Fire Safety Strategy
Stage 2 Report

Northwood and Pinner

65201169/HK/210302
Revision 03

SWECO

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Sweco
1 Bath Road
Maidenhead
Berkshire
SL6 4AQ

+44 (0)1628 623 423
building.services@sweco.co.uk
www.sweco.co.uk

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Introduction

This report outlines the RIBA Stage 2 fire safety strategy (FSS) for Northwood and Pinner, a community hospital refurbishment in London.

This FSS provides design guidance for the proposed scheme and has been developed in conjunction with the project stakeholders (client, advisors and professional design team) to satisfy the aims of the brief, which is to comply with the Building Regulations 2010.

The figures/drawings included within this strategy are for illustrative purposes only, intended to convey key features and objectives of the fire strategy. Reference is to be made to the detailed architectural, structural and services layouts provided by the wider design team.

The Building Regulations

The information contained in this document is intended to help focus the design in achieving the functional requirements of Parts B1 – B5 of the Building Regulations 2010 only, as outlined below:

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

Consultation

Initial consultation has not been carried out with the Building Control Authority and the key fire safety principles have yet to be agreed. The fire strategy will continue to evolve however and consultation with the relevant authorities will commence at the next stage of design.

While this document sets out the basis of design in terms of fire safety, it does not represent a detailed design document. Areas for specialist contractor design are clearly highlighted throughout.

Exclusions

The FSS does not:

- Set out to specifically address insurance requirements, risks to business continuity or property protection. Recommendations or guidance provided for life safety purposes may or may not be beneficial regarding these issues.
- Address fire precautions during the construction works for which the risk and hazard from fire are often greater. It is recommended that the guidance issued by the Health and Safety Executive (HSE) be consulted accordingly.
- Represent a design or specification; it is a series of principle recommendations that others may consider and relate to the design of the building as appropriate.
- Constitute a fire safety management strategy.
- Satisfy the duties of the 'responsible person' to carry out a fire risk assessment under the Regulatory Reform (Fire Safety) Order.
- Satisfy duties under Regulation 38 of the Building Regulations to provide the building management team / owner / responsible person with a package of as built information. This duty is handled by the principal contractor, albeit this document shall be updated throughout construction to reflect design development.

Basis of design

With respect to addressing the functional objectives of Parts B1-B5, the FSS draws on the framework from BS 7974 to establish a disciplined approach to the fire safety design.

The FSS considers the total fire safety package within the scheme to provide a functional and practical solution to fire safety. The FSS draws on prescriptive standards as a basis for design; however, it is only through utilising a combination of established guidance, fire engineering and technical experience that a satisfactory standard of fire safety can be achieved given the complexity and existing nature of the scheme from a Buildings Regulations standpoint.

To this end, the FSS is based primarily upon the recommendations of BS 9999: 2017, *Code of practice for fire safety in the design, management and use of buildings* and BS 9991 *Code of practice for fire safety in the design, management and use of residential buildings.*

The FSS will address the areas that have a significant influence on the design of the building; however, where the FSS is silent on an issue, it is expected that the design guidance of BS 9999 be implemented. Where the FSS or BS 9999 references other documentation, design guidance or British Standards, it is expected that these documents are incorporated appropriately.

Fire engineering

Where a feature, arrangement or area of the project lies outside the recommendations of guidance, a fire-engineered solution will be developed. This solution will be based upon current guidance, good engineering practice and information available at the time of writing. It should be noted that any fire-engineered solution may not be valid if the design criteria etc. on which it is based are altered.

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Future fire safety management.

This FSS is not a fire safety management document. The eventual management strategy for the building will need to be developed and should incorporate the recommendations of this document.

In developing the FSS, it has been assumed that a robust level of fire safety management will be adopted once the building is occupied. The site will be provided with 24/7 security / concierge services, which will form an important role in the holistic fire safety strategy and various fire engineered solutions. Good fire safety management is vital given the scale and complexity of the project. It is important that management are aware of their roles and responsibilities in the day to day running of the site. Further guidance for the development of a robust, sensible management procedure may be sought in the appendix to BS 9999.

The Regulatory Reform (Fire Safety) Order 2005

On occupation of the building, the 'responsible person' as defined in the Regulatory Reform (Fire Safety) Order 2005 (FSO) is required by law to undertake a fire risk assessment. This FSS will not satisfy this obligation; instead it may be used as a basis for the risk assessment.

Limitations

The information contained within this report is for use solely in relation to this scheme and should not be used in relation to any other project. SWECO does not accept responsibility for the use of the FSS for any other purpose or by other parties without their express written agreement.

2. Outline Project Description

2.1 Project outline

The project is a renovation and development of a community hospital in London. It consists of two blocks (A and B). Block B consists of residential use, while block A is divided, as can be seen in Figure 1. The west portion of block A being residential and the east being a healthcare accommodation.

The heights of the different blocks are as following:

- Healthcare unit (1st floor) – 5m
- Block A (3rd floor) – 9.9m
- Block B (3rd floor) – 10.1m

Building height is measured from the Fire Service access level to the finished floor level of the topmost occupied floor.

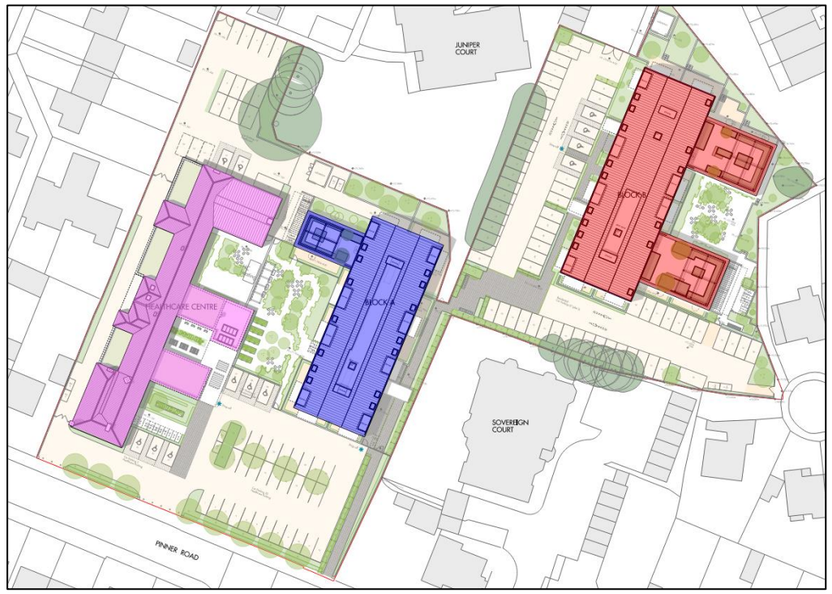


Figure 1: Illustration showing the three proposed buildings; Healthcare Centre (pink), Block A (blue) and Block B (red).

2.2 Risk profile and floor space factors

The following table identifies the appropriate risk profiles and associated floor space factors for the scheme in accordance with BS 9999.

Occupancy	Risk Profile	Floor space factor
Plant	A2	30m²/person
Cycle Store / store	A3	30m²/person
OP / GP / Nurse / reception	B2	1m²/person
Amenity	B2	2m²/person
Residential	C(ii)2	2 per bed

2.3 Summary of fire protection measures

Item	Description
Escape strategy	Residential – Defend in place Healthcare – Simultaneous
Escape widths	Escape stair = 1000mm
Fire detection and alarm	Healthcare Centre – BS 5839-1 Category L1 Residential – BS 5839-6 Category LD1
Sprinkler protection	BS 9251 serving residential accommodation
Emergency power supply	Secondary supply from other blocks substation
Emergency escape lighting	In accordance with BS 9999, BS 5266-1 and BS 5266-7
Structural fire protection	60 min
Compartmentation	Every residential level / unit is a compartment
Access and provision for the fire service	Firefighter access via normal means of escape Perimeter vehicle access provided
Smoke ventilation	Block A – 0.8m² mechanical smoke ventilation Block B – 1.5m² AOV on the external wall

3. Package of fire protection measures

3.1 Fire detection and alarm system (AFD)

3.1.1 Residential Blocks A and B

The apartments will operate under a 'defend in place' strategy. A BS 5839-6 Category LD1 system will be installed in all apartments. The fire alarm system will be Grade C. Neither sounders nor manual call points will be provided in the common residential lobbies, given the 'defend in place' strategy. Detection will however be provided in the common residential corridors that will activate the smoke control measures, in accordance with a BS 5839-1 Category L5 system.

Fire warning should be provided to private/balconies of individual apartments where the access room is not fully visible from the balcony/terrace.

3.1.2 Healthcare Centre

A BS 5839-1 Category L1 system will be provided. A central monitoring position will be located at reception.

3.2 Suppression System

3.2.1 Residential Blocks A and B

The residential accommodation will be served by sprinkler protection in accordance with BS 9251 – Category 1.

Sprinkler protection within apartments will cover the habitable rooms, including living areas, bedrooms and kitchens. Bathrooms less than $5m^2$ in area and cupboards less than $2m^2$ or where the least dimension does not exceed 1m do not require sprinkler protection

3.3 Smoke Control

3.3.1 Common residential corridors

3.3.1.1 Residential Block A

An addressable mechanical smoke extract system will be provided in common residential corridors where the travel distances exceed 15m.

An addressable mechanical smoke extract system allows for each shaft to be used as either extract or supply dependant on the location of source of smoke within the corridor and controlled by an automated system to ensure that smoke extract is away from the escape stairs. This will be made up of a $0.8m^2$ shaft placed at the far ends of the corridor, such that dead-end distances are limited wherever possible, and to optimise system performance.

Air supply will be provided with the AOV in the escape stair.

Override controls for the corridor vent system will be provided in the firefighting stair at every level.

The system will be designed in accordance with BS 9991 and will use the 'Guidance on smoke control to common escape routes in apartment buildings' issued by the Smoke Control Association (rev3), as a basis for design. The system should ensure the stair remains smoke free. The design, validation, specification and installation of these systems will be by specialist contractor.

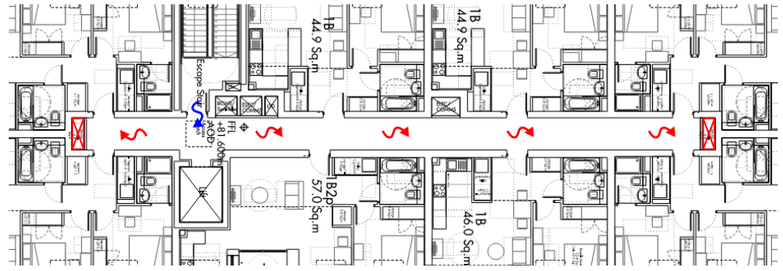


Figure 2: Illustration demonstrating the addressable mechanical smoke extract system within a typical corridor in Block A, with vents (red-crossed rectangles) and example air flow direction (red arrows).

3.3.1.2 Residential Block B

A natural smoke extract ventilation system will be provided in common residential corridors where the travel distances are limited to 15m. This will be made up of either power opening external doors or through a 1.5sqm AOV at high level. The AOV should be positioned at high level and comply with EN 12101-2.

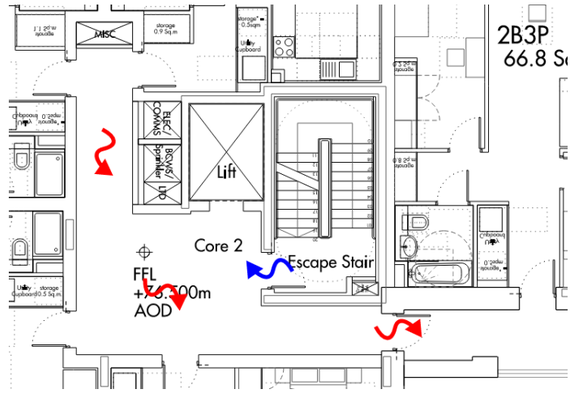


Figure 3: illustration demonstrating the natural smoke extract airflow (red arrows) with powered open external door (blue) acting as an AOV.

3.3.2 Escape stair

A 1.0m^2 automatic opening vent at the top of the escape stairs in accordance with BS EN 12101-2.

3.4 First aid fire fighting

Fire extinguishers will be provided in the healthcare accommodation, selected and maintained in accordance with BS 5306-8.

3.5 Signage

Fire escape signage and fire protection indication and warning signage shall be provided in accordance with BS 5499-4 & BS ISO 3864-1. The final provision of signage remains subject to a risk assessment prior to practical completion of the construction.

3.6 Artificial and emergency escape lighting

Emergency escape lighting will be designed in accordance with BS 9999 Table 8, BS 5266-1 and BS 5266-7.

4. Means of escape

4.1 Evacuation strategy

The high degree of compartmentation in the residential accommodation means that the spread of fire from one apartment to another is unlikely. As such a 'defend in place' evacuation strategy will be implemented. In the event of fire, it is only necessary to evacuate the apartment where fire has broken out. Occupants in all other apartments will remain in place.

Individual apartment evacuation remains independent from the evacuation of fires elsewhere on the site, unless deemed necessary by the management team / attending Fire Service.

Communal terraces will evacuate simultaneously on fire detection within any of the residential corridors and non-residential areas of their respective block.

Remaining areas such as plant, staff or GP/nurse rooms will evacuate simultaneously upon a confirmed detection of fire.

4.2 Travel distances

BS 9999 provides recommendations for travel distances for various risk profiles. The actual travel distances are identified in the table below.

Aspect	Distance (m)	
	Single direction	Two directions
Open plan apartments [1]	20	-
Private apartment corridor	9	-
Common residential corridor	15	30
External communal areas	45	-
OP / GP / Nurse rooms (B2)	20	50
Plant, storage, refuse (A2)	22	55
Amenity (B2)	20	50

[1] if adopted

4.3 Number of exits

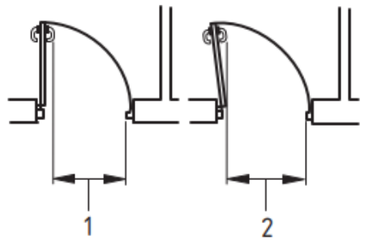
BS 9999 provides guidance on the number of escapes routes and exits that should be reasonably provided within a building. It notes that where the occupancy level can be reasonably expected to exceed 60, a minimum of two exits should be provided.

Where only a single exit is available, the occupancy should not exceed 60 persons.

Where more than 600 people are expected on a storey level, a minimum of 3 escape routes must be provided.

4.4 Storey exit widths

Note that the clear width is measured between the door stop and the door leaf (or projecting ironmongery, as indicated in the **Figure 4** below).



Key

1 Effective clear width (door stop to projecting building hardware)

2 Effective clear width (door stop to door leaf)

Figure 4: Measurement of door width.

The opening of a door should not encroach on the minimum stair width. Door width is measured between the door stop and projecting ironmongery, or from door stop to door leaf, whichever is the lesser.

There are multiple office spaces located on the lower floors . Using 6m^2 per occupant as stated in section 2.2 a maximum occupancy density for a given exit is 88 people. Therefore, the storey exits should achieve 850mm clear width to the respective stairs.

4.5 Stair widths

Stair width is measured between the walls or balustrades. Handrails may encroach up to 100mm on either side of the stair.

4.6 Final exits

Final exits from stairs should open in the direction of escape and achieve a clear width equal or greater than the corresponding clear stair width.

4.7 Doors and escape corridors

The opening of a door should not encroach on the minimum escape width. The width is measured as the clear width between the door stop and any projecting ironmongery, or from door stop to door leaf, whichever is the smaller.

In general, doors on escape routes (whether the door is a fire door or not) should either not be fitted with a lock, latch or bolt fastening, or be fitted with simple fastenings that can be readily operated from the side approached by people making an escape. The inclusion of panic hardware is recommended where more than 60 people are expected to use a door (i.e. at the final exits from each core).

Exits should open in the direction of escape if the number of people that might be expected to use the door at the time of a fire is more than 60. In this case, the final exit door should be fitted with panic hardware in accordance with BS EN 1125.

Escape stair doors should open against the direction of escape to provide air supply to the mechanical smoke extract system.

Electrically powered locks should return to the unlocked position on operation of the AFD system, loss of power and/or activation of a manual door release unit (Type A – BS EN 54-11).

Any security gates/turnstiles located at the ground floor reception will be set to open upon confirmation of alarm and fail-safe open at loss of power.

The width of a door in a corridor should be not less than either the calculated corridor width minus 150mm, or 1050mm, whichever is the greater.

The width of a corridor should not be less than 1200mm.

4.8 Stairs serving above ground

The following stairs will be provided throughout the complex for means of escape (see Figure 5 for an illustration showing all escape stairs serving the building):

- Escape Stair 1 (Block A) – Level 00 to 01
- Escape Stair 2 (Block A) - Level 00 to 01
- Escape Stair 3 (Block A) - Level 00 to 03
- Escape Stair 4 (Block B) - Level 00 to 03
- Escape Stair 5 (Block B) - Level 00 to 03

Figure 5: Illustration showing all escape stairs in blocks A, B and healthcare.

4.9 Conventional apartments

Conventional apartments consist of a protected entrance hall serving all habitable rooms. A protected internal hallway, enclosed in 30-minute fire rated construction and FD30 doors, will be provided to all apartments. The travel distance in the protected entrance hall will be limited to 9 m from the flat entrance door to the door of any habitable room.

4.10 Means of escape for the disabled

Disabled refuges will be provided within each stair/lobby of non-residential accommodation. Disabled refuges should also be provided where step-free access to outside is not possible at ground floor.

Disabled refuges are not required on residential levels, except in the cases where communal amenity areas present.

Each refuge point will be provided with means to alert the reception desk to the presence of persons requiring assistance. This will be in the form of outstations as recommended under BS 5839-9. Refuges will be 1400mm x 900mm and located clear of the minimum escape width.

5. Internal fire spread – structure

5.1 Structural fire protection standard

The term 'elements of structure' is applied to the main load bearing elements of structure. Structure includes, but is not limited to:

- Structural frame
- Beams
- Columns
- Load bearing walls (internal and external)
- Floor structures
- Party Wall

The following tables provides an overview of the plots, building heights and proposed structural fire protection.

Block	Height (m)	Rating (min)
Healthcare Centre	5m (1st floor)	60min
Block A	9.9m (3rd floor)	60min
Block B	10.1m (3rd floor)	60min

The ratings in the table above rely on the provision of fire suppression. Building height is measured from the Fire Service access level to the finished floor level of the topmost occupied floor. Floors used solely as plant space may be regarded as unoccupied.

5.2 Compartmentation

The following outlines additional compartmentation recommendations. Compartmentation in the following locations should be provided in terms of insulation and integrity on both sides. Where the standards of compartmentation overlap, the higher value should be adopted.

Area	Ratings (mins)	Area
Life safety plant room	120	Life safety plant room
Life safety riser	120	Life safety riser
Separation between risk profiles	120	Separation between risk profiles
Escape stair and access points	60	Escape stair and access points
Floors	60	Floors above ground
Service risers	60	Service risers
Compartmentation separating apartments	60	Compartmentation separating apartments
Storerooms / Refuse stores	60	Storerooms / Refuse stores
Residential corridors	60	Residential corridors

The junction between compartment walls / floors with external cladding should maintain the relevant standard of compartmentation. Cladding should be fixed securely to the compartment wall/floors to resist movement in the event of fire. Adequate fire stopping should be provided that is securely fixed in place.

5.3 Door ratings

Door location	Door ratings (mins)
Onto protected shaft	Half the period of shaft
Plant rooms	FD60
Escape stair / stair lobby doors	FD60S
Sub-dividing a corridor	FD30S
Service riser	FD60
Storerooms / Refuse stores	FD60S
Apartment doors	FD60S

5.4 Concealed cavities

Where concealed cavities are incorporated (vertically or horizontally), cavity barriers (30min integrity and 15min isolation) will be provided at the following locations:

- The junction of compartment wall or floor and any external or internal cavity walls
- Within the voids of any external rain screens / concealed cavity and around all openings
- Within floor or ceiling voids to subdivide the area in accordance with BS 9999 (see table below)

Location of cavity	Class of surface/product exposed in cavity (excluding the surface of any pipe, cable or conduit or any insulation to any pipe)		Maximum dimensions in any direction
	National class	European class	m
Between a roof and a ceiling	Any	Any	20
Any other cavity	Class 0 or Class 1	Class A1; or Class A2-s3, d2; or Class B-s3, d2; or Class C-s3, d2	20
	Not Class 0 or Class 1	Not any of the above classes	10

[1] The national classifications do not automatically equate to the equivalent classifications in the European column; therefore, products cannot typically assume a European class unless they have been tested accordingly.

[2] When a classification includes “s3, d2”, this means that there is no limit set for smoke production and/or flaming droplets/particles.

5.5 Ductwork

Ductwork that passes through escape routes or breaches compartmentation will be fire rated in line with the methods outlined in BS 9999 as follows:

Method 1 – protection using dampers (not appropriate for protecting escape routes unless motorised dampers activated at smoke detection)

Method 2 – protection using fire-resisting enclosures

Method 3 – protection using fire-resisting ductwork

5.6 Smoke extract shafts

Any smoke shaft which penetrates fire compartments should, as a minimum, maintain the same level of fire compartmentation as that which has been breached. As well as form a complete barrier to smoke and fire between the different compartments which the shaft connects.

5.7 Openings for pipes

Pipes which pass through a fire separating element (unless within a protected shaft) should meet the following provision:

Option 1 – proprietary seals (any pipe diameter)

Provide a proprietary sealing system which has been shown through test evidence to maintain the fire resistance of the compartmentation.

Option 2 – pipes with restricted diameter

When a proprietary sealing system is not used, fire stopping may be used around the pipe, where every effort is made to keep the opening as small as possible.

Option 3 – sleeving

A pipe of lead, aluminium, aluminium alloy, fibre-cement or uPVC, with a maximum nominal internal diameter of 160mm, may be used with a sleeving of non-combustible pipe as per diagram 31 of BS 9999.

All fire stopping should be in accordance with the recommendations of the ASFP Red Book.

5.8 Protected lobbies / corridors

Protected lobbies will be provided in the following locations:

- Communication with refuse areas
- Refuse, store and plant rooms accessed off common residential corridor

5.8.1 Refuse stores

Refuse storage should not be located within or accessed directly from common stairs and not be sited adjacent to escape routes or final exits.

Rooms containing refuse chutes or provided for the storage of refuse should be approached only by way of a protected lobby having not less than 0.2 m^2 of permanent ventilation or suitable mechanical alternative.

Refuse storage lobby should not be a part of the general circulation route.

6. Internal fire spread – linings

6.1 Linings

The classification of the surfaces of walls and ceilings will comply with the following:

Location	National Class	European Class
Small rooms not more than 30m^2 (4m^2 in residential accommodation)	3	D-s3, d2
Other rooms, not used as circulation space	1	C-s3, d2
Circulation spaces including common areas in blocks of flats	0	B-s3, d2

6.2 Examples of materials

Rating [1] [2] [3]	Typical performance ratings of some generic materials and products
Class 0	Any non-combustible material or material of limited combustibility
	Brickwork, blockwork, concrete and ceramic tiles
	Plasterboard (painted or not with a PVC facing not more than 0.5 mm thick) with or without an air gap or fibrous or cellular insulating behind
	Wood wool cement slabs
	Mineral fibre tiles or sheets with cement or resin binding
Class 3	Timber or plywood with a density more than 400 kg/m3, painted or unpainted
	Wood particle board or hardboard, either untreated or painted
	Standard glass reinforced polyesters

[1] For details of European class ratings consult BS EN 13501.
[2] Materials and products listed under the above class 0 and meet class 1.
[3] Timber products listed under class 3

7. External fire spread

Any external elements within 1m of the site boundary should be provided with fire resisting construction equivalent to the structural fire protection rating of the respective block (see section 5.15.1).

7.1 Building position

The extent of permissible unprotected areas for portions of the external wall construction more than 1m from the relevant site boundary is evaluated based on guidance set down within BR 187.

Where the façade faces onto a roadway then the boundary is taken as the mid-point of the roadway, as future redevelopment on the road is considered unlikely.

This project does not pose any risk to neighbouring buildings due to the distance between and highly compartmentalised nature of the scheme. Detailed calculations will be included in the next stage of design.

7.2 External cladding

External walls should either meet the performance criteria given in BR 135 [N2] for cladding systems using full scale test data from BS 8414-1 or BS 8414-2, or meet the following recommendations set by BS 9999.

Where a cavity exists in the external wall construction, cavity barriers should be provided to sub-divide the cladding at each compartment floor and around openings (see figure below). Open-state cavity barriers would not be permitted within the external wall cavities since they are thermally actuated and therefore not considered to provide an equivalent level of protection to closed-state cavity barriers.

Where ducts penetrate cavity walls, fire dampers may be required, subject to key stakeholder discussion.

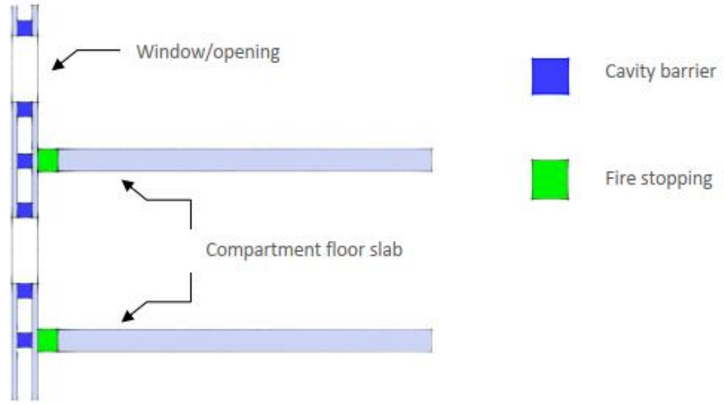


Figure 6: Fire stop and cavity barrier indicative diagram

External cladding should be restrained at the junction of compartment walls and floors to resist movement in the event of fire.

All fire stopping and cavity barrier details shall be supported by valid test certification

External cladding at the junction of a firefighting shaft shall be 60-minute fire rated for 500mm.

8. Access and facilities for fire fighting

8.1 Vehicle and firefighter access

Vehicle access will be provided to within 18m of the entrances.

Figure 7: Illustration showing the fire service vehicle access points and points of entry (A&M planning drawing)

The following table sets out the road and route requirements for firefighting access.

Criteria	Pump	High reach	Special appliance
Width of road between kerbs	3.7m	3.7m	4.0m
Width of gateway	3.1m	3.1m	3.1m
Turning circle between kerbs	16.8m	26.0m	26.0m
Turning circle between walls	19.2m	29.0m	29.0m
Clearance height	3.7m	4.0m	4.27m
Carrying capacity	14 tonnes	23 tonnes	32 tonnes

Vehicular access will need to be developed with the wider design team during the next stages of design.

8.2 Firefighting shaft

The buildings do not require a firefighting shafts. Nonetheless the following will be available for the use of the fire service:

- Escape stairs - total of five escape stairs will be provided across all blocks. As highlighted in red on Figure 7 and as stated in Section 4.8
- Protected corridors or lobbies forming lobby protection to escape stairs.
- Dry risers (accessed from the stairs, in accordance with BS 9990)

8.3 Hose Coverage

Hose coverage on all floors should be within 45m of the rising main.