS 8414-2 [29]; or
- Meet the following recommendations:
- External surfaces should meet the recommendations in Table 10.1 of ADB Vol.1 reproduced in Table 13 below; and
- Cavity barriers should be provided in accordance with Section 4.7 of this report.

Table 14 -External surface of walls less than 11m

Building height	Top storey height	Less than 1m from boundary	More than 1m from boundary
All residential purpose groups (purpose groups 1 or 2)	11m or less	Class B-s3, d2(1) or better (1)	No provisions

Note:
1) Profiled or flat steel sheet at least 0.5mm thick with an organic coating of no more than 0.2mm thickness is also acceptable.

5.4.3 For buildings less than 11m in height, there are no restrictions placed on the combustibility of insulation or filler materials in the external walls. However, due to changing requirements for external wall systems and to meet societal and community expectations for fire safety, it is strongly recommended that non-combustible materials are used in the construction of external walls and any

insulation product, filler material (such as the core materials of metal composite panels, sandwich panels and window spandrel panels but not including gaskets, sealants and similar), etc. used in the construction of the external walls are specified as achieving class A2-s3, d2 or better in accordance with BS EN 13501-1.

5.4.4 Regulation 7(1A) prohibits the use of relevant metal composite materials in the external walls of all buildings of any height. The definition of a relevant metal composite material is given in Regulation 2(6)(c) and reproduced in Clause 10.12 of ADB Vol.1.

5.4.5 Balconies and terraces are to be provided in accordance with the recommendations in BS 8579 and should be constructed from materials achieving class A1 or A2-s1, d0 in accordance with BS EN 13501-1

5.5 Roof coverings

5.5.1 The properties of a roof covering are only of relevance:

- If the roof is close enough to a boundary to be at risk of ignition from a fire in other buildings;
- In the vicinity of a compartment wall to avoid fire spread between compartments via. a roof covering.

5.5.2 The relevant test and classification standards for the external fire performance of roof systems are BS 476-3 [30] (National Class) and BS EN 13501-5 [31](European Class).

5.5.3 Roof coverings refer to a construction that can consists of one or more layers of material but does not refer to the roof structure as a whole.

5.5.4 Table 15 bellow summarises the separation distances from the boundary according to the type of roof covering as described in Table 12.1 of ADB vol 1.

Table 15 – Limitations on roof coverings

Distance from relevant boundary	National Class / European Class	AA, AB or AC	BA, BB or BC	CA, CB or CC
		B_{ROOF}(t4)	C_{ROOF}(t4)	D_{ROOF}(t4)
Less than 6m		✓	×	×
At least 6m		✓	✓	×
At least 20m		✓	✓	✓

5.6 Space separation and unprotected areas of the façade

5.6.1 Should a fire occur in a building, heat will radiate through non-fire resisting openings in the external walls. This heat can be enough to set fire to nearby buildings. In order to reduce the chance of this occurring, the Building Regulations place limits on the area of the external elevation with no fire resistance, known as the unprotected area.

5.6.2 The relevant boundaries are the reference point at which the potential for fire spread, being:

- the site boundary;
- a notional boundary created on the centreline of an adjacent carriage way; or
- a notional boundary created midway between this building and the nearest adjacent building.

5.6.3 In accordance with ADB guidance, only small unprotected areas in an otherwise protected façade do not contribute to the extent of unprotected area. These are shown in Figure 23.

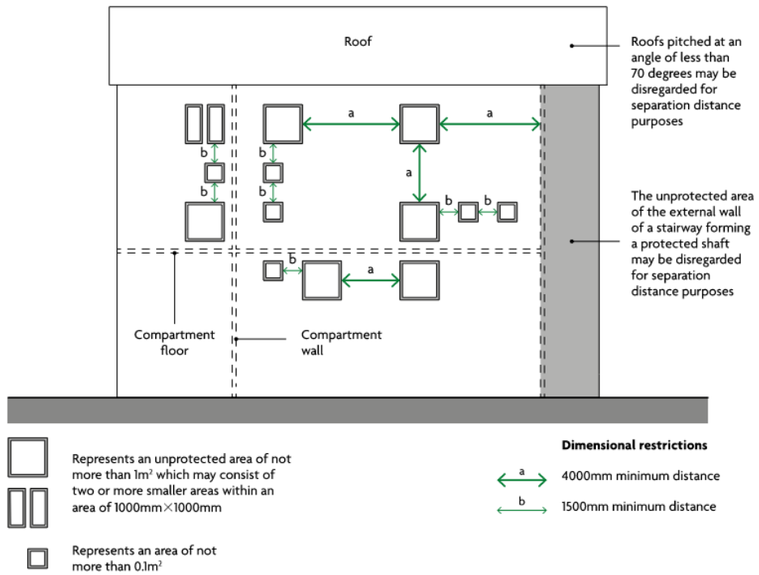

Figure 23 -Exclusion from unprotected area calculations

5.6.4 Where the external elevation required to be protected, the external wall within the relevant elevation should be fire rated in accordance with

5.6.5

5.6.6 Table 9.

5.6.7 It should be noted that where an external wall is within 1.0m from the relevant boundary, that external wall shall have 0% unprotected area and is required to have the same fire resistance as the structure of the building.

5.6.8 Where an external wall has the appropriate standard of fire resistance, but has a surface material classified as less than European Class B-s3, d2 and is more than 1mm thick, that part of the wall shall be classified as an unprotected area equating to half its area.

5.6.9 In accordance with ADB guidance, the external fire spread assessment shall be carried out using the enclosing rectangle method as detailed in BRE Report 187 [32] and taking sprinkler protection into consideration.

5.6.10 The amount of unprotected area depends on height and width of the fire compartment and the distance between the façade and relevant boundary. To inform the design, the relevant distance required for different compartment size in order to allow for 100% unprotected area is summarised below.

Table 16 - Minimum required distance to relevant boundaries for 100% unprotected areas of facades

Use	Compartment size (W X H)	Amount of unprotected areas	Minimum required distance to relevant boundary (1)
Residential	18m² (6m x 3m)	100% (18m²)	1.8m
	27m² (9m x 3m)	100% (27m²)	2.0m

Use	Compartment size (W X H)	Amount of unprotected areas	Minimum required distance to relevant boundary (1)
	36m² (12m x 3m)	100% (36m²)	2.2m
	45m² (15m x 3m)	100% (45m²)	2.3m
	54m² (18m x 3m)	100% (54 m²)	2.4m
Ancillary areas	15m² (5m x 3m)	100% (15m²)	2.6m
	30m² (10m x 3m)	100% (30m²)	3.5m
	42m² (14m x 3m)	100% (42 m²)	3.9m
	54m² (18m x 3m)	100% (54 m²)	4.2m
	63m² (21m x 3m)	100% (63 m²)	4.5m
	72m² (24m x 3m)	100% (72m²)	4.5m
	81m² (27 x 3m)	100% (81m²)	4.6m
Notes: 1) Based on sprinkler provision.			

5.6.11 A further detailed external fire spread assessment shall be carried out at detailed design stage.

6. ACCESS AND FACILITIES FOR THE FIRE AND RESCUE SERVICE

6.1 Overview

6.1.1 In the event of fire, the fire and rescue service will be notified by a resident or, where applicable, by a member of management staff or a 'Redcare' or similar monitoring agency (if provided).

6.2 Vehicle access to and around the site

6.2.1 Access to the development is provided to the South West of the site with internal site roads providing access to each block.

6.2.2 Fire and rescue service (FRS) vehicle access shall be provided to within 18m and clear sight of dry riser inlets to facilitate personnel access and connectivity with firefighting equipment.

6.2.3 Any point on the floor plate shall be within 45m of a dry riser outlet measured on a route suitable for laying hose.

6.2.4 Fire and rescue service appliances should not reverse more than 20m, otherwise, suitable turning facilities shall be provided.

6.2.5 Vehicle access route will comply with the minimum specification indicated in Table 17 for a pump-type appliance. Fire and rescue service appliances are not standardised, therefore vehicle access provision should be discussed and agreed with the local fire and rescue service to ensure their vehicle complies with the parameters listed in Table 17.

Table 17 -Typical pump-type firefighting appliance access requirements

Minimum access route specification	Dimension
Width between kerbs	3.7 m
Width between gateways	3.1 m
Turning circle between kerbs	16.8 m
Turning circle between walls	19.2 m
Clearance height	3.7 m
Carrying capacity	12.5 tonnes (To be confirmed by local FRS)

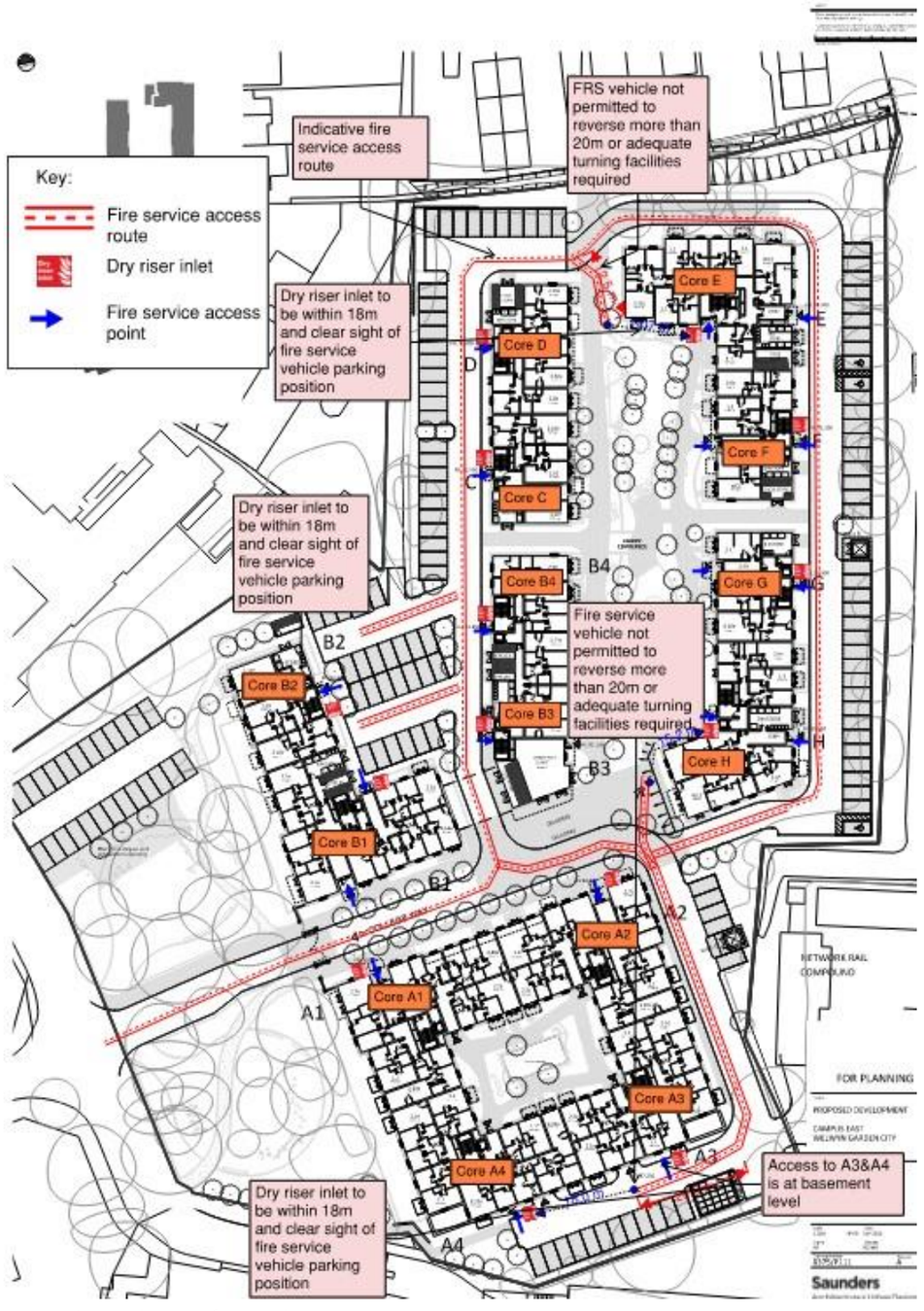

Figure 24 - Indicative fire track access route

6.3 Access into and through the building

6.3.1 Access into each core is provided at ground floor level, except for A3 & A4. Access to A3 & A4 will be to the stairs at basement level, where these will be accessed from open air due to the building sitting on a sloping site.

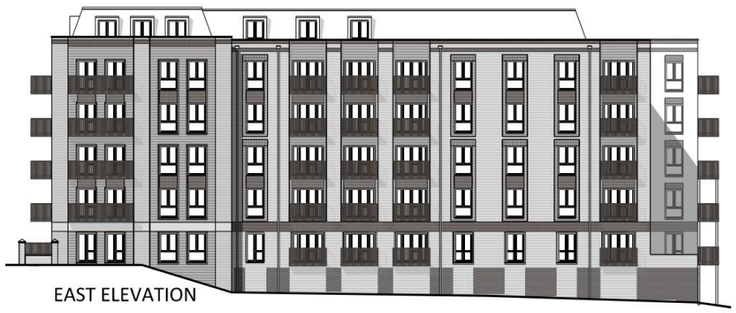

Figure 25 - East elevation showing sloping site

6.3.2 Access to the upper floors is provided via a protected stairway.

6.3.3 Access to any point on the floor plate on upper floors should be not more than 45m, measured on a route suitable for laying hose, from the dry rising outlet within the stair core.

6.3.4 The dry-rising inlet should be within 18m and within clear sight, typically on the face of the building close to the entrance, from the FRS vehicle parking position. Dry-riser mains outlets should be located within the stairway on the full landing at each level. The maximum horizontal pipe run permitted for a dry rising main is 18m in accordance with BS 9990 [33]. The dry-rising main shall be designed and installed in accordance with BS 9990.

6.3.5 All doors giving access to the interior of the building will have a minimum width of 750mm.

6.4 Firefighting facilities

6.4.1 All blocks have a top floor height less than 18m above fire service access level therefore no firefighting shafts will be provided.

6.4.2 Blocks A1 & A2 are located approximately 15.75m above the fire service access level into the cores on the north elevation. Although the top floor height measured from the lowest point at ground level (where Blocks A3 & A4 are accessed from) results in a height of more than 18m, this is not considered to be relevant for firefighting access and facilities as per Section 15.2 and Diagram 15.2 in ADB.

6.4.3 Firefighting operations within each core shall be supported by a protected stair, and a protected lobby.

6.4.4 The communal corridor in front of the stairs and lifts shall be provided with a smoke ventilation system in accordance with Section 2.3, in order to protect the stair from the ingress of smoke.

6.5 Water supplies

6.5.1 Hydrants will be required in the vicinity of the building to support firefighting operations.

6.5.2 As the blocks shall be provided with dry rising mains, hydrants should be located not more than 90m of each dry-rising main inlet.

6.5.3 If fire hydrants are to be installed, they should be included as part of a ring fire main system. They should preferably be sited immediately adjacent to roadways or hard-standing facilities suitable for fire and rescue service appliances. To ensure that they remain usable during a fire they should be sited with consideration of the effect that falling debris and other possible occurrences during a fire might have on the continuing viability of the location and should be not less than 6m from the building.

6.5.4 A water supply capable of providing a minimum of 1,500 litres per minute at all times is recommended. Water supplies will be designed and installed in accordance with BS 9990.

6.6 First-aid firefighting

6.6.1 First-aid firefighting provisions should be assessed and provided as part of the fire risk assessment for the building, including consideration for the day-to-day management of these provisions.

6.6.2 In general, fire points should be located within the ancillary areas presenting a significant fire risk and to ensure coverage of at least one fire point for every 200m^2 of floor area. The type and size of extinguisher(s) at each fire point should be chosen in accordance with the guidance given in BS 5306-8 [34].

7. CONCLUSION

7.1 General

7.1.1 This fire report summarises the RIBA Stage 3 fire strategy design information and demonstrates how the building shall satisfy the functional requirements of the Building Regulations through further design development.

7.1.2 Any departures from current guidance will be subject to consultation with the approval authorities and represent a project risk until agreed.

7.1.3 It is expected that detailed fire reports for each of the blocks shall be developed as the project progresses through RIBA Stage 4 following co-ordination with the design team.

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