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FIRE SAFETY STRATEGY

RIBA Stage 4

Town Centre West, St Andrews Park, Uxbridge

St Modwen Homes Limited
IFC Report FSS/22338/03

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1. INTRODUCTION

International Fire Consultants Ltd (IFC) have been commissioned by St Modwen Homes Limited to produce a fire safety strategy for the development at Town Centre West, St Andrews Park in Uxbridge. The development consists of 3 blocks of flats and 27 townhouses consisting of a total of 294 units (as shown in Figure 1).

This report describes the fire strategy for the Block 3 building, and provides strategic information on means of escape, linings, internal and external fire spread, access and facilities for the Fire and Rescue Service (i.e. B1-B5 of the Building Regulations). The report has been produced at RIBA stage 4 of design.

This report is based on compliance with the fire safety legislation listed in Section 2 below. It does not include for compliance with any other criteria (e.g. additional client requirements, insurance etc.) unless specifically described in this report.

It is envisaged that this report will be used to inform and assist the person or persons responsible for this building in the assessment of risk with regard to fire. As such this report (or updated version of this report) should be considered along with the recommendations and findings of any fire risk assessment which should be carried out for the non-residential and residential common areas of the building once complete.

It is recommended that the building insurers be approached so that their requirements can be considered as part of the scheme.

The analysis may also, at the client's request, consider the issue of property protection and business continuity although these are outside of regulatory control and therefore not covered by this fire strategy report.

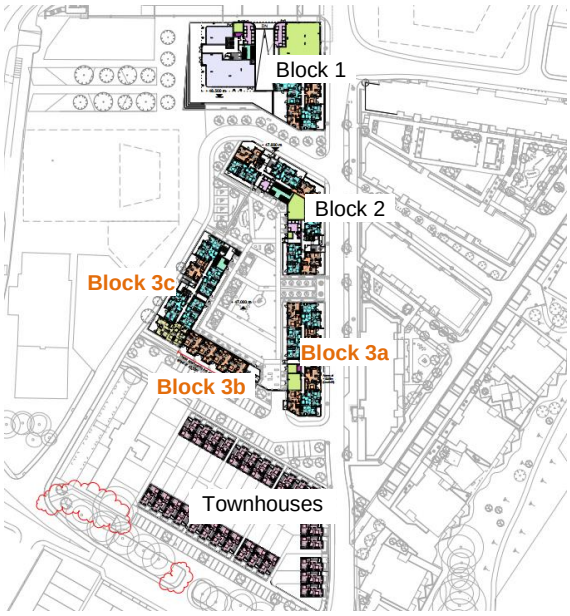

Figure 1- Overview of the St Modwen Uxbridge Development

This project consists of the following:

- Block 3 is 6-floor (G+5) residential building, split into Block 3a, 3b and 3c, as shown in Figure 1. The highest occupied floor (5th floor) of Block 3c is 15.7 m above ground. Block 3b goes onto 3rd floor only, and is connected with Block 3c via a balcony. For Block 3a, the fire service access is via the basement level, therefore, its highest occupied floor is 18.9 m above its fire service access floor.
- Automatic water fire suppression systems (AWFSS) / sprinkler protection will be installed throughout the building.

- Joint under croft lower ground carpark.

The report has been based on drawings produced by FBM Architects, as listed in Table 1. As the design of the project is an interactive process, these drawings may not include all recommendations within this report.

Table 1 - Drawings reviewed

DRAWING NUMBER	REVISION	RECEIVED DATE	DRAWING DESCRIPTION
R9110-FBM-21-00-DR-A-1630	P1	24/11/2021	Block 3A Level 00
R9110-FBM-21-01-DR-A-1631	P1	24/11/2021	Block 3A Level 01
R9110-FBM-21-02-DR-A-1632	P1	24/11/2021	Block 3A Level 02
R9110-FBM-21-03-DR-A-1633	P1	24/11/2021	Block 3A Level 03
R9110-FBM-21-04-DR-A-1634	P1	24/11/2021	Block 3A Level 04
R9110-FBM-21-05-DR-A-1635	P1	24/11/2021	Block 3A Level 05
R9110-FBM-21-RF-DR-A-1636	P1	24/11/2021	Block 3A Roof
R9110-FBM-21-BA-DR-A-1639	P1	24/11/2021	Block 3A Level -01
R9110-FBM-21-00-DR-A-1640	P1	24/11/2021	Block 3B&3C Level 00
R9110-FBM-21-01-DR-A-1641	P1	24/11/2021	Block 3B&3C Level 01
R9110-FBM-21-02-DR-A-1642	P1	24/11/2021	Block 3B&3C Level 02
R9110-FBM-21-03-DR-A-1643	P1	24/11/2021	Block 3B&3C Level 03
R9110-FBM-21-00-DR-A-1644	P1	24/11/2021	Block 3B&3C Level 04
R9110-FBM-21-00-DR-A-1645	P1	24/11/2021	Block 3B&3C Level 05
R9110-FBM-00-DR-A-1656	P1	24/11/2021	Site Fire Strategy Plan

2. LEGISLATION AND GUIDANCE DOCUMENTS

2.1 Building Regulations

The building will be subject to approval under the Building Regulations 2010 as modified by the Building (Amendment) Regulations 2018.

That will require the design and construction to comply with the functional Requirements as shown below.

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

In order to demonstrate compliance with functional Requirements B1 to B5, it is conventional to base the design on standard fire safety design documents. Variations to the guidance given in those documents is permitted, as long as it can be demonstrated to have still met the Functional Requirements shown above.

In addition, under changes introduced in the Building (Amendment) Regulations 2018, for buildings classified as "relevant buildings", Regulation 7(2) (and other modified Regulations) applies additional criteria on the combustibility of materials within the external walls.

The definition of a "relevant building" is a building with a storey that is 18m or more above ground level (excluding roof-top plant areas and storeys consisting solely of plant rooms) and contains one or more dwellings, an institution or a room for residential purposes (excluding rooms in hostels, hotels or boarding houses).

The Block 3a, b and c building within this development meet the criteria above, based on the understanding that the 18m criteria originates from the lowest level where the fire service enter the building. NOTE, Block 3c and 3b are less than 18m, however due to the connection of the basement with all three blocks, we deem that all three blocks are relevant buildings.

The additional criteria for "relevant buildings" under Regulation 7(2) are prescriptive and so need to be complied with. Variations are not allowed.

This report has based the design of the building (residential part) on BS9991:2015[1]. Where units other than residential exist (commercial, industrial, etc), BS9999:2017 2[2] is used as a performance benchmark. Both guidance documents can be used to demonstrate compliance with the functional requirements of the Building Regulations 2010. These documents have not yet been modified to include the additional requirements of the Building (Amendment) Regulations 2018 and so the changes shown in the Amendments to the Approved Documents (November 2018)[3] as well as the 2020 amendments to Approved Document B[4] have also been incorporated into this fire strategy.

In situations where the building design varies from the guidance in these documents, that has been highlighted and justified in this report.

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1 *BS 9991:2015, Fire safety in the design, management and use of residential buildings – Code of practice.*
2 *BS 9999:2017, Fire safety in the design, management and use of buildings – Code of practice.*
3 The Building Regulations 2010: Amendments to the Approved Documents, November 2018, HM Government
4 Approved Document B Volume 1: Dwellings. 2019 edition incorporating 2020 amendments – for use in England

This report describes the main fire safety issues relating to the building. In any areas that are not mentioned in this report, the design should comply with the guidance of the relevant guidance documents mentioned above.

2.2 The Housing Act 2004

The Housing Act 2004 is the primary piece of legislation governing the health and safety of residents of all dwellings once occupied. It introduced the Housing Health and Safety Rating Scheme. Fire Safety is one of the aspects against which buildings are assessed under this scheme.

The Act itself does not contain detailed standards which must be met. Instead, detailed advice on fire safety standards is given in the guidance document Fire safety in purpose-built blocks of flats published by the Local Government Association (referred to in the following as the LGA guide)[5].

2.3 Regulatory Reform (Fire Safety) Order 2005

Once completed, the building will be subject to the Fire Safety Order. That will require the Responsible Person for the building to ensure that a fire risk assessment has been carried out by a competent person.

This report (or subsequent updated versions of this report) could be used to assist that fire risk assessment.

2.4 Construction (Design and Management) Regulations 2015

The CDM Regulations require that the design of the building should ensure that it can be constructed and managed safely.

This report deals with the fire safety design of the building when completed and does not address fire safety during construction.

There are a number of standard guidance documents available giving guidance on managing fire safety within construction sites (such as HSG168 produced by the HSE) and so the relevant main contractor will need to ensure that the construction site complies with that guidance.

[5] Fire safety in purpose-built blocks of flats, Local Government Group, London 2011

3. DESIGN APPROACH

3.1 General

This report has based the design of the building on BS9991:2015 and BS9999:2017. Both guidance documents are mainly concerned with life safety and not property protection, although the fire protection provisions provided for the building should offer some degree of property protection.

Fire engineering solutions will be used where necessary to ensure that the key fire safety objectives for the design are achieved.

This report describes the main fire safety issues relating to the buildings. In any areas that are not mentioned in this report, the design should comply with the guidance of the relevant guidance documents mentioned above.

3.2 Evacuation Approach

In purpose-built apartment blocks, special provisions are made to ensure that a fire is contained within the apartment of origin and that common escape routes and stairways remain relatively free from smoke and heat in the event of a fire within a dwelling. For this reason, a 'defend in place' evacuation strategy is adopted. In this case, when a fire occurs in an apartment, the occupants of that dwelling evacuate, but occupants of all other dwellings can safely remain in their apartments unless directly affected by heat and smoke or directed to leave by the fire and rescue service.

For the ancillary and non-residential areas, a simultaneous evacuation strategy will be utilised, whereby the entire occupancy of the fire-affected compartment/zone is evacuated immediately upon receiving an evacuation signal or instruction.

3.3 Occupant Characteristics and Risk Profiles

BS 9999 (which applies to the non-residential areas) recommends that building occupants are categorised in order to specify appropriate fire precautions. This is not a requirement for the residential areas under BS 9991.

Building occupants are expected to be predominantly residents from the apartments. Apartment residents will be familiar with the building but not always awake.

Maintenance personnel would be present as a function of their employment. Such persons should be trained and require permits to access the building. Not all maintenance personnel may be familiar with the layout of the building but an induction on evacuation procedures should be provided by management.

It is understood that the car park is intended to be used by the residents and servicing & FM staff only.

In accordance with Section 6 of BS 9999, a risk profile has been applied to the residential ancillary and non-residential areas to determine an appropriate means of escape and design features of the space for fire and life safety. The risk profile reflects the occupancy characteristics and fire growth rate for a building or building part. This is further expressed as a value combining these two elements.

Table 4 of BS 9999 provides a method of assessment for determining an appropriate risk profile. The relevant risk profiles that influence this assessment for the different parts of the building are summarised in Table 2. The values take into account that the building will be fully sprinkler protected (as discussed in Section 4.2), permitting the fire growth rate to be reduced by one level.

Table 2 - Allocated Risk Profiles

Occupancy Type	Occupancy Characteristic	Fire Growth Rate	Risk Profile
Cycle Storage	A	1	A1
Water Tank Rooms			
Residential Lounges/Foyer			
Refuse Rooms	A	2	A2
Plant Rooms			
Car Park			
Substations*	A	3	A3
Occupancy Characteristic *A: occupants who are awake and familiar* *B: occupants who are awake and unfamiliar*		*Fire Growth Rate* *1: slow fire growth rate* *2: medium fire growth rate* *3: fast fire growth rate*	

* Electrical substations will not be sprinkler protected

4. FIRE SAFETY SYSTEMS

The main fire safety systems that are to be provided within the building are summarised below. Sections 5 to 9 of this report then demonstrate how these systems achieve compliance with the relevant requirements of the Building Regulations.

4.1 Fire Detection and Alarm System(s)

4.1.1 General

A summary of the fire alarm and detection system(s) are shown in Table 3, which also indicates the minimum category permissible under general guidance.

Table 3 – Fire Detection and Fire Alarm System

Accommodation	Minimum Acceptable System
Apartments	Grade D Category LD1 in accordance with BS 5839-6[6]
Common area where automatic ventilation is required	Category L5 in accordance with BS 5839-1[7]
Ancillary space / Car Park, Substation, etc.	Category L2 in accordance with BS 5839-1[7]

Consideration should be given when selecting the appropriate type of detector for any room with respect to the speed of detection required, the likely type of fire and the need to avoid false alarms. The minimum spacing recommendations from the relevant standard should also be followed.

Where required, detectors within rooms should be sited such that no point is further than 7.5m from the nearest smoke detector or, in rooms protected by heat detectors, no further than 5.3m from the nearest heat detector.

Smoke and heat alarms should be tamper proof and should comply with BS EN 14604[8] and BS 5446-2[9] respectively.

To reflect the 'defend in place' strategy adopted in residential buildings it is not proposed that any flat fire alarms will be linked to any other flat alarm system or to other areas. It is expected that the Landlord's alarm system will be monitored by the site concierge.

4.1.2 Residential Area

Each apartment will be fitted with a mains-powered automatic fire detection and alarm (AFD) system to a Grade D Category LD1 standard in accordance with BS 5839-6[6].

Smoke and heat alarms within apartments should be of the long-life type, and be tamper-proof if the apartments are going to be rented (Grade D1) or provided with user-replaceable batteries if the apartments are going to be occupied by the owner (Grade D2).

A Grade D system involves having one or more mains-powered smoke alarms. The system may also incorporate one or more mains-powered heat alarms for areas deemed appropriate such as kitchens. It

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6 BS 5839-6:2019 Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises

7 BS 5839-1:2017, Fire detection and fire alarm systems for buildings. Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises.

8 BS EN 14604:2005 Smoke alarm devices

9 BS 5446-2:2003 Fire detection and fire alarm devices for dwellings. Specification for heat alarms

is recommended for rented or housing association units that the AFD system should have a tamper-proof standby supply (Grade D1). Private apartments may have a standard replaceable battery (Grade D2). Where more than one smoke and/or heat alarm is installed, those alarms should be interlinked.

In a Category LD1 system, smoke detectors will be installed throughout the premises, incorporating detectors in all circulation spaces and all rooms in which a fire might start, apart from the kitchen that will have a linked heat detector. This excludes toilets and bathrooms but includes the utility cupboard.

There is no need for interconnection between smoke alarm systems in different apartments.

4.1.3 Common Residential Corridors

It is not current practice to provide fire alarms in the communal areas or ancillary accommodation (e.g. plant rooms) of typical residential buildings when a 'defend in place' strategy has been adopted. No fire detection equipment is needed where automatic ventilation is not required. In buildings where automatic ventilation is required, it is recommended that a Category L5 AFD system (but without sounders) be provided within the common corridors. These should be installed in accordance with the relevant parts of BS 5839-1[7] - i.e. be installed as part of the ventilation system not as a fire alarm system. In summary, the following should be achieved:

1. Although the proposed Category L5 AFD system will not technically comply in full to BS 5839-1 (as it is installed as part of the ventilation system not as a fire alarm system), it is expected that the design, equipment and standard of installation will follow the relevant recommendations within BS 5839-1.

2. Smoke detectors should be of the optical type.

3. Activation of a smoke detector within a common corridor/lobby should immediately activate the automatic opening mechanisms for smoke vents relevant to that area as well as any fans as and where appropriate. See section 4.4.2.

4. Smoke detectors installed within protected common residential corridors/lobbies need not sound an alarm, however immediate notification should be provided at the smoke control or fire alarm control panel.

5. An automatically opening vent (AOV) is to be provided at the head of the residential escape stair and actuated upon activation of a smoke detector in the common residential corridor/lobby accessed off that stair. Actuation should occur at the same time as any corridor vents.

6. It is recommended that override switches for the smoke ventilation system should be located within the stair on each level. This should be discussed and agreed with the local FRS prior to installation.

7. The control panel should confirm the floor of smoke detector and smoke vent activation, confirm smoke detector or system faults and give a local (panel only) audible and visual indication of a fire alarm. It should also be possible for the FRS to override the system manually should they require.

8. No fire alarm manual call points should be installed on the residential floors of the building.

4.1.4 Ancillary and Non-Residential Areas

Table 7 of BS 9999 recommends that a manual fire alarm system, in accordance with BS 5839-1, would typically satisfy Building Regulations for the ancillary and non-residential areas within the building (with the exception of spaces with a designated A3 risk profile).

Due to the connection of the spaces to residential areas and as an enhanced level of robustness IFC recommend that all residential ancillary accommodation and non-residential areas be provided with a fire alarm system designed to BS 5839-1 with manual call points and automatic smoke detection. It is recommended that this be provided to an L2 standard. Sounders are only required for the roof and basement levels.

Manual call points (MCPs) should be located on escape routes and, in particular at all storey exits and all exits to open air that lead to an ultimate place of safety (whether or not the exits are specifically designated as fire exits). In addition, MCPs should be positioned such that no one need travel more than 45 m to reach the nearest one.

Where possible it is recommended that all fire alarm systems be linked to the landlord system so they can be monitored by the site concierge.

NOTE: to avoid false alarms, it is recommended that suitable fire detection be provided in areas where false alarms are a risk, such as the car park. A specialist contractor should be consulted, but this may take the form of heat or some other detector type, rather than smoke that might be susceptible to dust, etc.

4.1.5 Evacuation Alert System for the Fire and Rescue Service

In high-rise residential buildings there is a potential need for a system to be provided that will enable the fire and rescue service to evacuate apartments without the need to knock on doors to alert the occupants. BS 8629[10] outlines a stand-alone system for achieving this.

Such a system will include a control panel at ground floor and a single sounder in the entrance of every apartment. More sounders may be needed depending on the apartment layout and size if sound pressure levels are not achieved (typically not less than 85 dB(A) at the doorway of each bedroom with the door open and not less than 60 dB(A) in all other habitable rooms).

This standard is not currently enforced in England but may start to become recommended in the near future for high rise residential buildings, it therefore may be prudent to include such a provision in the design now rather than at a later stage. The Fire service should be consulted on this matter.

4.2 Sprinkler System

As a result of the height and use, the building is required to be provided with an automatic fire water suppression system under the Approved Document B 2020 amendments[4].

4.2.1 Apartments

The 2021 issue of BS 9251:2021[11] guidance requires that residential building over 11m will need to have a Category 4 sprinkler system for residential corridors. 60 minutes water supply is required for the Cat 4 system – 9 m^3 water tank and 2 pump sets (can be splitted with separate power supply) are required.

Sprinklers in apartments will cover all parts of the dwelling, including:

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10 BS 8629:2019 Code of practice for the design, installation, commissioning and maintenance of evacuation alert systems for use by fire and rescue services in buildings containing flats

11 BS 9251:2021, Fire sprinkler systems for domestic and residential occupancies. Code of practice.

- corridors;
- bathrooms with a floor area of 5 m² or more;
- cupboards and pantries with a floor area of 2 m² or more where the least dimension exceeds 1 m; and
- utility cupboards regardless of room dimensions.

NOTE: IFC recommend a sprinkler is included in any utility cupboard that has space for a washing machine or dryer, regardless of dimensions.

Sprinklers need not be provided in other common areas such as stairs and landings when these areas are fire sterile. A full list of areas where sprinkler protection can be excluded can be found in BS 9251.

In multi-storey blocks of flats, a sprinkler flow switch should be provided for every dwelling to signal the actuation of the sprinkler system within the dwelling. Alternatively, sprinkler flow switches may be configured to serve a sprinkler alarm zone, rather than each individual dwelling, provided the following recommendations are met:

- The sprinkler alarm zone should cover no more than a single floor; and
- Sprinkler flow switches should be connected to suitable control and indicating equipment so that a signal is sent to management and any emergency action plan initiated.

4.2.2 Ancillary and Non-Residential Areas

Non-residential sections of the development (retail units, plant rooms, etc.) and the car park will be provided with a commercial sprinkler system designed and installed in accordance with BS EN 12845[12]. It is recommended that the sprinkler system should be a Category 3 system as a minimum - a twink tank or a tank split into two parts would be needed, with a minimum total size of 135 m³. Two pump sets would be required for life safety purpose.

IFC recommend that the commercial sprinkler system be extended to residential ancillary accommodation located on the ground and first floors.

Based on the latest issue of BS 9251, it is also possible to extend the residential sprinkler system into certain ancillary spaces, providing that the ancillary accommodation is less than 100 m² , which contains fire load no worse than that of an Ordinary Hazard classification. IFC recommends that this is only to be considered where no commercial sprinkler system is in place.

Electrical substations will not be sprinkler protected.

4.3 Firefighting Shafts

Block 3c has occupied floors more than 18 m above fire service access level, which will need to be provided with a firefighting shaft (i.e. firefighting stairs and firefighting lifts). This is discussed in more detail in Section 9.

[12] BS EN 12845:2015+A1:2019, Fixed firefighting systems – Automatic sprinkler systems – Design, installation and maintenance.

4.4 Smoke Ventilation System

4.4.1 Residential Apartments

No smoke venting systems are proposed internally within any of the apartments or retail units on the development.

4.4.2 Residential Corridors

The common corridors in each block will be provided with natural smoke shaft with a minimum free area of 1.5 m^2 (or mechanical system with equivalent performance) discharging at roof level. A damper or automatically opening vent should be provided on each floor between the corridor and vent shaft. On detection of smoke in a corridor, the vent on the fire-affected floor will open, all other vents into the shaft will remain closed.

Override switches for the corridor ventilation system should be provided in locations to be agreed with the fire service. This would typically include a control panel in the entrance lobby of the block, adjacent to (or combination with) the main fire alarm control panel (FACP), or override switches within the stair on each level.

The override system should not allow the smoke ventilation system to be activated on more than one level at the same time (otherwise it may allow smoke to spread between levels via the smoke vent shaft).

As recommended by the Smoke Control Association, the installation of the smoke ventilation system should be carried out by a contractor that is covered by an appropriate UKAS accredited third party certification scheme, such as the IFC SDI 19 scheme that is provided by IFC Certification.

4.4.3 Ancillary Accommodation

All ancillary stores, plant rooms and bin stores etc. that are accessed from the communal residential escape routes will need to be separated via a protected lobby provided with minimum 0.4 m^2 permanent ventilation or equivalent mechanical extract system.

4.4.4 Staircases

A minimum free area of 1m^2 should be provided from the top storey of the stair.

Block 3a to 3c each has a staircase connected to the covered car park located at basement level. Where a common stair forms part of the only means of escape from an apartment it should not also serve a covered car park. In addition to the requirement that the staircase shall be separated at ground floor level and the fact that the car parking being provided with a commercial sprinkler system, each stair will be separated from the car park via a protected and ventilated lobby. A 1m^2 AOV or permanent opening to the lobby of the staircase at the basement level shall be provided via a fire-rated duct. This will be further illustrated in Section 9.4.

4.4.5 Car Park

The car park will be ventilated utilising openings in the façade for replacement air with smoke exhaust facilitated by impulse fans towards mechanical extract points. The mechanical extract system will need to be capable of:

- providing 10 air changes per hour;
- handling gas temperature of 300°C for a continuous period of not less than 60 minutes; and
- operating automatically on activation of the sprinkler system or fire alarm system.

4.5 Fire Main

Fire mains will be provided within the firefighting stair. A dry fire main will be required for each firefighting stair. The dry riser is required to be extended into the basement lift lobby for both stairs.

For blocks less than 18m from top occupied floor (Block 3b & 3c), a fire main is not required, but the path for hose to be laid shall not exceed 75m from the fire and rescue pumping appliance to the furthest point on the topmost floor. Otherwise, a dry fire main is still required. This is discussed in more detail in Section 9.

4.6 Emergency Lighting & Exit Signage

Emergency lighting on escape routes and exit signage should be provided throughout the block buildings (as recommended in BS 9991 and BS 9999) to the extent in accordance with BS ISO 3864-1[13], BS 5499-4[14] and BS 5266-1[15].

Table 4 - Emergency Lighting

Use of the building	Areas Requiring Emergency Lighting
Residential	• All common escape routes • Common stairs • Electricity and generator rooms • Switch room/battery room for emergency lighting system • Emergency control rooms

If the mains electricity power supply fails, escape lighting should illuminate the escape routes from the building, including externally where necessary.

Escape stair lighting should be on a separate circuit from the electricity supply to any other part of the escape route.

IFC recommend that the final signage provision is agreed with the Regulatory Authorities prior to occupation of the complete building through the development of a clear design specification and design drawings.

4.7 Secondary Power Supplies

Each life safety system provided within the building will have an independent power supply which would operate in the event of a failure of the main supply. Secondary power supplies should be provided to all life safety systems such as, but not limited to:

- Automatic fire alarm and detection systems;
- Automatic fire suppression systems;
- Automatic smoke ventilation systems;

[13] BS ISO 3864-1:2011, Graphical symbols. Safety colours and safety signs. Design principles for safety signs and safety markings.
[14] BS 5499-4:2013, Safety signs. Code of practice for escape route signing.
[15] BS 5266-1:2016, Emergency lighting – Part 1: Code of practice for the emergency lighting of premises.

- Firefighting lifts;
- Illuminated emergency signage; and
- Emergency lighting.

In some cases, this may be via internal battery systems (e.g. the fire alarm system).

The secondary power supply should be provided in accordance with the recommendations from Section 15 of BS 9991, and should comply with BS 8519:2020[16].

NOTE:

- the openable vent will also need secondary power if it is “motor-open” for any reason
- the current sprinkler guidance in BS EN 12845 only acknowledges a secondary supply from a diesel generator or provision of a secondary diesel pump.

4.8 Fire Safety Management

A Fire Risk Assessment will be required for the common areas of the building, according to The Regulatory Reform (Fire Safety) Order (FSO) 2005.

It will be the responsibility of the Landlord to ensure that adequate information will always be available on fire safety procedures for any operatives working in the common areas.

[16] BS 8519:2010, Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting and other critical applications. Code of practice.

5. B1 – MEANS OF WARNING AND ESCAPE

5.1 Evacuation Strategy

As discussed in Section 3.2, apartments will adopt a 'defend in place' evacuation strategy and ancillary/non-residential areas of the site will adopt a simultaneous evacuation strategy.

5.2 Means of Warning

The fire detection and alarm system recommendations are covered in Section 4.1.

5.3 General

Apartments need to be planned so that it is reasonably likely that the occupants can safely and quickly escape in the event of a fire within the apartment. UK design guidance recognises that it is not common practice to provide more than one entrance/exit from an apartment constructed on a single level.

For means of escape within the building, the following provisions should be adopted:

- The horizontal escape routes are required to be kept free from obstacles, such as steps or raised thresholds, which delay or impede travel in an emergency evacuation or escape. Where such obstacles occur, a suitable ramp should be provided.
- A clear height of 2m will be maintained throughout the escape route. Doorways are exempt from this minimum height.
- Corridors at all levels should not be less than 1.2m in clear width, where the corridor is not accessible to wheelchair users, the width may be reduced to 1m. Note that the requirements of Part M should also be satisfied.
- Apartment cooking facilities should be located in such a way that they do not prevent exit if they are involved in a fire. IFC recommend that a 1.8m horizontal distance between the cooking appliance and the escape route be achieved where possible. This 1.8m distance draws similarities to recommendations related to final exits and the need for them to be sited such that they are clear of immediate risk from radiated heat. An escape route is assumed to be 0.5m in width. IFC's recommendation is based on further analysis as detailed in Appendix B.
- Any air handling systems installed within the apartments should be designed and installed so as not to compromise evacuation, or to spread fire and smoke out of the apartment of fire origin.
- Where practicable, fire doors should be positioned where they are not likely to be wedged or propped open. Where this is not practicable, fire doors should be provided with hold-open devices on an automatic release mechanism in accordance with BS 7273-4[17].
- Final exit doors open into a place of ultimate safety; such exits should be designed to avoid or minimize any risk of obstruction to rapid dispersal of persons from the vicinity of the building.
- All doors on escape routes should be hung to open not less than 90°, and with a swing that is clear of any change of floor level.
- All doors on escape routes, including pass doors (whether or not the doors are fire doors), should not be fitted with lock or latch fastenings unless a simple, single action unlocking device is provided on the escape side (such as a thumb turn or push bar).

[17] BS 7273-4:2015, Code of practice for the operation of fire protection measures – Part4: Actuation of release mechanisms for doors

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 fire detection system, or
- Failure of the power supply, or
- Operation of a hand-operated green break glass unit located to the side of the door
- Malfunction.

5.4 Apartment Layouts

Acceptable apartment layouts under Clause 9.4 of BS 9991 should conform to the following recommendations:

- for studio flats, a total travel distance from any point within the apartment to the entrance door not exceeding 20 m (extended from 9m as an automatic water fire suppression system (AWFSS) as described in Section 4.2 and an LD1 fire detection and alarm system will be provided). As described in Section 5.3, cooking facilities should be sited away from the apartment entrance door and the internal escape route; or
- Open plan apartments (including apartments with entrance halls that are not constructed with fire resisting walls and doors), a maximum internal travel distance of 20m given provision of residential sprinklers and LD1 AFD.

Where open plan apartment layouts are proposed, the design should comply with the following recommendations under Clause 9.7 of BS 9991:

- the apartment should not exceed 16 m × 12 m in area;
- the apartment should be provided with sprinklers and LD1 alarms;
- the apartment should be located on a single level only; and
- the ceiling within the apartment should have a minimum height of 2.25 m.

It should be noted that BS 9991 states that if an open plan apartment exceeds 8 m × 4 m, the kitchen should be enclosed. However, it can still be possible to achieve an equivalent level of safety to a code compliant layout in IFC's opinion, as detailed in Appendix C.

A typical apartment layout is shown in Figure 2, demonstrating the maximum travel distance from within the apartment to the entrance door not exceeding 20m, and cooking facilities are sited at least 1.8m away from available escape route.

Figure 2 - Typical Apartment Layout

5.5 Escape from Private Terraces/Balconies

All private balconies should meet the following provisions, as per Annex D of BS 9991:

- the escape route from the balconies should not pass through more than one access room;
- the interior of the access room should be clearly visible from all parts of the balcony unless the access room is provided with a fire detection and alarm system in accordance with BS 5839-6;
- any cooking facilities in the access room that is provided with a fire detection and alarm system in accordance with BS 5839-6 should be remote from the balcony and positioned in such a way that it does not prejudice the escape route through the access room. Alternatively, the cooking facilities should be enclosed; and
- where the travel distances from the balcony access door to the furthest point on the balcony exceeds 7.5 m, it should be provided with an alternative escape route without going via the same access room, or the access room should be provided with an automatic smoke detection (not just heat detector).

The private balcony layout for Block 3 indicates that the escape route from these balconies will not pass through more than one access room.

For common balcony or deck approach, BS 9991 Section 7.3 states that “in general there is little risk of a balcony or deck becoming smoke-logged and there is thus no need to impose a limitation on the travel distance from the dwelling entrance to the stairway, although account should be taken of the needs of the fire rescue service, such as the distance between the nearest connection to a fire main and the flat”.

Block 3b has escape routes via common balconies/open air access deck that leads to the fire fighting shaft and Block 3c, as shown in Figure 3. The current escape arrangement from the balcony accessed apartments involves leaving the envelope of the building and re-entering via the fire fighting shaft or Block 3c. It is considered that in the case of such an apartment fire, once the occupants reach the fire fighting shaft or Block 3c, they are considered to be in a relatively safety point, considering the fire safety protection measures to the shaft and fire separation measures between Block 3b and 3c. They will further travel down the stairs in the shaft until they reach the ground floor and exit the building via the final exit. The re-entering process takes the reverse route.

IFC considers the concept design aligns with BS 9991 requirement and is acceptable.

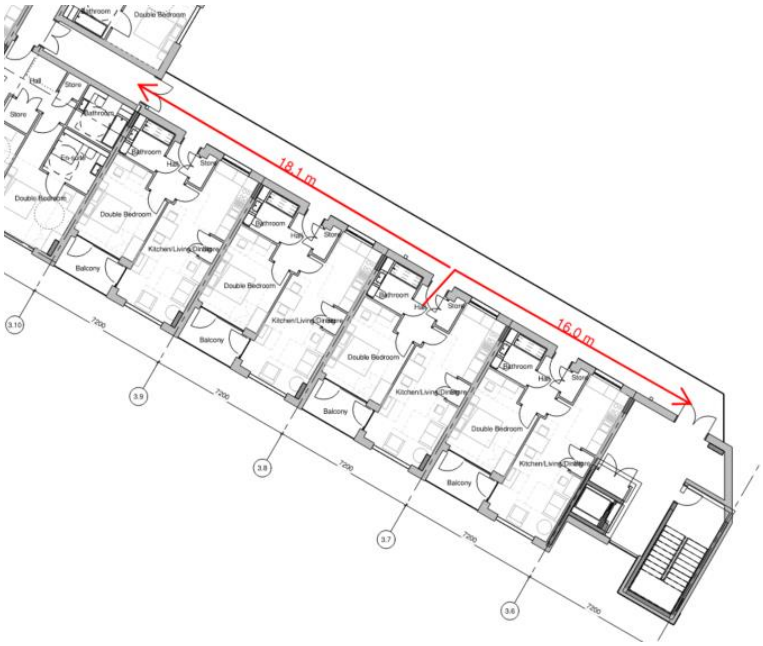


Figure 3 - Typical layout on evacuation route via balcony in block 3b

As some of the balconies/open air access deck provide a single direction of escape, the detailed design should comply with the following recommendations under Clause 7.3 of BS 9991:

- the walking surface should be imperforate (i.e. there should be no holes or perforations in the structure so that users are protected from the effects of heat or smoke from below);
- the sectional profile should be such that any fire plume breaking out of a flat is directed outwards and upwards, and should be arranged such that smoke does not leak laterally along the soffit. Balconies should be as open as possible to allow for the dispersal of smoke originating in a flat. At least 50% of the vertical section should be open and the area of opening should be uniformly spread around the surface. The opening for ventilation should be at least between the top of the balustrade at 1.1m and the soffit to the balcony above;
- window openings should not extend below a height of 1.1m above the deck level;
- the external balustrade should be imperforate.

5.6 Escape via Common Residential Corridors

5.6.1 Travel Distances

In accordance with BS 9991 recommendations, escape provisions within the residential common areas of the single-stair building should conform to the following:

- the common corridor/lobby should be ventilated with a maximum single direction travel distance of 15 m (due to the provision of sprinklers within apartments)

The design intent is for the common corridor in each block to be within this limit (see an illustration in Figure 4). IFC consider this acceptable.

5.6.2 Ventilation

It is proposed that the residential corridors will be provided with natural smoke shaft of at least 1.5 m², with a minimum dimension of 0.85m in any direction:

- The smoke shaft should be fully open to the external air at the top and closed at the base;
- The opening at the top of the smoke shaft should be located at least 0.5m above any surrounding structures that fall within a 2m radius on a horizontal plane so that it is not subject to adverse wind effects (i.e. it should always have negative wind pressure coefficients);
- The shaft should extend a minimum length of 2.5m above the ceiling of the highest storey which is served by the shaft;
- The lobby or corridor vent, the opening at the head of the shaft and all internal locations (such as safety grilles) within the shaft should have a free area of at least 1.0 m²;
- The top of the lobby or corridor vent should be located as close to the ceiling of the lobby or corridor as is practicable, and should be at least as high as the top of the door connecting the lobby or corridor to the stairwell;
- The lobby or corridor vents, in the closed position, should have a minimum fire and smoke resistance performance of 30 minutes and integrity (leakage) no greater than 360 m3/h/m2 when tested in accordance with BS EN 1366-2[18].
- The smoke shaft should be constructed either of non-combustible materials conforming to BS 476-4[19] or any material which, when tested in accordance with BS 476-11[20], does not flame or cause any rise in the temperature on either the centre of the specimen or the furnace thermocouples. The smoke shaft should run vertically from top to bottom with no more than 4m of the shaft at an inclined angle (max 30°);
- No services other than those relating to the smoke shaft should be contained within the smoke shaft;
- The smoke shaft should be located at the remote end of the lobby/corridor away from the staircase.

A damper or automatically opening vent should be provided on each floor between the corridor and vent shaft. On detection of smoke in a corridor, the vent on the fire-affected floor will open and the smoke will naturally vent to outside. All other vents into the shaft will remain closed.

Override switches for the corridor ventilation system should be provided in locations to be agreed with the fire service. This would typically include a control panel in the entrance lobby of the block, adjacent to (or combination with) the main fire alarm control panel (FACP), or override switches within the stair on each level.

[18] BS EN 1366-2:2015, Fire resistance tests for service installations, Part 2
[19] BS 476-4:1970, Fire tests on building materials and structures, Part 4
[20] BS 476-11:1982, Fire tests on building materials and structures, Part 11

The override system for smoke shaft should not allow the smoke ventilation system to be activated on more than one level at the same time (otherwise it may allow smoke to spread between levels via the smoke vent shaft).

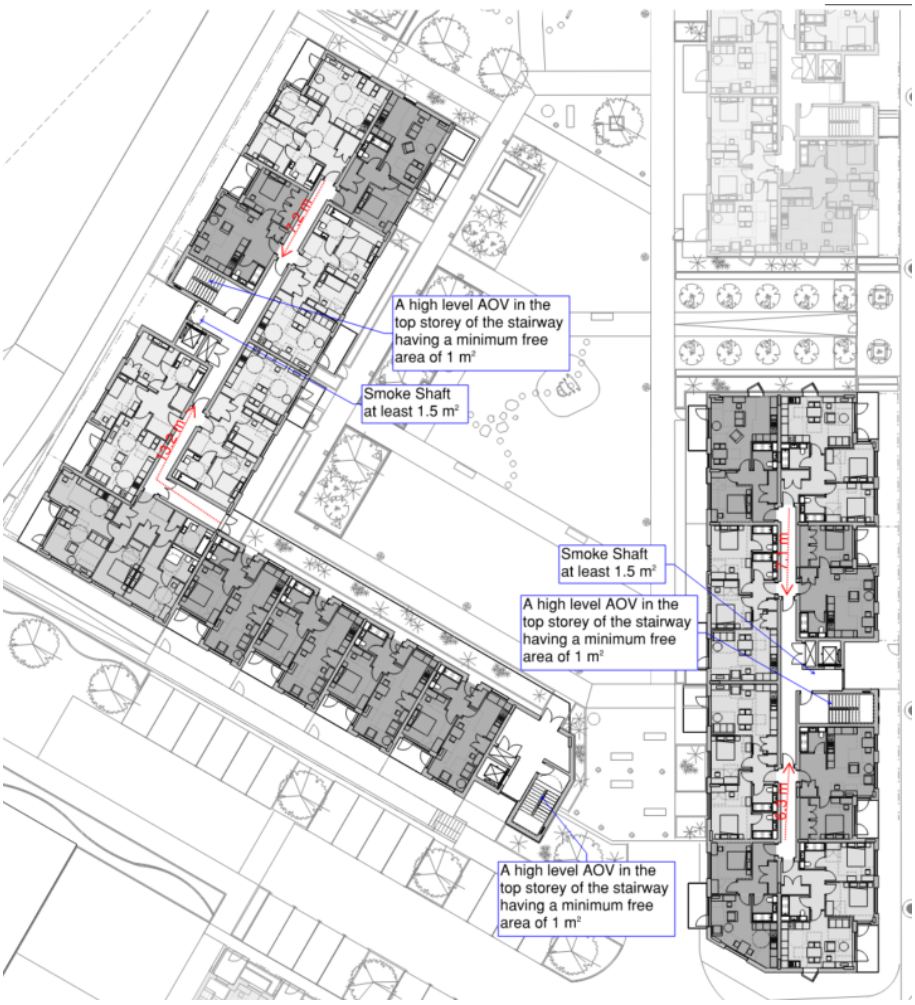


Figure 4: Proposed Common Residential Corridor Escape Provisions (for illustration, see Appendix A for final edition)

5.7 Escape via Common Residential Stairs

5.7.1 Ventilation

An AOV should be sited at the head of each residential stairway, having a minimum free area of 1.0 m^2 which will be activated at the same time as the corridor vents, as shown in Figure 4.

5.7.2 Staircase Design

For staircase designed to be firefighting stair, the firefighting stair should be designed with a width between the walls or balustrades of not less than 1.1m. For the evacuation only staircase, a width for everyday use (normally it is 1 m) will be sufficient for escape purposes. This width should be kept clear for a vertical distance of 2m, as measured from the pitch line or landing floor level, with the following exceptions:

- Stringers, each intruding into the stair by not more than 30mm; and
- Handrails, each intruding into the stair by not more than 100mm.

The stair cores should be constructed out of non-combustible materials. A protected stairway needs to be relatively free of potential sources of fire and should not be used for direct access to a risk space, except for a lift well or electricity meters provided that the meters are enclosed in a non-combustible box.

5.8 Escape from Ancillary and Non-Residential Areas

5.8.1 Overview

The majority of ancillary space and non-residential areas are located on the basement floor of Block 3 (see Figure 5). These include:

- Undercroft car park;
- Plant rooms;
- Bin store;
- Water tank room;
- Cycle parking;
- Heat Substation, etc.

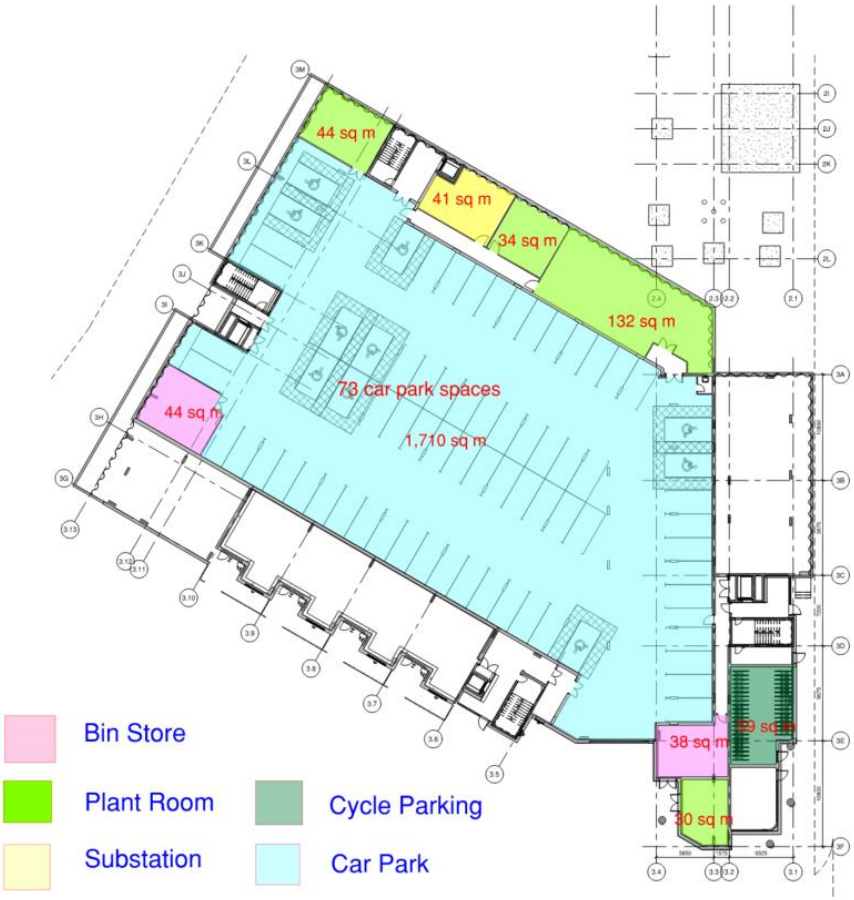


Figure 5 - Block3 Basement Floor - Ancillary and Non-Residential Areas

5.8.2 Occupancy

Occupancy characteristics have been outlined previously in Section 3.3. Recommendations for appropriate floor space factors are given in BS 9999 for various occupancies.

The guidance documents estimate the expected population in the car park based on the number of car parking spaces provided, assuming two persons per car parking space. It is considered unlikely that this will be achieved in reality but provides a conservative basis for calculation purposes.

The approximate floor area of these spaces has been measured from the GA plans provided and typical floor space factors defined in BS 9999 have been applied as outlined in Table 5.

Table 5 - Anticipated Occupancy Levels

FLOOR	USE OF SPACE	APPROXIMATE FLOOR AREA (M2)	FLOOR SPACE FACTOR (M2/P)	EXPECTED OCCUPANCY
Block 3 - Basement	Car Park	73 spaces	2 person per space	146
	Bin Store 1	44	30	2
	Bin Store 2	38	30	2
	Plant Room 1	44	30	2
	Plant Room 2	30	30	1
	Cycle Parking	59	30	2
	Heat Substation	41	30	2
	Resi Water Tank Room	34	30	2
	Commercial Sprinkler Tank and Pump Room	132	30	5

5.8.3 Travel Distance

Travel distance limits are dependent on the allocated risk profile of the space. It should be ensured that travel distances are within the limits outlined in Table 6.

Table 6 - Maximum Permitted Travel Distances

FLOOR	USE OF SPACE	RISK PROFILE	TRAVEL DISTANCE (ONE WAY, M)	TRAVEL DISTANCE (TWO WAY, M)
Block 3 - Basement	Car Park	A2	22 (15)	55 (37)
	Bin Store 1	A2		
	Bin Store 2	A2		
	Plant Room 1	A2		
	Plant Room 2	A2		
	Cycle Parking	A1	26 (17)	65 (44)
	Heat Substation	A3	18(12)	45(30)
	Resi Water Tank Room	A1	26 (17)	65 (44)

FLOOR	USE OF SPACE	RISK PROFILE	TRAVEL DISTANCE (ONE WAY, M)	TRAVEL DISTANCE (TWO WAY, M)
	Commercial Sprinkler Tank and Pump Room	A1		

NOTES

- *direct travel applies where the layout is unknown (value in the brackets), actual travel distance applies where it is known. It should be ensured during the design fitout that these limits are adhered to.*

The proposed travel distances are capable of demonstrating compliance with those in Table 6, as illustrated in Figure 6. Therefore, IFC consider this is acceptable.

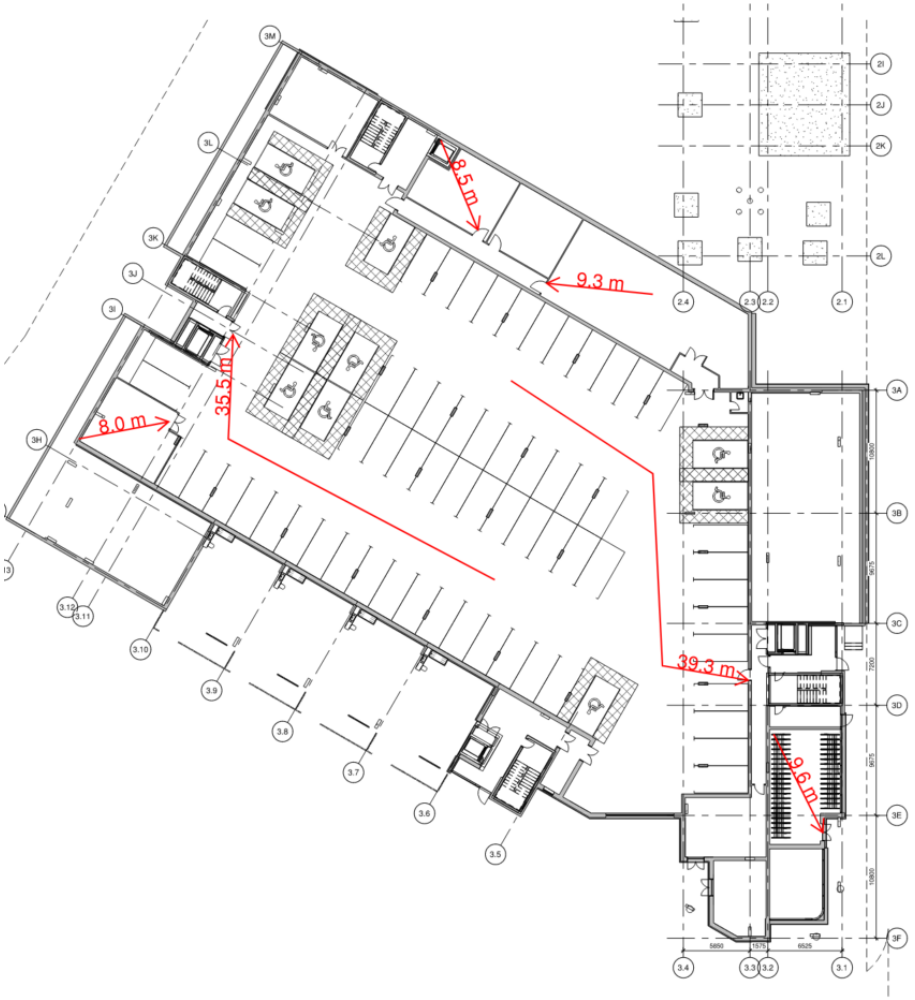


Figure 6 - Travel Distance from Non-Residential Area

5.8.4 Number of Exits

Where a room or storey is expected to have an occupancy of more than 60 people, more than one exit should be provided, with doors opening in the direction of escape, and a clear width representative of the expected occupancy levels.

Where there is access to more than one exit, it will be assumed that the largest exit is unavailable and blocked by fire, therefore the remaining exits will be sized such that there is sufficient capacity for all the anticipated occupants.

5.8.5 Width of Escape Routes

Any room serving less than 60 occupants can be provided with one exit with a clear width not less than 800 mm, however where access is available to wheelchair users, egress doors from these areas should not be less than 850 mm wide.

NOTE: the final exits of the commercial and residential areas etc. should open in the direction of escape as not to limit the room occupancy to 60 people.

For any room, the door width per person expected to use the door should generally not be less than the value given in Table 7 for the appropriate risk profile. The adjusted minimum exit width factors are based on the provision of an upgraded AFD system that will allow for a 15% reduction of the minimum exit width factors.

As indicated in Table 7, with the current exit provision, the clear width occupancy is larger than the expected occupancy, therefore the width of escape routes provided meets the above requirement.

Table 7 - Allowed Occupancy for Ancillary and Non-Residential Areas

Floor	Use of Space	Expected Occupancy	Adjusted Exit Width Per Person (mm)	Current Exit Widths (mm)	Clear Width Occupancy
Block 1 - Basement	Car Park	92	3.1	1000 x 3	980
	Plant B1,1	2		1000	327
	Plant B1, 2	2		1000	327
Block 1 - Ground Floor	Retail Unit 1	37	3.5	2100	603
	Retail Unit 2	123		2100x2	1205
	Substation	1	3.9	1700	435
	Bin Store 1A	2	3.1	1700	556
	Bin Store 1B	2		1700	556
	CHP Plant Room	10		2100	686
	Cycle Parking 1A / 1B	1	2.8	900	321
Block 3 - Basement	Car Park	146	3.1	1400x3+900	1667
	Bin Store 1	2		1400	458
	Bin Store 2	2		1400	458
	Plant Room 1	2		1400	458
	Plant Room 2	1		1400	458
	Cycle Parking	2	2.8	1400	499
	Heat Substation	2	3.9	900	230
	Resi Water Tank Room	2	2.8	900	321
	Commercial Sprinkler Tank and Pump Room	5		1400	499

5.9 Final Exit

Under Clause 34 of BS 9991 every protected stairway should discharge either:

- directly to a final exit; or
- into a protected corridor leading to a final exit which is itself separated from any accommodation by vented lobbies.

It is demonstrated that the residential stairs in Block 3 building will discharge into a protected corridor or lobby at ground floor level that leads directly to a final exit outside of the building.

The width of a final exit should be at least the same as the minimum required width of the escape route it serves. People should be able to rapidly leave the area around the building. Direct access to a street, passageway, walkway or open space should be available. The route away from the building should comply with the following.

- Be well defined.
- If necessary, have suitable guarding.

Final exit locations should be clearly visible and recognisable.

For final exit that leads to firefighting stair, the Fire and Rescue Service would typically expect a sterile protected route to the firefighting shaft, but extension of sprinklers into the residential entrance lobbies and provision of an alternative means of egress should mitigate the consequence of a fire starting in these locations. The lobby will be protected for 120 minutes fire resistance.

IFC would not consider post boxes as a significant fire load if they are to be located in these entrance halls but would recommend robust (non-combustible) construction.

5.10 Fire Safety Provisions for Disabled Occupants

5.10.1 Residential

In general, apartment storeys do not need specific measures for disabled occupants based on adopting a ‘defend in place’ evacuation strategy. Disabled occupants not affected by the fire would remain in their apartments and only those who are affected would escape to the corridor or stair enclosure.

The common residential corridors are designed such that persons needing to evacuate can move to a place of relative safety before reaching a storey exit leading to a place of ultimate safety.

It is recommended by IFC that disabled refugees be arranged in staircases (both at above ground floors and basement) to allow for safe evacuation of mobility impaired persons from these spaces if necessary.

NOTE: IFC recommend checking with any relevant third parties (e.g. housing associations) to ensure that they do not have any specific requests for any additional provisions for mobility impaired disabled people.

5.10.2 Non-Residential

In non-residential areas where access for persons with impaired mobility/those unable to self-evacuate is provided, suitable provisions for means of escape are needed.

It is recommended that refuges be provided within stairs serving non-residential areas (Basement floor) which will need to be of an area accessible to a wheel-chair user of at least 900 mm x 1400 mm. This should be located out of the escape path within a protected space.

Refuges will need to be provided with an emergency voice communications system (EVC) that will be designed, installed and commissioned in accordance with BS 5839-9[21]. This system will alert the building management to enable rapid identification of where people requiring assistance might be waiting.

No special requirements are needed in retail units with step-free egress.

21 BS 5839-9:2011, Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems

6. B2 – INTERNAL FIRE SPREAD (LININGS)

6.1 Material Classifications

Although unlikely to be the first materials to ignite, wall and ceiling linings of an enclosure such as a room can have a dramatic effect on the development of a fire and, in particular, the time it takes for the room to become completely involved.

Surface finishes and floor coverings should not comprise of materials that might contribute to surface spread of flame and/or fire or adversely affect the means of preventing such propagation.

The recommendations in relation to surface spread of flame are shown in Table 8 below. In each situation it gives two options, for the materials to comply either with the National Class or the European Class. Use of either option would be acceptable.

- National Class would relate to testing under BS 476-7:1997[22] and gives a result of Class 1, 2 or 3. For Class 0, testing is also needed under BS 476-6:1989[23] as described below.
- European Class would relate to the material's classification under BS EN 13501-1:2018[24].

Table 8 - Classification of linings

LOCATION	NATIONAL CLASS[a)]	EUROPEAN CLASS[b)]
Small rooms of area not more than 4m^2 in residential accommodation or 30m^2 in non-residential accommodation	Class 3	D-s3,d2
Rooms, general	Class 1	C-s3,d2
Other circulation spaces including the common areas of blocks of flats	Class 0	B-s3,d2

Note:

a) The National classifications do not automatically equate with the equivalent classifications in the European column, therefore products cannot typically assume a European class, unless they have been tested accordingly.

b) When a classification includes "s3,d2", this mean that there is no limit set for smoke production and/or flaming droplets/particles.

In this table, Class 0 is better than Class 1. While not identified in any BS test standard, a Class 0 product is either:

- composed throughout of materials of limited combustibility; or
- a material having a Class 1 surface spread of flame and which has a fire propagation index (I) of not more than 12 and a sub-index (i1) of not more than 6.

IFC recommends that Class 3 products should be avoided where possible.

22 BS 476-7:1997. *Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products*

23 BS 476-6:1989+A1:2009. *Fire tests on building materials and structures. Method of test for fire propagation for products*

24 BS EN 13501-1:2018. *Fire classification of construction products and building elements. Classification using data from reaction to fire tests*

7. B3 – INTERNAL FIRE SPREAD (STRUCTURE)

7.1 Structural Fire Resistance

It is important that the structure and key construction elements of a building remain fully functional for a reasonable period of time during a fire. It is obviously beneficial if these elements remain in a serviceable condition after the fire for ease of reinstatement. In addition, a fire should be contained by fire resisting elements of the building to prevent it spreading to other parts of the building. This containment should include voids and cavities that could provide a path for fire.

The purpose of providing the structure with suitable fire resistance is:

- To minimise the risk to the occupants who remain in place during a fire.
- To reduce the risk to firefighters who may enter the building to engage in search and rescue operations.
- To reduce the danger to people in the vicinity of the building who might be hurt by falling debris or as a result of the collapsing structure.
- To prevent from spreading to other parts of the building. This containment should include voids and cavities that could provide a path for fire.

Load-bearing elements of the structure should be able to withstand the effects of fire to an appropriate degree without loss of load-bearing capacity.

BS 9991 suggests that all elements of structure should be given the period of fire resistance in respect of the criteria of loadbearing capacity, integrity and insulation when evaluated in accordance with the relevant part of BS 476[25], BS EN 1363[26], BS EN 1364[27], , BS EN 1365[28] or BS EN 1366[29].

With respect to fire resistance periods for structural elements, the design of the building should be such that failure of one part will not lead to progressive collapse of another in the event of fire.

18m and 30m represents two benchmark heights when prescribing building structure fire resistance requirement in terms of load bearing capacity. Following Table 4 of BS 9991, buildings both at less than 18m and less than 30m with sprinkler protection requires 60 minutes protection. However, the building contains high fire risk rooms that defines a A3 risk profile, and stairs for each block from Block 3a to 3c all connect to the car park in the basement. Therefore, adopting 90 minutes protection is preferred and considered an enhancement of fire safety in the building – Block 3a to 3c.

The whole Block 3 will adopt 90 minutes protection to elements of structure. Structure that only supports a roof does not need any specific fire resistance unless it also supports a fire resisting wall or rooftop plant.

7.2 Compartmentation

The fire resistance performance of compartment walls and floors (or any other parts of the building which are required to prevent fire spread) should be not less than that specified below when tested in accordance with the relevant part of BS 476: Parts 20 to 24 or classified in accordance with BS EN 13501 Parts 2, 3 or 4.

[25] BS 476 Fire tests on building materials and structures.
[26] BS EN 1363 Fire resistance tests.
[27] BS EN 1364 Fire resistance tests for non-loadbearing elements.
[28] BS EN 1365 Fire resistance tests for loadbearing elements.
[29] BS EN 1366Fire resistance tests for service installations.

This applies to:

a. load-bearing walls, for load-bearing capacity, integrity and insulation from either side;

b. non-load-bearing walls and partitions, for integrity and insulation from either side;

c. fire doors for integrity from either side, with the exception of doors to lift wells where performance is in respect of exposure of the landing side only;

d. floors, for load-bearing capacity, integrity and insulation with respect to exposure of the underside only.

The main elements of compartmentation and the relevant fire performance is summarised below in Table 9. In scenarios where compartmentation exists between different purpose groups, Table 9 has allowed the use of both BS 9991 and BS 9999, so to provide proper fire separation to the non-residential area. Any items not described below would be in accordance with Table 3 of BS 9991 and Table 22 of BS 9999.

Table 9 - Fire compartmentation requirements

items	Minimum provisions when tested to the relevant part of BS 476 (in minutes)			Method of Exposure
	Loadbearing capacity	Integrity	Insulation	
Structural Frame, Beam or Column	90	N/A	N/A	Exposed faces
Load bearing Wall	90	90	90	Each side separately
Compartment floors	90	90	90	From underside
Walls: - Walls separating occupancies - between the apartments and the common circulation spaces / common corridor.	60	60	60	Each side separately
Roofs / External Walkway: Any part forming an escape route	30	30	30	From underside
External Walls: - Any part less than 1m from the relevant boundary or required for external fire spread. - Any part adjacent to an external escape route	90 30 (90*)	90 30 (90*)	90 N/A (90*)	From inside the building
Protected Shafts: - Services risers. - Protected Staircase.	90	90	90	Each side separately
Enclosure:	30	30	30	Each side separately

In flat to a protected entrance hallway or to protected landings.				
Fire resisting construction: Enclosing communal areas Enclosing places of special fire hazard (ancillary places such as storeroom, cleaner's stores, refuse chutes, refuse storage areas, etc.)	30 60	30 60	30 60	Each side separately
Cavity Barriers	N/A	30	15	Each side separately
Firefighting shaft: Construction separating fire-fighting shaft from rest of building Construction separating firefighting stair, firefighting lift shaft and firefighting lobby	120 60	120 60	120 60	From side remote from shaft
Balcony	N/A	30	30	From both sides
Enclosure around Substation	240 (typical requirements of suppliers)	240 (typical requirements of suppliers)	240 (typical requirements of suppliers)	From inside

* 90 mins protection for external walls within 1.8m of external escape routes, up to 1.1m high

Details on the fire resistance requirement of the building can be found in the mark-up in Appendix A.

7.3 Fire Doors

Fire doors within a fire resisting compartment wall will achieve the same level of fire resistance as the wall itself, although fire doors to the protected stairs and any service risers may be half the fire resistance of the wall.

Except for doors to storerooms, risers, cupboards, and plant rooms that are normally locked shut, all doors will be fitted with self-closing devices. In the case of an emergency, any installed hold open devices will release the door on activation of fire alarm systems.

Fire doors are designated by reference to their recommended performance (in minutes) for integrity only, and whether they need to retard the passage of smoke at ambient temperature. For example, the reference FD30 is a door that will achieve not less than 30 minutes of fire integrity. The addition of an S to the reference to form FD30S means that the door will require smoke seals.

A fire door should be fitted with intumescent strips along the sides and top of the fire door/frame including the gap between the leaves of a double leaf fire door. The gap along the sides/top/between the leaves should be as per the tested prototype but typically 3 mm +/- 1 mm depending on the door manufacturer's instruction.

Some representative fire door requirements are listed in Table 10.

Table 10 - Fire Door Requirements

POSITION OF DOOR	TESTED TO BS EN 1634-1	TESTED TO BS 476-22
Apartment entrances	E 30 Sa (self-closing)	FD 30S (self-closing)
Firefighting Stairs	E 60 Sa (Self-closing)	FD 60S (self-closing)
Passenger lift	E 60	FD 60
Firefighting lift	E 60	FD 60
Doors to service risers*	E 30 Sa	FD 30S
Ancillary Accommodation*	Same fire resistance as the wall it is fitted in, but no less than 30	Same fire resistance as the wall it is fitted in, but no less than 30
*Smoke seals must be provided to fire doors which open directly onto means of escape.		

7.3.1 Smoke sealing of fire doors

A fire door that is needed to resist the passage of smoke at ambient temperature conditions (the fire doors with the S or Sa against them) will either;

- Have a leakage rate not exceeding $3m^3/h/m$, when tested in accordance with BS 476-31.1[30] with the threshold taped and subjected to a pressure of 25Pa; or
- Meet the classification requirement of Sa when tested in accordance with BS EN 1634-3[31].

7.3.2 Hold-open devices

Magnetic hold-open devices should be employed to doors in common areas where such doors are expected to be rendered ineffective by occupants – i.e. chocked open or continued overuse. These should be linked to the fire detection and alarm system so that the doors are released to the closed position in the event of a fire.

7.4 Concealed Spaces

To remove a route for smoke and flame spread through concealed spaces within the building, fire resisting barriers will be placed at regular intervals and at joints within construction where there is the potential for unseen fire spread (this includes floor and ceiling voids).

Cavity barriers will, therefore, be provided to subdivide the cavities to restrict the spread of smoke and flame spread and will be provided in the following areas;

- Around openings and to close off edges of cavities
- At the junction between an external cavity wall and any wall, floor or door assembly which forms a fire resisting barrier.
- Within cavities that exceed the distances set out in the Table 11.

The maximum dimensions of cavities will not exceed those specified in the Table 11.

[30] BS 476-31.1:1983 Fire tests on building materials and structures. Methods for measuring smoke penetration through doorsets and shutter assemblies. Method of measurement under ambient temperature conditions

[31] BS EN 1634-3:2004 Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware. Smoke control test for door and shutter assemblies

Table 11 - Maximum Dimensions of Cavities

LOCATION	CLASS OF SURFACE-EXPOSED	MAX DIMENSION IN ANY DIRECTION
Between a roof & a ceiling	Any Class	20 m
Any other cavity	Class C-s3, d2 / Class 1	20 m
	Any Class	10 m

Generally, any cavity in the external wall in a residential will require a barrier in line with each party wall and compartment floor and will therefore fall within the distance limitations recommended above.

As a minimum cavity barrier should achieve 30 minutes integrity and 15 minutes insulation when tested in accordance with the relevant part of BS 476.

Where a single room exceeds 20m in any direction, cavity barriers within the ceiling void (and within any floor voids) need only to be placed on the line of enclosing walls/partitions of any room with, provided that:

- The cavity barriers are no more than 40m apart; and
- The surface of the material/product exposed in the cavity being Class 0 or Class 1 (national class) or Class C-s3, d2 or better (European Class).
- The “single room” definition can be applied to corridors, provided that cavity barriers are located above the walls enclosing the corridor and over any sub-dividing doors/partitions in the corridors.
- If the walls of the corridor and/or over the sub-dividing doors run to the underside of the slab, then no additional barriers will be required

Cavity barriers may also be formed by the following methods:

- Steel at least 0.5mm thick;
- Polyethylene sleeved mineral wool or mineral wool slab (both require to be under compression when used in cavity barrier construction); or
- Calcium silicate, cement based or gypsum plaster boards at least 12mm thick.

* Note that when used in an external wall these board types will need to be confirmed as achieving a minimum of class A2, s1-d0.

All cavity barriers will be tightly fitted to rigid construction and, where possible, mechanically fixed into position. Cavity barriers should be installed in accordance with the manufacturer’s recommendations and supporting evidence. Where ductwork penetrates a cavity barrier, it will be provided with an automatic smoke/fire damper as required.

Any compartment wall should continue up through a ceiling or roof cavity to maintain the standard of fire resistance, therefore compartment walls should be carried up full storey height to a compartment floor or to the underside of a roof covering as appropriate.

It is not appropriate to complete a line of compartmentation by fitting cavity barriers above the compartment wall or extension of a floor slab. Fire barriers should be provided to maintain integrity.

Typical cavity barriers provisions are demonstrated in Appendix E for information and consideration during design.

As a minimum, cavity barriers should be capable of achieving a fire resistance period of 30 minutes integrity and 15 minutes insulation. However, it is emphasised that fire barriers (>30 minutes) may be needed depending on the material composition of the external wall which is subject to design progression and further architectural detailing.

7.5 Ductwork

Any common area ductwork will be designed in accordance with the recommendations of BS 9999.

Where ductwork runs through any compartment lines, fire/smoke dampers must be provided.

Fire dampers should be provided within the thickness of the fire separating elements where non-fire resisting ductwork passes through fire resisting construction, or any space between the damper and the fire resisting wall should be formed of fire resisting duct and suitably insulated if applicable.

Adequate means of access will be provided to allow inspection, testing, and maintenance of both the fire damper and its actuating mechanism.

7.5.1 Air Transfer Grilles

Any air transfer grilles required as part of the ventilation system should not be provided within any wall, door, floor or ceiling enclosing a protected stairway or entrance hall. Air transfer grilles located in any fire hazard rooms should be provided with both fire and smoke containment. Any transfer grilles fitted in fire doors will need to be accompanied by a test certificate provided by the door manufacturer.

7.5.2 Protection of Openings and Fire-stopping

If the fire separating element is to be successful, every joint or imperfect fit, or opening to allow services to pass through the element, should be adequately protected by sealing or fire stopping so that the fire resistance of the element is not impaired.

Pipes that pass through a fire-separating element should be provided with proprietary seals that has been tested in accordance with BS 476-20[32], BS 476-21[33] and BS 476-22[34] or BS EN 1366-3[35] and shown by test to maintain the fire resistance of the wall, floor or cavity barrier; or

Further information on the types of proprietary fire-stopping products and systems that are available, information about their suitability for different applications and guidance on test methods is given in the ASFP Red Book.

[32] BS 476-20:1987 Fire tests on building materials and structures. Method for determination of the fire resistance of elements of construction (general principles)
[33] BS 476-21:1987 Fire tests on building materials and structures. Methods for determination of the fire resistance of loadbearing elements of construction
[34] BS 476-22:1987 Fire tests on building materials and structures. Method for determination of the fire resistance of non-loadbearing elements of construction
[35] BS EN 1366-3:200 Fire resistance tests for service installations. Penetration seals

8. B4 AND REGULATION 7 – EXTERNAL FIRE SPREAD

8.1 Regulation 7

As noted in Section 2.1 of this report, The Building (Amendment) Regulations 2018 introduced additional fire safety requirements into Regulation 7 (and other associated Regulations) of the Building Regulations. These additional requirements relate to the fire performance of materials within the external walls of "relevant buildings" and so the impact of those additional requirements is included in Section 8.2.2 of this report below. This building is required to satisfy Regulation 7.

Requirement B4 of the Building Regulations also applies to the external wall construction. The building design needs to comply with both Requirement B4 and Regulation 7 and so this report includes the most onerous requirements of each regulation.

It should be noted that Requirement B4 is a functional requirement which means that under Regulation B4 it is possible to use alternative solutions as long as they comply with the functional requirement. However, Regulation 7 is a prescriptive requirement and so strict compliance with the detailed criteria is required. Alternative solutions (e.g. such as risk assessment, or 'boxing in' of non-compliant materials) are not permitted under Regulation 7.

8.2 External Walls

8.2.1 External Wall Surface

The external surfaces of the building should comply with the guidance in Figure 17 of BS 9991 and Figure 47 of BS 9999.

For building Block 3a, b and c, Regulation 7(2) applies strict fire performance requirements on the combustibility of materials that are contained within (or attached to) external walls. As such the external wall surfaces should comply with the requirements of Regulation 7(2) as described in Table 12, which essentially means that the external walls should achieve a minimum European Class A2-s1,d0 for surface spread of flame.

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

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

Building	Less than 1 m FROM the relevant boundary	1 m or more from the relevant boundary
Block 3a, b and c	Class A2-s1,d0 or better	Class A2-s1,d0 or better

8.2.2 External Wall Materials – Block 3a, b and c

Regulation 7(2) of the Building (Amendment) Regulations 2018 introduces strict restrictions on the combustibility of materials that are contained within (or attached to) external walls of "relevant buildings". As noted in Section 2.1 earlier this building is classified as a "relevant building" and so those restrictions will apply. The implications are summarised below.

All materials which become part of an external wall or specified attachment (see below) of a relevant building must be of European Class A2-s1,d0 or Class A1. The definition of "external wall" includes anything contained within the wall, so it includes any materials used in the construction of the wall as well as anything passing through external walls such as ductwork or pipes.

The definition of an "external wall" includes all materials contained within the wall, from the external surface all the way through to the inner surface within the room although decorations and finishes to

the internal surface are excluded. This therefore includes all materials used within any part of the external wall construction as well as any materials which pass through the external wall (such as ducts or pipes).

A "specified attachment" is defined as:

a. a balcony attached to an external wall; or

b. a device for reducing heat gain within a building by deflecting sunlight which is attached to an external wall; or

c. a solar panel attached to an external wall.

In relation to these items (a-c), these are required to be European Class A2-s1,d0 or Class A1. In relation to balconies, this means that laminated glass is not permitted because it does not satisfy the European Class A2-s1,d0 or Class A1. This is an important factor for this building.

The following materials are exempt from the requirements shown above. This is a specific list of exceptions and if a particular material is not included in the list below, it would need to comply with the combustibility restrictions shown above.

- cavity trays when used between two leaves of masonry;
- any part of a roof (other than any part of a roof that falls within paragraph (iv) of regulation 2(6)) if that part of the roof 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 needed to meet the requirements of ADB;
- membranes (see note below);
- seals, gaskets, fixings, sealants and backer rods;
- thermal break materials where the inclusion of the materials is needed to meet the thermal bridging requirements of Part L of Schedule 1 of the Building Regulations; and
- window frames and glass.

Note: Whilst membranes are in the list of excluded items, there would still be a requirement for membranes within external walls to achieve at least a Euro Class B-s3,d0 performance.

The Euro Class A2-s1,d0/A1 performance is a relatively strict standard. In practice, materials that contain any significant amount of organic material (e.g. plastic or wood products) are unlikely to achieve that rating.

As noted earlier, the criteria listed above is prescriptive – i.e. there is no allowance for any flexibility. Typical issues that would need to be considered would be:

a. there is no relaxation or exclusion for materials that are only used in small quantities;

b. the list of exclusions includes "electrical installations". That is a defined term in the Building Regulations and would include electrical cabling and equipment, but would not include conduit. As a result, plastic conduit should not be used within external walls;

c. adhesive is not included in the list of excluded items (adhesive would not come under the definition of "fixings"). However, "seals" are excluded. As a result, adhesive would only be allowed if it:

   a. complied with the Euro Class A2-s1,d0/A1 criteria; or

   b. is being used as a "seal" (or other excluded item); or

   c. is included within a component that achieved the Euro Class A2-s1,d0/A1 classification for the component as a whole.

If, during construction, a non-compliant material is found to have been introduced within the external walls (even in small quantities) then that material will have to be removed, irrespective of the costs or delays that may incur.

As a result of the amendment to Regulation 7(2), IFC would suggest that the design team take this issue very seriously and adopt a very strict procedure for ensuring the compliance of all materials within the external walls.

8.3 Roof Coverings

Whilst not covered by Regulation 7, the performance of the building roofs should achieve at least the minimum performance under Requirement B4. Roof coverings must meet minimum fire resistance requirements based on distance from the boundaries. The performance is designated by reference to the test methods given in BS EN 13501-5[36] (European class) and PD 476-3[37] (national class).

Table 13 – Roof Covering Spacing

Designation of Covering of Roof/Part of Roof		Distance from Any Point on Relevant Boundary			
BS 476-3 Classification	BS EN 13501-5 Classification	Less than 6m	At least 6m	At least 12m	At least 20m
AA, AB or AC	B_{ROOF}(t4),	✓	✓	✓	✓
BA, BB or BC	C_{ROOF}(t4),	×	✓	✓	✓
CA, CB or CC	D_{ROOF}(t4),	×	✓	✓	✓
AD, BD or CD	E_{ROOF}(t4)	×	✓	✓	✓
DA , DB,DC or DD	F_{ROOF}(t4)	×	×	×	✓

8.4 Podium / Roof Terrace Coverings

The materials used on the podium and roof terraces with respect to fire should follow the guidance provided in Clause 12.3 of BS 8579[38], see Figure 7.

The podium and roof terraces should be designed so not to support the spread of fire:

- onto the terrace;
- across the terrace to an adjacent structure or building; or

36 BS EN 13501-5:2016 Fire classification of construction products and building elements. Classification using data from external fire exposure to roofs tests

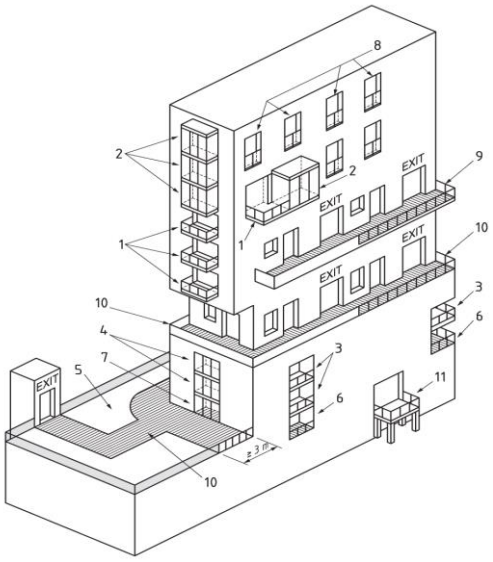
37 PD 476-3:2012 Classification rules for the end-use application of test results arising from BS 476-3, "Classification and method of test for external fire exposure of roofs"

38 BS 8579: 2020 Guide to the design of balconies and terraces

- across the terrace to an adjacent compartment in the same building.

It is recommended in BS 8579 that this be achieved by either:

- the materials within 3 m of the external wall should achieve $B_{ROOF}(t4)$; or
- following the guidance in section 3.5 of the GRO Guide[39] where a terrace containing planting may be divided by narrower strips of materials achieving $B_{ROOF}(t4)$; or
- a terrace containing planting may be divided by walls of fire resisting construction in different orientations.



Key

1	Projecting open balcony	9	Access balcony [can be referred to as "access deck" (see 3.1) or "walkway"]
2	Projecting enclosed balcony	10	Access terrace [can be referred to as "access deck" (see 3.1) or "walkway"]
3	Recessed open balcony	11	Free-standing balcony
4	Recessed enclosed balcony		Terrace, access terrace and access balcony surfaces with fire performance B_{roof} (t4) or better (see Clause 12).
5	Terrace		Imperforate (as BS 9991) guarding materials reaction to fire class as in Clause 12
6	Recessed open terrace		Other guarding materials reaction to fire class as in Clause 12
7	Recessed enclosed terrace		Other guarding
8	Juliet guarding		

NOTE National regulations might cover roof performance in relation to relevant boundaries.

Figure 7 – Balconies and Terraces (Figure 1 of BS 8579)

39 Green Roof Code of Best Practice for the UK 2014

8.5 Unprotected Areas

When a building is on fire, heat will radiate through non fire-resisting openings in the external walls. This heat can be intense enough to set fire to adjoining buildings. In order to reduce the chance of this occurring, the Building Regulations place limits on the area of external elevation with no fire resistance. This area is known as the 'unprotected area' and is affected by such factors as distance from the boundary, use of the building and compartment size.

Walls within 1m of the site boundary, which have no openings, will provide 90 minutes fire resistance (load bearing capacity, integrity and insulation) from both sides. Small openings (up to 1 m^2) in the external wall can be permitted, depending on size and separation (see Figure 21 of BS 9991 and Figure 45 of BS 9999).

For other openings, BRE Report BR187 *External fire spread: building separation and boundary distances* has been applied as a suitable method for calculating minimum boundary distances or maximum unprotected areas, as referenced in BS 9991 and BS 9999. This approach assumes that:

- A fire has spread throughout the full extent of any fire compartment (i.e. full flashover fire throughout the compartment);
- Any non-fire rated parts of the external wall have failed; and
- The heat and flames are radiating from the entire façade.

Boundary locations are taken as the centre of a public highway, the boundary of the site or a notional boundary mid-way between buildings on the same site (as Regulation B4 is concerned with the heat flux at half the distance between buildings).

Given the high level of compartmentation on the residential floors of the building, it is understood that the worst-case on each lower elevation are the plant rooms, commercial units/residential ancillary areas or residential duplexes (depending on the block) and for the upper elevations, the residential apartments only. On this basis, it can be certain that if the worst case complies then the remaining areas on the elevation are acceptable. Protected stairs and corridors are not required to be included in the assessment.

As previously mentioned in the report, the residential blocks will be protected by an automatic sprinkler system. Where a building is provided with automatic sprinklers, the boundary distance may be doubled, or the amount of unprotected area can be doubled.

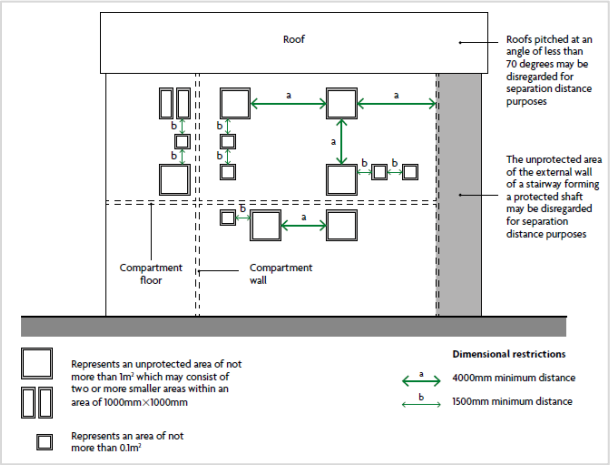


Figure 8 – Unprotected areas that can be disregarded for other openings

IFC have assessed the external fire spread of a worst-case fire scenario (ground floor) from each elevation, based on a 3.15m high (floor height) room and specific width enclosing rectangle. The

required minimum distance from the relevant boundary to each elevation is calculated, as shown in Table 14 and illustrated in Figure 9 and Figure 10. The current distance of each elevation to the relevant boundary exceeds the minimum distance requirement. Therefore the B4 requirement is satisfied and the design is considered acceptable.

Table 14 - Boundary Distance Required to Permit 100% Unprotected Area - Block 3

Reference	Measured Enclosing Rectangle		Minimum distance to Relevant Boundary to Achieve 100% Unprotected Area (m)
	Height (m)	Width(m)	
C1	3.15	13.3	2
C2	3.15	12	1.9
C3	3.15	6	1.4
C4	3.15	10.7	1.8
C5	3.15	6.1	1.5
C6	3.15	6.5	1.5

Figure 9 – External Fire Spread References – Block 3

Figure 10 - Required Relevant Boundary to Permit 100% Unprotected Area for Block 3 (Blue Dash Line)

9. B5 – ACCESS AND FACILITIES FOR THE FIRE SERVICE

In order to extinguish a fire within this building it is important that the fire service can gain access to the premises, and from there, into the building. This section deals with the various facilities intended to aid the fire service access to the building and in fighting a fire in the building.

9.1 Vehicle Access

All roadways leading to the buildings should be constructed to allow access for pump appliances which include the recommendations within Table 15.

Table 15 – Typical Fire Appliance Access Requirements[40]

Appliance Type	Min. Width of Road Between Kerbs	Min. Gateway Width	Minimum Turning Circle		Min. Clearance Height	Min. Carrying Capacity
			Kerb to Kerb	Wall to Wall		
Pump Appliance	3.7m	3.1m	16.8m	19.2m	3.7m	14 tonnes
High reach	3.7m	3.1	26.0m	29.0	4.0m	23 tonnes

Dead-end fire service access roads may be up to 20 meters long without being provided with a turning bay (i.e. a fire service vehicle will not have to reverse further than 20m)

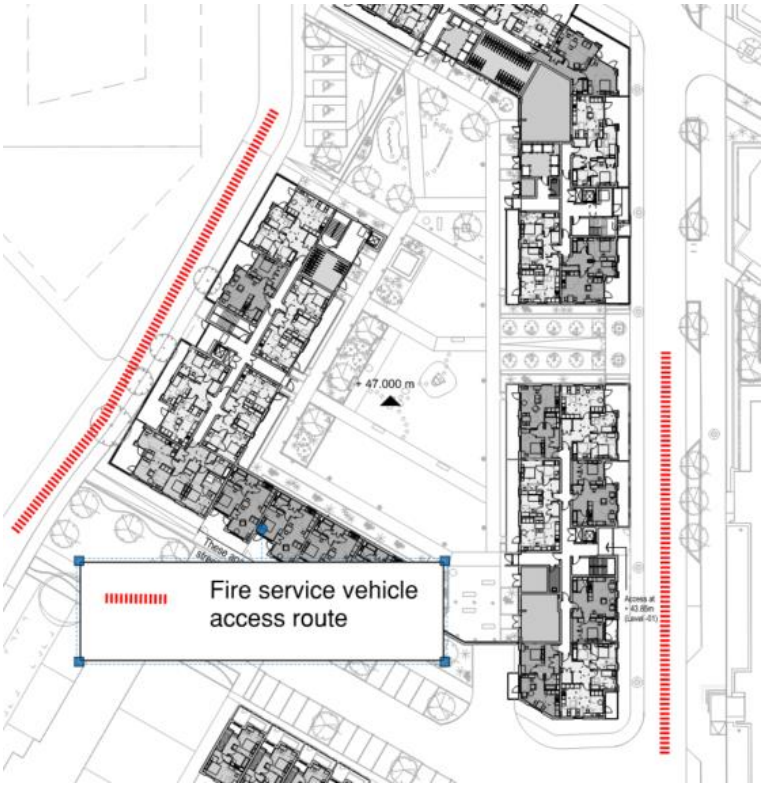


Figure 11 – Fire Tender Access

[40] London Fire Brigade. Fire Safety Guidance Note Number: 29, Access for Fire Appliances.

9.2 Firefighting Shafts

Block 3a contains an occupied floor level more than 18 m above firefighting access level, therefore will be provided with a firefighting shaft serving all floors. Block 3b&3c does not require a firefighting shaft due to building height.

As a minimum, each firefighting shaft will consist of a firefighting stair, a fire main and a firefighting lift. The firefighting stairs will be designed to the relevant criteria of BS 9991, which includes a 120-minute fire rated enclosure and a fire main within the staircase. The protected corridor used for means of escape purposes is considered to be the firefighting lobby and it is not necessary to provide an additional firefighting lobby between the protected corridor and the firefighting stair. The firefighting lift and the firefighting stair will be positioned within a distance of 7.5 m in accordance with BS 9991.

The firefighting stair of each block will have a minimum clear width of 1100 mm.

Where a firefighting shaft is not directly accessible from the outside, access to the firefighting shaft via a corridor can be provided. In this case, the route from the fire and rescue service entrance to the firefighting shaft should be as short as possible and in any case, not exceed 18 m in length.

Not all of the blocks have a dedicated, sterile corridor leading to the firefighting stair, but in all of these instances there is an alternative route of egress from the stair at ground floor. In the event of a fire at ground floor level that prevents use of the primary exit, residents will be able to use the alternative exit(s) to evacuate and the FRS can fight the fire directly from the street.

The firefighting lift installations, including the lift car, well, machinery space, control system and fire and rescue service communications systems will be designed and constructed in accordance with BS EN 81-72[41]. Measures should be taken to minimize the ingress of water into the lift shaft, typically this is a 25 mm ramped upstand local to the lift doors or a slot drain.

Smoke control for the firefighting shaft should be provided in accordance with BS 9999[2], that a 1.5 m^2 AOV in the lobby and 1m^2 AOV at the head of stair is provided.

9.2.1 Fire Mains

Each firefighting stair will be fitted with a fire main to meet the maximum 60 m hose-laying distance for sprinkler-protected buildings (including firefighting on the podiums). All Blocks will be served by a dry fire main.

The fire mains will be designed and installed in accordance with BS 9990[42].

The dry fire main inlets should be visible and provided within 18 m of a suitable fire appliance parking location such as a road. Ideally the dry riser inlet should be located adjacent to the door into the firefighting shaft.

Outlets should be located within the firefighting stairs (or protected stairs if firefighting stairs are not required) on each floor, including the ground floor. For the basement level, the outlets shall be arranged within the lobby. Signage of this facility is required at ground floor for the fire service operatives.

The dry mains should be configured so that horizontal runs between the inlets and the vertical parts of the risers will be no more than 18 m.

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41 BS EN 81-72:2020. Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts. Firefighters lifts.

42 BS 9990:2015. Non automatic fire-fighting systems in buildings. Code of practice

Firefighting in areas without fire mains and which have independent access (ground floor apartment etc.) will rely on perimeter access. All points within these spaces should be within a 60 m hose-laying distance of a suitable fire appliance parking location.

9.3 Water Supplies

For the design to demonstrate consistency with the recommendations set out under BS 9991, a water supply should be readily available and comprise of one or a combination of the following:

- Hydrants provided by the water supply company on the street mains which will usually depend on suitability of supply available from the town mains.
- Private hydrants designed and installed in accordance with BS 9990, ideally forming part of a ring main system.
- A static or natural water supply.

Where private fire hydrants are to be installed, BS 9990[43] states that they should be included as part of a ring fire main system and be positioned not more than 90m from an entry to any building on the site and not more than 90m apart.

Where the mains water supply does not provide sufficient pressure and capacity to provide the necessary supply, the fire main should be fed from two interconnected tanks of nominal equal capacity and can provide 60 minutes water supply.

Adequate signage will be needed on the face of the building to be able to direct the firefighting service to the appropriate riser, the level of signage required by fire service to be confirmed with local Fire and Rescue Service.

Furthermore, following the sprinkler system requirement in Section 4.2, it is proposed to install the sprinkler tanks in the basement area under Block 3 building. Detailed arrangements are:

- Sprinkler tank to be sized to meet the requirements of BS EN 12845, nominally 135 m^3 for the basement car park areas only;
- Dual power supplies to be provided to the run/standby pumpsets;
- Pressure reducing valves to be provided to the boosted supplies to suit the characteristics of building Block 1;
- The tank will be provided with the ball valve incorporating a type A air gap as a minimum.

9.4 Separation from Residential Areas

In accordance with clause 30.2 of BS 9991, a stair in a building where the top floor is greater than 11m should not continue down to the basement where it forms part of the only escape route from an upper storey or part thereof – i.e. relative to single stair buildings with topmost storey > 11m.

This situation is acceptable in small residential buildings with topmost storey < 11m on the basis that the Basement and upper storeys are fire separated within the staircase at Ground Floor level as demonstrated in Figure 12. In addition, there should be a fire-resisting ventilated lobby at Basement level between the accommodation and the staircase.

[43] BS 9990:2015 – TC Tracked Changes. Non automatic fire-fighting systems in buildings. Code of practice

The design developed for current building – Block 3a to 3c, each has a single staircase that is arranged to continue to the Basement, with fire door arranged at Ground Floor level to separate the Basement and upper storeys, as demonstrated in Figure 13. This arrangement is effectively reflecting the situation presented in Figure 12, which was generally only applicable to small residential buildings < 11m under general guidance. As such, the design is contravention to clause 30.2 of BS 9991.

While acknowledging this prescriptive departure, the key design objective is to satisfy the functional requirements B1, B3(3) and B5 of the Building Regulations. Therefore, the justification of this arrangement is made, as detailed in Appendix D.

Fire-resisting ventilated lobbies at Basement level are provided to the staircase, as shown in Appendix A. Ventilation of these lobbies is discussed in Section 5.6.

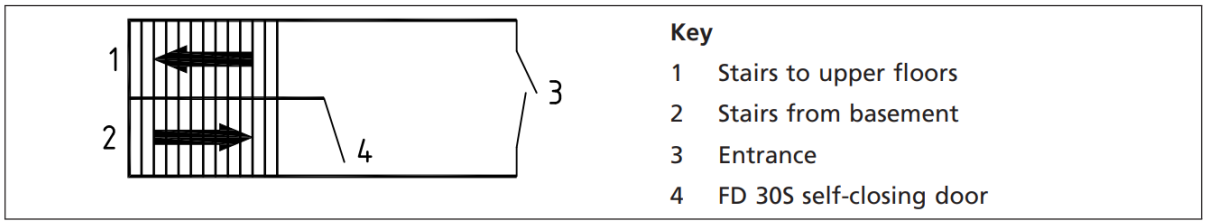

Figure 12 - Staircase separating basement and upper storeys in small single stair residential buildings

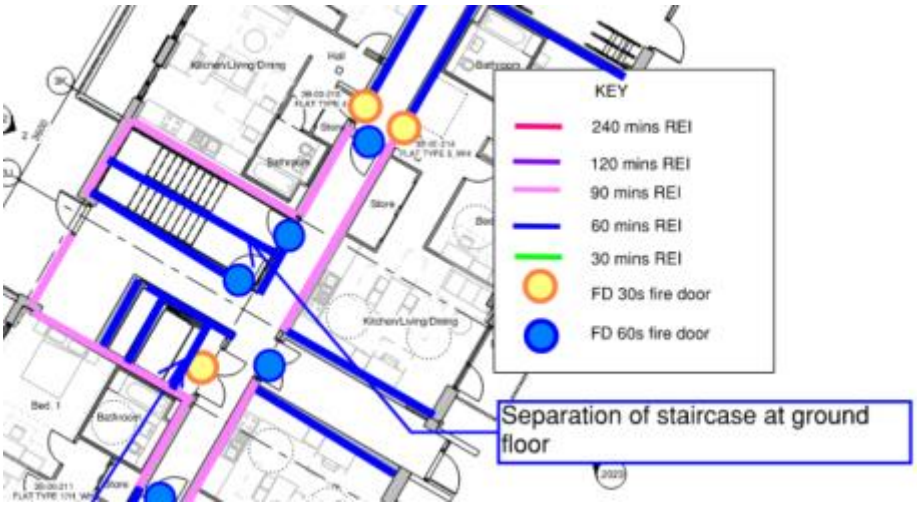

Figure 13 - Separation of Staircase at Ground Floor (Block 3c)

9.5 Wayfinding Signage for the Fire Service

The purpose of wayfinding signage is to assist the fire service to identify each floor in an apartment block and will include floor identification signs and flat numbers.

The floor identification signs will need to be located on every landing of each of the protected stairways. It is recommended that the signs are visible from the top step of each firefighting stair and, where possible, from the inside of the firefighting lift when the lift car doors open.

Floor identification signs should be supplemented by apartment indicator signs, which provide information relating to the apartments accessed on each storey and should be sited immediately below the floor identification signs. As apartments are in more than one direction from the stair cores, the wording should be supplemented by arrows.

10. LIMITATIONS

Our advice is strictly limited to the scope of our current brief, i.e. to advise on the RIBA stage 4 fire strategy for the development at Town Centre West, St Andrews Park in Uxbridge. It is considered that once the advice within this report is implemented, then it is demonstrated that the Building Regulations including Regulation 7(2) are satisfied.

International Fire Consultants Ltd have not reviewed any other issues within the project other than those identified in our report. We offer no comment on the adequacy or otherwise of any other aspects of the development (whether related to fire safety or any other issue) and any absence of comment on such issues should not be regarded as any form of approval. The advice should not be used for buildings other than that named in the title.

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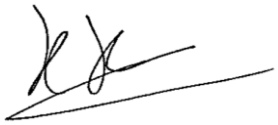

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