HOARE LEA

Bishopsgate Goodsyard.
London.
Bishopsgate Goodsyard Regeneration Limited.

FIRE ENGINEERING
RIBA STAGE 2 REPORT AND PLANNING STATEMENT
OUTLINE FIRE SAFEY STRATEGY
REVISION 02 – 24 JANUARY 2020

STAGE 2

Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	21/12/2018	RIBA Stage 2 Report	LC	KW	JL
01	28/02/2019	Update to reflect design changes	LC	GF	KW
02	24/01/2020	Update to include planning statement	LC	BR	MH

Project number: 19/19385
Document reference: REP-1919385-05-LC-20181210-FSS S2-Rev02

Contents.

1. Introduction.

Hoare Lea has been appointed to provide fire safety advice during RIBA Stage 2 and support the planning application for the proposed development of Bishopsgate Good Yard (BGY).

This RIBA Stage 2 report will be used as part of the planning application. Section 2 of this report contains the planning statement which details the how the BGY development will meet the London Policy Plan D11.

The BGY scheme consists of a mixed-use development with nine blocks linked at Ground Floor and Podium level. The different blocks are described in Table 1 along with their height and uses. Furthermore, one level of basement will be provided under Plot 2 and will consist of plant rooms serving the entire development.

The fire safety strategy will be designed in accordance with BS 9999:2017 [1] for the retail, office, hotel and assembly and recreation uses as it provides more flexibility than Approved Document B [2]; BS 9991:2015 [3] will be used for the residential accommodation and other guidance documents, e.g. BR 187 will be used where appropriate. Compliance with Part B of the Building Regulations is normally achieved by following the guidance BS 9999 and BS 9991. If followed, these will satisfy the functional requirements of the Building Regulations 2010 [4]; otherwise, a fire engineering justification will be required. Any departures or deviations from fire safety guidance will be detailed within this report, for discussion throughout the design process with the Statutory Authorities. Where not explicitly described within this report it is assumed that, in all other respects, the building will be designed to comply with the relevant sections of BS 9999, BS 9991, or the supporting British Standards referenced therein.

This report is not sufficient to support a Building Regulations application but is rather intended to assist with the planning application from a fire safety point of view.

This fire strategy has been developed based on illustrative layouts supplied for all plots, other than Plot 2 and 7 which are more developed, as part of RIBA Stage 2. The fire safety strategy for each individual plots will have to developed further at later stages to ensure that each plot meets the Building Regulations 2010.

Table 1: Blocks height and uses.

Plot		Height [m]	Number of storeys	Uses
1		62.3	17	Retail/Office
2		113.8	30	Retail/Office
3		29.7	7	Retail/Office
4		61.4	19	Retail/Residential
5	A	41.1	13	Retail/Medical/Residential
	B	31.5	10	Retail/Residential
	C	17.5	6	Residential
	D	9.5	4	Retail/Residential
	E	6.0	3	Office
6		Less than 18m	5	Assembly and Recreation
7		4.0	1	Retail
8	A	85.9	27	Hotel/Residential
	B	16.9	5	Hotel
	C	16.9	5	Hotel
10	A	37.3	10	Residential

Plot		Height [m]	Number of storeys	Uses
	B	40.5	11	Residential
	C	27.7	7	Residential

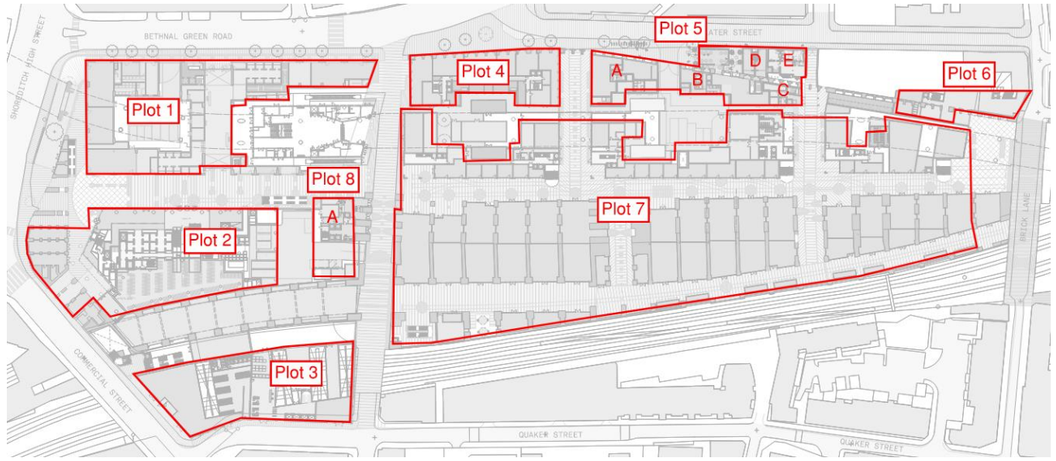

Figure 1: Ground Floor masterplan with blocks indicated.

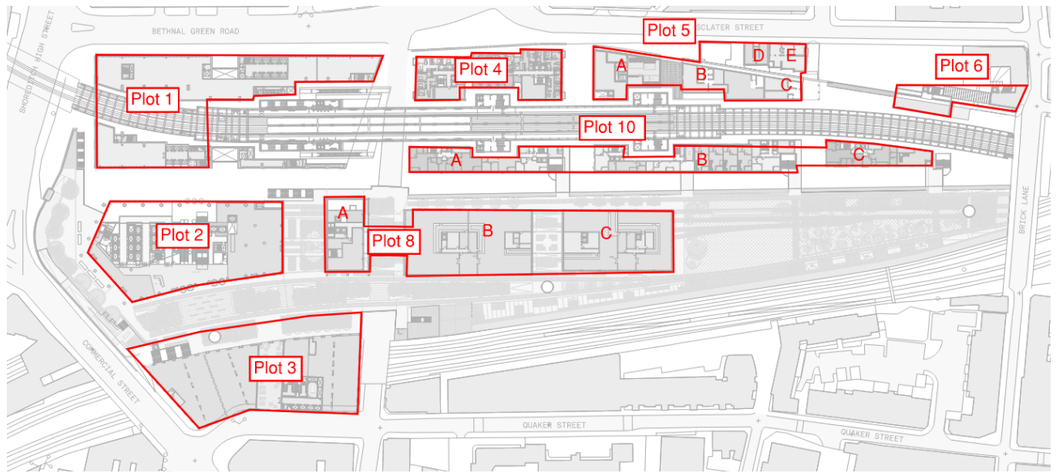

Figure 2: Podium level masterplan with blocks indicated.

2. Planning statement.

2.1 Hoare Lea competency statement

All Hoare Lea design projects are headed by chartered engineers with proven experience on a wide range of fire safety consultancy projects.

Our staff have appropriate expertise and experience of fire safety design on a wide range of complex buildings, not only in the UK, but also world-wide. Whilst most of our work is conducted to satisfy safety regulations within the UK (e.g. Building Regulations and associated legislation), our staff have been responsible for developing fire safety strategies based on the NFPA standards and other international codes.

All work produced at Hoare Lea have been reviewed and approved by a senior chartered fire engineer to ensure the work is suitable for submission.

This report has been produced, reviewed and approved by the following key individuals:

- Miller Hannah BEng (Hons), CEng, MIFireE – Partner
- Brad Rockell BSc (Hons), CBuildE, MCABE – Associate Fire Engineer
- Louis Chaumont Meng, AIFireE – Fire Engineer

2.2 Planning statement introduction

This fire safety strategy report and planning statement have been prepared to support the full planning application for the BGY development in response to emerging Policy D11 of the draft London Plan (2019). Policy D11 details that fire safety should be considered at the earliest opportunity to ensure the safety of the building users. Major developments should:

- Include safety features in the design to reduce risk to life in a fire case scenario;
- Construct the development to minimise risk of fire spread;
- Provide suitable and convenient means of escape for all occupants of the development;
- Adopt a robust evacuation strategy which all building occupants will be confident in; and
- Provide appropriate fire-fighting appliance access and equipment for use in a fire-fighting scenario at the development.

This report addresses the main fire safety items, principles and strategies and provides an overview of the requirements and recommendations that the proposed development will meet in regard to the functions set out above.

The BGY scheme, comprising of retail, office, hotels, medical, assembly and recreation and residential uses, is a mixed-use development with nine blocks linked at Ground Floor and Podium level. The height of the plots range from 4.0m to 113.8m as indicated in Table 1. Figure 1 and Figure 2 highlight the arrangement of the various plots on the development at Ground Floor and Podium level.

The fire safety strategy for the BGY development will be based on the guidance of:

- BS 9999:2017 *"Fire safety in the design, management and use of buildings – Code of practice";*
- BS 9991:*2015 "Fire safety in the design, management and use of residential buildings – Code of practice"*; and
- Other guidance documents will also be used where appropriate (i.e. Approved document B, HTM 05-02 etc) and specified where used.

The general fire safety strategy recommendations are provided for all plots in Section 3 of this report to show of the scheme will meet the functional requirements (B1 to B5) of the Building Regulations 2010. An outline and summary of the fire safety strategy for each individual plot is provided in Section 4. This is based on illustrative layouts only for all plots, except Plots 2 and 7.

2.3 Means of escape

The means of escape requirements and provision for the various uses are indicated in this section.

- Residential accommodation: The means of escape for the residential premises is detailed in Section 3.2.1.
- Office accommodation: The means of escape for the office spaces are described in Section 3.2.2.
- Hotel accommodation: The means of escape for the hotel accommodations are specified in Section 3.2.3.
- Retail units: The means of escape for the retail units are outlined in Section 3.2.4.
- Assembly and recreation: The means of escape for the assembly and recreation plot is itemised in Section 3.2.5.
- Medical: The means of escape for the medical spaces is detailed in Section 3.2.6.
- Plant rooms: Means of escape for the plant rooms which serve each premises are specified in Section 3.2.7.

2.4 Internal fire spread (structure)

The loadbearing elements of structure and sprinkler provision requirements for the different plots in the BGY development will depend on the height of the building in the development. Details for each plot are provided in Section 0.

2.5 External fire spread

In order to minimise any fire spread between buildings through the external wall, external wall construction requirements are provided in Section 0.

A space separation analysis has been undertaken to establish the necessary boundary distance or additional fire resisting construction required for the facades of the buildings, this assessment is shown in Appendix A.

2.6 Access and facilities for the Fire and Rescue Service

The fire-fighting vehicle access throughout the development and provisions to aid the Fire Service are detailed in Section 3.6.

2.7 Construction, design and management regulations

Design projects undertaken in the UK are subject to the requirements of the Construction (Design and Management) Regulations 2015 (CDM 2015), the objective of which is to ensure that health and safety issues are properly considered during a project's design and development so that the risk of harm to those who have to construct, use and maintain the building is reduced.

As a designer, in accordance with Regulation 9 of the CDM regulations, Hoare Lea will take into account the general principles of prevention in the preparation of this report and where reasonably practicable, eliminate, minimise and/or control foreseeable hazards associated with the design. Where elimination is not reasonably practicable, Hoare Lea will be required to provide 'pre-construction' information in respect of any significant and/or unusual project-specific hazards that remain.

2.8 Materials and Workmanship

Regulation 7 of the Building Regulations requires that all building work should be carried out in a workmanlike manner, with adequate and proper materials that are appropriate for the circumstances in which they are used, are adequately mixed and prepared, and are applied, used or fixed so as to perform the functions for which they are designed.

Further guidance is provided in the Approved Document supporting Regulation 7.

Independent certification schemes exist to provide additional confidence that products are manufactured and installed to an appropriate and consistent standard. Such schemes can assist in ensuring that the Material and Workmanship requirements of Regulation 7 are satisfied. It is therefore suggested that, where appropriate, manufacturers and installers that are subject to independent certification schemes are specified on this scheme.

Recent changes to Regulation 7 prohibit the use of combustible materials within the external wall construction and specified attachments including balconies, solar shading or solar panels, within residential buildings which have a storey more than 18m above the lowest adjacent external Ground level. Any relevant building within the site will comply with Regulation 7.

2.9 Conclusion.

This fire safety statement has been prepared to outline the main items relating to fire safety for the BGY development. This statement demonstrates that the proposals have considered fire safety at the earliest stage. The outlined items will be further developed for each plot in order to demonstrate how the proposed designs will meet the functional requirements of Part B of Schedule 1 of the Building Regulations 2010.

3. Key fire safety measures.

3.1 General Fire Safety Recommendations

In accordance with BS 9999, the risk profiles given in Table 2 will be assigned for each area. The residential premises are assessed following the guidance of BS 9991, which does not provide any risk profile.

Table 2: Summary of risk profiles.

Purpose area	Occupancy characteristic	Sprinkler protection	Fire growth rate	Risk profile
Office	Awake and familiar (A)	Yes	Slow (1)	A1
Retail	Awake and unfamiliar (B)	Yes	Medium (2)	B2
Retail	Awake and unfamiliar (B)	No	Fast (3)	B3
Hotel	Likely to be asleep and short term occupancy (Ciii)	Yes	Slow (1)	Ciii1
Assembly and recreation	Awake and unfamiliar (B)	No	Medium (2)	B2
Medical Note 1	Occupants receiving medical care (D)	Yes	Slow (1)	D1
Plant rooms	Awake and familiar (A)	Yes	Medium (2)	A2
Note 1: Doctor's surgery to be designed in accordance with HTM 05-02 (2015) [5].				

3.2 B1 – Means of escape and warning

3.2.1 Residential premises

- It is proposed to adopt a 'stay put' evacuation strategy for the residential premises of the development. That is, only the occupants of the apartment of fire origin will evacuate on activation of the fire detection and alarm system and the other occupants will remain in place.
- The apartment layout will be based on two principles, either a protected entrance hall or an open-plan design.
  - The apartments with a protected entrance hall should have all habitable rooms exiting into the hallway with a travel distance not exceeding 9m from the flat entrance door to the door of any habitable room.
  - Open-plan flats do not have a protected hall but have bedrooms that are inner rooms and are accessed directly from the living room or kitchen. In accordance with BS 9991, open-plan apartments should be provided with a Category LD1 fire detection and alarm system and a residential sprinkler system. The open-plan flats should meet the following recommendations:
    - The size of the open-plan flat should not exceed 16m x 12m if the kitchen is enclosed separately;
    - The size of the open-plan flat should not exceed 8m x 4m if the kitchen is not enclosed;
    - Open-plan flats should be situated on a single level only; and
    - The ceilings should have a minimum height of 2.25m

    However, it is proposed to have apartments that exceed the maximum size recommended in BS 9991. Therefore, a fire engineered solution supported by a Computational Fluid Dynamics (CFD) analysis may be required to justify the apartments layouts. This is to be discussed and agreed with the Approving Authorities.
- It is proposed to provide the open-plan apartments with Category LD1 fire detection and alarm system and the protected entrance hall apartments with Category LD2 in accordance with BS 5839-6:2013 [6].
- The travel distances in the common corridors should be limited to 7.5m in a single direction in the residential blocks not provided with a sprinkler system and 15m in the residential blocks provided with a sprinkler system along with a smoke extract system. If these 15m travel distance in a single direction is exceeded, a fire engineered consisting of two mechanical smoke ventilation shafts, known as a Double Reversible Mechanical Extract (DRME) should be provided. This may have to be justified by means of a CFD analysis. This is to be discussed and agreed with the Approving Authorities.
- Each residential block will be served by a single stair at least 1100mm wide. The final exit or protected passageway from the stair to the outside should be at least as wide and provided with the same standard of fire protection as the stair it serves.
- The draft London Policy Plan requests provisions for evacuation of disabled users of the residential premises. Therefore, it is proposed that the fire-fighting lift will be programmed to also be used as an evacuation lift.

3.2.2 Office accommodation

- It is proposed to adopt simultaneous (Plots 3 and 5) or phased (Plots 1 and 2) evacuation strategies for the office plots.
  - Simultaneous: On activation of the fire detection and alarm system, the plot of fire origin will evacuate simultaneously and immediately.
  - Phased: The normal sequence of evacuation should be: upon activation of the fire detection and alarm system, the occupants of the floor of fire origin will evacuate first then the remainder of the floors in groups of two. The following conditions should be met in any building design on the basis of a phased evacuation:
    - The stairways should be approached by protected lobbies;
    - Every floor should be a compartment floor;
    - The building should be provided with a fire detection and alarm system conforming to at least a Category L2 system incorporating a voice alarm;
    - An emergency voice communication system should be provided with outstations at each floor level which communicate with a master station located in the building control room; and
    - Lifts should be approached by protected lobbies. On the upper floors, this could be provided either with fire doors or a fire curtain between the Lift Lobby and the office accommodation.
- It is proposed to provide a Category L2 fire detection and alarm system in the office spaces in accordance with BS 5839-1:2017 [7]. This is considered to be an enhancement on the recommended manual system recommended for risk profile A1 buildings operating a simultaneous evacuation.
- The actual travel distances in the office space are recommended to be within 29.9m in a single direction and 74.7m when more than one direction is available for buildings operating a simultaneous evacuation and 26m and 65m for buildings operating a phased evacuation.
- The maximum occupancy of the office space will be determined depending on the storey exits and stairs capacity for each building.
- It is recommended to provide disabled refuges of dimensions 1400mm x 900mm on every means of escape route not providing level escape to the outside. These should be provided in each the protected stair or lobby enclosure and fitted with an Emergency Voice Communication (EVC) device in accordance with BS 8539-9:2011 [8].

3.2.3 Hotel accommodation

- It is proposed that the hotel (Plot 8) operates a simultaneous evacuation. That is, upon activation of the fire detection and alarm system, all occupants of the building evacuate immediately.
- It is proposed to provide the hotel accommodation with a Category L1 automatic fire detection and alarm system in accordance with BS 5839-1.
- The travel distance from any point in the building, to the nearest place of relative safety, should be limited to 13m in a single direction and 27m when more than one direction is available. In accordance with ADB, the following travel distance limits are recommended:
  - Hotel bedrooms - 9m (single direction);
  - Corridors (hotel) - 9m (single direction) and 35m (multiple direction); and
  - Elsewhere (hotel) - 18m (single direction) and 35m (multiple directions) such as plant rooms, restaurant, storage room.
- The stairs should discharge directly to a final exit or by way of a protected exit passageway to a final exit. The exit passageway should maintain the same fire resistance enclosure and width as the stairway it serves.
- It is recommended to provide disabled refuges of dimensions 1400mm x 900mm on every means of escape route not providing level escape to the outside. These should be provided in each the protected stair or lobby enclosure and fitted with an Emergency Voice Communication (EVC) device in accordance with BS 8539-9.

3.2.4 Retail units

- It is proposed that the retail units operate:
  - Independent simultaneous evacuation for all retail units; except
  - The retail units opening onto London Road will be separated into evacuation zones as the road will be covered and will be treated as a single-storey mall. All the retail units in an evacuation zone will evacuate simultaneously on activation of the fire detection and alarm system anywhere in the evacuation zone.
- It is proposed to provide the hotel accommodation with a Category L1 automatic fire detection and alarm system in accordance with BS 5839-1.
- The actual travel distances in the retail units should be limited to:
  - 23m in a single direction and 57.5m when alternative directions are available for retail units fitted with a sprinkler system (risk profile B2 with a 15% enhancement for automatic fire detection and alarm system); or
  - 16m in a single direction and 40m when alternative directions are available for retail units not fitted with a sprinkler system (risk profile B3).
- It is recommended to provide disabled refuges of dimensions 1400mm x 900mm on every means of escape route not providing level escape to the outside. These should be provided in each the protected stair or lobby enclosure and fitted with an Emergency Voice Communication (EVC) device in accordance with BS 8539-9.

3.2.5 Assembly and recreation

- It is proposed to adopt a simultaneous evacuation strategy for the assembly and recreation accommodation.
- It is proposed to provide the hotel accommodation with a Category L1 automatic fire detection and alarm system in accordance with BS 5839-1.
- The actual travel distances should be within 23m in a single direction and 57.5m when more than one direction is available.
- The maximum occupancy of the assembly and recreation spaces will be determined depending on the storey exits and stairs capacity.
- It is recommended to provide disabled refuges of dimensions 1400mm x 900mm on every means of escape route not providing level escape to the outside. These should be provided in each the protected stair or lobby enclosure and fitted with an Emergency Voice Communication (EVC) device in accordance with BS 8539-9.

3.2.6 Medical

- The patient dependency is required to be confirmed in accordance with HTM 05-02 as this impacts the fire safety design. It is currently assumed that the Doctor's Surgery in Plot 5 Block A is for independent patients; however, this needs to be confirmed.
- As stated in HTM 05-02, for medical centre for independent patients, the guidance of ADB is sufficient, with a purpose group 5 (Assembly and recreation).
- It is proposed to adopt an independent simultaneous evacuation strategy for the medical centre.
- The actual travel distances should be within 18m in a single direction and 45m when more than one direction is available.
- It is recommended to provide disabled refuges of dimensions 1400mm x 900mm on every means of escape route not providing level escape to the outside. These should be provided in each the protected stair or lobby enclosure and fitted with an Emergency Voice Communication (EVC) device in accordance with BS 8539.

3.2.7 Plant rooms

- The plant rooms will operate the same evacuation strategy as the building they are provided in. The basement under Plot 2 will operate within the same phased evacuation strategy as Plot 2 as these share means of escape routes.
- It is proposed to provide the plant rooms with Category L2 fire detection and alarm system in accordance with BS 5839-1.
- The actual travel distances in the plant rooms should be within 22m in a single direction and 55m when more than one direction is available.

3.3 B2 – Internal fire spread (linings)

The surface linings of walls and ceilings should meet the classifications outlined in Table 3.

Table 3: Classification of linings.

Location	National class	European class
Small rooms of area not more than: - 4m^2 in residential accommodation; and - 30m^2 in non-residential accommodation.	3	D-s3, d2
Other rooms and circulation spaces within dwellings	1	C-s3, d2
Other circulation spaces, including the common areas of blocks of flats	0	B-s3, d2

3.4 B3 – Internal fire spread (structure)

- The recommended fire resistance of the elements of structure can be found in Table 4 for each plot which depends on the height of the building.
- It is proposed to provide sprinkler systems throughout the buildings with a height over 30m. These should be:
  - Residential sprinkler systems in accordance with BS 9251:2014 [9] for the residential premises; and
  - Commercial sprinkler systems in accordance with BS EN 12845:2015 [10] for the other occupancies. It is proposed to have one sprinkler tank serving all commercial sprinkler systems in the development. As discussed in Section 3.6, it is also proposed to provide commercial sprinklers in Plots 8 (Blocks B and C), 9 and parts of 7 to mitigate for the non-code compliant fire-fighting access. This is to be discussed and agreed with the Approving Authorities.
- The development should be provided with back–up power supplies for the life safety systems in the development. A single development wide life safety generator would be sufficient for life safety purposes. This is considered to be reasonable on the basis that the entire development has been designed based on the assumption that a single fire will occur within the development at any one time. Should the client wish to consider property protection, a generator capable of supporting the demand of more than one building would be required.

Table 4: Fire resistance of elements of structure.

Plot		Height [m]	Fire resistance of elements of structure [minutes]
1		62.3	120
2		113.8	120
3		29.7	90
4		61.4	120
5	A	41.1	120
	B	31.5	120
	C	17.5	60
	D	9.5	60
	E	6.0	60
6		Less than 18m	60
7		4.0	30
8	A	85.9	120
	B	16.9	60
	C	16.9	60
10	A	37.3	120
	B	40.5	120
	C	27.7	60

3.5 B4 – External fire spread

- An initial external fire spread assessment was undertaken for the Ground Floor and Podium level in accordance with BR 187 (1991) “External fire spread: building separation and boundary distances” [11]. The results and the assumptions of this analysis can be found in Appendix A.
- In accordance with Regulation 7(2), any residential building with a storey height in excess of 18m above the lowest adjacent external ground level, the external wall construction, and specified attachments including balconies, solar shading or solar panels, should achieve European Classification A2-s1, d0 or Class A1. This does not apply to the following:
  - 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;
  - insulation and water proofing materials used below ground 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;
  - thermal break materials where the inclusion of the materials is necessary to meet the thermal bridging requirements of Part L of Schedule 1; or
  - window frames and glass.

  Additional guidance on the application of this Regulation is provided in Section 10 of Approved Document B (2019), including guidance on membranes, window spandrel/infill panels, thermal breaks and shop signage.

  It is recognised that the recent changes to the Building Regulations are not reflected in the guidance of BS 9991:2015 & BS 9999:2017. On this basis, it is, therefore, proposed to supplement this report with the relevant section of Approved Document B which accounts for the aforementioned changes.
- Where the residential buildings do not have a storey that exceeds 18m in height and, therefore, either the external walls should satisfy the performance criteria described in BRE report BR 135 or the external wall surface should be in accordance with Figure 17 of BS 9991 for surface spread of flame classification, and cavity barriers in any external wall cavity are required in accordance with Clause 19 of BS 9991.

  Full reference should be made to the guidance provided in BS 9991 regarding recommendations for external walls.

  Notwithstanding the above, the Ministry of Housing, Communities and Local Government has released additional guidance relating to the provision of balconies, which has been endorsed by their expert panel. In accordance with the advice note (published in June 2019) it is recommended that balconies should achieve a European classification A2-s1, d0 or Class A1 to minimise the risks associated with balcony fires. In practise this would preclude the use of timber in external balcony constructions.
- The development contains non-residential buildings which have a storey that exceeds 18m in height and, therefore, either the external walls should satisfy the performance criteria described in BRE report BR 135 or each element of the external wall build up, including any insulation product, filler material (not including gaskets, sealants or similar) etc. should be Class A2-s3, d2 or better (European Classification).

  In addition, the external wall surface should achieve Class B-s3, d2 or better (European Classification) surface spread of flame classification, and cavity barriers in any external wall cavity are required in accordance with Clause 33.1 of BS 9999.

  For the purposes of clarity, the external wall is defined as:
  - anything located within any space forming part of the wall;
  - any decoration or other finish applied to any external (but not internal) surface forming part of the wall;

– any windows and doors in the wall; and

  any part of a roof pitched at an angle of more than 70° to the horizontal if that part of the roof adjoins a space within the building to which persons have access, but not access only for the purpose of carrying out repairs or maintenance.

Full reference should be made to the guidance provided in BS 9999 regarding recommendations for external walls.

3.6 B5 – Access and facilities for the Fire Service

– All plots more than 18m in height should be provided with at least a fire-fighting shaft. Figure 3 shows a typical residential fire-fighting shaft and Figure 4 a typical non-residential fire-fighting shaft. The fire-fighting shafts should comprise of:
  – A fire-fighting stair at least 1100mm clear width;
  – A fire-fighting lift (to be also programmed to be used as an evacuation lift for residential buildings);
  – A fire main with an outlet at all levels;
  – A ventilated common corridor for the residential fire-fighting shaft or a ventilated lobby for the office fire-fighting shafts;
  – 120 minutes fire resistance enclosure around the fire-fighting stair and lift;
  – 60 minutes fire resistance construction between fire-fighting stair and lift; and
  – An AOV at least 1m^2 at the top of the stairs.

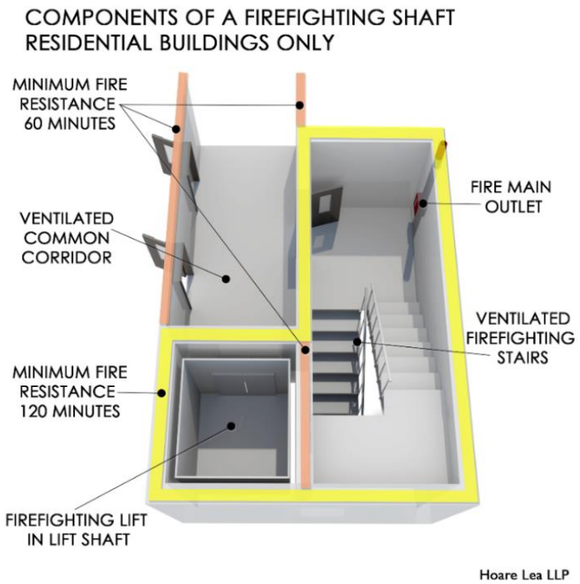

Figure 3: Typical residential fire-fighting shaft.

– In accordance with BS 9991 and BS 9999, when a building is more than 50m in height, the fire main should be installed in the form of a wet riser. Furthermore, it is proposed to have a site wide wet riser tank that will serve all plots provided with a wet riser and one central fire main inlets for the development next to Plot 8.
– All points within the plots should be within 45m from a fire main outlet when the building is not sprinklered or 60m hose distance from a fire main outlet when sprinklers are provided.
– The fire main inlets should be provided within 18m of a pumping appliance access route, typically on the façade of the buildings and visible from the access route. The fire-fighting vehicle access route is shown in Figure 5 and Figure 6. The fire-fighting access route should meet the specifications given in Table 5.

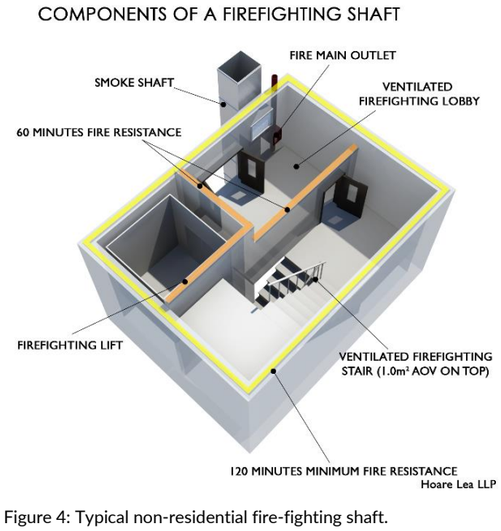

Figure 4: Typical non-residential fire-fighting shaft.

Table 5: Road specifications for pumping appliance access.

Appliance type	Min. width of road between kerbs [m]	Min. width of gateways [m]	Min. turning circle between kerbs [m]	Min. turning circle between walls [m]	Min. clearance height [m]	Min. carrying capacity [t]
Pump	3.7	3.1	16.8	19.2	3.7	14[Note 1]

Note 1: 12.5 tonnes in accordance to ADB; however, 14t in accordance with the LFEPA Fire safety guidance Note, Access for Fire Appliances, GN29 [13].

– There is no direct fire-fighting access to Plots 8 (Blocks B and C) at Ground Floor as there is no vehicle access on the Podium. As this is a deviation from the guidance of BS 9999 and BS 9991, it is proposed to provide the following features. This is to be discussed and agreed with the Approving Authorities.
  – Provide external stairs from Ground Floor to Podium level for the fire-fighters to travel up to the buildings entrances. These stairs should be at least 1100mm wide. The access at Podium is shown in Figure 6.
  – Provide Plot 8 Blocks B and C with wet riser systems to compensate for the walking distance for the fire-fighting despite being less than 50m in height.
  – Provide sprinkler systems to Plot 8 throughout to facilitate the fire-fighting activities. This will be used as a mitigation feature for Blocks B and C as these are less than 30m in height.
– There is no direct access to London Road and the retail units are more than 60m hose laying distance from any fire-fighting appliance access route. It is therefore proposed to provide sprinkler protection to the retail

units opening onto London Road and wet riser outlets at regular interval on London Road. This is to be discussed and agreed with the Approving Authorities.

- The basement under Plot 2 should be provided with a smoke ventilation system as it is more than 200m^2 in area. It is therefore proposed to provide a mechanical smoke ventilation system providing at least 10 air changes per hour based on the largest compartment. As a mechanical smoke extract system is provided , the basement should be provided with commercial sprinkler protection.
- A control room should be provided in each of the plots operating a phased evacuation strategy. In addition, it is proposed that a central control room for the development is provided in Plot 2. This is where the sprinkler and wet riser tanks are proposed to be located. This would be used by the Fire Brigade as the primary rendez-vous point when called for any incident throughout the entire development. The control rooms should be enclosed in 120 minutes fire resistance and should be provided with a 120 minutes fire resistance passageway to the outside.

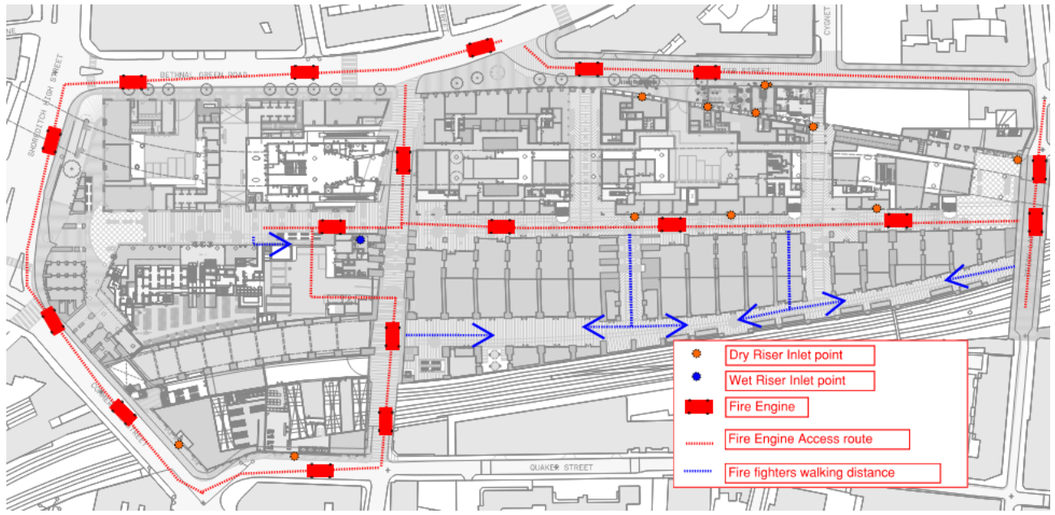

Figure 5: Fire-fighting vehicle access route at Ground Floor.

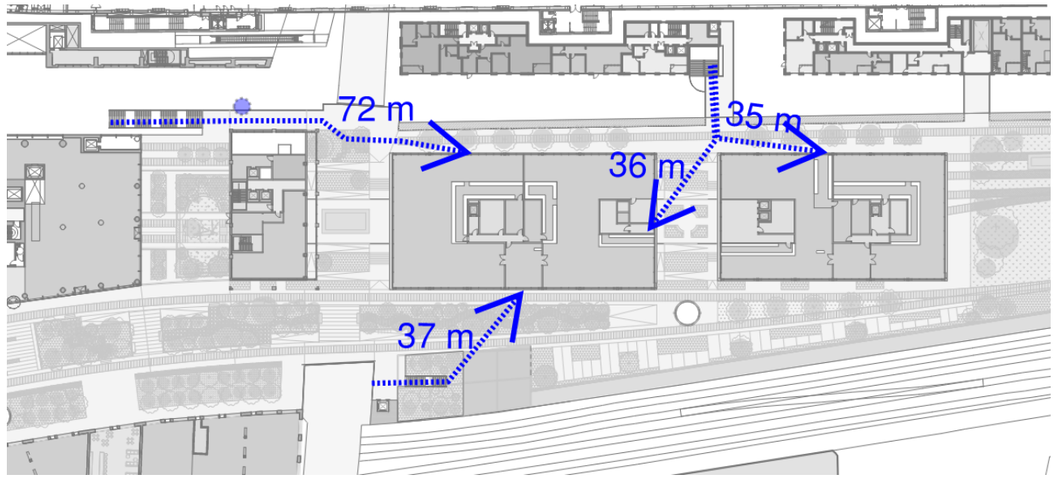

Figure 6: Fire-fighting access routes to Plot 8 Blocks B and C at Podium level.

4. Plots fire safety summary.

4.1 Plot 1

Table 6: Plot 1 summary fire safety strategy.

Provision	Comment
Use	Retail (Ground Floor), office (Upper floors) and bike storage (Basement)
Number of storeys	17 (i.e. Basement, Ground and First to Fifteenth Floor)
Building height	62.3m from access level to the topmost occupied floor level
Risk Profile	– Retail: B2 (occupants awake and unfamiliar and medium fire growth rate) – Office: A1 (occupants awake and familiar and slow fire growth rate)
Evacuation strategy	– Retail: Independent simultaneous evacuation – Office: Phased evacuation
Fire detection and alarm	– Retail: Category L1 fire detection and alarm system – Office: Category L2 fire detection and alarm system with voice alarm
Maximum travel distances	– Retail: 23m in a single direction and 57.5m in multiple directions; – Office: 26m in a single direction and 65m in multiple directions.
Stairs	Two fire-fighting stairs and two means of escape stairs
Final exits	Final exits should be at least as wide as the stairs discharging into them.
Smoke control	Smoke ventilation in both fire-fighting shafts (i.e. lobbies and stairs)
Disabled egress	Provided on all non-level means of escape routes
Elements of structure	120 minutes fire resistance
Compartmentation	Compartment floors throughout with potential atria joining floors
Sprinkler protection	Commercial sprinkler system provided throughout the building
External fire spread	See Appendix A
Fire Service access	Two fire-fighting shafts serving floors up to the 13th Floor and one from the 13th to 15th Floor.
Vehicle access	Within 18m of the fire-fighting access into the building
Fire mains	One wet riser main in each fire-fighting shaft
Further consideration	– Atria design in accordance with BS 9999; – Occupancy limitations in office and retail.

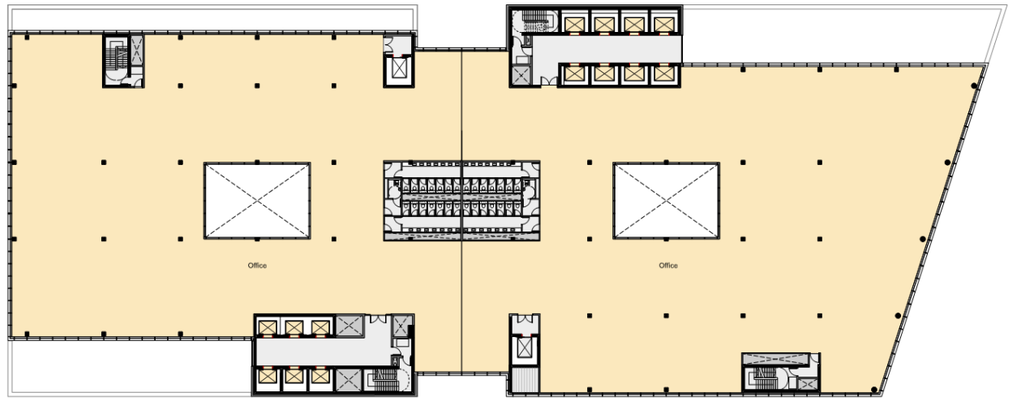

Figure 7: Plot 1 - Typical upper floor plan.

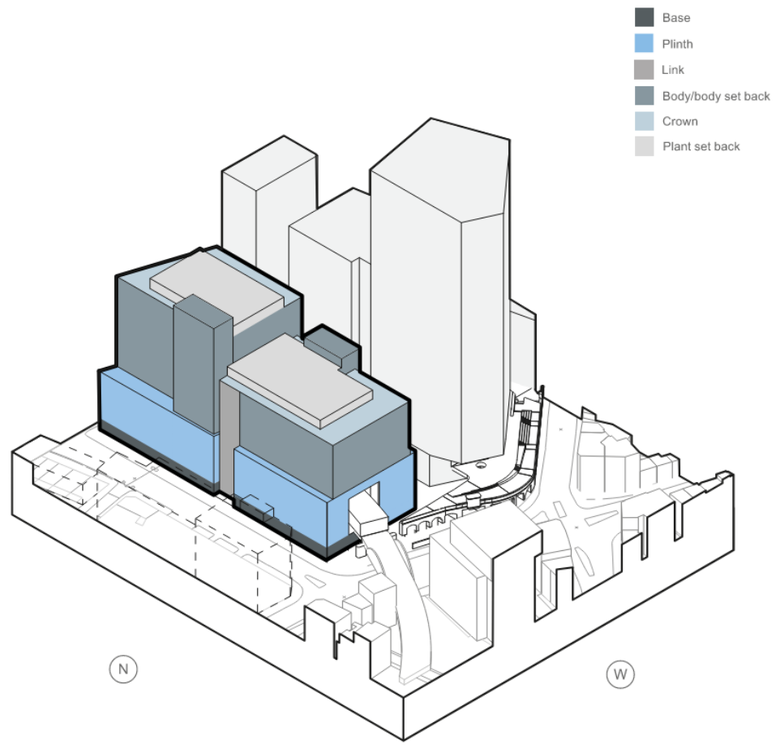

Figure 8: Plot 1 – Axonometric projection.

4.2 Plot 2

Table 7: Plot 2 summary fire safety strategy.

Provision	Comment
Use	Plant rooms (Basement), retail (Ground, Platform and Platform Mezzanine) and office (Ground to 25th Floor)
Number of storeys	30 (i.e. Basement, Ground, Ground Mezzanine, Platform, Platform Mezzanine and First to 25th Floor)
Building height	113.8m in height from access level to the topmost occupied floor level and 6.4m deep.
Risk Profile	– Plant rooms: A2 (occupants awake and familiar and medium fire growth rate) – Retail: B2 (occupants awake and unfamiliar and medium fire growth rate) – Office: A1 (occupants awake and familiar and slow fire growth rate)
Evacuation strategy	– Retail: Independent simultaneous evacuation – Office and plant rooms: Phased evacuation
Fire detection and alarm	– Retail: Category L1 fire detection and alarm system – Office and plant rooms: Category L2 fire detection and alarm system with voice alarm
Maximum travel distances	– Plant rooms: 22m in a single direction and 55m in multiple directions; – Retail: 23m in a single direction and 57.5m in multiple directions; – Office: 26m in a single direction and 65m in multiple directions.
Storey exits	All stairs are lobbied and proposed to be provided with doors 1050mm clear width opening onto them.
Stairs	– Plant rooms: two means of escape stairs; and – Office: two fire-fighting stairs and one means of escape stair up to the 15th Floor and one fire-fighting and one means of escape stair from the 116th to the 25th Floor. – All stairs are proposed to be 1200mm width.
Final exits	Final exits should be at least as wide as the stairs discharging into them.
Occupancy	The occupancy should be limited to 529 persons based on the stairs and storey exits capacity described above.
Smoke control	Smoke ventilation in both fire-fighting shafts (i.e. lobbies and stairs) and mechanical smoke extract system in the basement
Disabled egress	Provided on all non-level means of escape routes
Elements of structure	120 minutes fire resistance
Compartmentation	Compartment floors throughout with potential atria joining floors
Sprinkler protection	Commercial sprinkler system provided throughout the building
External fire spread	See Appendix A
Fire Service access	Two fire-fighting shafts serving floors up to the 15th Floor and one from the 16th to 25th Floor.
Vehicle access	Within 18m of the fire-fighting access into the building
Fire mains	One wet riser main in each fire-fighting shaft
Further consideration	– Travel distances in the plant rooms; – Tenancy splits arrangements; – Atria design in accordance with BS 9999; – Occupancy limitations in office and retail.

Figure 9: Plot 2 - Typical upper floor plan.

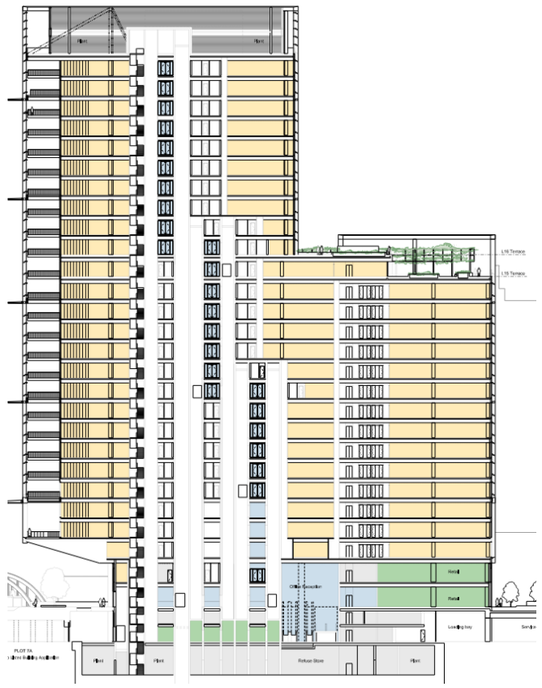

Figure 10: Plot 2 – Section.

4.3 Plot 3

Table 8: Plot 3 summary fire safety strategy.

Provision	Comment
Use	Retail (Ground and First Floor) and office (upper floors)
Number of storeys	Seven (i.e. Ground and First to Sixth Floor)
Building height	29.7m from access level to the topmost occupied floor level
Risk Profile	– Retail: B2 (occupants awake and unfamiliar and medium fire growth rate) – Office: A1 (occupants awake and familiar and slow fire growth rate)
Evacuation strategy	– Retail: Independent simultaneous evacuation – Office: Simultaneous evacuation
Fire detection and alarm	– Retail: Category L1 fire detection and alarm system – Office: Category L2 fire detection and alarm system
Maximum travel distances	– Retail: 23m in a single direction and 57.5m in multiple directions; – Office: 29.9m in a single direction and 74.7m in multiple directions.
Stairs	Two fire-fighting stairs and one means of escape stair
Final exits	Final exits should be at least as wide as the stairs discharging into them.
Smoke control	Smoke ventilation in both fire-fighting shafts (i.e. lobbies and stairs)
Disabled egress	Provided on all non-level means of escape routes
Elements of structure	90 minutes fire resistance
Compartmentation	Compartment floors throughout with void connecting Ground and First Floor
Sprinkler protection	Commercial sprinkler system provided throughout the building
External fire spread	See Appendix A
Fire Service access	Two fire-fighting shafts serving all floors
Vehicle access	Within 18m of the fire-fighting access into the building
Fire mains	Two dry riser mains, i.e. one in each fire-fighting shaft
Further consideration	– Open connection between Ground and First Floor; – Occupancy limitations in office and retail.

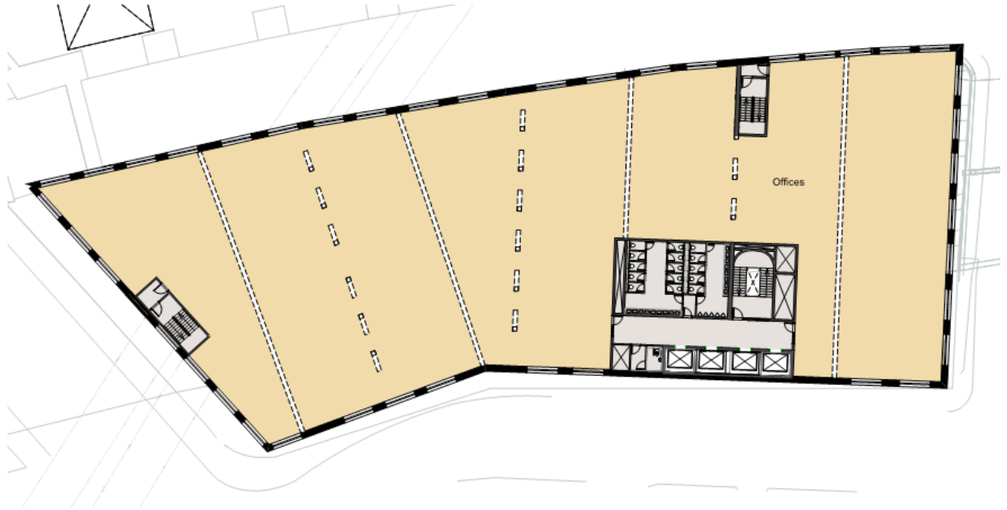

Figure 11: Plot 3 - Typical upper floor level.

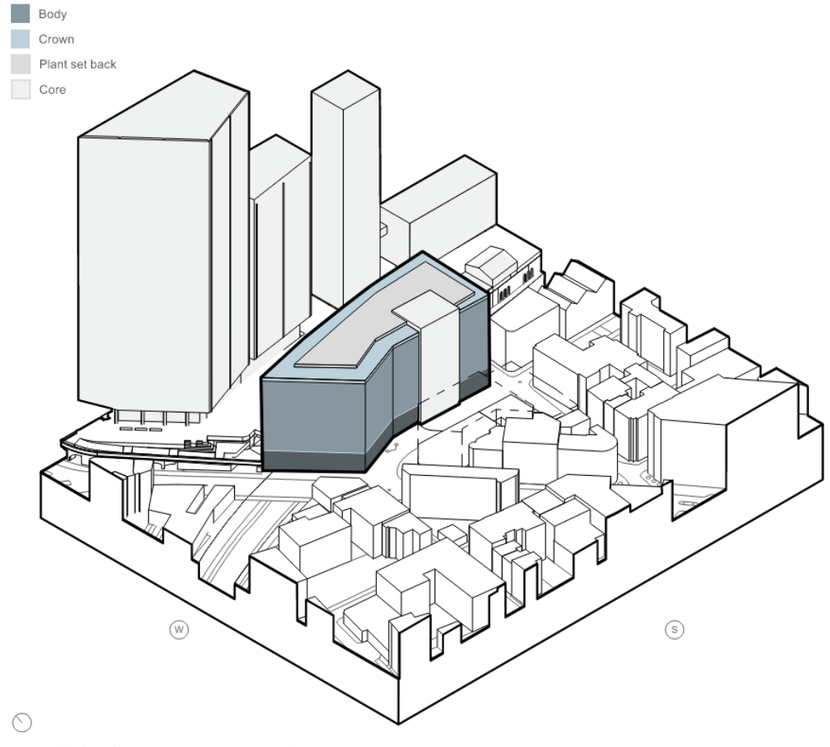

Figure 12: Plot 3 - Axonometric projection.

4.4 Plot 4

Table 9: Plot 4 summary fire safety strategy.

Provision	Comment
Use	Retail (Ground Floor) and residential (Upper floors)
Number of storeys	19 (i.e. Ground and First to Eighteenth Floor)
Building height	61.4m from access level to the topmost occupied floor level
Risk Profile	– Retail: B2 (occupants awake and unfamiliar and medium fire growth rate) – Residential: N/A
Evacuation strategy	– Retail: Independent simultaneous evacuation – Residential: 'Stay-put' evacuation
Fire detection and alarm	– Retail: Category L1 fire detection and alarm system – Residential: Category LD1 fire detection and alarm system
Maximum travel distances	– Retail: 23m in a single direction and 57.5m in multiple directions; – Residential: Up to 15m in a single direction in the common corridors
Apartments layout	Open-plan apartments
Stairs	Two fire-fighting stairs
Final exits	Final exits should be at least as wide as the stairs discharging into them.
Smoke control	One mechanical smoke extract shaft in the common corridors approaching each single core at each floor and one AOV at the top of each stair
Disabled egress	– Retail: Provided on all non-level means of escape routes – Residential: No disabled refuges
Elements of structure	120 minutes fire resistance
Compartmentation	Compartment floors throughout
Sprinkler protection	– Retail: Commercial sprinkler system throughout – Residential: Residential sprinkler system throughout
External fire spread	See Appendix A
Fire Service access	Two fire-fighting shafts serving all floors (i.e. single stair per block), fire-fighting entrance into building via reception
Vehicle access	Within 18m of the fire-fighting access into the building and dry riser inlets
Fire mains	Two wet riser mains, i.e. one in each fire-fighting shaft
Further consideration	– Retail occupancy limits; – Open-plan apartments; – Common corridors smoke ventilation; – Fire-fighting entrance into the building via reception.

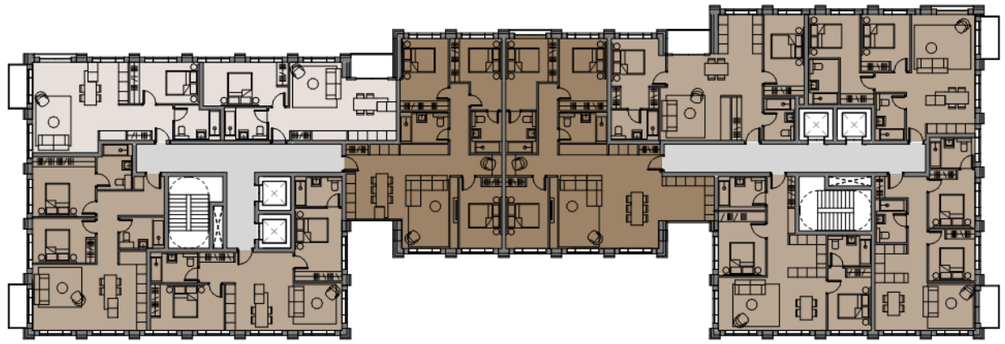

Figure 13: Plot 4 - Typical upper floor plan.

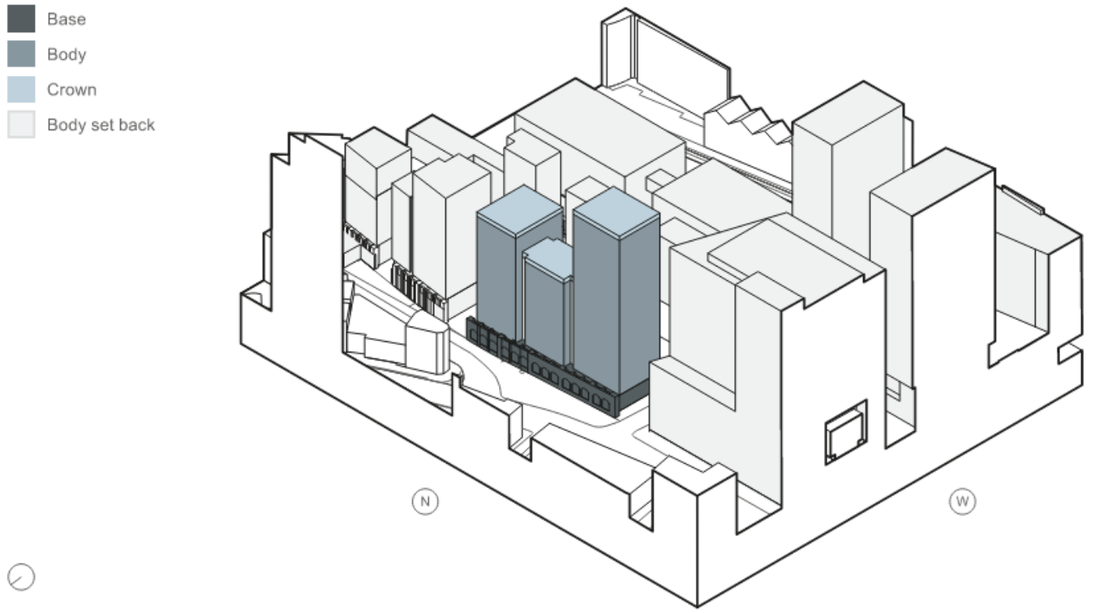

Figure 14: Plot 4 - Axonometric projection.

4.5 Plot 5

Table 10: Plot 5 summary fire safety strategy.

Provision	Comment
Use	– Block A: Retail (Ground Floor), medical (First Floor) and residential (upper floors); – Block B: Retail (Ground Floor) and residential (upper floors); – Block C: Residential; – Block D: Retail (Ground Floor) and residential; and – Block E: Office
Number of storeys	– Block A: Thirteen (i.e. Ground and First to Twelfth Floor); – Block B: Ten (i.e. Ground and First to Ninth Floor); – Block C: Six (i.e. Ground and First to Fifth Floor); – Block D: Four (i.e. Ground and First to Third Floor); and – Block E: Three (i.e. Ground and First to Second Floor).
Building height	– Block A: 41.1m; – Block B: 31.5m; – Block C: 17.5m; – Block D: 9.5m; and – Block E: 6.0m.
Risk Profile	– Retail (Block A): B2 (occupants awake and unfamiliar and medium fire growth rate); – Retail (Blocks B and D): B3 (occupants awake and unfamiliar and rapid fire growth rate); – Medical: D1 (occupants receiving medical care and slow fire growth rate), patient dependency to be determined (assumed to be independent in accordance with HTM 05-02 (2015)); – Office: A2 (occupants awake and familiar and medium fire growth rate); – Residential: N/A
Evacuation strategy	– Retail (all blocks): Independent simultaneous evacuation – Medical: Independent simultaneous evacuation – Office: Simultaneous evacuation – Residential: ‘Stay-put’ evacuation
Fire detection and alarm	– Retail: Category L1 fire detection and alarm system – Medical: Category L1 fire detection and alarm system – Office: Category L2 fire detection and alarm system – Residential: Category LD1 fire detection and alarm system
Maximum travel distances	– Retail (Block A): 23m in a single direction and 57.5m in multiple directions; – Retail (Blocks B and D): 16m in a single direction and 40m in multiple directions; – Medical: 18m in a single direction and 45m in multiple directions; – Office: 25.3m in a single direction and 63.2m in multiple directions – Residential: Up to 15m in a single direction in the common corridor
Apartments layout	Open-plan apartments (Blocks A, B and C) and two triplex apartments (Block D)
Stairs	Each block is provided with a single stair, which will be fire-fighting stairs for Blocks A and B.
Final exits	Final exits should be at least as wide as the stairs discharging into them.
Smoke control	Smoke ventilation in the form of a mechanical smoke extract shaft or an AOV to the outside in the common corridors approaching the single cores at each floor and one AOV at the top of each stair
Disabled egress	Provided on all non-level means of escape routes except for the residential premises
Elements of structure	– Block A: 120 minutes fire resistance; – Block B: 120 minutes fire resistance; – Block C: 60 minutes fire resistance; – Block D: 60 minutes fire resistance; and – Block E: 60 minutes fire resistance.
Compartmentation	– Blocks A, B and C: Compartment floors throughout
Sprinkler protection	– Block A: Commercial sprinkler system for the retail and medical accommodation and residential sprinkler system for the residential premises; – Block B: Residential sprinkler system for the residential premises; – Block C: Residential sprinkler system for the residential premises; – Block D: Residential sprinkler system for the residential premises; and – Block E: No sprinkler system.
External fire spread	See Appendix A
Fire Service access	– Block A: Fire-fighting shaft; – Block B: Fire-fighting shaft; – Block C: Dry riser in protected stair; – Block D: 45m hose laying distance in triplex apartments; and – Block E: Perimeter access.
Vehicle access	Within 18m of the fire-fighting access into the building and dry riser inlets
Fire mains	Dry riser main in the fire-fighting shafts (Blocks A and B) and one additional dry riser main in Block C.
Further consideration	– Open-plan and triplex apartments; – Common corridors smoke ventilation; – Doctor’s surgery and patient dependency in Block A; – Occupancy limitations in retail and Block E; and – Fire-fighting entrance into each block reception.

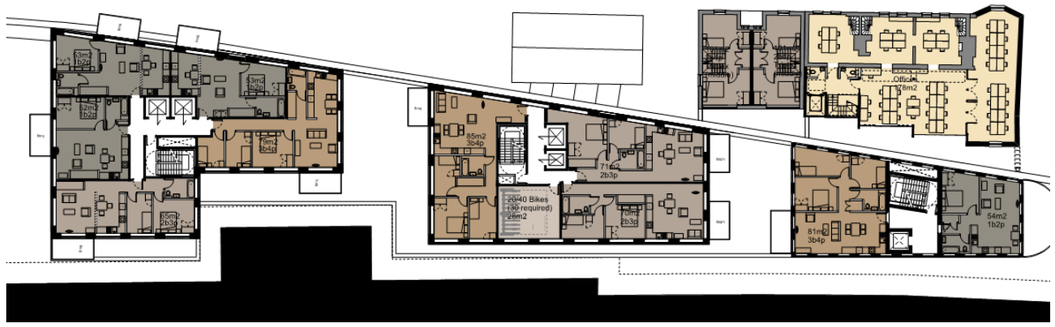

Figure 15: Plot 5 - Typical upper floor plan.

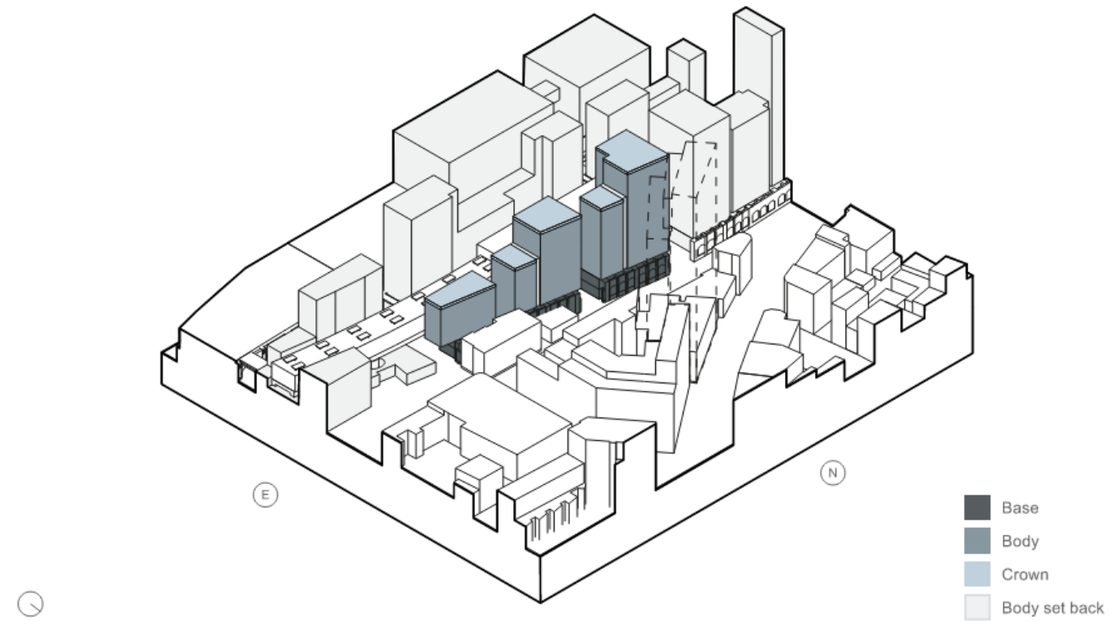

Figure 16: Plot 5 – Axonometric projection.

4.6 Plot 6

Table 11: Plot 6 summary fire safety strategy.

Provision	Comment
Use	Assembly and recreation
Number of storeys	Five (i.e. Ground and First to Fourth Floor)
Building height	Less than 18m
Risk Profile	B2 (occupants awake and unfamiliar and medium fire growth rate)
Evacuation strategy	Simultaneous evacuation strategy
Fire detection and alarm	Category L1 fire detection and alarm system
Maximum travel distances	23m in a single direction and 57.5m in multiple directions
Stairs	Two means of escape stairs
Final exits	Final exits should be at least as wide as the stairs discharging into them.
Smoke control	Smoke ventilation in the fire-fighting shaft (i.e. lobbies and stair)
Disabled egress	Provided on all non-level means of escape routes
Elements of structure	60 minutes fire resistance
Compartmentation	No compartment floors
Sprinkler protection	No sprinklers
External fire spread	See Appendix A
Fire Service access	Perimeter access and two protected stairs with fire mains
Vehicle access	Within 18m of the dry riser inlet; distance from a vehicle access route to the fire-fighting access into the building likely to be over 18m
Fire mains	One dry riser in each core
Further consideration	– Provision of compartment floors or sprinkler protection to reduce required protected area for external fire spread; – Fire-fighting access into the building and fire mains.

Figure 17: Plot 6 - Ground Floor plan.

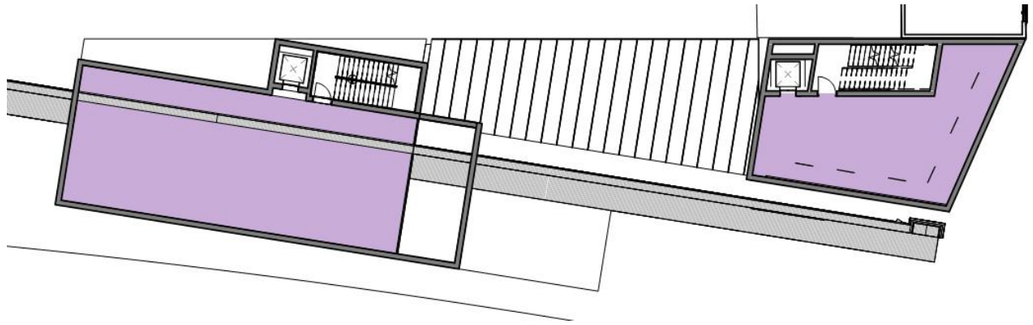

Figure 18: Plot 6 - Second Floor plan.

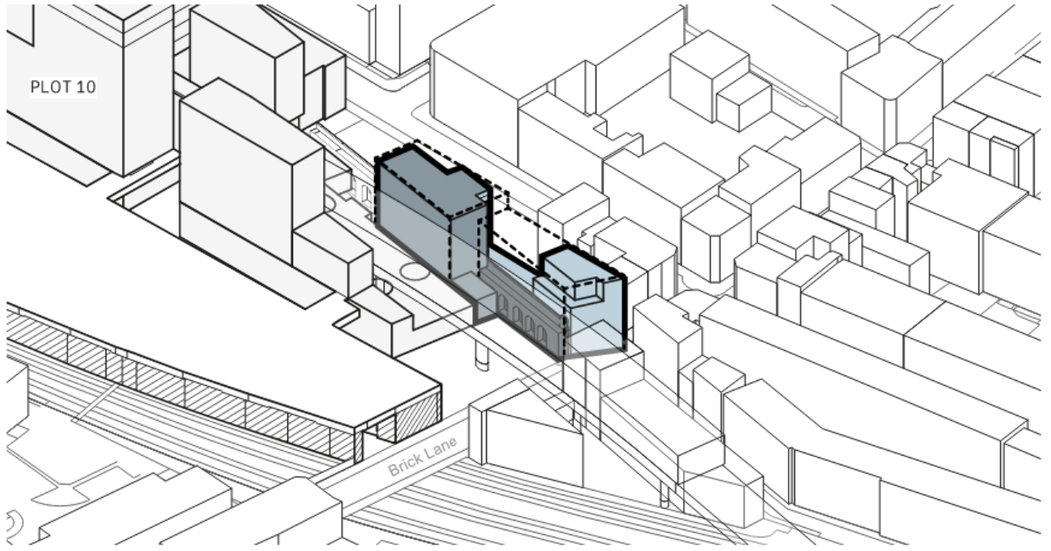

Figure 19: Plot 6 - Axonometric projection.

4.7 Plot 7

Table 12: Plot 7 summary fire safety strategy.

Provision	Comment
Use	Retail
Number of storeys	One (i.e. Ground Floor)
Building height	N/A
Risk Profile	– Sprinklered units: B2 (occupants awake and unfamiliar and medium fire growth rate); – Unsprinklered units: B3 (occupants awake and unfamiliar and rapid fire growth rate).
Evacuation strategy	– Independent simultaneous evacuation for all retail units; except – The retail units opening onto London Road will be separated into evacuation zones as the road will be covered and will be treated as a single-storey mall. All the retail units in an evacuation zone will evacuate simultaneously on activation of the fire detection and alarm system anywhere in the evacuation zone.
Fire detection and alarm	Category L1 fire detection and alarm system
Maximum travel distances	– Sprinklered units: 23m in a single direction and 57.5m in multiple directions; – Unsprinklered units: 16m in a single direction and 40m in multiple directions.
Stairs	N/A
Final exits	N/A
Smoke control	Smoke control required for London Road single-storey mall, see description below
Disabled egress	Provided on all non-level means of escape routes
Elements of structure	30 minutes fire resistance
Compartmentation	Compartmentation between all retail units
Sprinkler protection	Commercial sprinklers for the units opening onto London Road
External fire spread	See Appendix A
Fire Service access	See Section 3.6
Vehicle access	See Section 3.6
Fire mains	See Section 3.6
Further consideration	– Occupancy limitations for each retail unit; – Retail units to be sprinklered; – Compartmentation between units for future flexibility; – Smoke ventilation and evacuation zones for London Road; and – Fire-fighting access into London Road and wet riser outlets locations.

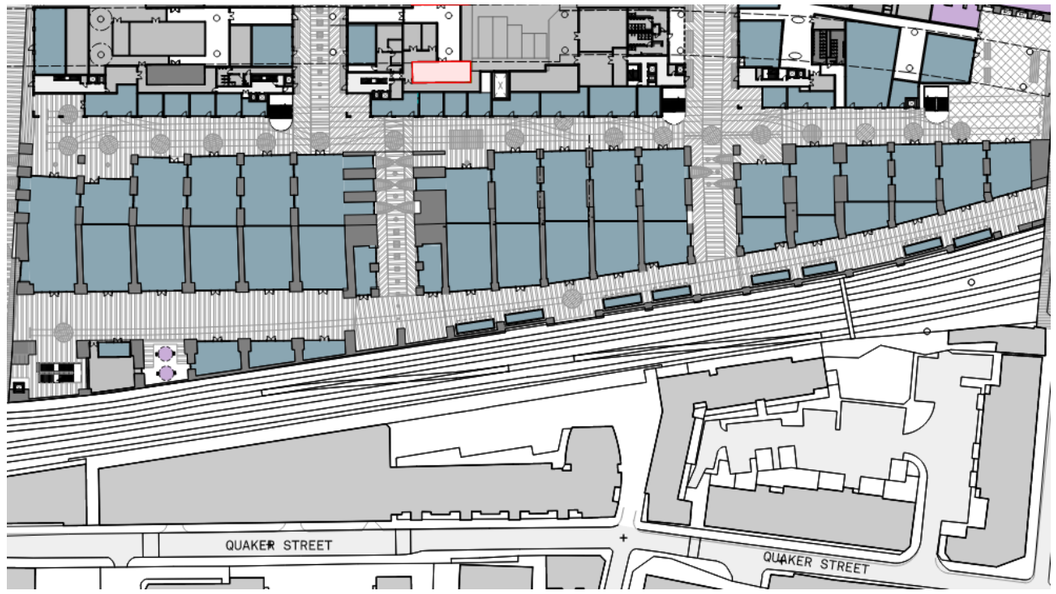

Figure 20: Plot 7 - Ground Floor plan.

4.7.1 London Road

London Road will be designed as a single-storey mall as it is proposed to be fully covered, in accordance with the guidance of BR 186 (1990) [14]. The smoke extract ventilation system should be either:

– Provide smoke extract ventilation to every retail unit; or

– Separate the covered mall into several evacuation zones and provide smoke extract ventilation to the mall in each different zone. This would require creating smoke reservoir for each evacuation zone and the smoke extract ventilation would be provided in each and could be either natural or mechanical.

The figure below shows an example of evacuation zones with smoke reservoirs in red with the distance between smoke reservoir screens within 60m. Detailed calculations would be required to determine the size of natural ventilation or the mechanical volume flow rate required for each reservoir.

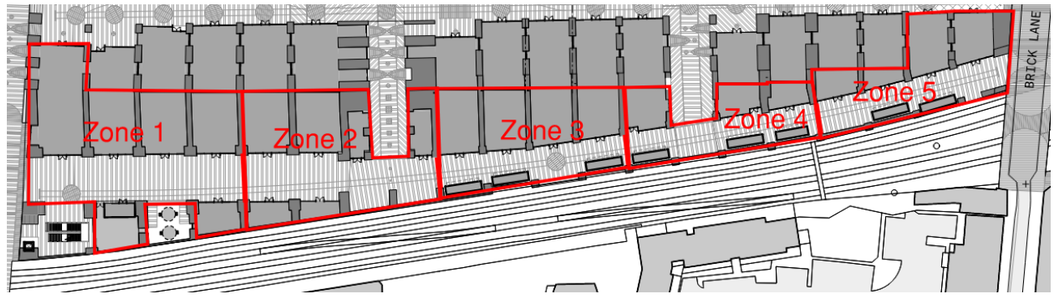

Figure 21: Example of evacuation zones for London Road retail units.

4.8 Plot 8

Table 13: Plot 8 summary fire safety strategy.

Provision	Comment
Use	Hotel and residential (Block A from Sixth Floor)
Number of storeys	– Block A: 27 (i.e. Ground, Mezzanine and First to 25th Floor); – Block B: Five (Ground and First to Fourth Floor); and – Block C: Five (Ground and First to Fourth Floor).
Building height	– Block A: 85.9m; – Block B: 16.9m; and – Block C: 16.9m
Risk Profile	– Hotel: Ciii1 (occupants likely to be asleep, short term occupancy and slow fire growth rate) – Residential: N/A
Evacuation strategy	– Hotel: Simultaneous evacuation strategy of all three blocks. – Residential: 'Stay-put' evacuation
Fire detection and alarm	– Hotel: Category L1 fire detection and alarm system incorporating a voice alarm system – Residential: Category LD1 fire detection and alarm system
Maximum travel distances	– 13m in a single direction and 27m when more than one direction is available (BS 9999) – Hotel bedrooms: 9m (single direction) (ADB); – Bedroom corridors: 9m (single direction) and 35m (multiple direction) (ADB); and – Elsewhere (i.e. plant rooms, restaurant, storage room): 18m (single direction) and 35m (multiple directions) (ADB) – Residential: Up to 20m in a single direction in the common corridors
Stairs	– Block A: One fire-fighting stair serving all storeys and one means of escape stair serving up to the Third Floor; – Block B: Two means of escape stairs; – Block C: Two means of escape stairs.
Final exits	Final exits should be at least as wide as the stairs discharging into them.
Smoke control	– Hotel: Smoke ventilation in the fire-fighting shaft (i.e. lobbies and stair); – Hotel: Smoke ventilation in the atria in each Block B and C; and – Residential: DRME system in the common corridor.
Disabled egress	– Hotel: Provided on all non-level means of escape routes; and – Residential: No disabled refuges.
Elements of structure	– Block A: 120 minutes fire resistance; – Block B: 60 minutes fire resistance; and – Block C: 60 minutes fire resistance.
Compartmentation	Compartment floors throughout with atria linking floors in Blocks B and C.
Sprinkler protection	– Hotel: Commercial sprinkler protection throughout all three blocks; and – Residential: Residential sprinkler system throughout.
External fire spread	See Appendix A
Fire Service access	See Section 3.6
Vehicle access	See Section 3.6
Fire mains	One wet riser main in each block, see Section 3.6
Further consideration	– Atria design in accordance with BS 9999 (i.e. fire separation and smoke ventilation); – Open-plan apartments; – Common corridors smoke ventilation; – Shared means of escape routes for hotel and residential; – Fire-fighting access; – Occupancy limits.

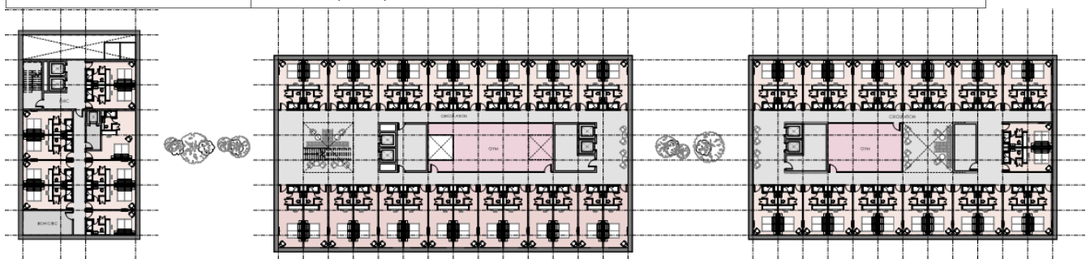

Figure 22: Plot 8 - Typical hotel bedroom upper floor plan.

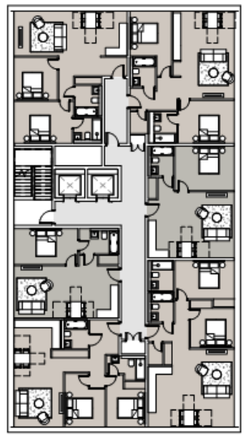

Figure 23: Plot 8 - Block A - Typical residential floor.

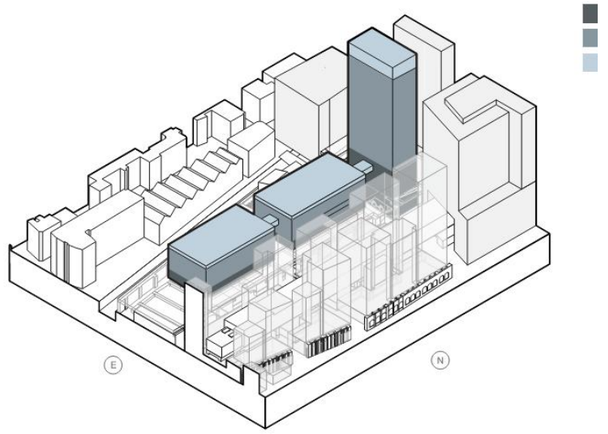

Figure 24: Plot 8 - Axonometric projection.

4.9 Plot 10

Table 14: Plot 10 summary fire safety strategy.

Provision	Comment
Use	Residential
Number of storeys	– Block A: Ten (i.e. Ground and First to Ninth Floor); – Block B: Eleven (i.e. Ground and First to Tenth Floor); and – Block C: Seven (i.e. Ground and First to Sixth Floor).
Building height	– Block A: 37.3m; – Block B: 40.5m; and – Block C: 27.7m.
Evacuation strategy	'Stay-put' evacuation
Fire detection and alarm	Category LD1 fire detection and alarm system
Maximum travel distances	Up to 15m in a single direction in the common corridors and 30m when more than one direction is available.
Apartments layout	Open-plan apartments and duplexes
Stairs	Five fire-fighting shafts
Final exits	Final exits should be at least as wide as the stairs discharging into them.
Smoke control	One mechanical smoke extract shaft in the common corridors provided with a single stair, two mechanical smoke extract shafts in the common corridors provided with two stairs and an AOV at the top of each stair subject to detailed design.
Disabled egress	No disabled refuges
Elements of structure	– Block A: 120 minutes fire resistance; – Block B: 120 minutes fire resistance; and – Block C: 60 minutes fire resistance.
Compartmentation	Compartment floors throughout
Sprinkler protection	Residential sprinkler system throughout
External fire spread	See Appendix A
Fire Service access	Five fire-fighting shafts serving all floors
Vehicle access	Within 18m of the fire-fighting building access location and dry riser inlets
Fire mains	One dry riser main in each fire-fighting shaft
Further consideration	– Open-plan apartments and dwellinghouses layouts; and – Common corridors smoke ventilation.

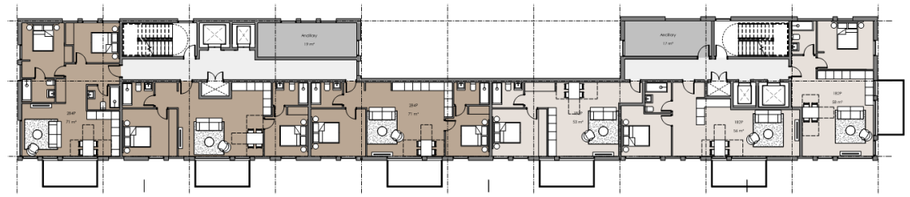

Figure 25: Plot 10 - Typical upper floor level (Block A).

Figure 26: Plot 10 - Typical upper floor level (Block B).

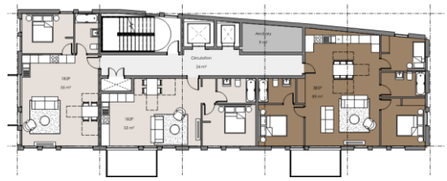

Figure 27: Plot 10 - Typical upper floor level (Block C).

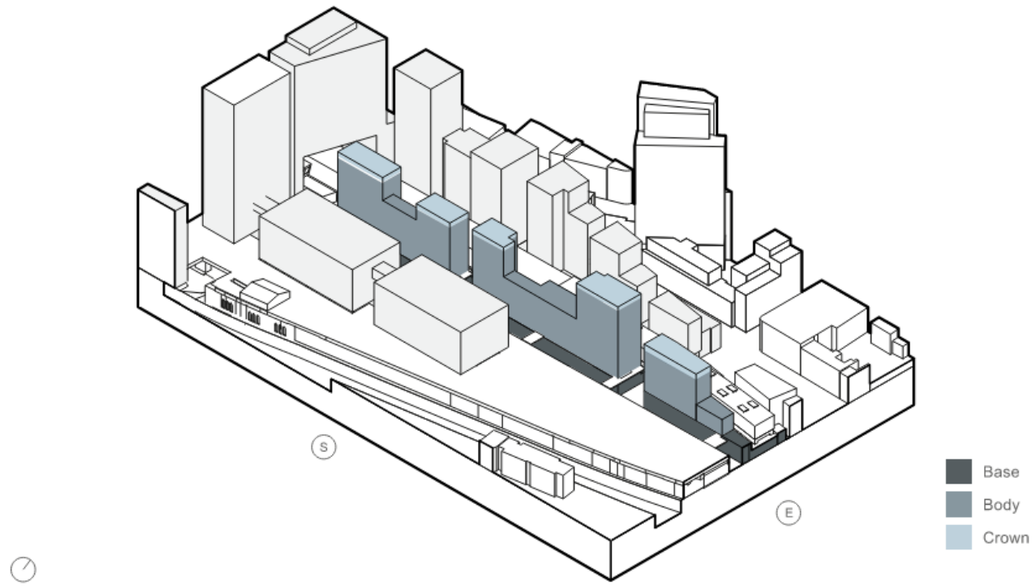

Figure 28: Plot 10 - Axonometric projection.

5. Conclusion

The scheme will generally comply with the guidance of Approved Document B, BS 9999:2017 or BS 9991:2015, however, some areas highlighted in this report require a fire engineering solution. The proposed fire engineered solutions within the report should be discussed and agreed with the Approving Authorities.

The report is an outline fire safety strategy report suitable for RIBA Stage 2 to illustrate how the scheme complies with the functional requirements of the Building Regulations 2010 and the need for further development in the next design stage in order to address all non-code compliant issues based on a fire engineered solution.

6. References

[1] *BS 9999 : Fire Safety in the Design, Management and use of Buildings - Code of Practice*. British Standards Institution, 2017.
[2] Department for Communities and Local Government (DCLG), *Approved Document B : Fire Safety - Volume 2: Buildings Other Than Dwellinghouses*, 2006th ed., vol. 2. NBS, 2006.
[3] British Standards Institution (BSI), *BS 9991 : Fire safety in the design, management and use of residential buildings - Code of practice*. BSI Global, 2015.
[4] Her Majesty's Stationery Office (HMSO), *The Building Regulations 2010, England and Wales*. The Stationary Office, 2010.
[5] Department of Health, *Health Technical Memorandum : Firecode - Guidance in support of functional provisions (Fire safety in the design of healthcare premises)*. 2015.
[6] British Standards Institution (BSI), *BS 5839 - 6 : Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises*. BSI Global, 2013.
[7] British Standards Institution (BSI), *BS 5839 - 1 : Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises*. BSI Global, 2017.
[8] British Standards Institution (BSI), *BS 5839 - 9 : Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems*. BSI Global, 2011.
[9] British Standards Institution (BSI), *BS 9251 : Sprinkler systems for residential and domestic occupancies. Code of practice*. BSI Global, 2014.
[10] British Standards Institution (BSI), *BS EN 12845 : Fixed firefighting system - Automatic sprinkler systems - Design, installation and maintenance*. BSI Global, 2015.
[11] Building Research Establishment (BRE), *BR 187 : External fire spread, building separation and boundary distances*, 1st ed. BRE, 1991.
[12] S. Colwell and T. Baker, *BR 135 : Fire performance of external thermal insulation for walls of multistorey buildings*, Third Edition. BRE, 2013.
[13] London Fire Brigade, *Fire Safety Guidance Note - GN29: Access for Fire Appliances*, Rev 7. London Fire & Emergency Planning Authority, 2007.
[14] H. P. Morgan and J. P. Gardner, *BR 186: Design principles for smoke ventilation in enclosed shopping centres*. Building Research Establishment (BRE), 1990.

Appendix A: External fire spread assessment.

Ground Floor

Table 15: Ground Floor external fire spread analysis.

Block	Façade	Building use	Sprinklers provided (Y/N)	Compartment width [m]	Compartment height [m]	Boundary distance [m]	Percentage of unprotected area [%]
Block 1	F1A	Retail	Y	36.1	6	11.7	100
	F1B	Office	Y	14.8	6	11.7	100
	F1C	Retail	Y	44.3	6	11.7	100
	F2	Retail	Y	56.4	6	34.3	100
	F3	Retail	Y	10.2	6	7.4	100
	F4	Retail	Y	25.1	6	28.0	100
	F5	Office	Y	29.5	6	42.1	100
	F6A	Retail	Y	36.5	6	10.6	100
	F6B	Office	Y	10.4	6	8.4	100
Block 2	F7A	Retail	Y	24.9	6	12.8	100
	F7B	Office	Y	18.1	6	8.4	100
	F7C	Retail	Y	13.2	6	8.4	100
	F7D	Hotel	Y	21.5	6	28.0	100
	F8	Hotel	Y	8.7	6	10.0	100
	F9	A&R	Y	11.2	6	7.1	100
	F11	Retail	Y	14.2	6	8.8	100
Block 3	F12	Retail	Y	25.4	6	5.1	56
	F13	Retail	Y	25.7	6	12.5	100
	F14	Retail	Y	11.6	6	7.2	100
	F15	Retail	Y	15.4	6	6.8	100
	F16	Office	Y	30.1	6	7.4	100
	F17	Retail	Y	20.6	8.2	7.3	100
	F18	Retail	Y	34.5	8.2	10.9	100
Block 4	F19A	Retail	Y	8.5	6	9.8	100
	F19B	Retail	Y	12.7	6	9.8	100
	F19C	Retail	Y	13.1	6	9.8	100
	F19D	Retail	Y	8.3	6	9.8	100
	F19E	Retail	Y	9.1	6	9.8	100
	F19F	Retail	Y	7.3	6	9.8	100
	F20	Retail	Y	27.6	6	7.9	95
	F21	Retail	Y	25	6	7.4	92
Block 5	F22A	Retail	N	10.6	6	9.8	100
	F22B	Residential	N	15.6	6	11.4	100
	F22C	Retail	N	14.7	6	6.6	56
	F22D	Retail	N	12.6	6	6.6	62
	F22E	Office	N	19.2	6	6.6	95
	F23	Office	N	19.5	6	6.3	88
	F24	Retail	N	25.3	6	7.9	51
Block 6 Note 2	F25	Assembly and Recreation	Y	60.2	18	0	0 Note 1
	F26		Y	15.9	18	5.3	51
	F27		Y	12.3	18	35.2	100
	F28		Y	12.0	18	4.4	55
	F29		Y	3.3	18	0	0 Note 1
Block 7	F31	Retail	N	25.7	6	27.0	100
	F32A Note 3	Retail	N	7.1	6	5.3	66
	F32B Note 3	Retail	N	10.2	6	5.3	49
	F32C Note 3	Retail	N	11.2	6	5.3	46
	F32D Note 3	Retail	N	5.8	6	5.3	80
	F33A Note 3	Retail	N	11.3	6	7.6	87
	F33B Note 3	Retail	N	3.6	6	7.6	100
	F35A Note 3	Retail	N	5.8	6	5.1	74
	F35B Note 3	Retail	N	11.4	6	5.1	43
	F35C Note 3	Retail	N	12.0	6	5.1	41
	F35D Note 3	Retail	N	11.7	6	5.1	42
	F35E Note 3	Retail	N	6.3	6	5.1	69
	F35F Note 3	Retail	N	5.6	6	5.1	77
	F35G Note 3	Retail	N	6.0	6	5.1	72
	F35H Note 3	Retail	N	11.5	6	5.1	42
	F36	Retail	N	9.2	6	7.2	95
	F37	Retail	N	9.3	6	7.2	94
	F38A Note 3	Retail	N	6.1	6	5.7	88

Block	Façade	Building use	Sprinklers provided (Y/N)	Compartment width [m]	Compartment height [m]	Boundary distance [m]	Percentage of unprotected area [%]
	F38B Note 3	Retail	N	6.2	6	5.7	87
	F38C Note 3	Retail	N	6.3	6	5.7	85
	F38D Note 3	Retail	N	6.6	6	5.7	82
	F38E Note 3	Retail	N	6.3	6	5.7	85
	F38F Note 3	Retail	N	12.4	6	5.7	48
	F39	Retail	N	16.4	6	7.0	100
	F40A Note 3	Retail	N	13.9	6	8.8	96
	F40B Note 3	Retail	N	13.7	6	8.8	98
	F40C Note 3	Retail	N	13.4	6	8.8	45
	F40D Note 3	Retail	N	13.6	6	5.7	45
	F40E Note 3	Retail	N	13.7	6	5.7	46
	F40F Note 3	Retail	N	12.2	6	5.7	49
	F41	Retail	N	38.0	6	10.0	55
	F42	Retail	N	38.0	6	6.2	33
	F43A Note 3	Retail	N	11.9	6	7.5	82
	F43B Note 3	Retail	N	12.0	6	5.9	53
	F43C Note 3	Retail	N	11.9	6	19.1	100
	F43D Note 3	Retail	N	11.8	6	6.1	57
	F43E Note 3	Retail	N	11.7	6	6.1	57
	F43F Note 3	Retail	N	13.1	6	6.1	52
	F44A Note 3	Retail	N	12.8	6	6.4	59
	F44B Note 3	Retail	N	12.3	6	5.1	41
	F44C Note 3	Retail	N	12.4	6	5.1	40
	F44D Note 3	Retail	N	12.6	6	5.1	40
	F44E Note 3	Retail	N	10.2	6	5.1	47
	F45	Retail	N	27.5	6	6.7	40
	F46A Note 3	Retail	N	12.3	6	3.6	22
	F46B Note 3	Retail	N	12.1	6	2.7	15
	F46C Note 3	Retail	N	12.3	6	8.2	94
	F46D Note 3	Retail	N	12.2	6	2.9	17
	F46E Note 3	Retail	N	9.8	6	2.8	16
	F47	Retail	N	38.0	6	6.2	33
	F48A Note 3	Retail	N	12.4	6	6.6	63
	F48B Note 3	Retail	N	12.4	6	5.3	42
	F48C Note 3	Retail	N	11.2	6	5.3	42
	F48D Note 3	Retail	N	11.9	6	5.3	44
	F48E Note 3	Retail	N	11.6	6	7.1	76
	F48F Note 3	Retail	N	12.1	6	15.0	100
	F50A Note 3	Retail	N	12.1	6	2.7	15
	F50B Note 3	Retail	N	12.8	6	2.8	16
	F50C Note 3	Retail	N	13.0	6	8.2	89
	F50D Note 3	Retail	N	12.4	6	2.8	16
	F50E Note 3	Retail	N	13.0	6	3.4	18
	F50F Note 3	Retail	N	11.9	6	8.2	96
	F51	Retail	N	35.5	6	6.7	37
	F52	Retail	N	9.9	6	5.9	62
	F54	Retail	N	10.2	6	0	0 Note 1
	F55A	Retail	N	9.8	6	6.1	67
	F55B	Retail	N	9.9	6	6.1	66
	F55C	Retail	N	9.9	6	6.1	66
	F56A	Retail	N	9.3	6	3.6	27
	F56B	Retail	N	9.3	6	2.7	16
	F56C	Retail	N	9.3	6	2.9	19
	F56D	Retail	N	9.3	6	2.8	17
	F57A	Retail	N	9.3	6	2.7	16
	F57B	Retail	N	9.3	6	2.8	17
	F58A	Retail	N	9.3	6	2.8	17
	F58B	Retail	N	9.3	6	3.4	24

Notes:
1. The façade is on the property boundary and adjacent to a neighbouring building. Therefore, it should be constructed as a compartment wall.
2. The assessment for Block 6 is based on the entire height of the building. If compartment floors are provided, each floor will be assessed as a separate compartment.
3. Each retail unit was assessed individually assumed to be separated from other retail units with compartment walls. If multiple retail units are to be joined together, a separate external fire spread assessment should be undertaken.

Podium Level

Table 16: Podium level external fire spread analysis.

Block	Façade	Building use	Sprinklers provided (Y/N)	Compartment width [m]	Compartment height [m]	Boundary distance [m]	Percentage of unprotected area [%]
Block 1	F1	Office	Y	11.5	3.5	25.4	100
	F2	Office	Y	143	3.5	10.5	100
	F3	Office	Y	9.9	3.5	7.4	100
	F4	Office	Y	135.7	3.5	0	0 Note 1
	F5	Office	Y	33.7	3.5	0	0 Note 1
	F6	Office	Y	21.5	3.5	36.0	100
	F7	Office	Y	33.5	3.5	8.7	100
Block 2	F8	Office	Y	43.3	6	8.7	100
	F9	Office	Y	46.3	6	37.6	100
	F10A	Retail	Y	21.1	6	13.1	100
	F10B	Office	Y	31.6	6	13.1	100
	F10C	Retail	Y	23.0	6	13.1	100
	F11	Retail	Y	37.7	6	9.9	100
	F12	Retail	Y	24.4	6	11.4	100
Block 3	F13	Retail	Y	27.1	3	12.1	100
	F14	Retail	Y	33.8	3	12.1	100
	F15A	Retail	Y	25.0	3	4.7	100
	F15B	Retail	Y	14.1	3	5.0	100
	F16	Retail	Y	33.0	3	6.7	100
	F18A	Retail	Y	48.9	3	13.1	100
	F18B	Office	Y	9.8	3	13.1	100
	F18C	Retail	Y	32.2	3	13.1	100
Block 4	F19	Residential	Y	14.8	3	15.0	100
	F20	Residential	Y	13.2	3	7.1	100
	F21	Residential	Y	13.2	3	2.7	100 Note 1
	F22	Residential	Y	13.2	3	7.4	100
Block 5	F23	Office	N	33.6	3	9.2	100
	F24	Office	N	12.4	3	5.3	100
	F25	Office	N	33.4	3	4.1	88 Note 1
	F26	Office	N	23.2	3	7.1	100
	F27	Office	N	38.3	3	6.7	100
	F28	Office	N	13.9	3	5.7	100
	F29	Office	N	11.5	3	7.0	100
	F30	Office	N	31.2	3	1.8	36 Note 2
	F33	Office	N	9.2	3	22.3	100
	F34	Office	N	59.9	3	4.0	80 Note 1
	F35	Office	N	13.5	3	5.3	100
Block 6 Note 4	F36	Assembly and Recreation	N	64.6	18	0	0 Note 3
	F37		N	14.4	18	6.6	41
	F38		N	60.9	18	0	0 Note 1
	F39		N	12.1	18	22.3	100
Block 8	F40	Retail	Y	25.1	3	24.3	100
	F41	Hotel	Y	44.4	3	7.8	100
	F42	Hotel	Y	25.1	3	8.4	100
	F43	Hotel	Y	44.4	3	22.5	100
	F44	Hotel	Y	26.6	3	8.4	100
	F45	Hotel	Y	51.8	3	9.2	100
	F46	Retail	Y	51.8	3	29.7	100
	F47	Hotel	Y	11.2	3	12.1	100
	F48	Hotel	Y	37.0	3	9.9	100
	F49	Hotel	Y	26.6	3	8.6	100
Block 10	F53	Residential	Y	6.3	3	14.3	100
	F54	Residential	Y	N/A	3	0	0 Note 1
	F55	Residential	Y	N/A	3	0	0 Note 1
	F56	Residential	Y	N/A	3	0	0 Note 1
	F57	Residential	Y	18.1	3	8.8	100
	F58	Residential	Y	13.4	3	7.7	100
	F59	Residential	Y	14.3	3	41.8	100
	F60	Residential	Y	12.2	3	8.0	100
	F62	Residential	Y	12.0	3	6.8	100
	F64	Residential	Y	12.0	3	6.6	100
Notes:							

Block	Façade	Building use	Sprinklers provided (Y/N)	Compartment width [m]	Compartment height [m]	Boundary distance [m]	Percentage of unprotected area [%]

1. The façade is facing the railway tunnel. It is assumed that the required fire resistance is provided by the existing tunnel wall. This is to be confirmed by the design team.
2. The building is existing, the current use of the building needs to be confirmed to determine if additional external fire spread measures are required.
3. The façade is on the property boundary and adjacent to a neighbouring building. Therefore, it should be constructed as a compartment wall.
4. The assessment for Block 6 is based on the entire height of the building. If compartment floors are provided, each floor will be assessed as a separate compartment.

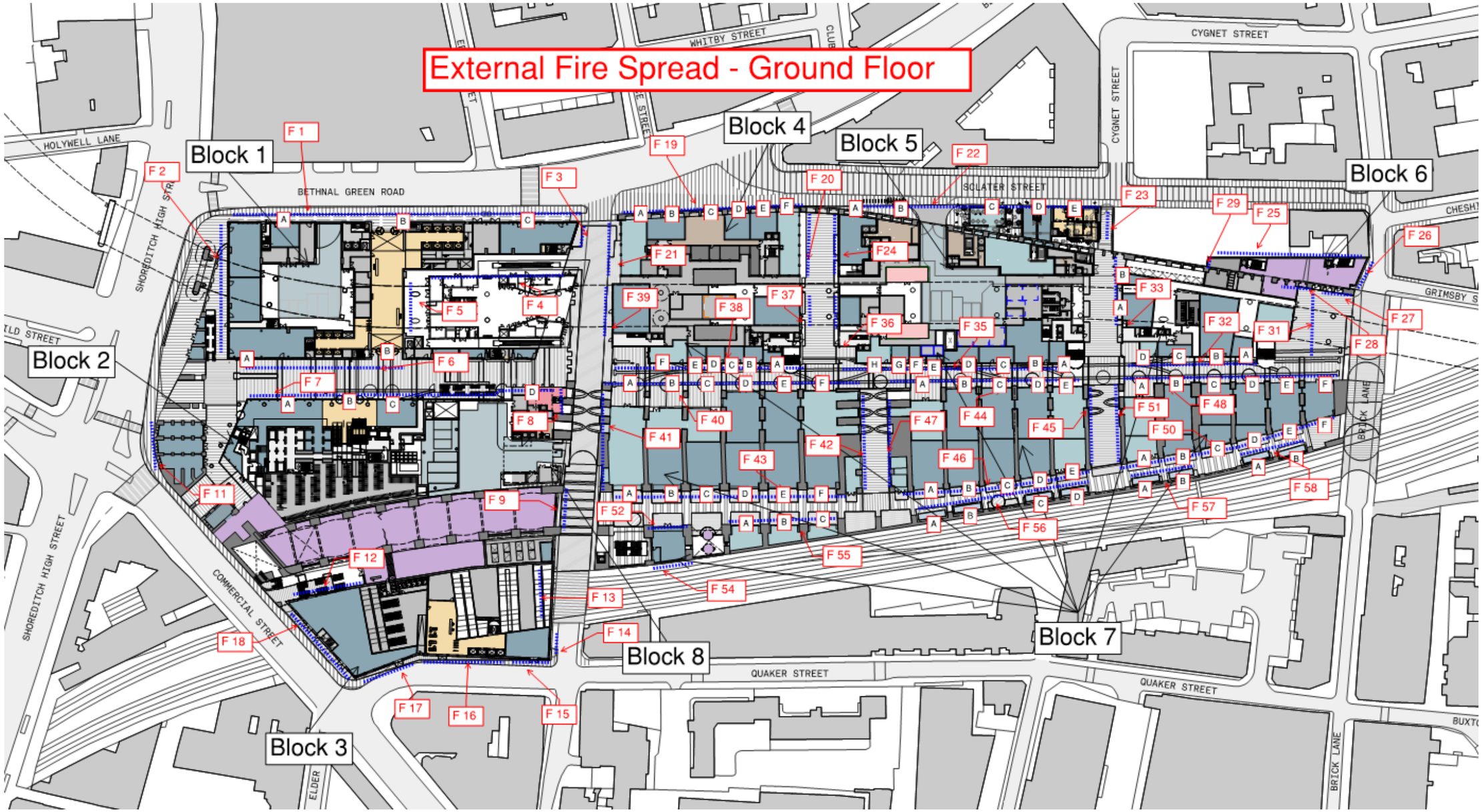

Figure 29: Ground Floor external fire spread façades numbering.

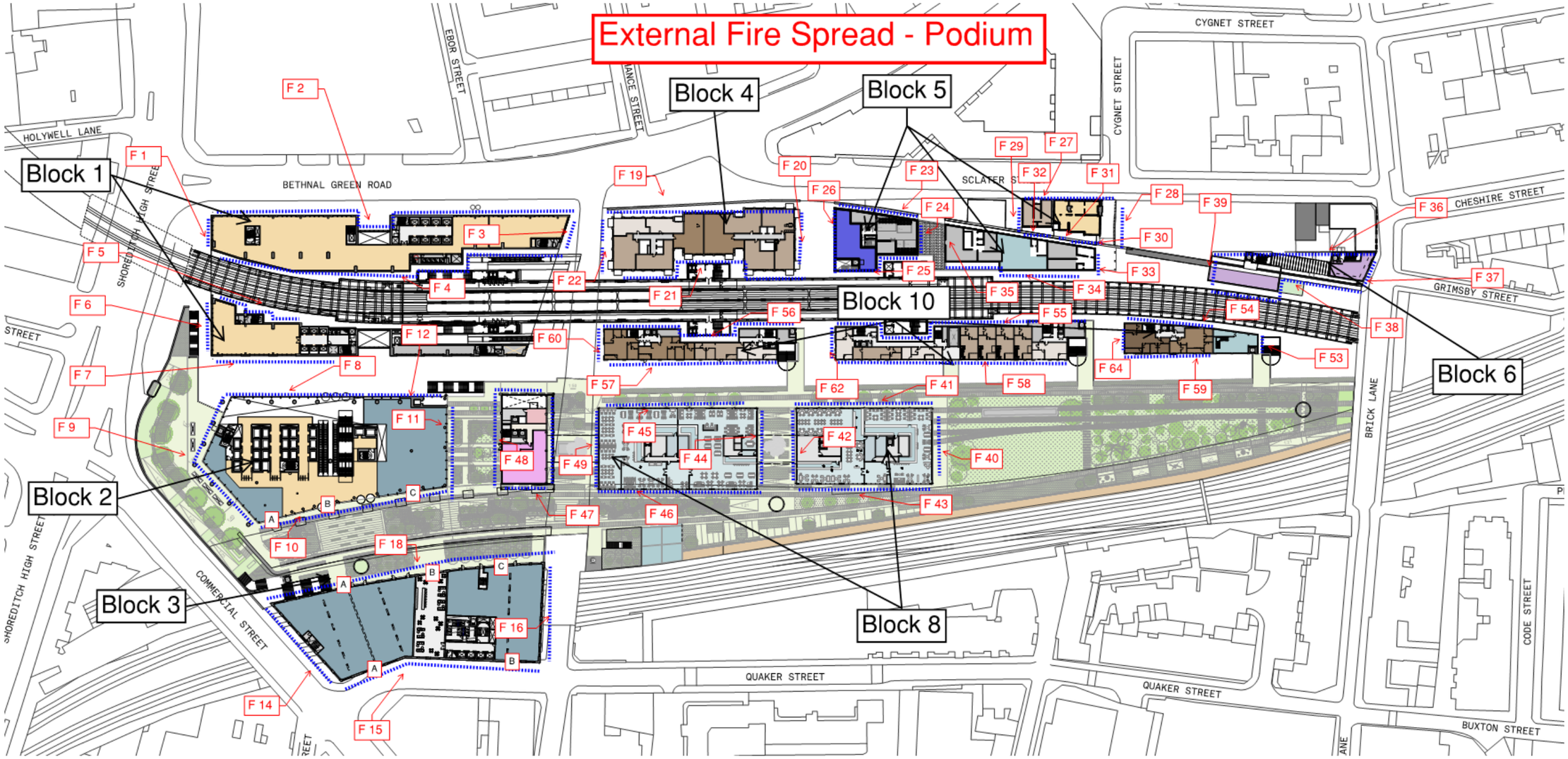

Figure 30: Podium level external fire spread façades numbering.

HOARE LEA

LOUIS CHAUMONT
FIRE ENGINEER

+44 20 3668 7296
louischaumont@hoarelea.com

HOARELEA.COM

Western Transit Shed
12-13 Stable Street
London
N1C 4AB
England