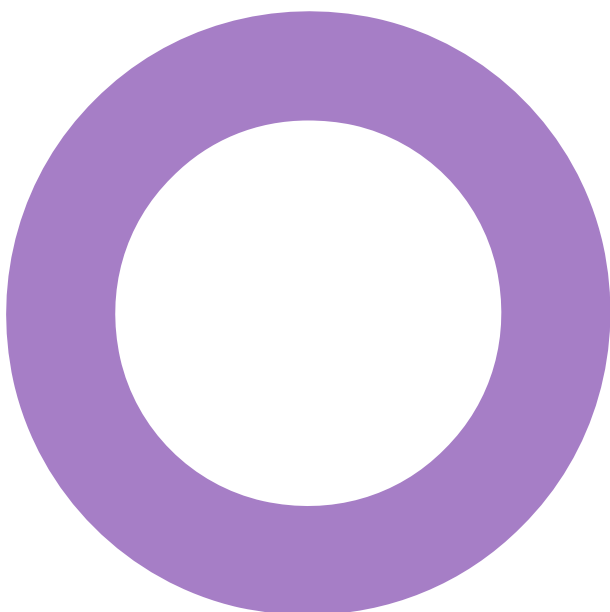


Broad Street. Reading.

Inception Reading SARL C/O Moorgarth Group Ltd (Leeds).

FIRE ENGINEERING
FIRE STRATEGY REPORT

REVISION 02 – 20 DECEMBER 2018



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	16/10/18	Fire Strategy Report	TB	IH	SB
01	25/10/18	Fire Strategy Report	TB	IH	SB
02	20/12/18	Updated based on latest plans	IH	SB	SB

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Project number: 1919616

Document reference: REP-1919616-5a-IH-20181217-Fire Strategy-Rev02

Contents.

Audit sheet.	2
1. Introduction	4
2. Building Description	5
2.1 Sprinklers	5
3. Statutory Guidance	7
3.1 The Building Regulations 2010	7
3.2 Construction, Design and Management Regulations	7
3.3 The Regulatory Reform (Fire Safety) Order	7
3.4 Property Protection	8
3.5 Materials and Workmanship	8
4. Means of Warning and Escape	9
4.1 Means of Warning	9
4.2 Means of Escape	9
4.3 Retail Means of Escape	12
5. Internal Fire Spread (Linings)	13
5.1 Wall and Ceiling Specifications	13
6. Internal Fire Spread (Structure)	14
6.1 Loadbearing Elements of Structure	14
6.2 Sprinklers	14
6.3 Compartmentation	14
6.4 Ancillary Accommodation	15
6.5 Concealed Spaces (Cavities) and Fire Stopping	15
7. External Fire Spread	16
7.1 Space Separation Analysis	16
8. Access and Facilities for the Fire Service	17
8.1 Residential Accommodation	17
8.2 Retail Accommodation	17
8.3 Vehicle Access	17
8.4 Fire Hydrants	17

1. Introduction

The purpose of this document is to provide a fire strategy report for the proposed residential development at Broad Street Mall, Reading. This report is intended to be read in conjunction with the architectural plans provided by Corstorphine + Wright as listed below;

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The following fire strategy report is principally based upon the design guidance given in British Standard (BS) 9991 for residential apartments, and BS 9999 for all non-residential accommodation. Each of these documents address the fire safety provisions necessary for the development to comply with the functional requirements in Parts B1 to B5 of the Building Regulations 2010, relating to means of escape, internal fire spread, external fire spread, and Fire Service access.

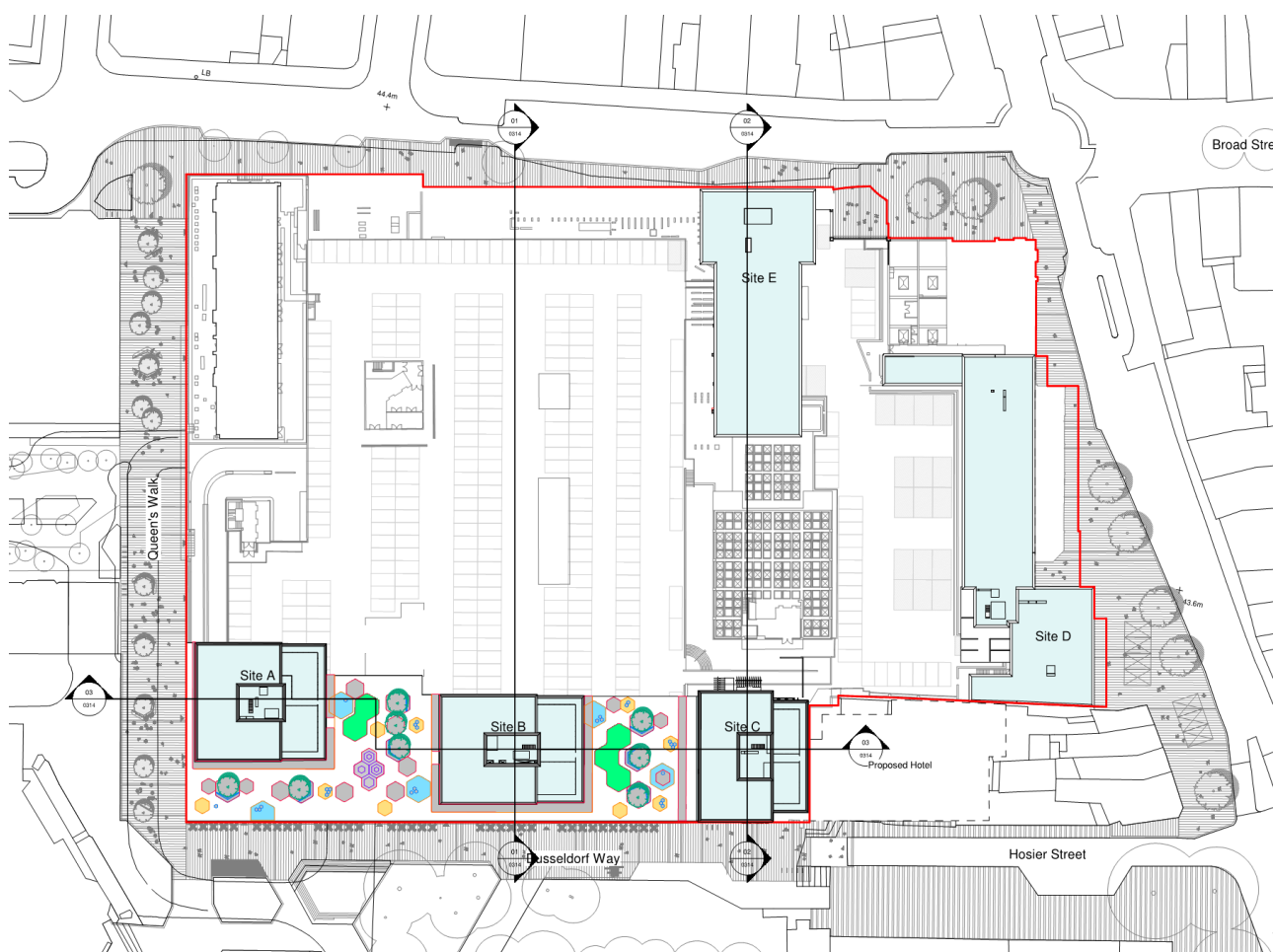
The contents of this report are subject to further development and agreement with the Statutory Authorities. This report is not intended for a formal Building Regulations submission.

2. Building Description

The Broad Street development is to be sited above the Broad Street Shopping Mall within the city centre of Reading. Although the proposed residential accommodation will be above the shopping complex, there will be no interconnection with the shopping mall, and hence each of the residential towers will be considered a building in their own right.

The proposed development is arranged over five residential blocks of accommodation. Blocks A, B, C and E are each accessed via a single stair arrangement. However, Block D is provided with two residential stairs for access and means of escape. For the purpose of this report the buildings will be referred to as Block A, B, C, D and E, in accordance with Figure 2.0.

Figure 2.0 – Site layout



The following document will assess each block independently, as well as addressing the impact on the site wide development.

2.1 Sprinklers

It is recommended that sprinklers are provided to each block, in order to comply with the guidance in BS 9991 due to the building arrangement (i.e. open plan apartments and extended single direction travel distances in common corridors) and heights.

This residential sprinkler system will be designed in accordance with BS 9251.

Sprinklers to the residential apartments only. This is supported by the guidance of Table 1 of BS 9251.

The retail units at Ground floor level of Blocks A, B and C will be provided with sprinkler protection from the existing mall sprinkler system.

3. Statutory Guidance

3.1 The Building Regulations 2010

The building will be subject to the requirements of the Building Regulations 2010. It will be necessary, therefore, for it to meet the requirements of Schedule 1 of the Regulations relating to:

- 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 the fire service).

Guidance on how these functional requirements can be satisfied is provided in *Approved Document B - Fire Safety* (the 'AD-B'). AD-B is one of several Approved Documents issued by the Department for Communities and Local Government (DCLG) to provide guidance for some of the more common building arrangements. However, there is no obligation to adopt any particular solution contained within the document. The document recognises that the functional requirements can also be demonstrated to have been satisfied by alternative solutions not contained within the AD-B. Such alternative solutions are acceptable, on the basis that an equivalent level of fire safety to that provided by the standard solutions can be demonstrated.

British Standard (BS) 9991(2015) is an alternative approach to the guidance within AD-B for residential accommodation. This document provides more specific guidance relating to residential areas. As the residential accommodation does not follow a standard approach detailed within AD-B, this report considers the more specific guidance within BS 9991. Therefore this guidance document will be adopted in its entirety for all residential accommodation.

This report is primarily intended to assess the statutory Life Safety requirements of Part B of the Building Regulations, and property protection is not, therefore, explicitly addressed.

3.2 Construction, Design and Management Regulations

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

As a designer, in accordance with regulation 9 of the CDM regulations, Hoare Lea Fire have taken into account the general principals of prevention in the preparation of this report and where reasonably practicable, have eliminated, minimised and/or controlled foreseeable hazards associated with the design.

Where elimination hasn't been reasonably practicable, Hoare Lea Fire is required to provide 'pre-construction' information in respect of any significant and/or unusual project-specific hazards that remain.

Following our design process, Hoare Lea Fire confirm that there are no significant and/or unusual residual hazards associated with this particular design.

3.3 The Regulatory Reform (Fire Safety) Order

The Regulatory Reform (Fire Safety) Order (the RRO) is based on risk-appropriate compliance and requires a fire risk assessment to be carried out. The fire service will conduct inspections of premises to enforce the regulations. Whilst a guidance document has been produced by the government to assist in the preparation of the risk assessment, it should be noted that this document should not be used to design the building – the building design should be focused on satisfying the functional requirements of the Building Regulations.

The fire strategy detailed in this report does not, therefore, explicitly address the management requirements of the RRO. It will be necessary for effective fire safety management regimes to be developed by the building occupier, and a risk assessment of the premises to be conducted (and updated on an on-going basis).

3.4 Property Protection

This report deals only with Statutory Requirements, and property protection is not, therefore, explicitly addressed, unless otherwise stated. As such, it is recommended that the building insurers are consulted at an early stage to ensure that any additional needs are satisfied.

3.5 Materials and Workmanship

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

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

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

4. Means of Warning and Escape

4.1 Means of Warning

In accordance with BS 9991, it is recommended that the residential apartments are provided with automatic fire alarm and detection complying with BS 5839-6. This alarm system will be based on a stay in place evacuation strategy where only the apartment of fire origin will evacuate.

Each apartment should be provided with a stand-alone Grade D Category LD2 system as minimum. In accordance with BS 5839-6, a LD2 system incorporates detectors in all circulation spaces that form part of the escape routes, and in all specified rooms or areas that present a high fire risk to occupants (e.g. typically, kitchens, lounges and store rooms).

Open plan apartments (as detailed in 4.2.2 below) should be upgraded to a Category LD1 system.

In accordance with BS 9991, there is no requirement to provide an alarm within residential common corridors. However, the corridors will be provided with an L5 detection system in accordance with BS 5839-1 which will be used to operate the smoke control system in the common corridors.

It is recommended to provide sounders and beacons on the amenities podiums as it is necessary to escape back through the residential stairs.

As a minimum, the retail accommodation requires the provision of L2 fire alarm and detection, which is designed and installed in accordance with BS 5839-1.

4.2 Means of Escape

4.2.1 Standard Residential Apartments

In accordance with BS 9991 there are four acceptable approaches when designing an apartment:

- a) The total travel distance from any point of the apartment to the entrance door of the flat should be limited to 9m. This limit may be extended to 20m if sprinklers and LD1 fire detection and alarm are installed. Cooking facilities should be sited away from the flat entrance door and the internal escape route. Note: For this approach the apartment bedrooms should not be access from the kitchen and/or living accommodation i.e. considered open plan.
- b) A protected internal hallway should be provided that leads off to all habitable rooms having a travel distance not exceeding 9m from the apartment entrance door to the door of any habitable room.
- c) All habitable room should be accessible from an internal hallway and have an alternative exit from the apartment.
- d) 30 minute fire-resisting construction should be provided between the living and sleeping areas of the apartment and an alternative exit from the bedroom area should also be provided.

Within Block D the majority of the apartments are designed with a protected internal hallway which all habitable rooms are accessed off, and some smaller studio apartment are also provided.

However, the apartment within the remaining blocks do not meet the guidance of BS 9991 for standard apartment types. The apartment designs do not have protected corridors or hallways, but have bedrooms that are inner room accessed directly from a kitchen/lounge, so are considered to be "open plan". Open plan apartments should be designed in accordance Section 4.2.2 below.

4.2.2 Open Plan Apartments

An open plan apartment is an apartment with inner room bedrooms accessed from the kitchen/lounge area. BS 9991 provide supplementary guidance on the design of open plan apartments. This is summarised as follows:

- The size of the apartment should not exceed 16m x 12m
- Residential sprinklers should be provided

- LD1, Grade D fire detection and alarm system should be provided
- Open plan apartments should be single level only
- Ceiling heights should be a minimum of 2.25m high
- The kitchen should be enclosed in open plan flats exceeding 8m by 4m. Cooking appliances in open plan flats having an area smaller than 8m by 4m should not be adjacent to the entrance of the flat.

Each apartment type will be reviewed in accordance with the recommendations above. Apartment types which do not meet the conditions above will require further consideration, and potentially CFD Modelling to determine whether a safe means of escape can be provided.

This is currently likely to be requested for the open plan apartments due to the provision of open plan kitchens in apartments larger than 8m x 4m.

4.2.3 Means of Escape from Common Corridors

In accordance with BS 9991, the maximum travel distance in the common corridor should not exceed the following limits:

- Escape in a single direction – 7.5m
- Escape in more than one direction – 30m

However, these distances can be affectively doubled if residential sprinklers are provided. The maximum travel distances and recommendations for each residential block is detailed below.

Block A, B and C

Each of these blocks should be provided with residential sprinklers by virtue of their height. Therefore, the recommended travel distance can be increased to 15m (single direction) and 60m (multiple direction), in accordance with BS 9991.

It is understood that the travel distances are within these recommended limits.

Block D and E

Sections of corridor within both Block D and E are considered to have significantly extended travel distances. The travel distances within Block D and E are 25m and 26m (single direction) respectively. Therefore, two mechanical smoke shafts should be provided to these corridors and residential sprinklers to the apartments accessed of these corridors.

4.2.4 Smoke Ventilation of the Common Corridors

Block A, B and C

As the corridors within these blocks are within the recommended travel distances, the smoke ventilation systems can be a proprietary natural or mechanical ventilation system, based on one of the following:

- Ventilation via a 1.5m² free area window.
- Discharge into a vertical smoke shaft of at least 1.5m² cross sectional area, and not less than 0.85m in any direction.
- Mechanical ventilation into a vertical smoke shaft (0.6m² minimum), in accordance with Section 14.2.4 of BS 9991.

It should also be noted that a 1.0m² vent is required at the head of each stair which will also activate upon detection of smoke in the common corridor.

Blocks D and E

Due to the travel distances within each of these blocks smoke ventilation should be provided by means of two shaft (one at each end of the corridor) mechanical ventilation system to compensate for the additional travel distances. It is necessary to use Computational Fluid Dynamics (CFD) modelling to demonstrate the performance of the proposed common corridor smoke ventilation system, provide a safe means of escape.

The 0.6m² minimum area mechanical shafts, which should be located at the furthest possible point at each end of each section of corridor.

It should also be noted that a 1.0m² vent is required at the head of each stair which will also activate upon detection of smoke in the common corridor.

4.2.5 Vertical Means of Escape

4.2.5.1 Stair Width

BS 9991 states that a stair of acceptable width for everyday use will be sufficient for escape purposes from residential apartments, but if it is also a fire fighting stair, it should be at least 1100mm wide. Therefore, it is proposed that all residential stair cores within the building will be provided with a minimum clear width of 1100mm.

4.2.5.2 Stair Discharge

BS 9991 states that protected stairs should discharge either:

1. Directly to a final exit, or
2. Into a protected corridor leading to a final exit which itself is lobbied from any accommodation.

On this basis, the residential stairs and discharge route should not communicate with any other accommodation (e.g. retail units). Discharge routes should remain fire sterile. This will preclude the provision of ancillary accommodation such as a reception, office or waiting area in the base of each staircase.

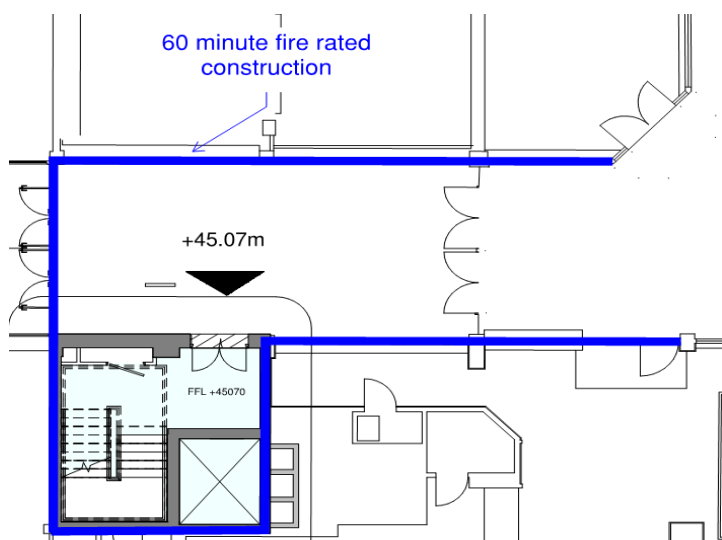
The final exits from both stairs within Block D is unclear. Further clarification is required with regards to the route to ultimate safety for the occupants of these blocks once they discharge from the stairs. The discharge route from these stairs to the podium should not require occupants to pass back through the common corridor area or within 1800mm of the façade of the apartments at the discharge level (if this can not be achieved the façade of these apartments would be required to be fire rated).

4.2.5.2.1 Stair Discharge from Block D

Based on the height of Block D being more than 18m in height and protected with sprinklers, to the highest storey level, the residential stair and associated discharge route is required to achieve 60 minutes fire resistance.

Any existing construction should be retrospectively upgraded to meet this specified period of fire resistance.

Figure 4.0 – Stair Discharge



4.2.5.3 Ancillary Accommodation

In accordance with BS 9991 ancillary accommodation should not be directly accessed from the residential stair if it is the only stair serving the building.

If a stair provides access to ancillary accommodation in a block with more than one stair, there should be a ventilated protected lobby or corridor between this accommodation and the residential stair. The lobby should be provided with 0.4m² of natural ventilation or mechanical ventilation to 10 ACH.

It is noted that the single stairs of Blocks A, B, C and E extend down to serve the basement levels. This is not in accordance with the guidance of BS 9991 and therefore it is recommended that the stairs are provided with a mechanically vented lobby at basement level.

4.3 Retail Means of Escape

4.3.1 Travel Distances

In order to reduce the risk of occupant experiencing untenable conditions, the distance to the nearest exit should be limited. In accordance with BS 9999 the following travel distances should be applied based on a B3 occupancy:

Table 4.3 – Recommended Travel Distances

Area	Single Direction	Multiple Direction
General Accommodation	16m	40m

4.3.2 Egress Widths

The width of any escape route is dependent on the number of persons required to use the route. In accordance with BS 9999 for exits greater than 1050mm a unit exit width of 6.0 mm per person should be applied. Where more than one exit is provided, a single storey exit must be discounted due to the location of the fire. If a single exit is provided then the maximum occupancy of the unit is limited to 60 persons.

5. Internal Fire Spread (Linings)

5.1 Wall and Ceiling Specifications

All wall and ceiling linings should comply with the relevant guidance in Section 20.1 of BS 9991. Table 5.1 summarises the guidance to inhibit the internal spread of fire.

Table 5.1 – Classification of Wall and Ceiling Linings

Location	National Class	European Class
Circulation spaces within dwellings	1	C-s3, d2
Other circulation spaces (including common areas of blocks of flat)	0	B-s3, d2
Small rooms not exceeding 4m ²	3	D-s3, d2

6. Internal Fire Spread (Structure)

6.1 Loadbearing Elements of Structure

Under the guidance of BS 9991, all elements of the structural frame, including the beams, columns, load bearing elements, and floor structures are required to be provide the following specified fire resistance based on the building height:

- Less than 18m in height – 60 minutes
- Less than 30m in height – 90 minutes
- Over 30m in height- 120 minutes

A structure which supports a roof will not require fire resistance unless the roof performs the function of a floor, supports a roof top means of escape route, or the structure is essential for the stability of a fire-rated element or external wall.

6.2 Sprinklers

In accordance with BS 9991, sprinklers are required in buildings over 30m in height only. Therefore, it is proposed to provide sprinkler protection to each Blocks A, B and C by virtue of their height. Notwithstanding, residential sprinklers have been recommended to Blocks D and E as a compensatory feature for the provision of open plan apartments and extended travel distances. It is recommended for sprinklers to be installed in accordance with BS 9251 to the residential areas.

It is considered reasonable to provide sprinklers to the residential blocks only, based on a high degree of compartmentation, and means of escape being independent to other accommodation. Notwithstanding, this would be subject to discussions and approval with Statutory Authorities.

It should be noted at this stage that sprinklers may also need to be provided to non-residential area to a commercial sprinkler standard in accordance with BS EN 12845, if considered part of the same building.

6.3 Compartmentation

6.3.1 Compartment Walls

In accordance with BS 9991, the walls between adjacent apartments, and between apartments and the common corridor will be provided as compartment walls and provided with a minimum of 60 minutes fire resistance, irrespective of the building height.

Compartment walls should be provided to separate different building accommodation (i.e. residential apartments, retail units, amenities space), in accordance with the specified period of fire resistance within Section 6.1 above. The higher period of fire resistance should always be adopted.

6.3.2 Compartment Floors

It is necessary to provide each floor as a compartment floor within residential accommodation, in accordance with the specified period of fire resistance within Section 6.1 above.

6.3.3 Protected Shafts

All stairs, lift wells, ventilation shafts and service risers (containing pipes, ducts or chutes), which pass through a compartment floor need to be constructed as protected shafts and provided with a period of fire resistance equal to the floor through which they pass (as per Section 6.1).

The doors to the shafts should be provided with half the period of fire resistance to the shafts which they serve.

6.4 Ancillary Accommodation

Ancillary areas should be provided with appropriate fire resistance in accordance with BS 9999, as per table 6.4.0 below.

Table 6.4 – Fire Protection of Ancillary Areas

Area of ancillary accommodation	Type of construction needed to separate ancillary accommodation from other parts of the building
1 Storage areas greater than 1 m ² in area but not greater than 450 m ² (other than refuse storage areas).	Robust construction having a minimum standard of fire resistance of 30 min ^{A)}
2 Repair and maintenance workshops where flammable or highly flammable liquids are not used or stored	
3 Kitchens (separately or in conjunction with an associated staff restaurant or canteen)	
4 Transformer, switchgear, and battery rooms for low-voltage or extra-low-voltage equipment	
5 Engineering services installation rooms (other than those covered by items 8, 15 and 19)	
6 Dressing rooms or changing rooms	
7 Cinema projection rooms ^{B)}	
8 Storage areas greater than 450 m ² (other than refuse storage areas)	Robust solid non-combustible construction having a minimum standard of fire resistance of 60 min ^{A)}
9 Car parks within or adjoining the building and not greater than 450 m ² in area	
10 Service installation rooms (other than those covered by items 4, 16, 17, 18, 19)	
11 Places classified as high fire risk areas	
12 Repair and maintenance workshops where flammable or highly flammable liquids are used or stored	Robust solid non-combustible construction having a minimum standard of fire resistance equivalent to that required for the elements of construction of the building and in no case less than 60 min ^{A)}
13 Covered loading bays and storage areas other than those covered in items 1 and 8	
14 Car parks within or adjoining the building and greater than 450 m ² in area	
15 Refuse storage areas	
16 Boiler rooms	
17 Fuel storage spaces	
18 Transformer and switchgear rooms for equipment above low voltage	
19 Rooms housing fixed internal combustion engine(s)	
20 Scene docks	Robust solid non-combustible construction having a minimum standard of fire resistance of not less than 120 min ^{C)}
21 Any electrical substation or enclosure containing any distribution board, generator, powered smoke control plant, pressurization plant, communication equipment, and any other equipment associated with life safety and fire protection systems	
^{A)} Any openings in the required construction should be protected by doors having a similar standard of fire resistance.	
^{B)} Attention is drawn to the Cinematograph (Safety) Regulations 1955 [47] in particular in respect of cellulose nitrate film.	
^{C)} Any openings in the required construction should be protected by doors having a fire resistance not less than 60 min.	

6.5 Concealed Spaces (Cavities) and Fire Stopping

Where appropriate, suitable provisions should be made to prevent the unseen spread of fire and smoke through cavities or concealed spaces by the use of cavity barriers. The provision of any such barrier should meet the general recommendations of Section 19 of BS 9991.

7. External Fire Spread

7.1 Space Separation Analysis

It is important to assess the impact of the possible radiation emitted for one building to another. Therefore a full external fire spread assessment between adjoining buildings will be conducted during RIBA Stage 3. However, a preliminary assessment of the elevations considered a risk is detailed within the section below. In accordance with the BR 187 methodology, the largest compartment in each case has been assumed to be radiating heat.

7.1.1 Residential Apartments

- Based on an enclosing rectangle 18m x 3m (54m²), a separation distance of 4.0m to the notional/relevant boundary is required. This is based on 100% unprotected area, which is highly conservative. However, as each apartment will be sprinklered it is recognised that the intensity and extent of the fire will be reduced. On this basis, the required separation distance may be halved (2.0m). For the majority of the apartments this distance is achieved so there is considered little risk of external fire spread.
- It is understood that a hotel is to be constructed within close proximity of Block C. The majority of this façade will require fire rated construction where directly adjacent to the hotel. A detailed external fire spread assessment will be conducted and will be coordinated a part of the hotel works.

7.1.2 Retail Units

- Retail Unit 1 (Block A) – This façade is adjacent to Queen's walk, and has a separation distance of 7.0m to the nearest site boundary. This elevation has an actual radiating area of 10.9m x 4m (43.6m²). Therefore, this equates to an enclosing rectangle 12m x 6m (72m²), which is permitted 70% unprotected area (50.4m²). Therefore, the risk of external fire spread is considered low, no fire rating is required to this façade.
- Retail Unit 2 (Block B) – This façade is adjacent to Dusseldorf Way, and has a separation distance of 7.2m to the nearest site boundary. This elevation has an actual radiating area of 20.0m x 4m (80m²). Therefore, this equates to an enclosing rectangle 21m x 6m (126m²). Therefore, 52% of this elevation, or 65.5m² of unprotected area is permitted to this elevation.
- Retail Unit 3 (Block B) – This façade is adjacent to Dusseldorf Way, and has a separation distance of 7.5m to the nearest site boundary. This elevation has an actual radiating area of 18m x 4m (72m²). Therefore, this equates to an enclosing rectangle 18m x 6m (108m²). Therefore, 60% of this elevation or 64.8m² of unprotected area is permitted to this elevation.
- Retail Unit 4 (Block C) – This façade is adjacent to Dusseldorf Way, and has a separation distance of 11.1m to the nearest site boundary. This elevation has an actual radiating area of 13.1m x 4m (52.4m²). Therefore, this equates to an enclosing rectangle 15m x 6m (144m²). Therefore, the risk of external fire spread is considered low, no fire rating is required to this façade.

8. Access and Facilities for the Fire Service

8.1 Residential Accommodation

8.1.1 Fire Fighting Shafts

Buildings in excess of 18m in height should be provided with firefighting shafts. The components of the shaft will be as follows:

- **Ventilated fire-fighting stairs:** Stairs will be provided with a 1.0m² AOV at the head of the stair.
- **Ventilated common corridor:** A smoke shaft with an AOV serving each stair at every floor level.
- **Fire-fighting lift:** Constructed to BS EN 81-72 and not more than 7.5m away from the stair it serves.

8.1.2 Rising Mains

Rising main outlets should be located on every residential floor level, to allow every part of every dwelling to be reached within the 60m hose distance (on a route suitable for laying hose). For blocks exceeding 50m in height, wet rising mains should be provided.

8.2 Retail Accommodation

As the total floor area of these elements of the building is between less than 2,000m² vehicle access is required to 15% of the building perimeter, for a pump appliance.

8.3 Vehicle Access

Any access route for fire service vehicles should satisfy the following specification:

- Minimum width of road between kerbs – 3.7m.
- Minimum width of gateways – 3.1m.
- Minimum turning circle between kerbs – 16.8m.
- Minimum turning circle between walls – 19.2m.
- Minimum clearance height – 3.7m
- Minimum carrying capacity – 12.5 tonnes.

Vehicle access should be provided to within 18m of each riser inlet connection point, as well as the wet riser tank top up point.

8.4 Fire Hydrants

If existing hydrants are present within the site of the development they should be within 100m of the dry rising main inlets and wet rising main top up point. In the event that existing hydrant are not available, then a hydrant should be provided within 90m of the inlets and not more the 90m apart.



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