PART B

RIBA 2 CONCEPT DESIGN REPORT

SHELDON HOUSE

TEDDINGTON

RHP Developments Limited

Design | Analyse | Assure

Quality Control

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Table of Contents

1 Introduction

1.1 General

PartB Group Ltd. has been appointed by RHP Developments Limited, to advise this fire strategy at RIBA Stage 2, concept design, for Sheldon House, Cromwell Road, Teddington, TW11 9EJ. The proposal for this building is a new building apartment block. This report is based on information provided by RHP Developments Limited.

This report is based on recommendations from the fire safety guidance documents which are listed in Section 2 below. Insurers requirements are not commented on unless speciffcally described in this report.

The fire safety aspects of the design are highlighted, providing a concept fire safety strategy supproting the Building Regulations Part B application for the scheme.

The assessment consists of the following:

- B1 - Means or Warning and Escape
- B2 - Internal Fire Spread (linings)
- B3- Internal Fire Spread (structure)
- B4 - External Fire Spread
- B5 - Access and Facilites for the Fire Service

Where the design deviates from the recommendations contained within the guidance, fire engineering prinicples have been applied to bring the design in line with the functional requirements of the Building Regulations.

This fire strategy report is primarily concerned with life safety; however inherent property protection will be provided from some of the life safety provisoins, such as compartmentation.

1.2 Limitations of Report

The fire safety strategy is based on information provided by RHP Developments Limited. Under no circumstances is liability accpeted for the accuracy of such information. PartB Group have not carried out any visual inspections of this site.

Table 1: References

	Document/Plans No.	Revision	Prodcued by	Date
Location Plan	SH-01	/	Clive Chapman Architects	25/08/2021
Site Layout & Roof Plan	SH-02	/	Clive Chapman Architects	16/03/2022

Site Layout & Ground Floor Plan	SH-03	/	Clive Chapman Architects	16/03/2022
Contextual Elevations & Section	SH-04	/	Clive Chapman Architects	16/05/2022
Floor Plans & Roof Plan	SH-06	/	Clive Chapman Architects	28/02/2022
Block Elevations	SH-07	/	Clive Chapman Architects	20/04/2022

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 above.

To demonstrate compliance with functional Requirements B1 to B5, it is typical to base the design on standard fire safety design documents. Variations to the guidance given in those documents is permitted if it can be demonstrated and/or justified to have still met the functional requirements B1-B5.

As the building is not a high-risk residential building, the changes introduced in the building (Amendment) Regulations 2018, for buildings classified as "relevant buildings", Regulation 7(2) (and other modified Regulations) do not apply. However, consideration will be given to the potential of external fire spread.

This report has based the fire safety design of the building on the guidance contained in Approved Document B Volume 1: Dwellings- 2019 edition; incorporating 2020 amendments –for use in England (herein ADB).

In circumstances where the building design diverges from the guidance in that document, which has been highlighted and justified in this report.

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

2.2 Regulatory Reform (Fire Safety) Order 2005

Once occupied, the building will be subject to the provisions of Regulatory Reform (Fire Safety) Order (herein FSO). It is necessary for the Responsible Person to arrange for a fire risk assessment to be carried out by a competent person. The FSO has been amended by the Fire Safety Act 2021. In the case of multi-occupied residential buildings, the Fire Safety Act puts beyond doubt that structure, external walls and flat entrance doors fall within the scope of the Fire Safety Order. The Fire Safety Act will require Responsible Persons to ensure that these elements are included in their fire risk assessments, if they have not been covered already.

The building's management will be responsible under the FSO to ensure that the building's fire safety provisions are appropriately managed, maintained and tested over the building's lifetime.

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

2.3 Construction (Design and Management) Regulations 2015

This report outlines the fire safety strategy for complying with the functional and performance requirements of the Building Regulations Part B (Fire Safety) in the finished building. Where any

conclusions or recommendations specific materials, products or forms of construction, these will need to be assessed during the design process, in accordance with the CDM Regulation 9 (Duties for Designers).

In the event that these involve significant residual risks or health and safety critical assumptions, this information will be made available to the Principal Designer. Where the architect or other consultants use the standards put forward in this report to specify works, they need to be competent in alerting the Client, Principal Designer, Contractor, and Building Occupiers of CDM issues.

2.4 Regulation 38

The person carrying out the work shall give fire safety information to the responsible person not later than the date of completion of the work, or the date of occupation of the building or extension, whichever is the earlier. The intention of this regulation is to ensure that the person responsible for the building has sufficient and suitable information relating to fire safety to allow them to manage the building effectively. This should enable person responsible for the building to understand and implement the fire safety strategy of the building, maintain any fire safety system provided in the building and to carry out an effective fire risk assessment.

An as-built plan of the building should be provided showing all the following:

- Escape routes – this should include exit capacity i.e., the maximum allowable number of people, where applicable, for each storey and for the building.
- The provision enabling the evacuation of disabled people.
- Location of fire-separating elements, including cavity barriers.
- Fire doorsets, fire doorsets fitted with a self-closing device and other doors equipped with relevant hardware.
- Locations of fire and/or smoke detector heads, alarm call points, detection/alarm control boxes, alarm sounders, fire safety signage, emergency lighting, fire extinguishers, dry or wet firemains and other firefighting equipment, and hydrants outside the building.
- Any smoke control systems, or ventilation systems with a smoke control function, including mode of operation and control systems.
- Any high-risk areas such as places of special fire hazard.

Details should also be given of all of the specifications of fire safety equipment provided, including routine maintenance schedules and any assumptions regarding the management of the building underpinning the design of the fire safety arrangements.

3 Building Overview

3.1 General

The building known as 1-9 Sheldon House will be a new build, five storey residential development consisting of a total of 27 units. The building will consist of a mix of flat types to include for a range of needs and abilities across the population. A total of three wheelchair accessible units will be provided at ground floor level along with a mix of studios, one-bed, two-bed and three-bed single level apartments provided at the upper floor levels. There is presently a residential building at this site, however it is to be demolished in order to erect this new block of flats

Access will be provided by a single stair to the building. Firefighting operations will be carried out internally using the means of escape communal stairs and corridors. This may be supplemented by handheld firefighting jets from external ground floor level if required

A railway line is provided approximately 40 metres to the rear of the building behind the communal garden. No buildings are directly adjacent to the proposed new build with the closest existing building a single storey garage to the southeast side of the building approximately 1.95 metres away.

Figure 1: Proposed site layout and ground floor plan of Sheldon House (Source: Clive Chapman Architects Drawing SH-03)

3.2 Building Height

Although dimensions have not been set in terms of floor levels, the building height has been measured from the outside ground floor level to the approximate location of the top floor level.

The height of the building from outside ground floor level to the top floor is anticipated to be approximately 12.3 metres.

Figure 2: Sketch of the Front Elevation (Source: Clive Chapman Architects Drawing SH-07)

3.3 Design Approach

The residential development is to be designed in accordance with guidance in ADB. In a building containing flats, a defend in place/ stay put approach is the normal method for safeguarding residents. In case of fire only the people in the flat directly affected will need to leave the building. Extensive fire compartmentation and material control means that people in other flats should not be directly at risk while the fire service control the fire service. In this case however, a suitable means of escape is needed to be in place so that anyone may leave the premises should they feel at risk, or if asked to do so by the fire service. The building has a means of escape stair linked by fire protected corridors so that anyone who feels at risk can leave the building. An independent fire alarm and detection system is installed into each flat. In a building such as this where the evacuation approach is defended in place, there is no requirement for a communal fire alarm and detection system.

The general layout of this development most closely resembles guidance set out in paragraph 3.27 and diagram 3.7 of ADB for a block of flats served by one common stair. Given the layout and nature of the staircase, the escape route will be protected by the appropriate fire separation and fire resisting lobbies in each apartment. There are also two communal lobbies protecting the staircase at each floor from first to fourth floor levels. The ground floor also has a communal lobby protecting the stair from the apartments, with the rest of the ground floor being used for ancillary purposes. This will provide adequate protection in line with guidance in ADB. There will be automatic smoke ventilation provided into the staircase.

3.4 Fire Strategy Plans

Floor plans have been annotated in order to reflect the following elements of the fire strategy for ease of reference: compartment wall lines, protected lobbies and the location of fire doors.

The fire strategy plans are contained in Appendix A at the end of this report. As a RIBA Stage 2 report, these are initial high-level recommendations and will need to be developed through the design process into detailed design to meet the functional requirements of the Building Regulations.

4 B1 - Means of Escape and Warning

4.1 Functional Requirement

The building shall be designed and constructed so that there are appropriate provisions for the early warning of fire, and appropriate means of escape in case of fire from the building to a place of safety outside the building capable of being safely and effectively used at material times.

4.2 Means of Warning

A Grade D2 Category LD3 (or better) within the apartments in accordance with BS 5839-6.

As this building is likely to operate under a defend in place evacuation strategy, no communal alarm system within the common stair core. The only fire detection in the communal areas will be smoke detectors that activate the smoke control system. There is no requirement for any call points or fire alarm sounders in these areas. The smoke detectors are intended to act as switches for the smoke control system only.

4.3 Building Occupancy Load

The purpose group that this report is based on is Purpose Group 1(a) Flat. It has been confirmed by the client that for this building, 70 people will be distributed across the five floor levels.

4.4 Evacuation Strategy

The evacuation strategy for the building is based on a defend in place evacuation approach. In case of a fire, the only people who are expected to leave the building, are those who inhabit the flat containing the fire. Other occupants should be protected by high level compartmentation measures and smoke control which means that they should remain safe whilst the fire is extinguished. Activation of a detector within a single flat will initiate sounders in that flat only evacuating the flat entirely.

4.5 Internal Flat Layouts

As this is a block of flats with storeys more than 4.5m above ground level, section 3.18 of ADB allows a maximum distance from any point in a flat to its entrance or protected lobby to be limited to 9.0 metres. The maximum travel distance in a protected lobby should also be restricted to no more than 9.0 metres. Diagram 3.2 from ADB (seen below as Figure 3) shows guidance on a flat where all habitable rooms have direct access to an entrance hall.

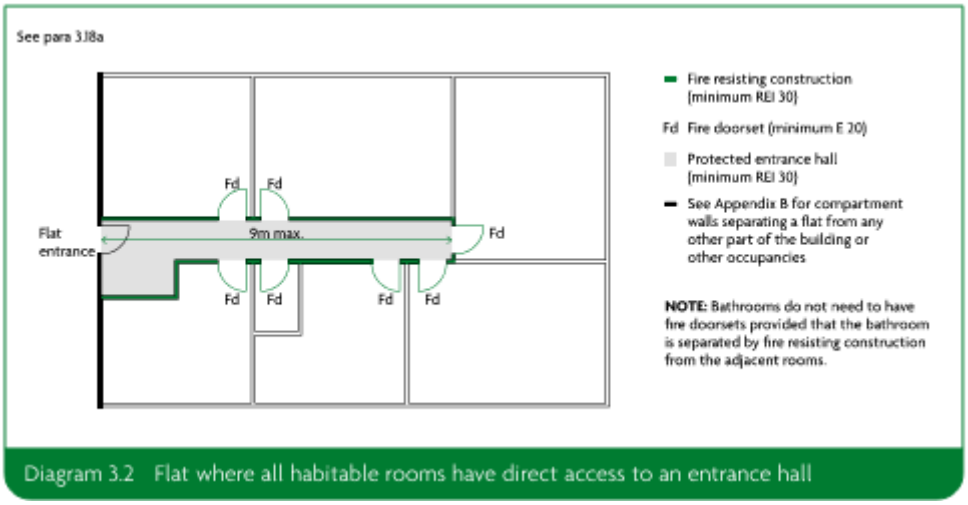


Figure 3: Flat where all habitable rooms have direct access to an entrance hall

Based on drawings provided, all flats have a travel distance complaint with that stated in ADB. It is less than 7.5 metres from flat entrance doors to the stair. Additionally, there is a provision of less than 9 metres travel distance in every flat within the protected hallway in apartments from the furthest away room door to the flat entrance door.

4.6 Common Corridors/Layouts

A person who is escaping through a common area, should be able to turn away from a fire and make an escape via an alternative exit, if they are confronted by a fire.

From the flat entrance door, a single escape route is acceptable in a building such as this so long as the following condition applies.

The flat on a storey served by a single common stair and both of the following apply:

a) Every flat is separated from the common stair by a protected lobby or common protected corridor
b) The maximum travel distance for escape in one direction only is not exceeded, which can be seen below.
    a. Escape in one direction only - 7.5 metres
    b. Escape in more than one direction - 30 metres

Diagram 3.7 from ADB (Figure 4) shows a guide on the layout of a common stair which would be appropriate for this building. Diagram "a" will be used for guidance.

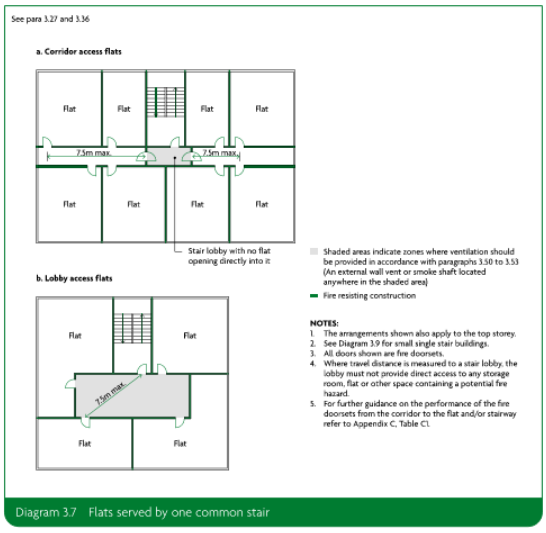


Figure 4: Flats served by one common stair (Source: ADB)

With regards to this building:

Every flat is separated from the common stair by a protected lobby

The maximum travel distance requirement of 7.5 metres is not exceeded, as the flats open into a protected lobby before the stair, which leads to the ground floor and offers two means of escape.

4.7 Number of Escape Routes

In the event of a fire within the building, occupants should be provided with an adequate provision of exits in order to ensure a swift and prompt evacuation of the building before the escape routes become inhabitable by the various effects of smoke and flames. Considering the potential factors of this building, including its height, the escape route proposed by the stair is deemed to be acceptable.

Additionally there is an evacuation lift provided serving all floors which can be used in the event of an emergency, which discharges 5.26 metres from the final exit.

4.8 Escape Route Widths

In residential buildings, a stair of acceptable width for everyday use will be sufficient for escape purposes. The width is the clear width between the walls of balustrades. Any handrails and strings intruding into that width by a maximum of 100mm on each side may be ignored.

The staircase within this building has been measured to be 1100mm wide. This stair is not considered to be a dedicated firefighting stair, but rather a stair which provides firefighting access. This stair is adequate for the means of escape purposes for defend in place. All door widths onto the escape routes are measured to be approximately 1000mm in width and are acceptable.

4.9 Door Opening Directions

Where an exit is proposed to serve more than 60 people for escape purposes, it should be arranged so that the door is to open in the direction of the escape. There are no instances where outward facing doors are essential for any area of this building.

4.10 Accessible Means of Escape, Inclusive Design

Within the fire safety aspects of the Building Regulations, a reasonable standard of health and safety for people in and around buildings should be achieved. All persons, regardless of the physical ability, age, gender, or other characteristics should be able to use and access a building as well as its facilities. The fire safety measures which are implemented into a building should take account of the needs of anyone who may be in the building, in this case either as visitors or as occupants.

At the time of writing, there is an ongoing consulting process in order to help provide practical advice on this matter. This includes the process known as the Emergency Evacuation Information Sharing (EEIS+). As the design develops, it will be more necessary to understand the likely nature of any resident's ability to self-evacuate and the management response available on site, if there is any. This will enable an appropriate process to be implemented.

On the ground floor of the development there are three dedicated wheelchair apartments, which are to be constructed slightly differently to other flats within the development in order to accommodate those in wheelchairs, with larger lobbies and turning spaces within the flats.

Additionally for any persons who may be less physically abled but not be located on the ground floor, there is a proposed evacuation lift within the building, which they may use during an incident within the building.

4.11 Vertical Means of Escape Protected Stairways

This building is provided with a protected staircase. This staircase will be protected in order to provide 60 minutes fire separation from the flats. The staircase runs from the ground floor, through to the fourth floor, serving all flats in the process. The main escape route from this staircase discharges into open air onto Cromwell Road or Fairfax Road. Should the occupants need to use the alternative escape route, they must turn at the bottom of the stair and escape to the rear of the building.

4.12 Smoke Ventilation System

The protected stair will be provided with a $1m^2$ Automatic Opening Vent (AOV) at the head of the stair. This vent is to be designed and installed in accordance with the guidance set out in BS EN 12101-1:2017. This vent should open automatically upon the activation of a site wide fire alarm. There should be an override switch installed for use by the Fire and Rescue Service.

The corridor or lobby next to each stair will have a smoke vent.

Smoke vents will discharge into a vertical smoke shaft, closed at the base, that meets all of the following criteria.

- The shaft should conform to the following conditions. Have a minimum cross-sectional area of 1.5m2 (minimum dimension 0.85m in any direction).
- Open at roof level, minimum 0.5m above any surrounding structures within 2m of it horizontally.
- Extend a minimum of 2.5m above the ceiling of the highest storey served by the shaft.
-
- The free area of all the following vents should be a minimum of 1m ² in the following places. From the corridor or lobby into the shaft.
    - At the opening at the head of the shaft.
    - At all internal locations within the shaft (e.g. safety grilles).

- The smoke shaft should be constructed from a class A1 material. All vents should either be a smoke leakage (Sa) rated fire doorset (see Appendix C, Table C1, item 2.e for minimum fire resistance) or fitted with a smoke control damper achieving the same period of fire resistance and designed to operate as described below. The shaft should be vertical from base to head, with a maximum of 4m at a maximum inclined angle of 30 degrees.
- If smoke is detected in the common corridor or lobby, both of the following should occur. Simultaneous opening of vents on the storey where the fire is located, at the top of the smoke shaft and to the stair.
- Vents from the corridors or lobbies on all other storeys should remain closed, even if smoke is subsequently detected on storeys other than where the fire is located.

4.13 Emergency Lighting & Escape Route Signage

All escape routes should be provided with adequate artificial lighting. Should the mains electricity power supply fail, then escape lighting should illuminate the route, including external escape routes. Escape stair lighting should be installed onto a separate circuit from the main electricity supply for the building. Escape lighting should conform to BS 5266-1:2016.

Every doorway or exit which provides access to a means of escape, other than exits in ordinary use, as in a main entrance, should be distinctively marked by an exit sign in accordance with guidance in BS ISO 3864-1 and BS 5499-4.

In order to assist the fire service to identify each floor in a block of flats with a top storey more than 11 metres above ground level, floor identification signs and flat indicator signs should be provided.

The floor identification signs should meet the following conditions:

a) The signs should be located on every landing of a protected stairway
b) The text should be in sans serif typeface with a letter height of at least 50mm. The height of the numeral that designates the floor number should be at least 75mm
c) The signs should be visible from the top step of a firefighting stair
d) The signs should be mounted between 1.7 metres and 2 metres above floor level and as far as practicable all the signs should be mounted at the same height throughout the building

e) The text should be on a contrasting background, easily legible and readable in low level lighting conditions

The wording used on each floor identification sign should take the form of Floor X, with X designating the number of the storey, as intended for reference by residents. The floor number designations should meet the following conditions:

a) The floor closest to the mean ground level should be designated as either Floor 0 or Ground Floor
b) Each floor above the ground floor should be number sequentially beginning with Floor 1
c) A lower ground floor should be designated as either Floor -1 or Lower Ground Floor
d) Each floor below the ground floor should be numbered sequentially beginning with Floor -1 or Basement 1

All floor identification signs should be supplemented by flat indicator signs which provide information relating to the flats accessed on each storey. The flat indicator signs should meet the following conditions:

a) The signs should be sited immediately below the floor identification signs such that the top edge of the sign is no more than 50mm below the bottom edge of the floor identification sign
b) The wording should take the form Flats X-Y with the lowest flat number first
c) The text should be in sans serif typeface with a letter height of at least half that of the floor indicator sign
d) The wording should be supplemented by arrows when flats are in more than one direction
e) The text and arrows should be on a contrasting background easily legible and readable in low level lighting conditions

Every doorway or other exit providing access to a means of escape, other than exits in ordinary use (e.g. main entrances) should be distinctively and conspicuously marked by an exit sign in accordance with BS 5499-4. For this reason, a block of flats with a single stair in regular use would not usually require any fire exit signage, such would be the case in this building. However, whilst not required in order to comply with the guidance of ADB, it is still recommended that fire exit signage is installed into this building in order to aid the escape of the occupants.

5 B2 - Internal Fire Spread (Linings)

5.1 Functional Requirement

(1) To inhibit the spread of fire within the building, the internal linings shall-

a) Adequately resist the spread of flame over their surfaces; and
b) Have, if ignited, either a rate of heat release or rate of fire growth, which is reasonable in the circumstances

(2) In this paragraph "internal linings" means the materials or prodcuts used in lining any partition, wall, ceiling, or other internal structure.

5.2 General

In the event of a fire, although unlikely to be the first materials to ignite, wall and ceiling linings within any given room may have a significant impact on how fast a fire may spread throughout a building. This affect the time it takes form the room to become completely involved in fire, the levels of heat and the volume of smoke and hot gases that are allowed to build up. All surface finishes and floor covering materials should resist flame spread over their surfaces and, when ignited, any heat release or propagation of the fire is limited.

5.3 Material Classification (Wall and Ceilings)

Table 4.1 of ADB (seen below as Table 2) shows the surface linings of walls and ceilings which certain locations of buildings should meet and as is follows:

Table 2: Classification of Linings

Location	Classification
Small Rooms of maximum internal floor area of 4m^2	D-s3, d2
Garages (as part of a dwellinghouse) of maximum internal floor area of 40m^2	
Other rooms (inc. garages)	C-s3, d2
Circulation spaces within a dwelling	
Other circulation spaces (including the common areas of blocks of flats	B-s3, d2

For the purposes of this requirement, a wall includes both of the following:

- The internal surface of internal and external glazing
- Any part of a ceiling which slopes at an angle greater than 70 degrees to the horizontal

For the purposes of this requirement, a wall does not include any of the following:

- Doors and door frames
- Window frames and frames in which glazing is fitted
- Architraves, cover moulds, picture rails, skirtings and similar narrow members
- Fireplace surrounds, mantle shelves and fitted furniture

Parts of walls in rooms may be of lower performance than stated in the table above, but no worse than class D-s3, d2. In any one room, the total area of lower performance wall lining should be less than an area equivalent to half of the rooms floor area up to a maximum of 20m^2 of wall lining.

For the purposes of this requirement, a ceiling includes all of the following:

- Glazed surfaces
- Any part of a wall at 70 degrees or less to the horizontal
- The underside of a gallery
- The underside of a roof exposed to the room below

For the purposes of this requirement, a ceiling does not include any of the following:

- Trap doors and their frames
- The frames of windows or roof lights and frames in which glazing is fitted
- Architraves, cover moulds, picture rails, exposed beams and similar narrow members

Per these requirements all the flats within this dwelling are required to have linings with classification C-s3, d2, whilst the common stair within the building is required to be lined with materials of classification B-s3, d2.

6 B3 - Internal Fire Spread (Structure)

6.1 Functional Requirement

(1) The building shall be designed and constructed so that, in the even of a fire, its stability will be maintained for a reasonable period

(2) A wall common to two or more buildings shall be designed and constructed so that it adequately resists the spread of fire between those buildings

For the purposes of this subparagraph a house in a terrace and a semi-detached house are each to be treated as a sperate building.

(3) Where reasonably necessary to inhibit the spread of fire within the building, measures shall be taken, to an extent appropriate to the size and intended use of the building, comprising either or both of the following-

a) Subdivision of the building with fire resisting construction
b) Installation of suitable automatic fire suppression systems

(4) The building shall be designed and constructed so that the unseen spread of fire and smoke within concealed spaces in its structure and fabric is inhibited.

6.2 General

It is important that the loadbearing elements of structure of the building survive for defined periods during a fire incident, to withstand the effects of fire without loss of stability.

Fire should be contained by resisting construction elements in order to prevent the fire spreading to different parts of the building. Unseen spread of fire and smoke within cavities and voids should be inhibited in order to reduce the risk of structural failure and spread of fire and smoke.

6.3 Sprinkler provision

Blocks of flats with a top storey more than 11m above ground level (see Diagram D6) should be fitted with a sprinkler system throughout the building in accordance with Appendix E. Sprinklers should be provided within the individual flats, they do not need to be provided in the common areas such as stairs, corridors or landings when these areas are fire sterile. The sprinkler system design should meet the requirements of BS 9251.

6.4 Structural Fire Resistance

In order to comply with requirements of ADB, where the highest occupied floor level is more than 11 metres and less than 18 metres above ground level, the structural fire resistance requirements for load bearing elements is 60 minutes provided that the building is fitted with a sprinkler system.

6.5 Compartmentation

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

This applies to the following from Table B3 of ADB (which can be seen below as Table 3:)

Table 3: Specific provisions of the test for fire resistance of elements of structure etc.

Type	Load-bearing capacity, Integrity and Insulation (REI)?	Exposed Side
Load-bearing walls	Load-bearing capacity, Integrity and Insulation (REI)	Each Side Separately
Non-load-bearing walls and partitions	Integrity and Insulation (EI)	Each Side Separately
Fire Doors	Integrity Only (E)	Each Side Separately
Compartment Floors	Load-bearing capacity, Integrity and Insulation (REI)	From the underside only
External Walls-any part of a minimum of 1000mm from the relevant boundary	Load-bearing capacity, Integrity and Insulation (REI)	From inside the building

The key elements of compartmentation and the relevant fire performance are summarised below in Table 4

Table 4: Specific Provisions of the test for fire resistance of elements of structure etc.

Element	Minimum provisions when tested to the relevant European standard (minutes)
All load bearing elements within basement	60
Compartment Floors	60
All loadbearing elements	60
Walls separating flats from communal corridor	60
Enclosure of Stair	60
Enclosure of Riser	60
Walls enclosing plant rooms	60
Refuse Storage areas	60
External Walls	60

6.6 Fire Doors

Fire doors (with smoke seals and fire resistance as appropriate) should be located in various locations as follows:

All flat doors which separate the flats from the common circulation spaces, the minimum fire resistance of the door in terms of integrity (in minutes) when tested to BS EN 13501-2 should be E30 Sa(2).

For all doors which form part of the enclosure to a protected entrance hall and/or protected landing in a flat, the minimum fire resistance of the door in terms of integrity should be E20.

When an exit is to serve more than 60 people for escape purposes, it should be designed so that it should open in the direction of escape. Within a building such as this, with its limited occupant capacity, outward facing doors are not required at any part of the building.

6.7 Concealed Spaces

Concealed spaces and cavities in the construction of the building provide a ready route for smoke and flame spread, especially in voids above and below ceilings or floors.

They should be provided to:

- Divide cavities
- Sub Divide extensive cavities (e.g., Ceiling Voids)
- Block pathways around fire resisting elements which might allow unseen fire spread

The fire resisting structures forming compartment walls or protected escape routes should be carried to full storey height or the underside of the roof. This is shown in Diagram 8.1 of ADB (which can be seen below as Table 3:). For cavities above the fire resisting construction in protected escape routes, enclosed on the lower side by a fire resisting ceiling (minimum EI 30) that extends throughout the building, compartment or separated part may be acceptable.

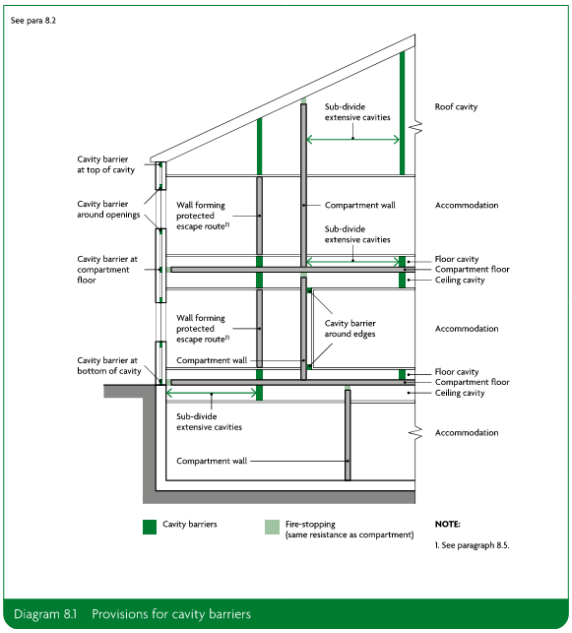


Figure 5: Provisions for cavity barriers

6.8 Cavity Barriers

If any of the external walls have cavities, cavity barriers should be provided in line with any locations where fire rated walls or floor meet the wall. Cavity barriers should also be provided around all openings in the external walls, such as windows, doors, and service penetrations and at the top and bottom of the cavity. Cavity closers may be sufficient in a traditional double skinned brick wall.

Cavity barriers should achieve a fire resistance of at least 30 minutes for integrity and 15 minutes for insulation. Alternatively, if located in a stud wall or partition, or provided around openings in the external wall, they may be formed of:

- Steel a minimum of 0.5mm thick
- Timber a minimum of 38mm thick
- Polythene-sleeved mineral wool, or mineral wool slab, under compression when installed in the cavity
- Calcium silicate, cement based or gypsum-based boards, a minimum of 12mm thick.

Any fire stopping which is chosen for use in this building must be chosen with care for its intended use. If there is any doubt surrounding the fire stopping to be used, then a proprietary

option should be preferred. Different materials suit different situations and not all are suitable in every situation.

7 B4 - External Fire Spread

7.1 Functional Requirement

(1) The external walls of the building shall adequately resist the spread of fire over the walls and from one building to another, having regard to the height, use and position of the building

(2) The roof of the building shall adequately resist the spread of fire over the roof and from one building to another, having regard to the use and position of the building

7.2 External Fire Spread

The external wall should not provide a medium for fire spread if that is likely to be a risk to the health and safety of the occupants.

It is unknown at this time what the construction of the walls at Sheldon House will be. However as this building is over 11 metres in height there is a restriction on the material classification which can be used at is set out in Table 10.1 of ADB (seen below as Table 5)

Table 5: Reaction to fire performance of external surface of walls

Building Type	Building Height	Less than 1000mm from the relevant boundary	1000mm or more from the relevant boundary
All residential purpose groups	More than 11m	Class A2-s1, d0 or better	Class A2-s1, d0 or better

The restrictions on the fire performance of external surface of walls should not present a high risk to occupants of the building.

7.3 Balconies

In buildings that include a "residential" purpose with a storey 11 metres or more in height, balconies should meet either of the following conditions.

a) Only contain materials achieving class A1 or A2-s1, d0 except for any of the following:
   i. Cavity trays when used between two leaves of masonry
   ii. Intumescent and fire stopping materials where the inclusion of the materials is necessary to meet the requirements of Part B of Schedule 1 to the Building Regulations 2010.
   iii. Membranes
   iv. Seals, gaskets, fixings, sealants and backer rods.

v. Thermal break materials where the inclusion of the materials is necessary to meet the thermal bridging requirements of Part L of Schedule 1 to the Building Regulations 2010.
vi. Any material achieving class A1fl or A2fl-s1 when it forms the top horizontal floor layer of a balcony and is provided with an imperforate substrate under it which extends to the full size of the class A1fl or A2fl-s1 material.
vii. Electrical installations
viii. Fibre optic cables.

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

Each flat within this building has its own independent balcony, all of which must conform to the guidance within ADB, regarding levels of combustibility in their construction. This also applies to the recessed fourth floor level. As the floor area of this floor is less than that of the floors below it, there is space remaining for a terrace level surrounding the floor. The provision for balconies also apply for this terrace.

7.4 Unprotected Areas

During a fire, heat will radiate through non fire resisting openings in the external walls of the building. This heat transfer can be significant, such that the heat radiation through the unprotected openings is sufficient to set adjacent building on fire. To reduce the possibility of this happening, it may be necessary to restrict areas on external elevations.

For external walls more than 1 metre from the boundary, the guidance found in 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. This approach assumed that a full flashover fire throughout the compartment has occurred, and that radiation is emitted from all unprotected openings in the compartment. 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.

The aim of calculating building separation distances is to ensure that ignition of a building adjacent to a fire is delayed sufficiently to allow the fire and rescue service to arrive and act upon the fire. The method used for calculating these distances for each elevation is as follows:

i. Calculate the size of the compartment
ii. Determine the size of the enclosing rectangle
iii. Calculate the area of the enclosing rectangle
iv. Measure the distance to boundary on the site plan
v. Determine the permitted unprotected area from tables for calculations in document BR 187

vi. Assess what the unprotected area of the façade is
vii. Determine if the proposal is acceptable

To calculate the amount of unprotected are allowed for each elevation, the worst-case scenario is to be carried out. This is the largest compartment, in this case, one of the flats on each elevation. The method used to calculate the allowable unprotected area is the BR 187 enclosing rectangle method which is recommended within ADB.

The presence of a suppression system within a building will not impact the response of the building exterior to thermal radiation from an adjacent building. However, if the unprotected areas on the exposed face of the building fail, then sprinklers will be able to control the spread of fire into the compartment.

National building regulation guidance permits the reduction of the boundary distance if a building has a suppression system. This assumes that the probability of a successful sprinkler operation (maximum of 95% from BS PD 7974-7, Table A 17(44)) and thereby the probability of preventing building to building fire spread is acceptable.

The assumptions used for calculations are:

- The whole façade of the compartment is considered to be unprotected
- The worst-case scenario (biggest compartment) has been considered for each elevation
- A successful sprinkler operation

The reduction of the required boundary distance will be double the length of the original boundary distance and can be seen in the following series of calculations.

Figure 6 below shows the boundary distances from each façade of the building.

Figure 6: Distances to Boundaries from each facade

Northeast - 10.5 metres

Northwest - 5.6 metres

Southwest - 15.5 metres

Southeast - 1.7 metres

Northeast Elevation

No elevation was provided so the calculations below are based on the information provided.

Size of compartment - 2.48m high x 8.80m wide

Size of enclosing rectangle - 3m high x 9m wide

Area of enclosing rectangle - 27m^2

Distance to boundary (With Sprinklers) - 21.0m

Permitted unprotected area for a 3m high x 9m wide with a distance of 21.0m to boundary (residential) - 100% unprotected area

Unprotected area - Assumed to be 100%

Is this acceptable as proposed? - Yes

Northwest Elevation

No elevation was provided so the calculations below are based on the information provided.

Size of compartment - 2.48m high x 6.75m wide

Size of enclosing rectangle - 3m high x 9m wide

Area of enclosing rectangle - 27m^2

Distance to boundary (With Sprinklers) - 11.2m

Permitted unprotected area for a 3m high x 9m wide with a distance of 11.2m to boundary (residential) - 100% unprotected area

Unprotected area - Assumed to be 100%

Is this acceptable as proposed? - Yes

Southwest Elevation

No elevation was provided so the calculations below are based on the information provided.

Size of compartment - Size of compartment - 2.48m high x 4.62m wide

Size of enclosing rectangle - 3m high x 6m wide

Area of enclosing rectangle - 18m^2

Distance to boundary - 31.0m

Permitted unprotected area for a 3m high x 6m wide with a distance of 31.0m to boundary (residential) - 100% unprotected area

Unprotected area - Assumed to be 100%

Is this acceptable as proposed? - Yes

FIRST FLOOR PLAN

Southeast Elevation

The southeast elevation is the main concern for external flame spread as there is a single level garage adjacent to the site boundary. No elevation was provided so the calculations below are based on the information provided.

Size of compartment - 2.48m high x 7m wide

Size of enclosing rectangle - 3m high x 9m wide

Area of enclosing rectangle - 27m^2

Distance to boundary - 3.4m

Permitted unprotected area for a 3m high x 9m wide with a distance of 3.4m to boundary (residential) - 95% unprotected area

Unprotected area - only windows assumed to be unprotected - 23.22% ((1.90 x 2.48) + (0.879 x 2.48) = 6.92m^2. 6.92/27 x 100 = 23.22 %)

Is this acceptable as proposed? Yes

FOURTH FLOOR PLAN

7.5 Roof Coverings

There is a risk of fire spreading into a building from fire in an adjacent building via falling embers within the fire plume, or by passing through the party wall at ceiling level. This therefore requires any roofs to have an appropriate resistance to ignition. This is assessed on the performance of the roof covering to external fire exposure in terms of penetration through the roof construction and spread of flame across its surface.

Roof constructions are classified within as BROOF(t4), CROOF(t4), DROOF(t4), EROOF(t4) or FROOF(t4) in accordance with BS EN 13501-5:2016, where BROOF(t4) refers to the highest performance level and FROOF(t4) refers to the lowest performance.

BS EN 13501-5 refers to four separate roof tests. The suffix (t4) refers to Test 4, which is used for the purposes of this design as stipulated in ADB.

Table 12.1 from ADB (seen below as Table 6) gives a guide on the limitations on roof coverings.

Table 6: Limitations on roof coverings

Designation of covering of roof or part of roof	Distance from any point on the relevant boundary			
	Less than 6m	At least 6m	At least 12m	At least 20m
BROOF(t4)	●	●	●	●
CROOF(t4)	○	●	●	●
DROOF(t4)	○	●	●	●
EROOF(t4)	○	●	●	●
FROOF(t4)	○	○	○	●

- Acceptable
- Not Acceptable

Polycarbonate and uPVC rooflights that achieve a class C-s3, d2 rating by test may be regarded as having a BROOF(t4) designation

Not Acceptable on the following buildings:

Dwelling houses in terraces of three or more dwellings

Any other buildings with a cubic capacity of more than 1500m^3

Acceptable on buildings not listed in (1) if both of the following apply.

Part of the roof has a maximum area of 3m2 and is a minimum of 1500mm from any similar part

The roof between the parts is covered with a material rated class A2-s3, d2 or better.

When used in rooflights, unwired glass of a minimum 4mm thick can be regarded as having a BROOF(t4) classification.

In addition, roof covering prodcuts (and/or materials) defined in Commission Decision 2000/553/EC of September 6th, 2000, implementing Council Directive 89/106EEC can be considered to fulfil all of the requirements for the performance characteristics of "external fire performance" without the need for testing.

The roof covering in this building to be designated B_{ROOF}(t4) in accordance with the guidance in Table 6

8 B5 - Access and Facilites for the Fire Service

8.1 Functional Requirement

(1) The building shall be designed and constructed so as to provide reasonable facilities to assist fire fighters in the protection of life

(2) Reasonable provision shall be made within the site of the building to enable fire appliance to gain access to the building.

8.2 Firefighting Access

The fire service arrangements have not been changed from the previous residential building that existed at this site. The existing access route has not been changed. The fire service will not be able to access all parts of the building within 45 metres from the pumping appliance parking station, as the furthest point away, based on drawings, is the living and dining area in Flat 23, which is approximately 75 metres from a vehicle which would be at the Car park just off Cromwell Road.

Whilst the hose laying distance within Sheldon House is over the allowance of ADB, document BS 9991:2015 allows a scenario where sprinklers are fitted in accordance with BS9251:2014 are fitted throughout a block of flats, then the distance between the fire and rescue service pumping appliance and any point within the house or flat may be up to 75 metres (in houses or flats having one floor more than 4.5 metres above ground level. As the design detail is defined, it is recommended that a dry rising main be installed into this building. As the hose laying distance is on the limit for what is acceptable, the provision of a rising main would help to better comply with guidance in ADB with regards to firefighting access.

Access to the inside of Sheldon House is provided via the escape route which enters from Car park just off Cromwell Road. and then continuing up the protected stair. Additionally, if required the fire service could enter the building using the alternative exit, but then still have to continue up the same flight of stairs.

100% of building perimeter accessible by foot by the fire and rescue service and their firefighting hose.

8.3 Firefighting Shafts

As the building is under 18 metres in height, there is no requirement for a firefighting shaft

8.4 Vehicle Access

The closest fire station to this building is the "Twickenham Fire Station" which is located approximately 1.4 miles away and would take an average of 6 minutes for the Fire and Rescue Service to arrive at the scene of an incident.

It is reasonable to assume, that coming from this direction, that an appliance would travel down Cromwell Road in order to attend an incident. Traffic flows in both ways on Cromwell Road so there is no requirement for an appliance to go one way or another when approaching the scene.

At the site, there is an appropriate provision of parking for an appliance. A fire service site plan can be seen shown below in Figure 7.

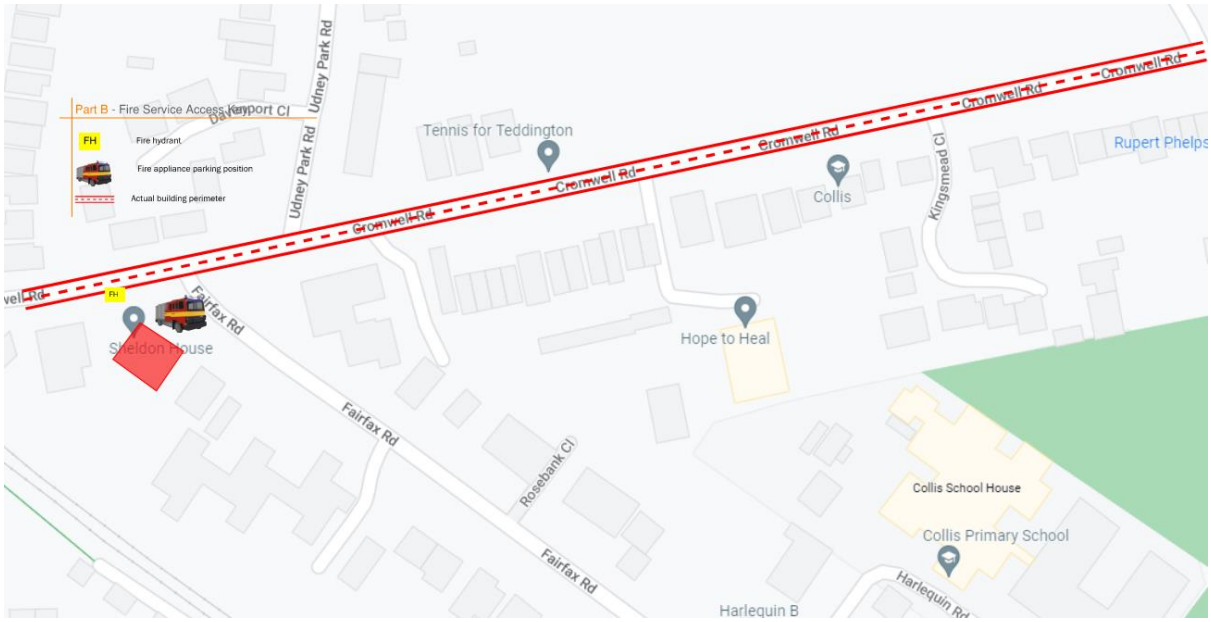


Figure 7: Fire Service Site Plan

8.5 Fire Hydrants

Public fire hydrants should be provided within 90 metres from the entrance of a building on a route which is suitable for hose laying.

This development relies on existing hydrants. Information provided from the Water Office confirms that the closest hydrant to the site is provided on Cromwell Road as can be seen below. Main size 100mm. There are no defects in hydrant.

Confirmation that the hydrant has been provided less than 90 metres from the building on Cromwell Road can be seen below in Figure 8

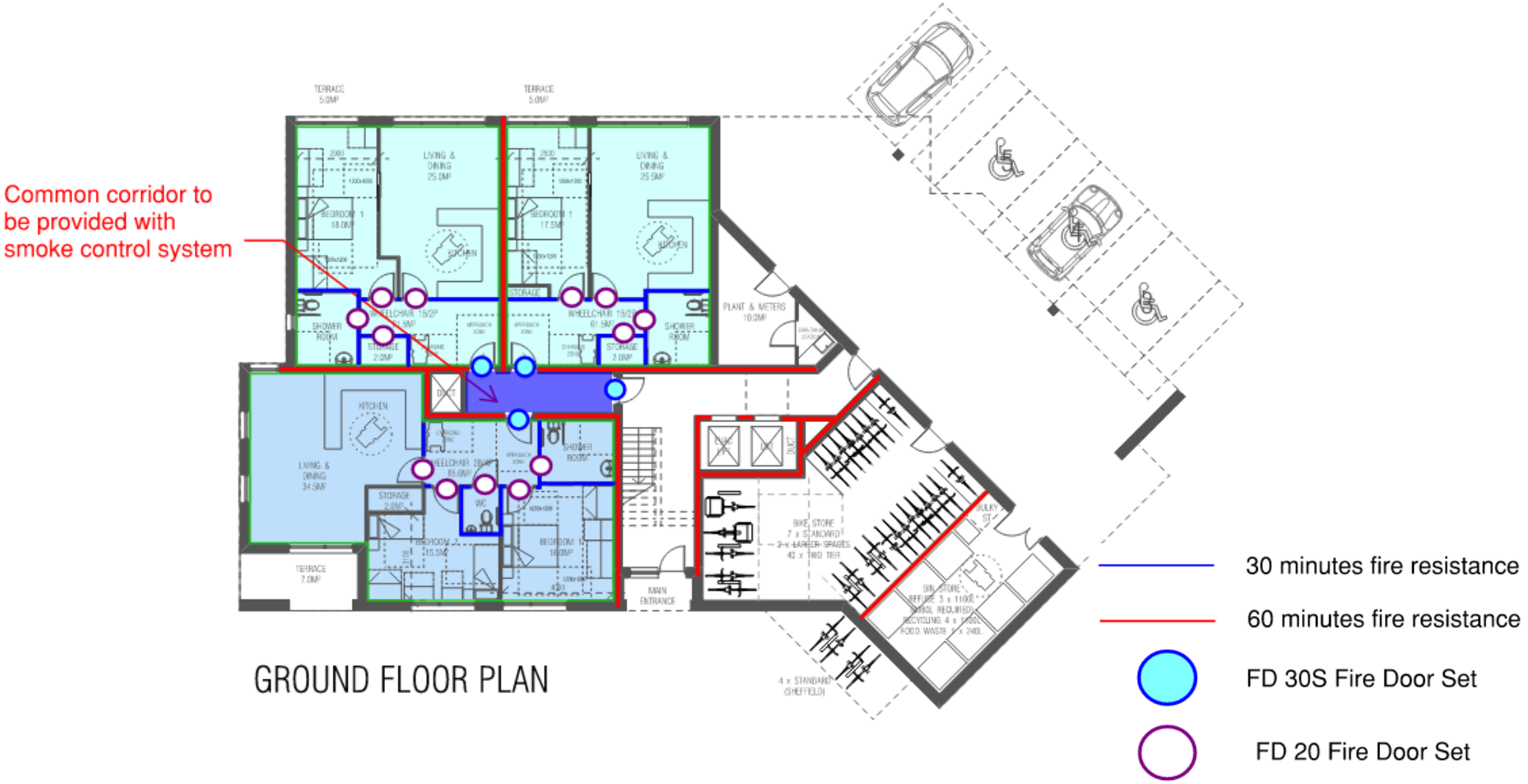
Figure 9 also shows the location of the fire hydrant outside the existing building at Sheldon House where the redevelopment will be erected.

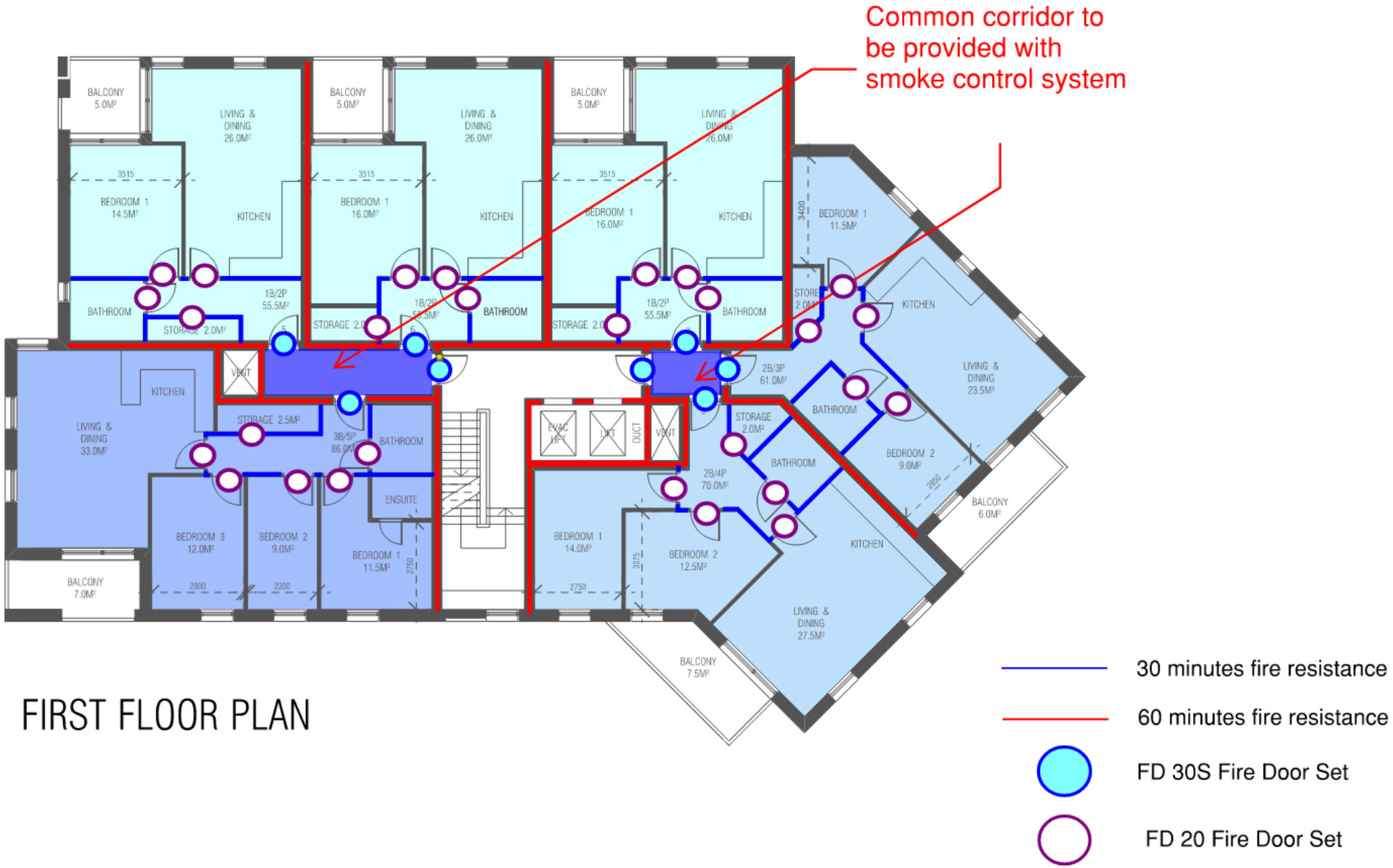
Figure 8: Fire Hydrant Location

Figure 9: Location of Fire Hydrant

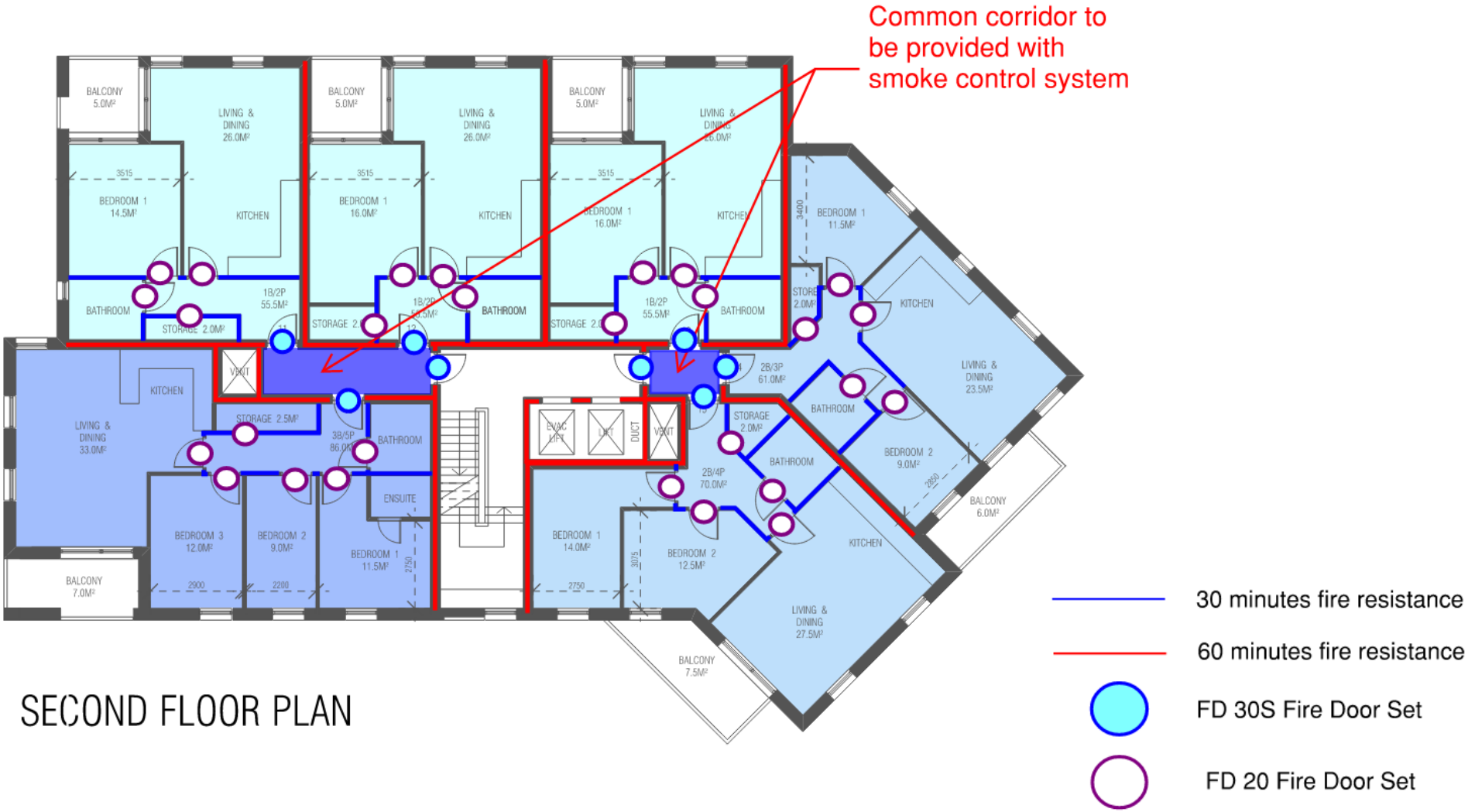
9 Appendix A - Fire Strategy Plans

See Below

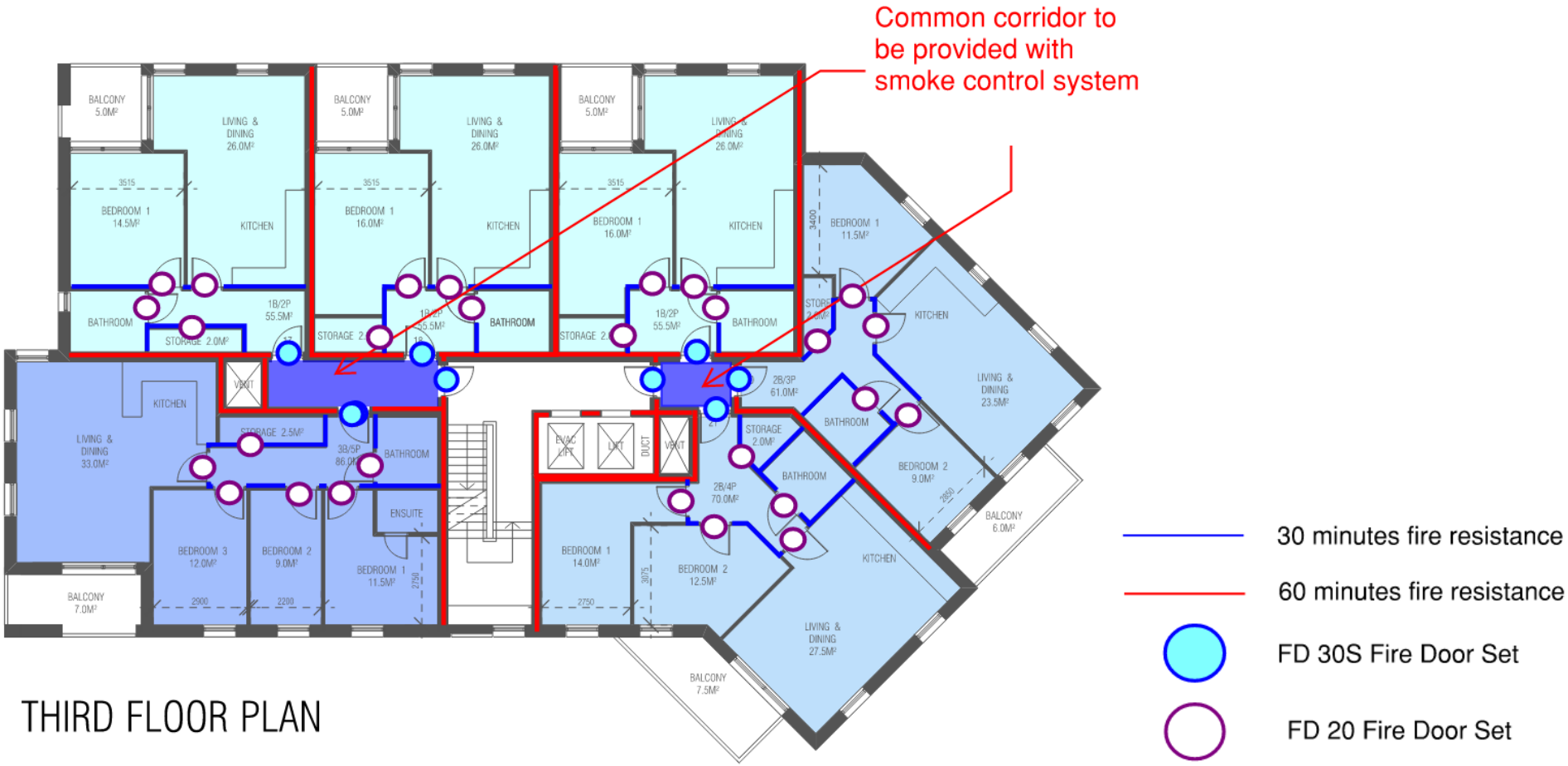

Common corridor to be provided with smoke control system
GROUND FLOOR PLAN
30 minutes fire resistance
60 minutes fire resistance
FD 30S Fire Door Set
FD 20 Fire Door Set



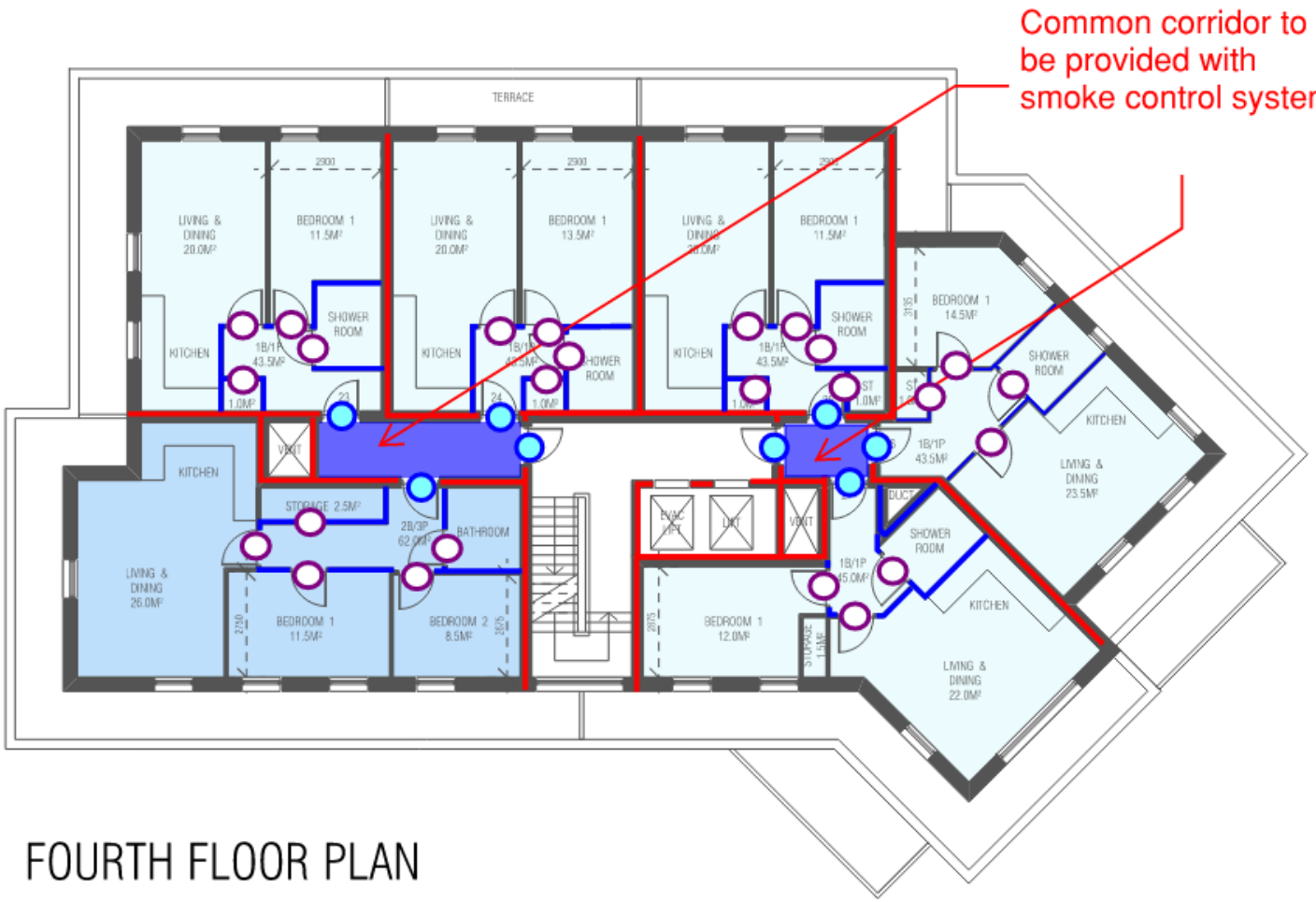
FIRST FLOOR PLAN



SECOND FLOOR PLAN



THIRD FLOOR PLAN



FOURTH FLOOR PLAN

30 minutes fire resistance

60 minutes fire resistance

FD 30S Fire Door Set

FD 20 Fire Door Set