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South Beach Apartments, Bexhill

Fire Strategy Report
Issue 1

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CONCEPT FIRE STRATEGY REPORT CONTENTS

DOCUMENT CONTROL & NOTES

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Notes:	
This report is prepared for the exclusive use of the South Beach Apartments project team and a third party shall not rely upon the information that it contains. BWC will not accept any responsibility for matters arising because of use by a third party. The recommendations and conclusions of the report should not be applied to any other building and may not be relevant if the report contents are not implemented into the design. This report is formulated on the basis of the information and experience available at the time of preparation. It is applicable to the above-mentioned project only in accordance with the client's instructions. It is only valid provided no other modifications are made other than those for which a formal opinion has been sought and given by BWC Fire Limited.	

DOCUMENT HISTORY

Issue	Date	Amendment Details	Author	Checked
1	11/01/17	Initial report for comment	BH	BW

Note: All amendments since the previous edition are highlighted with a vertical line in the right hand margin

1.0 INTRODUCTION

1.1 Report Scope and Objectives

1.1.1 BWC Fire Limited (BWC) has been appointed to produce the fire strategy for the proposed development known as South Beach Apartments in Bexhill, East Sussex.

1.1.2 The fire strategy is intended for discussion between the design team and to assist the design team in gaining approval in principle from the Approving Authorities. This strategy is intended to address Building Regulations.

1.1.3 This report is based on the guidance in Approved Document B[1] (ADB) to the Building Regulations, April 2007 Edition as well as other relevant guidance, such as British Standard BS5839 Part 1[2] and 6[3].

1.1.4 The report follows the main sections in ADB.

1.1.5 Typically the adoption of a fire engineering approach can result in a greater design freedom and reduced project and building lifetime costs, whilst maintaining or often exceeding the level of fire safety inferred by ADB.

1.1.6 The findings and opinions expressed are based on the conditions encountered and the information reasonably available at the date of issue of this document, and shall be applicable only to the circumstances envisaged herein.

1.1.7 As this document forms a concept approach for fire matters, the design team must ensure the contents of the report are incorporated in the building.

1.1.8 Until this report is agreed with the approving authorities, the content should only be used 'As Preliminary Information'.

1.2 Building Description

1.2.1 This project entails the proposed development of the building known as South Beach Apartments in Bexhill.

1.2.2 The proposed development consists of ground plus five levels of residential apartments, located atop a basement car park and served by a single stair core. The apartments are proposed to be accessed at each level via enclosed common corridors, with ventilation achieved via a mechanical fan assisted smoke shaft serving the common corridor at each level. The general layout of the building is shown below.

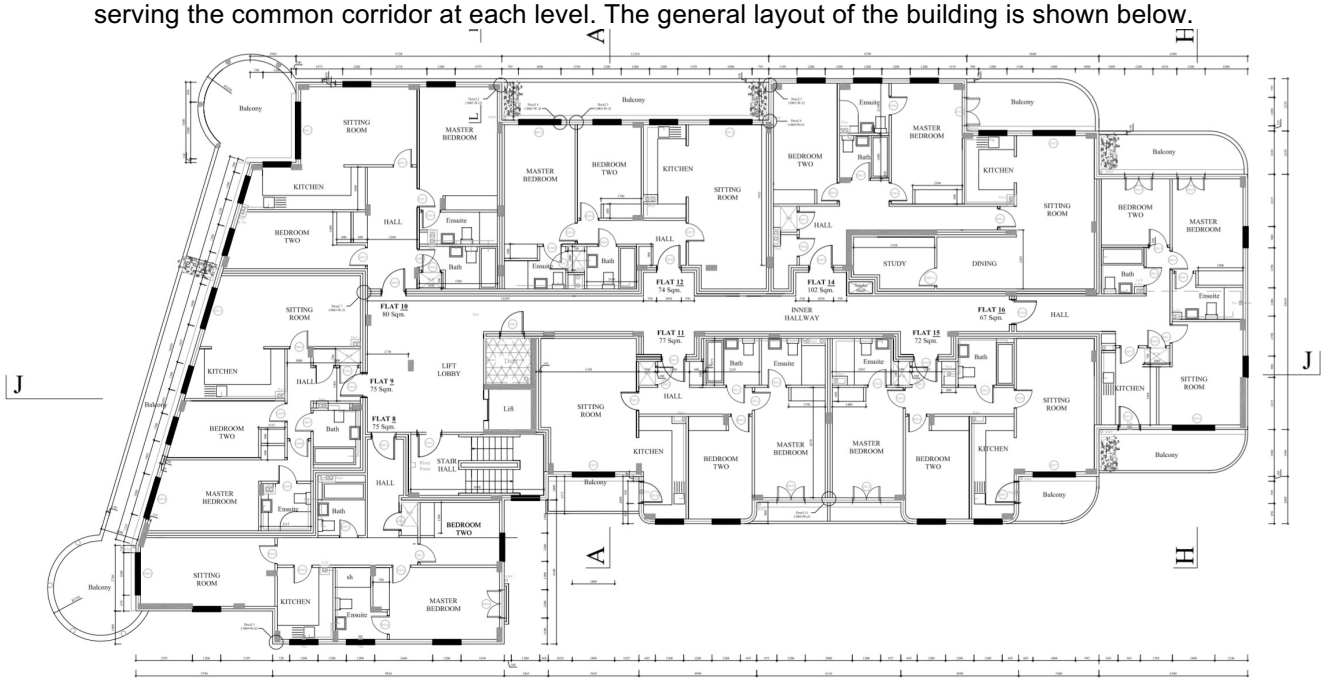


Figure 1.1 – Indicative layout showing the building at first floor level

1.2.3 The proposed building has a top floor level of less than 18m from the access level, and as such no fire fighting shafts are proposed to be introduced.

1.2.4 The accommodation on the site at South Beach Apartments is classified in the following Purpose Groups under ADB:

Accommodation	Purpose Group
Residential Apartments	1(a)
Car Park	7(b)

Note – The plant and store rooms have been considered ancillary to the main building uses.

1.3 Fire Strategy Overview

1.3.1 The proposals outlined in this document demonstrate a level of fire safety equal to or greater than the general standard implied by compliance with the recommendations in Approved Document B, Volume 2. This level of safety therefore satisfies the functional requirements of the Building Regulations relating to fire safety.

1.3.2 The fire strategy described in this report can be summarised as follows:

- Means of escape will be based on the dwelling of fire origin only evacuating in the event of a fire. No interconnection of fire alarm system or evacuation protocol is proposed between any areas of the building.

- The apartments are accessed from the common staircase by enclosed common corridors. Ventilation of the enclosed common corridors will be achieved by a mechanical smoke shaft serving each level from ground to fifth floor.

- Structural fire resistance will afford 60 minutes fire resistance. Any conflicts in fire resistance will be resolved by the higher standard of fire resistance being adopted.

- Each floor will be constructed as a compartment floor with a fire resistance period equivalent to that of the building structure (i.e. 60 minutes). Each apartment will form its own 60 minute fire resistant compartment. Vertical shafts will generally afford a fire resistance period equal to that of the elements of structure (i.e. 60 minutes).

- Fire alarm and detection systems within the building will be:

    - Within apartments – LD3 (BS5839 Part 6)
    - Residential common areas – L5 (BS5839 Part 1) to areas provided with automatic smoke venting only
    - Car Park – None

- Fire service vehicle access to the site is achieved based on access from Jameson Road and Sea Road. The building does not incorporate a floor more than 18m above the access level, therefore no fire fighting shafts are proposed, however the stair core will incorporate a dry riser in order to satisfy hose distance limitations. All apartments are covered within 45m of a dry riser outlet located within a protected staircase. No additional fire hydrants are proposed within these works.

2.0 LEGISLATION

2.0.1 The main fire legislation applicable to this building includes, The Building Regulations and The Regulatory Reform (Fire Safety) Order 2005.

2.0.2 This document forms a concept approach for fire matters, the design team must ensure the contents of this report are incorporated in the building. This concept will not prevent a fire occurring and good housekeeping will be encouraged to reduce the risk. This strategy is mainly concerned with getting occupants out of the building safely and providing measures, where necessary, to assist the fire fighters in their operations.

2.0.3 The concept is only valid where the systems are designed correctly and maintained in an operating condition. If there is a failure in the management approach and a fire occurs, this concept may not reduce the impact on contents or building damage.

2.0.4 Following occupation the management of the premises are required under current legislation to carry out a fire risk assessment (the residential common areas in the two blocks and the office tenant). This documentation will be developed following completion and will form part of the fire manuals developed for the premises (BS9999[4] provides appropriate guidance in this area).

2.1 Building Regulations

2.1.1 The construction or modification of any building in England & Wales needs to comply with the statutory requirements of the Building Regulations. These regulations deal with the minimum standards of design and building work for the construction of domestic, commercial and industrial buildings. The Building Regulations contain a list of requirements, referred to as Schedules, which are designed to ensure the health and safety of people in and around buildings. There are 14 Parts, which cover subjects such as structure, fire safety, ventilation, drainage, etc.

2.1.2 In the case of fire, the regulations are dealt with under the functional requirements B1 to B5 of Schedule 1 of the Building Regulations. There are a number of prescriptive documents, which can be adopted to show compliance with the Schedules. These include Approved Document B and various British Standards (most notably BS9999 for fire safety design purposes). These guides are considered as adequate to provide general guidance for the more common buildings. An alternative approach is to adopt Fire Safety Engineering, which integrates fire engineering calculations, life safety systems, building inherent features and professional judgement, to produce a fire strategy that achieves appropriate levels of safety to a specific building and use.

2.2 Regulatory Reform (Fire Safety) Order 2005

2.2.1 A full risk assessment covering general health and safety as well as fire safety will be required on occupation of the building to meet the Regulatory Reform Order and will allow the ongoing control to be monitored to ensure safe escape can be achieved.

2.3 Construction (Design and Management) Regulations 2015

2.3.1 Projects undertaken in the UK are subject to the requirements of the Construction (Design and Management) Regulations 2015 (CDM Regulations 2015) or within the European Union, that particular country's interpretation of the European Union Directive.

2.3.2 This report defines the strategy for meeting the functional and performance requirements for fire safety in the finished building. It is intended to form part of the submission for approval under the Building Regulations, Part B (Fire safety). Where any conclusions or recommendations contained within this report specify particular materials, products or forms of construction these will have been assessed in accordance with CDM Regulation 9 (Duties of Designers).

2.3.3 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 all or part of this report to specify works, they are understood to have the necessary skills, knowledge and experience to alert the Client, Principal Designer, Designers, Contractors and Building Occupier of issues arising under the CDM Regulations.

3.0 MEANS OF ESCAPE

3.0.1 Schedule 1 of the Building Regulations requires the following functional requirements to be met in respect of B1, Means of warning and escape:

"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 all material times."

3.0.2 The following discusses the implications of this proposed building design and seeks to demonstrate that a satisfactory standard of fire safety is achieved.

3.1 General Principles

3.1.1 The general philosophy for means of escape is that the occupants of the building should be able to turn their back on a fire and escape via the nearest exit without additional assistance from other occupants or fire fighters. This is achieved by providing alternative escape routes where necessary, limiting travel distances, providing sufficient exit width and escape routes that, depending upon the use of the building, will have specified periods of fire resistance.

3.1.2 Residential means of escape is somewhat different to many other types of buildings in that only the particular apartment that has a fire in it is immediately evacuated. The reasoning behind this is due to the level of compartmentation between each of the apartments and to reduce false alarms affecting all the people within the building. The Fire Service carries out evacuation of the other apartments if necessary or alternatively the non-affected residents can evacuate of their own accord. This philosophy is reflected by the stand-alone detector/sounders, which are required in each apartment but not necessarily in the common corridors or escape routes. A smoke detection system can be required within the common areas but this is only to operate the life safety systems within that area if required, i.e. automatic opening vents (AOV's).

3.2 Escape within Apartments

3.2.1 All of the apartments on the site are single level standard apartments, whereby the apartment has the individual rooms connected to the apartment entrance via a protected entrance hallway.

3.2.2 In each case the dwelling entrance doors will be FD30S and self closing.

3.2.3 The apartments will be provided with an internal protected hallway with travel distances restricted to 9m from the apartment front door to the door of the furthest habitable room. The protected entrance hallways will afford at least 30 minutes fire resistance with doors to all habitable rooms will be FD20 (no self closers are needed).

3.2.4 Doors to cupboards /stores entered off the protected hallways will have a minimum fire rating of FD20 but will not be self closing.

3.2.5 Following Approved Document B the fire alarm and detection systems within the individual apartments should generally be designed in accordance with BS 5839 Part 6 and be of an LD3 standard (interlinked mains powered smoke detection to the protected entrance hallway). Please see section 3.6 for further discussion on the automatic fire alarm and detection systems.

3.3 Escape within Residential Common Areas

3.3.1 The residential apartment floors are each served by a single staircase. Each floor presents extended dead end travel distances within the enclosed common corridors up to a maximum of 27m in a single direction.

3.3.2 Due to the single direction travel distances in the common corridors being in excess of 7.5m in a single direction, a mechanical smoke shaft has been introduced to the dead end in order to justify the extended travel distances. Further details of this mechanical smoke shaft are included within Appendix B of this report.

3.3.3 On the above basis each of the common corridors from ground to fifth floor will be automatically ventilated by the mechanical smoke shaft, activated upon smoke detection within the common corridor at each level and drawing replacement air via a 1.0sqm vent at the head of the communal stair core.

3.3.4 The communal stair core will be provided with a 1.0sqm AOV at the stair head as mentioned above, which will activate automatically at the same time as the mechanical smoke shaft serving the common corridors below.

3.3.5 At ground floor level the central staircase discharges directly to outside to the rear of the building, as well as to the front of the building via the basement stair and residential common corridor. A break within the stair enclosure is provided in order to separate the stair serving the basement car park from that serving the residential levels above.

3.3.6 No ancillary plant or store rooms are accessed from the residential common corridors.

3.3.7 Staircases within residential apartment buildings do not need to be sized for simultaneous evacuation and therefore the staircase widths are determined by fire fighting provisions and other non-fire design requirements. As the building does not include a floor level over 18m and therefore does not incorporate any fire fighting shafts, the staircase must achieve the minimum clear width required for day to day use (anticipated to be at least 750mm). Staircase doors on the upper floors will maintain a minimum clear width of 750mm. The direction of opening is not essential for escape (due to the low occupancy).

3.3.8 The final exits and discharge routes from the staircase will maintain the clear escape widths of the staircase (i.e. at least 750mm).

3.3.9 Where access control devices are installed to staircase doors or cross corridor doors that are required for escape these need to be useable and available for escape. To this end the access control devices must be overridable in a manner acceptable to the approving authorities (this is typically via the provision of green break glass points adjacent to the exit doors needing override controls). All access control devices will also fail safe upon power failure.

3.3.10 All doors needed for escape will be openable with a single action and without the use of a key.

3.3.11 All escape routes will maintain a minimum height clearance of 2m.

3.3.12 The staircase discharge routes at ground floor should be maintained unobstructed and free of fire load.

3.4 Escape from Car Park

3.4.1 The car park is located at basement level below the site. The car park is accessed from the residential staircase serving the core above, in addition to directly from outside via the entrance ramp. For means of escape, travel distances will be limited to those outlined in the table below.

Travel distance possible in one direction	Travel distance possible in more than one direction
25m	45m

3.4.2 The travel distance limitations above are satisfied through the provision of the access into the residential core, and the access ramp to outside.

3.4.3 Based on an occupancy load factor of 2 people per car parking space, the maximum anticipated car park occupancy is 74 people. The ancillary accommodation accessed from the car park brings this total up to 75 occupants.

3.4.4 The car park is provided with two potential discharge routes. On the basis that one of these exits may be rendered inaccessible due to a fire location, the remaining exit would need to support up to 74 occupants. Each of the exits serving the car park should therefore achieve a clear width of 850mm and open in the direction of escape.

3.4.5 In order to provide adequate separation between the car park and the residential staircase serving the apartments above, the residential staircase will be separated from the car park by a protected lobby

provided with at least 0.4sqm of permanent natural ventilation. A break will also be provided in the staircase at ground floor level, in order to separate the stair serving the basement car park from that serving the residential apartments above.

3.4.6 As the car park is provided with a reasonable amount of natural ventilation via penetrations through the façade and the ramp openings, it is considered that adequate ventilation is achieved in order for the car park to be considered naturally ventilated for smoke clearance and environmental purposes. The required amount of ventilation required to achieve this classification is equivalent to 5% of the car park floor area, of which half must be split between opposing walls (i.e. 1.25% on each of two opposing walls, the remaining 2.5% anywhere else within the car park). If it is not possible to achieve these vent areas, it may be necessary to introduce mechanical assistance for environmental and potentially smoke clearance purposes.

3.4.7 Due to the low occupancy load present in the car park, the staircase serving the car park will need to achieve a clear width of 1000mm. The exits at ground floor level from the staircase should maintain the clear width of the staircase and open in the direction of escape.

3.4.8 Due to the simple layout of the car park and the proposed passive natural ventilation, it is not considered necessary to incorporate a fire detection and alarm system within the car park. On this basis no fire alarm system is currently proposed to serve the car park. Ancillary inner room areas accessed from the car park are considered acceptable on the basis that they are provided with a suitably sited vision panel of at least 0.1sqm in area in order to allow occupants to see if a fire has started in the car park.

3.4.9 Any more inner rooms in the car park introduced during the fitout should be acceptable providing the following conditions are adopted:

- The occupant capacity of the inner room will not exceed 60 people
- The escape route from the inner room will not pass through more than one access room
- The travel distance from any point in the inner room to the exit from the access room will not exceed 25m
- The access room will not be a place of special fire risk (e.g. Transformer Rooms, Switch Gear Rooms, Boiler Rooms or Plant Room)
- The access room and inner room should either be fitted with smoke detection and alarms (to provide early warning in the event of a fire), or a suitably sited vision panel of at least 0.1sqm area should be provided from the inner room to enable occupants to see if a fire has started in the access room.

3.4.10 All doors needed for escape will be openable with a single action and without the use of a key.

3.4.11 All escape routes will maintain a minimum height clearance of 2m.

3.5 Escape from Ancillary Accommodation

3.5.1 There are no dedicated plant or ancillary rooms located at roof level however there are a number of plant facilities present at roof level which will need periodic maintenance. In each case access is provided either via a roof access hatch from the residential staircase. From these access hatches or doors all plant will be reached within a maximum of 60m.

3.5.2 The majority of plant and ancillary accommodation serving the development is located at basement level and accessed directly from the car park. Travel distances within these areas are limited to those recommended by the codes, as shown in the table below:

Accommodation	Area	Travel distance possible in one direction	Travel distance possible in more than one direction
Plant Room	Within Room	9m	35m
	Escape route not in open air (overall distance)	18m	45m
	Escape route in open air (overall distance)	60m	100m
Storage	Normal Hazard Storage	25m	45m

3.5.3 Any plant or store rooms which are introduced internally as the design develops should be accessed via protected lobbies provided with a minimum 0.4sqm permanent natural ventilation to outside air.

3.5.4 Plant rooms and bin stores will be separated from all other accommodation by a minimum of 60 minutes fire resisting construction.

3.5.5 All ancillary accommodation will have individual occupancies of much less than 60 people and therefore the exit doors from these rooms will maintain a clear opening width of 750mm and are acceptable swinging in either direction.

3.6 Disabled Evacuation

3.6.1 The evacuation of disabled occupants plays an important role in the overall evacuation of the building. The building operates on a several levels above and below ground level.

3.6.2 The residential areas of the building are not proposed to be provided with disabled refuges as the high degree of compartmentation in building provides adequate protection and refuge for occupants to be able to safely remain in a separate compartment. As no commercial or publicly accessible accommodation is present on the site, it is therefore not necessary to incorporate disabled refuges into the building design.

3.7 Fire Alarm and Detection Systems

3.7.1 *Residential Apartments*

3.7.2 The automatic fire alarm and smoke detection systems within the apartments will be designed in accordance with the recommendations of Approved Document B and therefore as a minimum each apartment will be provided with a single sounder / smoke detector in the internal hallway. The sounders will be capable of delivering 85dB (A) through the open doorway to each room and be hard wired, interlinked and include a self contained battery backup. The facilities composing the fire alarm and detection systems will be compliant with the principles of BS 5839 Part 6.

3.7.3 It should be noted that the above provisions only satisfy the minimum recommendations for Building Regulations and is therefore not offering full compliance with industry best practice or British Standards. If the client wishes full compliance with BS 5839 Part 6 then each apartment should be fitted with an LD2 standard fire alarm and detection system. This typically means the addition of a heat detector within the kitchen/living area on top of the recommendations discussed above.

3.7.4 All fire alarm and detection systems proposed above will be to a minimum Grade D category.

3.7.5 *Residential Common Areas*

3.7.6 A common zoned smoke detection system will be provided at every level in the enclosed common corridors that are provided with automatic smoke venting. The purpose of the detection systems is to initiate the operation of the life safety automatic ventilation systems. No sounders or manual call points will be provided as part of the system.

3.7.7 Broadly the smoke detection systems serving the common corridors will be designed in accordance with the BS 5839 Part 1 to an L5 standard, with smoke detection being provided solely to the common corridors at each level which are directly provided with smoke venting.

3.7.8 *Car Park*

3.7.9 As discussed in section 3.4.8 above, it is not currently proposed that a fire alarm system will be incorporated within the car park due to the simple layout of the car park and passive ventilation proposed.

3.8 Emergency Lighting Systems

3.8.1 To facilitate normal daily operations the lighting levels throughout the building are excellent. In the event of a fire within the building, it is very unlikely that the power to the normal lighting circuit would be lost in the early stages while the occupants are escaping. This is based upon the fact that the electric supply to the light fittings would initially be away from a fire and would continue to operate.

3.8.2 However, assuming a power failure, emergency lighting is provided as a secondary backup, complying with the requirements of with BS 5266 Part 1[4]. This includes coverage as per following:

Residential Accommodation	• All common escape routes • Areas directly outside the final exits • Toilets with a floor area over 8m^2 • Switch gear/battery room for the emergency lighting system • Electricity/generator rooms • Windowless accommodation
Car Park and Ancillary Areas	• All escape routes • Areas directly outside the exits • Underground or windowless accommodation • Open plan areas of more than 60m^2 • Internal corridors more than 30m long • Toilets with a floor area over 8m^2 • Switch gear/battery room for the emergency lighting system • Electricity/generator rooms

3.8.3 The lighting comprises luminaries in all identified areas, with the type of fitting appropriate to the space they serve.

3.9 Emergency Signage

3.9.1 Escape signage will be provided above all common exit routes, storey and final exit doors within the blocks.

3.9.2 The signs will be in accordance with BS ISO 3864 Part 1: 2011[5] and Health and Safety (Safety Signals and Signs) Regulation 1996.

3.9.3 Any doors in the lines of fire resistance will be provided with appropriate fire signage. In general doors to staircases and sub-division corridor doors will be provided with 'Fire door keep shut' signage. Doors to cleaner's cupboards, stores, plant rooms and service risers will be provided with 'Fire door keep locked' signage.

3.9.4 Examples of signage mentioned above that is dependent on their method of closure are given below.

Method of Closure	Signage	Sign Diameter	Letter Height
Self-closing device		60mm	5mm
Kept locked shut			

3.9.5 Examples of signage mentioned above that are applicable to exit doors and escape routes are given below.

Signage	Sign Diameter	Letter Height
	240mm	20mm
		

3.10 Fire Extinguishers

3.10.1 Manual fire fighting equipment will not be installed within the residential accommodation.

4.0 FIRE SPREAD AND CONTROL

4.0.1 Schedule 1 of the Building Regulations requires the following functional requirements to be met in respect of B2, Internal fire spread (linings):

(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, a rate of heat release which is reasonable in the circumstances.

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

4.0.2 Schedule 1 of the Building Regulations requires the following functional requirements to be met in respect of B4, External fire spread:

(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 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.

4.0.3 The following sections discuss the implications of the proposed building design and seek to demonstrate that a satisfactory standard of fire safety is achieved with respect to both requirements stated above.

4.1 Linings

4.1.1 The wall and ceiling linings will meet the recommendations of ADB Section 6 and Table 10, as shown below.

Location	National Class*	European Class#
Small Rooms of area (<4m² in residential accommodation or <30m² in non-residential accommodation)	3	D-s3,d2
Other Rooms (Residential or non-residential)	1	C-s3,d2
Other circulation spaces (including common areas, staircases, lobbies etc.)	0	B-s3,d2

Note: * = National Classifications are based on tests in BS 476 Part 4, 6 and 7.
= The European classifications are described in BS EN 13501-1:2000.

4.1.2 The class of linings recommended in the table above can be downgraded (but not less than Class 3 or D-S3, d2) in walls of rooms providing the total area of those parts in any one room does not exceed one half of the floor area of the room and subject to a maximum of 20m^2 in residential accommodation and 60m^2 in non-residential accommodation.

4.2 Unprotected Areas

4.2.1 A review of the unprotected areas has been undertaken following the space separation methods described in BRE Guide 187[6], "External fire spread: building separation and boundary distances". This exercise has been carried out for the site.

4.2.2 Given the compartmentation provided between dwellings, any fire is assumed to be limited to a single dwelling. The largest dwelling on the site presents an enclosing rectangle of 3m high by 15m wide – on this basis the minimum boundary distance for the façade to be fully unprotected across the site is 4.0m. Any facades which are within 1m of the relevant boundary are required to be fully protected, with any unprotected openings limited to those outlined in Diagram 44 of Approved Document B Volume 2. On this basis only areas with a boundary distance of between 1m and 4.0m have been assessed in more detail.

Elevation	Actual Enclosing Rectangle (WxH)	Standard Enclosing Rectangle (WxH)	Minimum Available Boundary (m)	Unprotected Area Percentage
Flat 1 – South Elevation	15.0m x 2.4m	15m x 3m	1.7m	34% (i.e. 15.3m^2, or 42.5% of actual façade)

Table 4.1 – Unprotected area calculations for the Residential Accommodation

4.2.3 It is clear from the table above that the majority of the residential façade is acceptable unprotected. Any areas which are identified in the table above as needing to be protected should be fire rated to achieve 60 minutes integrity and 15 minutes insulation, for exposure from the inside.

4.2.4 Any facades which are within 1m of the site boundary should be fire rated for 60 minutes integrity and insulation for, exposure from both sides. It is understood that this requirement currently applies to the South elevation of Flats 8, 17 and 25, and the East elevation of Flats 16, 24 and 32. As mentioned in 4.2.2 above, any openings within these facades should either be restricted to those outlined in Diagram 44 of Approved Document B Volume 2 or fire rated to achieve 60 minutes integrity and insulation from both sides and fixed shut.

4.2.5 Any areas of the residential façade which are within 1800mm of the external wall to a protected staircase on a separate façade should be fire rated to achieve 30 minutes integrity and insulation for exposure from the inside in line with Diagram 24 of Approved Document B Volume 2. One such location where this arrangement occurs within the current scheme is the interface between the East façades of Flats 8, 17, 25 and 33 and the South facing external wall of the communal stair core.

4.3 External Wall Construction

4.3.1 Any areas of the building façade more than 18m above ground should achieve a Class 0 (national class) or class B-s3, d2 or better (European class) rating for surface spread of flame. This limitation also applies to any areas of the façade which are within 1000mm of the land boundary.

4.3.2 Any areas of the façade which are less than 18m in height and more than 1000mm from the land boundary should achieve an Index (I) of not more than 20 (national class) or class C-s3, d2 or better (European class). Timber cladding at least 9mm thick is also acceptable in these areas.

4.3.3 As the building does not include a floor more than 18m above ground level, there are no limitations applied to the insulation materials used within external cavity walls.

4.4 External Roof Construction

4.4.1 As the building is located less than 6m from the relevant external boundaries the roof coverings present will achieve a minimum AA, AB or AC (National Class) or a $B_{ROOF}(t4)$ (European Class).

5.0 CONSTRUCTION

5.0.1 Schedule 1 of the Building Regulations requires the following functional requirements to be met in respect of B3, Internal fire spread (structure):

(1) The building shall be designed and constructed so that, in the event of 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 two buildings.

(3) To inhibit the spread of fire within the building, it shall be sub-divided with fire resisting construction to an extent appropriate to the size and intended use of the building.

(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.

5.0.2 The following sections discuss the implications of these requirements on the proposed design of the building.

5.1 Elements of Structure

5.1.1 The building does not contain a top floor more than 18m above ground level, therefore the elements of structure will achieve 60 minutes fire resistance.

5.1.2 Any elements of structure which only support themselves or a roof do not require any specific fire resistance.

5.1.3 It should be noted that any structure which supports a compartment wall or floor with a higher fire resistance than that of the general structure will also be increased to the same level as that of the compartmentation element.

5.2 Compartmentation

5.2.1 All floors will be constructed as compartment floors which afford a fire resistance of 60 minutes.

5.2.2 Each apartment will be fire separated from the common areas and each other by construction having a minimum fire resistance of 60 minutes. Each apartment front door will be a minimum FD30S self closing door.

5.2.3 Internally within each apartment the entrance hall that connects each room to the main entrance door will be constructed as a protected hallway achieving a minimum of 30 minutes fire resistance with FD20 doors (no self closers or smoke seals are needed).

5.2.4 The communal stair core will afford 60 minutes fire resistance with FD30S self closing doors.

5.2.5 The ground floor discharge route from the stair core to the final exit will maintain the fire resistance of the staircase itself, i.e. 60 minutes with FD30S self closing doors.

5.2.6 The lift shaft will achieve 60 minutes fire resistance with FD30 lift landing doors.

5.2.7 Any ancillary accommodation that adjoins the residential accommodation will be separated with construction achieving a fire resistance equal to that of the elements of structure (i.e. 60 minutes).

5.2.8 All wall and floor construction separating the residential areas from the car park below will achieve a minimum of 60 minutes fire resistance.

5.2.9 All service risers will be constructed as protected shafts having a minimum fire resistance not less than that of the elements of structure, i.e. 60 minutes fire resistance with FD30 doors.

5.3 Fire Doors

5.3.1 Fire doors will be provided with protection in accordance with the below table:

Locations	When tested in accordance with BS476-22	When tested in accordance with BS EN 1634–1
Apartment entrance doors	FD30S Self Closing	E30S Self Closing
Apartment internal hallway door	FD20	E20
Staircase doors	FD30S Self Closing	E30S Self Closing
Riser doors	FD30	E30
Lifts	FD30	E30
Cross corridor doors	FD20S Self Closing	E20S Self Closing
Plant room doors	FD30 Self Closing	E30 Self Closing
Store doors	FD30 Self Closing	E30 Self Closing

5.3.2 All doors will be provided with self closers, except riser and small cupboard doors which should be kept locked shut and signed as such. Internal entrance hall doors to habitable rooms also do not require self closing devices.

5.3.3 It is acceptable to provide doors on electromagnetic door hold open devices which release on the operation of the fire alarm system. Any smoke detectors included to assist with providing early closure of these doors will be located suitably close to the doors.

5.3.4 All doors necessary for escape which are provided with access controls will be provided with a suitable override facility that is acceptable to the approving authorities.

5.4 Places of Special Fire Risk

5.4.1 Plant rooms will achieve at least 60 minutes fire resistant separation with FD30 self closing doors from any adjacent accommodation.

5.4.2 Refuse stores will achieve at least 60 minutes fire resistant separation with FD60 self closing doors from any adjacent accommodation.

5.4.3 Any electrical sub-stations will be fully separated from the adjacent accommodation spaces by at least 30 minutes fire resisting construction, although these requirements are likely to be superseded by the electricity supplier's requirements, which are typically based on 4 hours fire separation.

5.4.4 Any plant rooms and stores accessed internally should be separated from the residential escape routes by protected lobbies provided with no less than 0.4m^2 permanent natural ventilation.

5.4.5 Any refuse rooms accessed internally should be accessed via a protected lobby provided with no less than 0.2m^2 permanent natural ventilation.

5.4.6 Cleaner cupboards, stores and utility rooms will be enclosed in 30 minutes fire resistance with FD30 self closing doors.

5.5 Fire Stopping

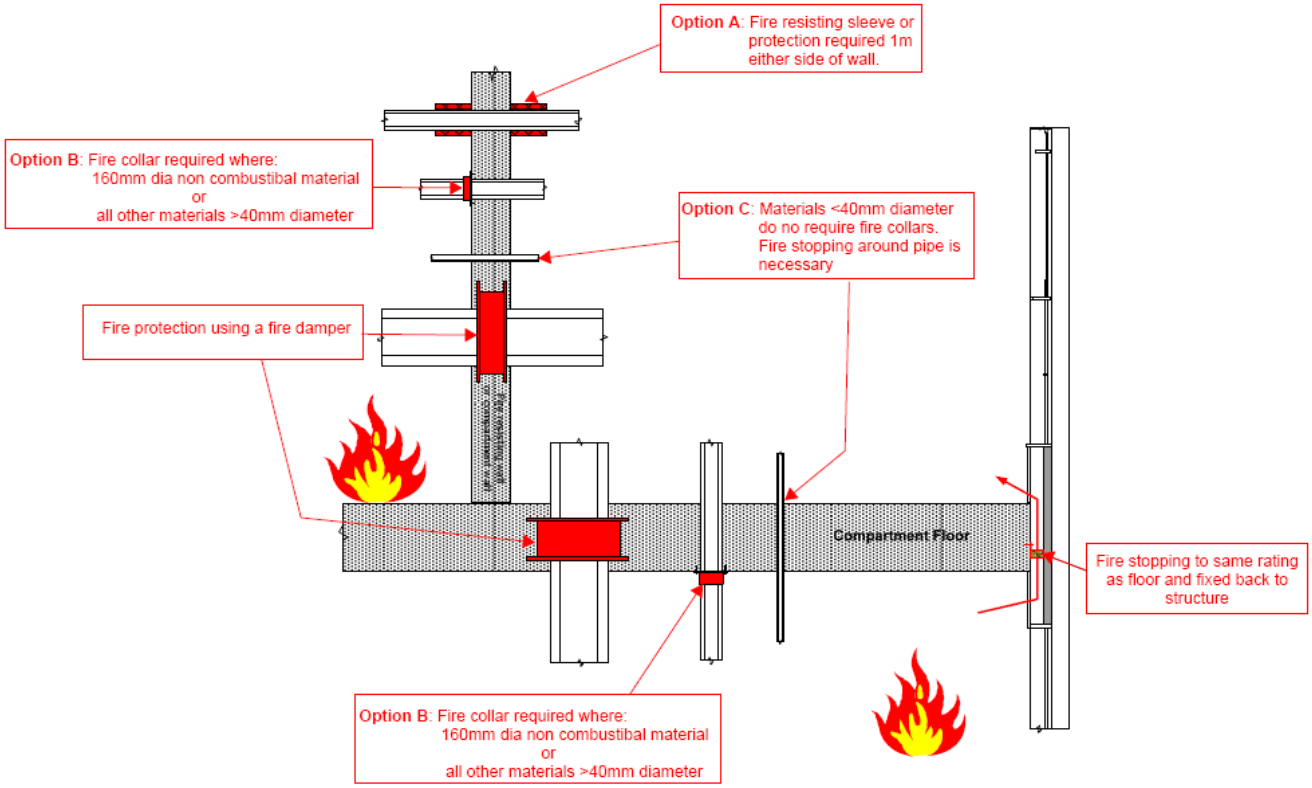
5.5.1 Ductwork passing through compartment/fire resistant walls within the residential accommodation will be either contained within fire resisting construction or provided with fire dampers.

5.5.2 The ductwork will be provided with fire and smoke dampers activated automatically on the activation of the building fire alarm and detection system. Fire and smoke dampers will be provided to ductwork which are installed in any of the following areas (unless they are contained within fire resisting construction throughout their route to fresh air):

- Ductwork serving both escape routes and accommodation or;
- Ductwork passing through both stairs, stair lobbies and accommodation or;
- Ductwork passing through walls separating fire compartments.

5.5.3 Any openings for services (exceeding the dimensions discussed in Table 14 of ADB, as shown below) breaching compartment walls or floors will be fire stopped (unless protected throughout their entire length with fire resisting material) in accordance with Section 10 of ADB. This is to prevent the passage of fire and to assist in retarding the movement of smoke. Joints between elements of structure that serve as barriers to fire will be fire stopped to prevent the passage of fire and smoke.

Situation	Pipe material and maximum nominal internal diameter (mm)		
	(a) Non-combustible material	(b) Lead, Aluminium, aluminium alloy, UPVC, fibre cement	(c) Any other material
Structure (but not a wall separating buildings) enclosing a protected shaft which is not a staircase or a lift shaft	160	110	40
Compartment wall or Compartment floor between flats	160	160 (stake pipe) 110 (branch pipe)	40
Any other situation	160	40	40



5.6 Cavity Barriers

5.6.1 Cavity barriers will be included in any large cavity with the potential for extensive unseen fire spread. The key areas that require cavity barriers are as follows:

- At the junction between an external cavity wall and a compartment wall that separates buildings; and at the top of such an external cavity wall.
- At the junction between an external cavity wall and every compartment floor and compartment wall.
- At the junction between a cavity wall and every compartment floor, compartment wall, or other wall or door assembly that forms a fire-resisting barrier.
- In a protected escape route, above and below any fire-resisting construction that is not carried full storey height.
- Where the corridor will be sub-divided to prevent fire or smoke affecting two alternative escape routes simultaneously.
- Within the void behind the external face of rainscreen cladding at every floor level, and on the line of compartment walls abutting the external wall of buildings
- At the edges of cavities (including around openings).

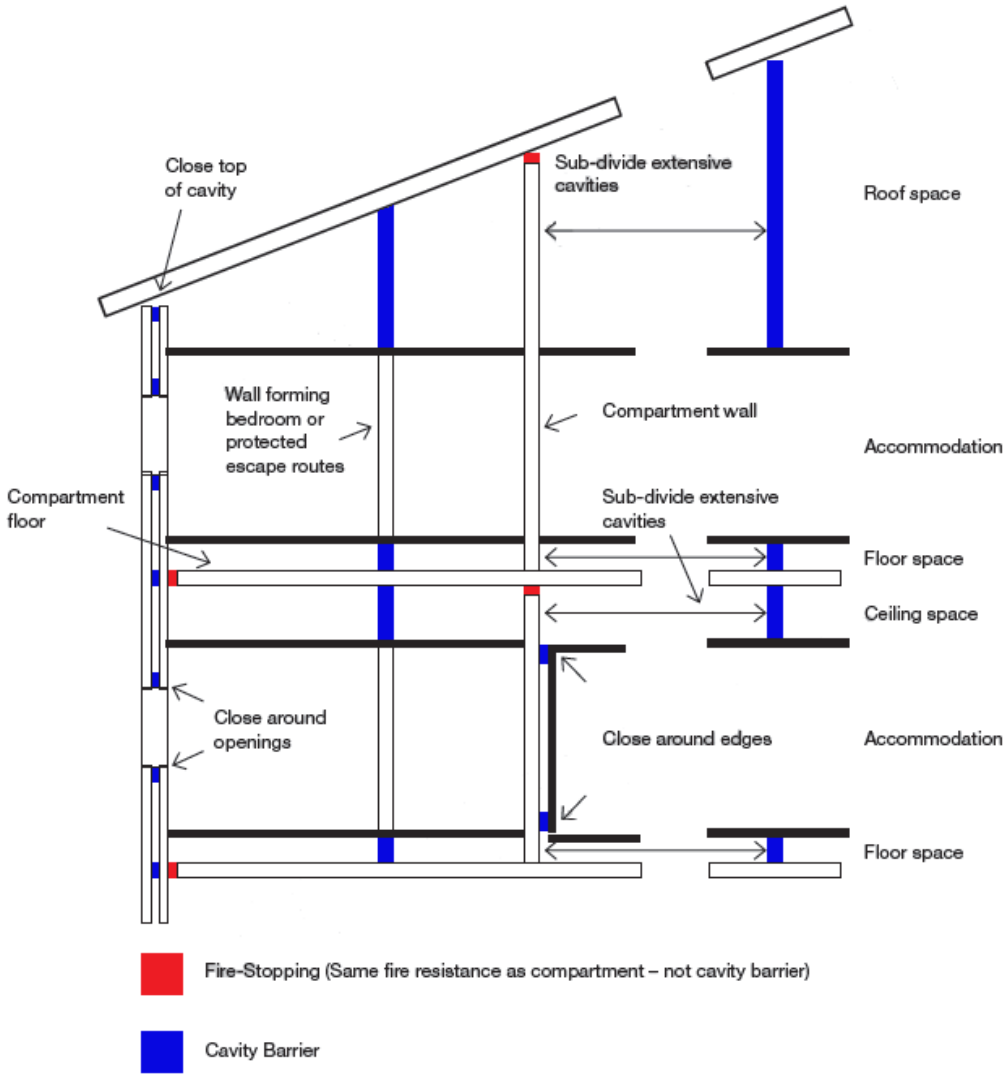
5.6.2 In addition to the above locations cavity barrier are also normally required in cavities (including ceiling voids and under floor service voids) where the cavity exceeds 20m. However ADB makes the recommendation that such cavity barriers (including dampers in air conditioning ductwork) can be omitted, resulting in unlimited cavity sizes, providing the criteria outlined in paragraph 9.12 of ADB are adopted (see summarised recommendations in the table below).

ADB Recommendations from Paragraph 9.12
A) The room and the cavity together are compartmented from the rest of the building.
B) An automatic fire detection and alarm system meeting the relevant recommendations of BS5839 Part 1 is fitted in the building (however detectors are not required in the cavity)
C) The cavity is used as a plenum and the recommendations about re-circulating air distribution system s in BS5588 Part 9: 1999[7] are followed.
D) The surface of the ceiling exposed in the cavity is Class O and the supports and fixings in the cavity are non-combustible construction
E) The flame spread rating of any pipe insulation system is Class 1
F) Any electrical wiring in the void is laid in metal trays, or in metal conduit
G) Any other materials in the cavity are of limited combustibility

5.6.3 The cavity barriers will provide a 30-minute fire rating (i.e. 30 minutes integrity and 15 minutes insulation). Any penetrations through the cavity barriers will be either;

- Fitted with a proprietary sealing system.
- Pipes of limited diameters that are sealed with fire-stopping, or sealed with sleeving of non-combustible pipe material.

5.6.4 The specification of cavity barriers should not be confused with the specification of fire stopping between fire resisting elements, e.g. walls and floors, which should afford the same level of fire resistance as the fire resisting elements themselves. These principles are highlighted in the diagram below.


Close top of cavity
Sub-divide extensive cavities
Roof space
Wall forming bedroom or protected escape routes
Compartment wall
Accommodation
Compartment floor
Sub-divide extensive cavities
Floor space
Ceiling space
Close around openings
Close around edges
Accommodation
Floor space
Fire-Stopping (Same fire resistance as compartment – not cavity barrier)
Cavity Barrier

6.0 FIRE SERVICE ACCESS

6.0.1 Schedule 1 of the Building Regulations requires the following functional requirement to be met in respect of B5, Access and facilities for the fire service:

(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 provisions shall be made within the site of the building to enable fire appliances to gain access to the building.

6.0.2 The following discusses the implications of these requirements on the proposed design with regard to access and facilities for the Fire Service within and around the building.

6.1 External Vehicle Access

6.1.1 The building does not contain a top floor more than 18m above ground level, therefore the stair core has not been designated as a fire fighting shaft. A single dry riser is proposed to the stair core in order to satisfy hose distance limitations. Dry riser outlets are proposed to be located within the protected stair enclosure at each floor level.

6.1.2 There will be access for a fire service pumping appliance to within 18m of the fire main inlet connection point, proposed on the face of the building ideally adjacent to the core entrance. The dry main inlet will be visible from the fire appliance.

6.1.3 The external vehicle access provisions to the site will adopt the recommendations from ADB Table 20 as outlined below:

Min Width of road between kerbs	Minimum width of gateways	Minimum turning circle between kerbs	Minimum turning circle between walls	Minimum clearance height	Minimum carrying capacity
3.7m	3.1m	16.8m	19.2m	3.7m	12.5 tonnes*

Notes: * = It may be necessary to increase this requirement subject to confirmation of local fire service vehicle weights.

6.2 Internal Access

6.2.1 *Residential Common Areas*

6.2.2 The residential portion of the development is served by one internal stair core, which serves a top floor less than 18m above ground floor level. On this basis the core has not been designated as a fire fighting shaft, but will incorporate a dry riser in order to satisfy hose distance limitations.

6.2.3 As stated earlier there will be access for a pumping appliance to within 18m of the fire main inlet connection point, which will be located on the face of the building adjacent to the core entrance.

6.2.4 All areas of the floor plate are accessible within 45m of a dry riser outlet located within a protected staircase.

6.2.5 *Car Park*

6.2.6 All points within the car park will be accessible within 45m of a fire appliance parking location or dry riser outlet located within a protected stair enclosure.

6.3 Fire Suppression Systems

6.3.1 No automatic fire suppression systems are proposed within the development.

6.4 Smoke Venting Systems

6.4.1 *Residential Apartments*

6.4.2 No smoke venting systems are proposed internally within any of the apartments.

6.4.3 Residential Common Areas

6.4.4 Each of the common corridors from ground to fifth floor will be served by a mechanical smoke shaft in order to achieve the required protection to the staircase and justify the extended travel distances (where present). Further details of the proposed mechanical smoke shaft are included in Appendix B of this report.

6.4.5 The automatic smoke ventilation proposed will be activated by smoke detection within the enclosed common areas concerned. The staircase will also be provided with a 1.0sqm AOV at the stair head, which will activate automatically at the same time as the smoke ventilation system on the affected floor.

6.4.6 A common zoned smoke detection system will be provided at all levels in the enclosed common corridors. The purpose of the detection systems is to initiate the operation of the life safety automatic ventilation systems. No sounders or manual call points will be provided as part of the system. These facilities are discussed further in Section 3.9.

6.4.7 *Car Park*

6.4.8 Smoke clearance and environmental ventilation is needed from car park. ADB recommends that a car park be provided with ventilation to two sides equally to achieve a minimum natural vent area of 2.5% of the floor area. However, the environmental ventilation requirements override this. Approved Document F (ADF) recommends that permanent ventilation to two sides equally is provided. This ventilation should achieve a free vent area of at least 5% of the floor area or alternatively it should be demonstrated that the toxicity levels within the car park will not exceed 50ppm over an 8 hour period or 100ppm over a 15 minute peak period.

6.4.9 It is understood that the above ventilation requirements are satisfied based on the openings currently proposed from the car park to outside air.

6.4.10 The exit from the car park into the lift/staircase shafts should be via a protected and ventilated lobby. It is proposed that this lobby will be provided with a 0.4m² natural vent direct to outside air.

6.5 Emergency Power Supplies

6.5.1 In the event of a failure of the mains power supply a secondary backup power supply will be provided to feed all life safety systems that require electricity to function as intended. The secondary supply will be appropriate for the life safety system concerned. At this stage the following life safety systems will include an appropriate backup power supply:

- Any illuminated emergency signage
- Emergency lighting
- Automatic fire alarm and detection system
- Automatic smoke venting systems
- All fire alarm interlinked fire/smoke dampers (if applicable)

6.5.2 Fire resistant power and control cable systems for life safety and fire fighting applications will be in accordance with BS 8519: 2010[8].

6.6 Fire Fighting Lifts

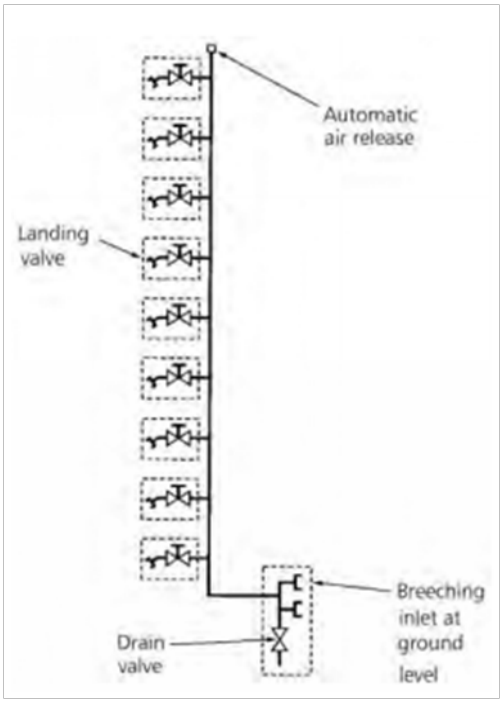
6.6.1 As discussed earlier the development does not incorporate any fire fighting shafts, therefore no fire fighting lifts are proposed.

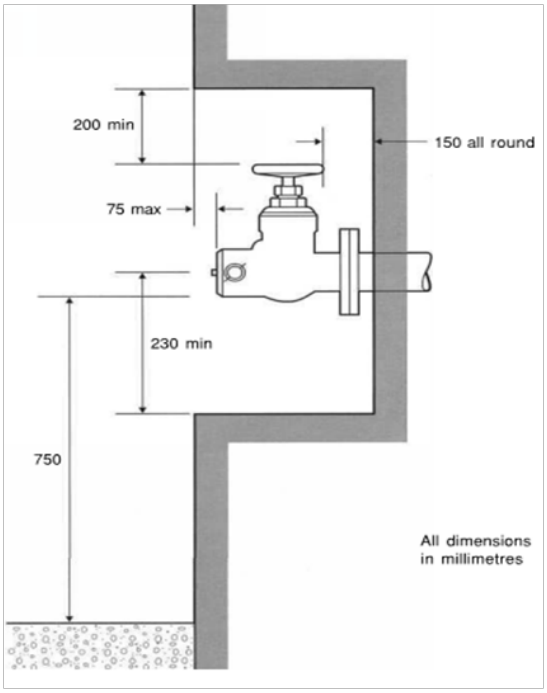
6.6.2 In accordance with BS EN 81-73[9] the passenger lift within the development will be provided with a means of grounding the lift. As the lift is not intended for fire fighting or escape the British Standard recommends that the grounding facility can be by automatic or manual means. In this case (as a whole building automatic fire alarm system is not proposed) it is recommended that a manual grounding switch be provided at fire service access level.

6.7 Wet and Dry Risers

6.7.1 As discussed in Section 6.2 the core will include a single dry rising water main. This main will be located within the protected staircase. The dry rising water main will have outlets located in the protected staircase at ground to fifth floor level and the inlet located adjacent to the core entrance. The dry main inlet will be within 18m of the fire appliance parking position and also visible from the fire appliance.

6.7.2 The dry main will be designed and installed in accordance with BS 9990[10]. Particular attention will be paid to the fixing heights and recess requirements for landing valves as detailed below.





6.8 Hydrants

6.8.1 Until April 2007 the Building Regulations did not include requirements to provide additional fire hydrants beyond what was already provided in the public highways, however recent amendments to Approved Document B have included a recommendation to consider this as part of the development of the building design.

6.8.2 In this case ADB recommends that where a building with a compartment size of 280m^2 or more in area is being erected more than 100m from a existing fire hydrant, additional hydrants should be provided. In this case there the only compartment exceeding this area is the basement car park, however it is understood that an existing fire hydrant is located well within 100m of the site at the corner of Jameson Road and Sea Road. On this basis there is no requirement for any additional fire hydrants to be provided within these works.

7.0 FIRE SAFETY MANAGEMENT

7.0.1 The primary focus of this strategy is on two groups, the persons present in the building and the provisions associated with ensuring safe egress, and on fire-fighter protection. It is considered that in addressing these any impact on the environment and other persons will be minimised to a reasonable level. It is believed that the strategy outlined in the previous sections together with an effective fire manual and risk assessment developed from this strategy will provide a template for effective fire management of these premises.

7.0.2 ADB requires that the fire strategy be brought to the attention of building management and incorporated into the risk assessments that will have to be carried out post occupation under the Regulatory Reform (Fire Safety) Order together with staff training, systems maintenance etc. and documented.

7.0.3 The Regulatory Reform (Fire Safety) Order 2005 (RRO) requires that systems provided for fire safety are maintained in good working order at all times. This includes fire fighting equipment together with other facilities to be provided for the safety of people in the building and to help fire fighters.

7.0.4 Appendix G of the current Approved Document B (Regulation 38) requires information to be passed onto the responsible person (as defined within the RRO) on completion of the project. This project is considered a complex building and therefore the following information is required:

- This fire strategy
- All design assumptions relating to the management of the building (where not included in the fire strategy)
- Escape routes, escape strategy and muster points
- Details of all passive fire safety measures including compartmentation, cavity barriers, fire doors, self closing fire doors and other doors equipped with relevant hardware (e.g. access controls), duct dampers and fire shutters.
- Fire detector heads, smoke detector heads, alarm call-points, detection/alarm control panels, alarm sounders, emergency communication systems, CCTV, fire safety signage, emergency lighting, fire extinguishers, dry and wet risers and other fire fighting equipment, other interior facilities for the fire service, emergency control rooms, location of hydrants outside the building, other exterior facilities for the fire service.
- Details of all active fire safety measures including:
  - Smoke control system(s) (or HVAC system with a smoke control function) design, including mode of operation and control systems.
- Any high risk areas (e.g. heating machinery) and particular hazards
- As built plans of the building showing the locations of the above items.
- Specifications of any fire safety equipment provided, including operational details, operators manuals, software, system zoning and routine inspection, testing and maintenance schedules. Records of any acceptance or commissioning test.
- Any provision incorporated into the building to facilitate the evacuation of disabled people.
- Any other details appropriate for the specific building.

7.0.5 This information is mainly provided in the form of as built plans, but supplemented in this case by the fire strategy i.e. this document. Marked up as-built plans will be provided by the architect on completion. The client has a procedure in place for the formal handover of the above information to the end user client at completion of the building works.

7.0.6 Using this information and the original fire strategy the “responsible person” should ensure a fire risk assessment is carried out for the residential common areas of the building accommodation. It is recommended that this is recorded, kept with the other information indicated in this document and updated on an annual basis or if any significant change is made to the fire risk or facilities in these areas.

7.0.7 It is suggested that a fire manual (see BS 9999) will be developed for the building bringing together all aspects needed for the effective fire safety management of the building. The items discussed above are discussed in greater depth, along with key items that should be recorded in the buildings Fire Risk Assessment, in Appendix A.

8.0 CONCLUSIONS & RECOMMENDATIONS

8.0.1 The proposals outlined in this document demonstrate a level of fire safety equal to or greater than the general standard implied by compliance with the recommendations in Approved Document B, Volume 2. This level of safety therefore satisfies the functional requirements of the Building Regulations relating to fire safety.

8.0.2 The fire strategy described in this report can be summarised as follows:

- Means of escape will be based on the dwelling of fire origin only evacuating in the event of a fire. No interconnection of fire alarm system or evacuation protocol is proposed between any areas of the building.

- The apartments are accessed from the common staircase by enclosed common corridors. Ventilation of the enclosed common corridors will be achieved by a mechanical smoke shaft serving each level from ground to fifth floor.

- Structural fire resistance will afford 60 minutes fire resistance. Any conflicts in fire resistance will be resolved by the higher standard of fire resistance being adopted.

- Each floor will be constructed as a compartment floor with a fire resistance period equivalent to that of the building structure (i.e. 60 minutes). Each apartment will form its own 60 minute fire resistant compartment. Vertical shafts will generally afford a fire resistance period equal to that of the elements of structure (i.e. 60 minutes).

- Fire alarm and detection systems within the building will be:

    - Within apartments – LD3 (BS5839 Part 6)
    - Residential common areas – L5 (BS5839 Part 1) to areas provided with automatic smoke venting only
    - Car Park – None

- Fire service vehicle access to the site is achieved based on access from Jameson Road and Sea Road. The building does not incorporate a floor more than 18m above the access level, therefore no fire fighting shafts are proposed, however the stair core will incorporate a dry riser in order to satisfy hose distance limitations. All apartments are covered within 45m of a dry riser outlet located within a protected staircase. No additional fire hydrants are proposed within these works.

9.0 LIMITATIONS, ASSUMPTIONS AND REFERENCES

9.0.1 The information limitations and assumptions used in the preparation of this report are described below.

9.1 Drawing Information

9.1.1 This document is based on the most recent Stephen Langer Associates drawings available at the time of issue. All dimensions have been taken from these drawings.

9.2 Building Regulations

9.2.1 This report considers Building Regulations which deal with life safety only. Property protection, business continuity and insurance issues are not addressed in this report.

9.3 Other Limitations

9.3.1 Complying with the recommendations of this report will not guarantee that a fire will not occur.

9.3.2 This report has been prepared for the sole benefit, use and information of the South Beach Apartments project team and the liability of BWC Fire Limited, its directors and employees in respect of the information contained in the report will not extend to any third party.

9.4 References

1. Building Regulations, Approved Document B – Volume 2, April 2007, Fire Safety: Buildings other than dwelling houses

2. BS 5839 Part 1: 2013, Fire detection and fire alarm systems for buildings. Code of practice for system design, installation, commissioning and maintenance

3. BS 5839 Part 6: 2013, Fire detection and fire alarm systems for buildings. Code of practice for the design, installation and maintenance of fire detection and fire alarm systems in dwellings

4. BS 5266 Part 1: 2016, Emergency lighting. Code of practice for the emergency lighting of premises

5. BS ISO 3864-1: 2011, Graphical symbols. Safety colours and safety signs. Design principles for safety signs and safety markings.

6. BRE Guide 187: 2014, External fire spread: building separation and boundary distances

7. BS 5588 Part 9: 1999, Fire precautions in the design, construction and use of buildings. Code of practice for ventilation and air conditioning ductwork

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

9. BS EN 81-73: 2016, Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts. Behaviour of lifts in the event of fire.

10. BS 9990: 2015, Code of practice for non-automatic fire fighting systems in buildings.

APPENDIX A – MANAGEMENT RISKS / FIRE RISK ASSESSMENT LOG

The following log identifies the key fire strategy elements (although this is not an exhaustive list) that must be highlighted to the end user/occupier to assist them with managing and maintaining the fire safety strategy. These items should be incorporated into all applicable fire risk assessments and management procedures that consider fire safety within this building.

1. The residential common areas form the only route of escape from the apartments. It is therefore essential that the staircase, final discharge routes and common corridors are maintained as sterile areas that are free of obstructions, combustible materials and furnishings. The staircase and corridors also need particular attention with respect to standards of housekeeping. Management procedures should also be developed and implemented for the management of deliveries, post, visitors and maintenance to avoid fire load and ignition sources being introduced in the escape routes.

2. The residential staircase also includes automatic smoke venting from the common corridors and staircase in order to protect the residential escape routes. These facilities need to be regularly tested and maintained to ensure they operate and perform effectively in the event of an emergency. Records must be kept to document the successful testing and maintenance regime. Both the automatic and manual operation of the smoke venting should be tested and maintained.

3. In addition to item 2, fire compartmentation is proposed, including compartment walls and floors to separate each residential apartment from its neighbours and the communal areas. Any post occupation service penetrations created in any of these compartment walls and floors must be appropriately fire stopped to an appropriate standard (either 30 or 60 minutes depending on the location). It is essential that once the building is occupied that these separating walls and floors are regularly checked for breaches. Flat entrance doors will be retained a landlord responsibility to maintain following occupation and it essential that these are regularly checked for defects.

4. The buildings generally include several physical and active fire safety systems necessary to maintain the fire strategy proposals. Each system should undergo regular testing and maintenance to ensure that an acceptable level of safety is maintained throughout the life of the buildings.

5. It is a requirement under the RRO for the building owners / occupiers to carry out a Fire Risk Assessment (FRA) for the residential common areas of the building.

APPENDIX B – RESIDENTIAL FAN ASSISTED SMOKE SHAFT CONCEPT DESCRIPTION & PERFORMANCE CRITERIA

B1.0 INTRODUCTION

The South Beach Apartments development in Bexhill has been proposed to utilise a single mechanical fan assisted smoke shaft to provide smoke ventilation to the extended common corridors at Ground to 5th floor. Mechanical ventilation has been specifically provided to justify the extended dead end travel distances present (up to 27m in a single direction).

A single 0.5m^2 fan assisted smoke shaft is proposed to serve the common corridors from Ground to 5th floor, positioned close to the dead end of the corridor in each case. Makeup air is provided via a 1sqm AOV located at the head of the common staircase. At this stage to ensure that makeup air can be drawn into the common corridor the staircase doors will open against the direction of escape (acceptable due to the low occupancy numbers involved).

This appendix discusses the mechanical smoke ventilation concept that has been applied to this scheme along with the proposed performance criteria that the mechanical smoke ventilation will be designed to achieve, as well as providing a brief overview of the proposed system configuration.

It is proposed that this note assists with obtaining agreement from the approving authorities for the smoke venting concept and subsequently these criteria form the basis of the technical submission, including detailed system design and CFD modelling justification, by the appointed specialist smoke venting contractor.

B2.0 FAN ASSISTED SMOKE SHAFT CONCEPT DESCRIPTION

B2.1 System Objective

The mechanical fan assisted smoke shaft proposed on this development is designed to provide smoke clearance from the residential common corridors during means of escape and fire fighting to a standard that is similar or better than that of a common corridor with traditional smoke clearance provisions.

In addition to the general objective above the smoke clearance is also provided to mitigate the extended single direction travel distances within the corridors at 1st to 5th floor level, and also to protect the single staircase serving the corridors.

B2.2 Performance Concept Discussion

Legislative Position

Approved Document B (ADB) outlines the basic recommendations to achieve minimum fire safety standards to residential common corridors. Adopting ADB guidance any residential apartment building over 11m in height and served by a single staircase should have travel distances limited to 7.5m and automatic smoke ventilation by natural means should be provided.

Further developing the above ADB recommends that the common staircase can be accessed from a sterile staircase lobby, which is provided with smoke ventilation. A common corridor enables the individual apartments to access the staircase lobby and staircase beyond. The travel distances in this common corridor are then limited to 7.5m however no smoke clearance is provided to this common corridor.

Given the above guidance it is clear that the primary purpose of smoke ventilation in common corridors is to assist with protecting the staircase. This rationale is confirmed by the commentary in Paragraph 2.25 of ADB extracted below:

"Despite the provisions described in this Approved Document, it is probable that some smoke will get into a common corridor or lobby from a fire in a flat, if only because the entrance door will be opened when the occupants escape. There should therefore be some means of ventilating the common corridors/lobbies to control smoke and so protect the common stairs. This offers additional protection to that provided by the fire doors to the stair. (The ventilation also affords some protection to the corridors/lobbies)."

ADB goes on to discuss different forms of smoke venting that are considered to provide minimum acceptable standards of smoke venting to residential common corridors. These ventilation methods can be classified as follows:

- Traditional Automatically Openable Vents (AOV's) – 1.5m^2 vents or windows that discharge directly to outside from the common corridor concerned. In addition ADB recommends that a 1m^2 AOV should also be provided at the head of the common staircase that opens at the same time or before the AOV in the affected common corridor.
- Natural smoke shaft – A natural 1.5m^2 chimney type smoke shaft with 1m^2 AOV's into the smoke shaft from the common corridors at each level. Again a 1m^2 AOV should also be provided at the head of the common staircase that opens at the same time or before the AOV in the affected common corridor. Further details on this ventilation approach are given in Paragraph 2.26 of ADB.
- Mechanical pressure differential systems designed in accordance with BS EN 12101 Part 6.

Means of Escape Issues and Concept Proposals

From the discussions above it is clear that the primary concept objective for the smoke venting system must be to ensure that the staircase is maintained free of smoke at all times.

As the travel distances in the corridors are extended it is also necessary to demonstrate additional benefits and mitigation for the additional travel. To do this, consideration should be given to occupants escaping from the apartment of fire origin and those occupants of the other non-affected apartments.

It is proposed that once occupants in the apartment of origin have entered the common corridor (a separate fire compartment) they have entered a place of relative safety and can make their way to the staircase relatively unimpeded by heat and smoke. Logically this statement is valid as with the occupants moving away from the fire source conditions should be naturally improving and therefore for these specific occupants the relative conditions in a code compliant corridor as opposed to a corridor with extended travel distance are relatively negligible.

A much greater importance is the impact of the travel distance on occupants whom are in other non-affected apartments. These occupants may or may not be aware of the fire event but within the guidance should not be unduly confined to their apartments. The defend in place strategy certainly means that occupants may wish to leave their apartment at a point after which smoke has leaked into the common corridor. Within the code the 7.5m travel distance limit originated as a distance through which occupants would be reasonably prepared to attempt escape through a smoke filled environment, however the lack of performance criteria makes this an unrealistic design criteria. It should also be noted that on a practical level if the apartment door to the fire apartment is open then it is unlikely that any common corridor would be considered tenable for escape (in both a code compliant or extended corridor).

As a defend in place strategy is present then an important secondary design condition is to ensure that smoke cannot leak into any non-affected apartments. Beyond this the smoke venting should be designed to ensure that following the detection of smoke within the common corridor the ventilation should quickly and efficiently return the common corridor to tenable conditions. The design period needed to return the common corridor to tenable conditions is relatively arbitrary providing this period is completed shortly after the occupants evacuated the apartment of origin. One rationale could be that the common corridor should be returned to tenable conditions in a duration proportional to the performance of a code compliant common corridor and associated smoke clearance. Subject to external wind conditions, the fire scenario, the apartment entrance door etc the clearance times and conditions can vary significantly and therefore a reasonable short and practical clearance time is proposed of up to 160s from activation of the smoke ventilation system (as suggested within the Smoke Control Association document "Guidance on Smoke Control to Common Escape Routes in Apartment Buildings (Flats and Maisonettes) - Revision 2: October 2015").

Finally once the corridor has been returned to tenable conditions the smoke ventilation system should ensure that further smoke is not encouraged to leak into the common corridors from the fire apartment up until fire service intervention.

Fire Fighting Issues and Concept Proposals

During fire fighting the affected apartment entrance door and the staircase door are likely to be open, leading to significant smoke logging of the common corridor.

Previous research studies, notably by the Building Research Establishment, have explored conditions within common corridors and staircases during fire fighting. Such studies have highlighted that it is exceptional difficult to maintain the common corridors tenable under these circumstances and also with natural ventilation systems (particularly traditional wall mounted AOV's) there is the potential for some smoke logging of the staircases.

Given the above it is considered particularly onerous to attempt to design the smoke venting system to maintain tenable conditions within the common corridors during fire fighting. On this basis it is proposed that the fundamental objective during fire fighting operations remains to keep the staircase free of smoke at all times.

Further to the above, it is proposed that the smoke venting systems is also designed to ensure that conditions within the common corridors are in line with the performance criteria outlined in section 5.3.3 of the Smoke Control Association document "Guidance on Smoke Control to Common Escape Routes in Apartment Buildings (Flats and Maisonettes) - Revision 2: October 2015".

B2.3 Performance Criteria

Based on the discussions in earlier the design information for the fan assisted smoke shaft will need to achieve the following criteria:

During Means of Escape

- The staircase remains free of smoke at all times.
- The common corridor will be returned to tenable conditions within a maximum of 160s of the smoke ventilation system activating.
- Once activated the system will ensure that the pressure drop within the common corridor will not exceed 50Pa.

During Fire Fighting

- The staircase remains free of smoke at all times.
- Conditions within the common corridor are in line with those outlined in section 5.3.3 of the Smoke Control Association document referenced above.

B2.4 Justification & Design Validation

A CFD modelling study will be conducted that is specific to this development which demonstrates that the performance criteria outlined in Section C2.3 can be achieved via the smoke venting design.

The CFD modelling study will be documented in a Smoke Control Report which will be submitted to the approving authorities and include sufficient detail for the modelling study to be checked. The report will outline the system cause and effect, all modelling assumptions, relevant validation and all measurement data to be tested onsite at completion.

B3.0 FAN ASSISTED SMOKE SHAFT SYSTEM CONFIGURATION

B3.1 System Configuration Overview

As discussed earlier the system is proposed to provide smoke clearance similar to a natural Approved Document B recommended smoke clearance methods.

The basic fan assisted smoke shaft system can be described as:

- A smoke extract shaft
- Automatic smoke shaft doors or dampers opening from the common corridor into the smoke shaft
- An Automatically Opening Vent (AOV) at the head of the common staircase that serves the common corridors.

The remaining sections of this report discuss each aspect of the system in more depth.

B3.2 Smoke Extract Shaft Design

The follow provides an indicative outline for the construction of the smoke extract shaft.

- The smoke extract shaft will have a minimum internal cross-sectional free area of $0.5m^2$.
- The smoke extract shaft and common corridor shaft doors/dampers will have a minimum critical dimension of 500mm.
- Each shaft door/damper structural opening into the smoke extract shaft from a common corridor will have a minimum opening of 1m high by 0.5m wide and be located at least 1.1m above the finished floor level in each common corridor served.
- The smoke extract shaft is not required to be open at the bottom and is akin to a chimney.
- The smoke extract shaft outlet at roof level will be located in the horizontal plane.
- An Automatically Opening Vent (AOV) is required at the head of the common staircase in order to supply make up air to the system. The structural opening for this AOV be a minimum of 1m x 1m with a clear 150mm four sided upstand.
- The door between the staircase and the common corridor at each level should open out of the staircase (i.e. against the direction of escape). This is specifically to allow the pressure differentials created by the extract fans to “pull” the staircase door open on the floor of activation.
- The smoke extract shaft should be of air tight construction with a maximum leakage rate of $3.8m^3/hr/m^2$ of wall area at 50Pa. The shaft construction should also achieve fire resistance from both sides to the same period as the elements of structure (i.e. 60 minutes fire resistance).
- The shaft doors/dampers are operated via smoke detection within the common corridor on each floor independently. The operation is as follows:
  - Smoke is detected in a common corridor by the smoke detection system.
  - On activation the shaft door/damper on this corridor and the AOV at the head of the staircase will open.
  - All remaining doors/dampers will remain closed.
  - In the case of two speed systems, prior to approaching the apartment of origin fire fighters may operate a manual switch (volume control switch) located within the stairs at each level to switch the system into its higher volume extract rate.
  - In the case of two speed systems, as a safety feature, in the event that temperatures close to the smoke extract fans increase above 60^oC a thermostat should switch the fans automatically into their higher volume extract rate.

Some dimensions, facilities and operations given above may vary depending on the specific requirements of the appointed smoke venting contractor however the basic principles discussed above will be maintained.

B3.3 Fan Assisted Smoke Shaft Components

The following outlines key conceptual component proposals for the fan assisted smoke shaft. These proposals will be included within the specialist smoke venting contractors design:

Smoke extract fans

- The fans are likely to be variable volume smoke extract fans and also likely to be mounted in series.
- Each fan should be rated to temperatures of up to 600^{o}C unless the chosen smoke venting contractor can demonstrate that a lower temperature rating is reasonable.
- The fans should be connected to the smoke shaft by means of suitable ducting.
- The standby fan is to be activated by a method acceptable to the approving authorities on failure of the duty fan.

Corridor Shaft Extract Door/Damper

- The door/damper and controlling components should achieve a one hour fire resistance for integrity and stability when tested to BS 476 Part 20 as a combined unit (damper/motor/connections). This includes the holding close actuator which should keep the door/damper closed on the floors above the fire floor.
- A manual mechanical mechanism should be provided on each door which should allow fire fighters to open the door/damper should the controls fail or maintenance persons need to open the door/damper should the actuator become non-functioning.

Common Corridor door

- The stair door will swing into the lobby, providing inlet air supporting the system performance. The door should be fitted with an adjustable door closer which will satisfy the requirements of Approved Document M and limit the pressure difference to a maximum of 30 Pascals. The closer should conform to EN1154 & BS476 Part 22.

Stair Ventilator

- A ventilator should be provided at the top of the stair to provide the necessary replacement air.
- Consideration will be needed to ensure that the ventilator is not damaged or impeded by wind effects when in its open position.

Fire Fighter Volume Control Switches (multi-speed systems only)

- Localised volume control switches should be provided on each floor in the staircase by the door onto the common corridors. This will allow the system to be switched between the various modes.
- The switches should be labelled ‘Fire Volume Switch’, ‘High’ and ‘low’.
- On receiving a signal from the one of the volume switches the fan should speed up or slow down. It is proposed that these switches only become active once smoke has been detected within a common corridor.

Electrical Power Supplies

- The electrical power supply arrangements to the system will satisfy the design criteria in BS EN 12101 Part 6, Item 11.6 Electrical power supplies (primary and secondary), with respect to wiring systems, primary and secondary power supply arrangements.
- The electrical arrangements should be such that the smoke extract fans will not operate unless there is sufficient make up air is being provided and the fire floor shaft door/damper is in the open position.

Ground Floor Fire Alarm Control Information Panel

- A fire alarm status panel is to be provided at ground level in each block which controls the common corridor smoke detectors and fan assisted smoke extraction system. The panel and installation needs to satisfy the requirements of the British Standards BS 5839, EN54 Parts 2 & 4 and EN12094 Part 1.
- The panel is to indicate the floor of detection and the operation of the fan assisted system.
- Smoke detectors to an L5 standard need to be provided within the common corridors to operate the fan assisted system.
- A key switch is to be provided adjacent to the control panel which allows the Fan Assisted System to be manually turned to Auto/Off or manually by-pass the smoke detection systems allowing the shaft doors to be opened manually on the fire floor and bring the system into operation.

Wiring

- The system should be wired in fire rated cable with essential circuits required to maintain the system running, installed with enhanced fire rated cables.
- All cabling to support life safety systems within the buildings on the development should conform to BS 8519:2010.