

Royal National Throat, Nose and Ear Hospital, 330 Gray's Inn Road, London

## 1 APPOINTMENT AND BACKGROUND

OFR Consultants have been appointed by Groveworld to provide fire safety design advice in support of the redevelopment of the Royal National Throat, Nose & Ear Hospital site, London, known as 330 Gray's Inn Road. OFR will aid the design team in the development of the building, including assisting in specifying the requisite fire safety systems and provisions necessary for the building.

This document presents the fire statement for 330 Gray's Inn Road, prepared by OFR Consultants Ltd on behalf of Groveworld, as part of The London Plan [1]. The building, inclusive of active and passive fire safety measures, will ensure to satisfy the functional requirements of Part B of Schedule 1 to the Building Regulations 2010 (as amended, 2018) [2].

Policy D12 of The London Plan requires development proposals to achieve the highest standards of fire safety, embedding these at the earliest possible stage. The aim of this document / fire statement is therefore to demonstrate to the planners (and other that may review the application) that fire safety is being considered from the outset. It is not the fire strategy but is a standalone document which defines the fire safety objectives and performance requirements of a development, and the methods by which these objectives will be provided / satisfied. The fire statement evidences the provisions made for the safety of occupants and protection of property as well as the provision of suitable access and equipment for firefighting in light of London Plan fire safety policy requirements and the justification for these measures.

## 2 COMPETENCY, COMPLIANCE AND QUALITY ASSURANCE RECORD

Consistent with the guidance contained within Policy D12, the statement has been prepared by someone who is third-party independent and suitably qualified. The approver of this document is a registered engineer with the Engineering Council with the post-nominals CEng (Chartered Engineer) and is registered with the Institute of Fire Engineers with the post nominals MIFireE.

The technical content that will be produced within the development application will seek to comply with all relevant legislation and London Plan fire safety policy requirements.

Rev	Date	Comments	Author	Checked by	Approved by
R00	14/09/20	Initial Issue	MA	BMcC	JW
R01	30/10/20	Update following client comments		As above	
R02	16/11/20	Update following client comments		As above	

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## 3 THE DEVELOPMENT

The scheme comprises redevelopment of the former Royal National Throat, Nose and Ear hospital, comprising: Retention of 330 Gray's Inn Road and a two storey extension for use as hotel, demolition of all other buildings, the erection of a part 13 part 9 storey building plus upper and lower ground floors for use as a hotel including a café and restaurant; covered courtyard; external terraces; erection of a 7 storey building plus upper and lower ground floors for use as office together with terraces; erection of a 10 storey building plus upper and lower ground floors for use as residential on Wicklow Street and office space at lower ground and basement floors; erection of a 5 storey building plus upper and lower ground floors for use as residential on Swinton Street and associated residential amenity space; together with a gymnasium; new basement; rooftop and basement plant; servicing; cycle storage and facilities; refuse storage; landscaping and other ancillary and associated works.



Figure 1 – 330 Gray's Inn Road site masterplan

## 4 DESIGN APPROACH AND METHODOLOGY

The minimum fire safety goal for each building is to provide a reasonable standard of health and safety in accordance with the current social, economic and sustainable context. For each element of the scheme this will be achieved by satisfying the functional requirements of Part B of the Building Regulations 2010, the Construction Design and Management Regulations 2015 (CDM) and the management requirements of the Regulatory Reform (Fire Safety) Order 2005 (RRO).

In meeting the above, the base-build fire strategies for the hotel and office blocks will adopt the guidance in BS 9999:2017 [3], with the residential block adopting the guidance specific to residential buildings, as per that provided in BS 9991:2015 [4]. These strategies will be supplemented by fire engineering judgements and analyses, where necessary.

The design team will monitor changes / updates to any relevant legislation and guidance as the design progresses, instructing the design team and stakeholders, and implementing these as necessary. At Building Regulation submission, the design will seek to meet legislation that is current at the time of the submission (whilst being aware of impending changes). Should legislation / guidance changes occur beyond this time, the design team will look to adopt these as a matter of best practice, as opposed to regulatory obligation.

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OFR Consultants are applying a long-established methodology based on BS 7974 [5] and the International Fire Safety Engineering Guidelines [6], which includes actively involving stakeholders to weigh in on the strategy development. The aim of the process is to identify the aspirations of the project and its constituent parts, the associated fire safety objectives and the key issues that impact the development of a suitable fire strategy for these unique buildings of varied form and function.

Stakeholders being consulted include:

- Client - Groveworld;
- The appointed Building Control Body (to be appointed at RIBA Stage 3);
- London Fire Brigade (LFB); and
- Design team members and consultant team.

As part of the Regulatory Approvals process the strategies will each be the subject of milestone reviews and regular meetings which will be held with representatives from the appointed Building Control Body. As the regulatory approver, they will in turn lead the engagement process with London Fire Brigade (both the Fire Engineering Group and the Inspections team) and advice / feedback from these authorities will in turn inform the building design and the fire strategies that are being developed.

## 5 CONSTRUCTION MATERIALS

A mix of modern and traditional methods of construction are proposed for each block, with details of each presented in the following sections.

### 5.1 Office

The office block will comprise a concrete superstructure on the lower floors, with a steel frame and composite slab on the upper levels.

The outer linings will be constructed of brick or stone, hence being Euroclass A1. The external façade construction will achieve the following:

- Euroclass B-s3, d2 surface spread of flame for the portion of the façade more than 18 m above the adjacent ground level, and where external walls are required to be fire rated for space separation;
- Euroclass C-s3, d2 below this; and
- All insulation and filler materials used in the construction of the wall will be of limited combustibility (Euroclass A2-s3, d2), or better.

### 5.2 Hotel

The hotel blocks will have a concrete frame and slab superstructure, with internal plasterboard and stud partitions. The hotel external wall build-up will consist of terracotta spandrels / fins on stainless steel or aluminium supports, with rockwool insulation behind a plasterboard finish.

As of the 21<sup>st</sup> December 2018, the updated version of Approved Document B [7] and Regulation 7 came into effect, which specified more onerous requirements for the construction of external facades of relevant buildings.

Hotels are not defined as relevant buildings under Regulation 7; however, the scheme will adopt the provisions appropriate to relevant buildings as a matter of best practice due to the potential for delayed evacuation regime incurred from the building providing sleeping accommodation. Therefore,

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all materials used in the construction of the external walls and specified attachments (such as balconies) of the buildings are recommended to be Euroclass A1 or Euroclass A2-s1, d0.

### 5.3 Residential

The residential blocks will have a concrete frame and slab superstructure. The external wall build-up will consist of a masonry / stone outer lining, with mineral wool insulation.

As the residential blocks are considered relevant buildings under Regulation 7, external walls and specified attachments will be primarily constructed of materials which achieve a Euroclass A1 or Euroclass A2-s1, d0 in accordance with BS EN 13501-1[8]. This is in line with Regulation 7 of the Building Regulations. The only exceptions will be those listed in Regulation 7(3), such as door frames & doors, membranes etc.

## 6 RISK PROFILES

BS 9999 sets out fire safety measures as a function of risk profile. The risk profile is formed of two components: (a) the nature of the occupants, and (b) the nature of the fire hazard. The proposed risk profiles for the development are noted in Table 1. Generally, a base risk profile is applied for each block (e.g. office, hotel). Specific localised areas are given differing risk profiles according to the potential nature of occupants and hazards therein. BS 9991 does not set out fire safety measures as a function of risk profile, therefore one is not given for the residential block. The risk profiles have been reduced by one for both the office and hotel demises in consideration of the provision of sprinklers.

Table 1 – 330 Gray's Inn Road Risk Profiles

Area (s)	Nature of the occupants	Fire growth rate *	Risk Profile (inclusive of sprinkler provision)
Office block	Awake & familiar	Medium, reduced to slow	A1
Hotel block	Likely to be asleep, short term occupancy	Medium, reduced to slow	Ciii1
Residential block	As per BS 9991		
Reception / lobby Restaurant / café Gym	Unfamiliar and awake	Fast, reduced to medium to allow design flexibility	B2
Plant spaces	Awake & familiar	Fast, reduced to medium	A2
* After reduction in growth parameter by one increment as sprinklers are provided.			

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## 7 MEANS OF ESCAPE

### 7.1 Office

#### 7.1.1 Evacuation Regime

The office block will adopt a simultaneous evacuation regime whereby in the event of a fire, all occupants will evacuate the building.

#### 7.1.2 Means of Escape Provisions

The office block is planned around a central core, providing access to two escape stairs. Each of the two stairs will have a clear width of 1,300 mm and serve all 7 above ground storeys, resulting in an above ground occupancy of c. 1,600 persons, based upon simultaneous evacuation. This equates to a per floor occupancy of c. 230 persons. Protected lobbies are provided to both stairs, hence, ensuring their availability in a fire scenario.

Each floor will be provided with three storey exits into the central core at diverse locations. Therefore, horizontal travel distances are within the allowable limits given in BS 9999. That is, 74 m and 29 m for multiple and single direction travel, respectively. To accommodate the proposed per floor occupancy, storey exits will achieve a minimum clear opening width of 1,050 mm.

Upon exiting the building, occupants will assemble at a designated assembly point in the courtyard.

To facilitate egress of non-ambulant occupants, and in line with Policy D5 of the London Plan, an evacuation lift will be included in the building. Further, where egress direct to the outside of the building is possible, exits have been cited to permit unaided escape. Where a change in level is required, egress is provided through a combination of designated refuge spaces located within protected enclosures. Within these, occupants can have assistance provided to them by building management. Each floor is to be provided with a suitably sized area and numbers of refuge points.

### 7.2 Hotel

#### 7.2.1 Evacuation Regime

The hotel blocks will adopt either a simultaneous or phased evacuation regime, subject to further design development. As a minimum the floor of fire origin and floor above will always receive an alert to evacuate following first detection. Whichever evacuation regime is adopted, appropriate / relevant building-wide provisions will be ensured to facilitate its implementation.

#### 7.2.2 Means of Escape Provisions

The two hotel blocks (i.e. the smaller block retained on Gray's Inn Road and the new block) are formed as standalone buildings, each served by a single stair. Each of the two stairs will have a clear width of 1,100 mm, resulting in a maximum permitted building occupancy of c. 400 persons in the smaller block, and c. 700 persons in the main hotel block. However, the design occupancy will be less than the maximum permitted through the stair size calculation. Both stairs will be approached via protected lobbies at each level.

In the small hotel block, which does not contain bedrooms, single direction travel distances to the stair lobby are within the allowable limits given in BS 9999 for a B1 risk profile. That is, 57 m and 23 m for multiple and single direction travel, respectively. In the main hotel block single direction travel distances exceed those permitted in BS 9999 for sleeping hotel accommodation, risk profile Ciii1. That is, 27 m and 13 m for multiple and single direction travel, respectively. This extension is supported by

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the provision of a mechanical smoke extract system protecting the circulation corridor, as discussed further in Section 8.5.1.

At ground floor, each stair will discharge to a final place of safety (outside), or into a protected corridor leading to a final place of safety. Final exits at the base of stairs will be no narrower than the preceding stair width.

Upon exiting the building, occupants will assemble at a designated assembly point in the courtyard.

To facilitate egress of non-ambulant occupants, and in line with Policy D5 of the London Plan, an evacuation lift will be included in the building. Further, where egress direct to the outside of the building is possible, exits have been cited to permit unaided escape. Where a change in level is required, egress is provided through a combination of designated refuge spaces located within protected enclosures. Within these, occupants can have assistance provided to them by building management. Each floor is to be provided with a suitably sized area and numbers of refuge points.

## 7.3 Residential

### 7.3.1 Evacuation Regime

The residential blocks will be designed with a 'stay put' evacuation policy where only the flat of fire origin receives an alert to evacuate whilst other occupants remain within their flats. Special provisions are made to ensure that a fire is contained within the flat of origin and that common escape routes and stairways remain relatively free from smoke and heat in the event of a fire within a dwelling. This is premised upon the high levels of fire compartmentation and smoke control systems in place, as is typical for residential buildings.

This strategy does not restrict occupants within other flats choosing to evacuate, either of their own volition or at the request of the Fire and Rescue Service, with active and passive fire safety measures ensuring their escape routes maintain suitably tenable for escape.

### 7.3.2 Internal Planning of Flats

The flats will align with one the below design arrangements:

- Be provided with a protected entrance hall (rated to 30 minutes fire resistance) and sprinkler system, where the travel distance between access to all rooms and the flat front door is less than 9 m; or
- Limit the travel distance from the any point within the flat to the entrance door to 20 m in an open-plan arrangement, supported through a BS 5839-6 [9] LD1 detection system, and the sprinkler system provided to all flats to BS 9251 [10].

At ground and first floor in Block A, the flats will be formed as open-plan duplexes. This is supported by the provision of sprinklers in the flats as well as a further engineering analyses at a later design stage.

At top floor in Block B, each flat will contain an internal stair providing access to a roof terrace. These layouts will be afforded protection and escape routes commensurate with BS 9991.

### 7.3.3 Means of Escape Provisions

The flats in residential Block A will be approached externally via an open common walkway / balcony.

The flats in residential Block B will open onto the shared common corridor, from which the lifts and the protected stair will be accessed.

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The external balcony forming the flats in Block A is designed to permit the exhaust of smoke and hot gases away from building. The common corridors in Block B are the primary escape routes from the flats and will be mechanically ventilated with a smoke extract system to provide protection to the escape stair and common corridor. This system will ensure tenable conditions for both means of escape and firefighting and will be designed to prevent smoke from entering the single escape stair. A mechanical push-pull system is proposed.

In Block A, the distance to the most remote point in any flat will not exceed 30 m from the fire main outlet. The travel distance within the communal corridor in Block B is measured to be c. 10 m.

Each of the residential buildings will be served by a single escape stair. The stair discharge arrangement will be developed so that all lobbies which open onto the escape stair are afforded mechanical extract.

For disabled escape, in line with Policy D5 of the London Plan, an evacuation lift will be provided, with the common corridor on residential levels providing a similar level of protection as a disabled refuge. Non-ambulant residents may also take refuge in the stair cores. This is beyond the minimum expectation of life safety design guidance.

## 8 PASSIVE AND ACTIVE FIRE SAFETY SYSTEMS

A balance of passive and active fire safety systems will be employed within each of the buildings to support and enable the life safety objectives agreed with the project stakeholders.

### 8.1 Structural fire resistance

The fire resistance period for elements of structure will adhere to the recommendations made in the relevant guidance documents, as presented in Table 2, with construction achieving the designated rating through specification in accordance with BS EN 13501-2 [14]. The specifications consider the sprinkler provisions.

Elements which form the structural frame (e.g. columns, beams, floors, etc.) will achieve the ratings detailed in Table 2. This rating also applies to:

- Compartment floors;
- Compartment walls;
- High hazard spaces (e.g. electrical rooms operating above low voltage, refuse stores); and
- External walls which require fire resistance.

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Table 2 – Structural fire resistance periods for buildings

Building	Maximum storey height	Fire resistance period (presuming sprinklers installed throughout all buildings *)
Office block	> 30 m	120 minutes **
Small hotel block	< 18 m	60 minutes
Main hotel block	> 30 m	120 minutes **
Residential Block A	< 18 m	60 minutes
Residential Block B	> 30 m	120 minutes **
<p>* Only sprinkler systems installed in accordance with BS 9251 / BS EN 12845 (as appropriate) are suitable to reduce the fire resistance periods</p> <p>** Rationalisation may be possible through structural fire engineering assessment to be conducted at a later design stage. This would appraise the fire resistance requirements as per the methods outlined within BS 9999 / BS 9991 for the building-specific layouts and fire hazards.</p>		

## 8.2 Compartmentation

The spread of fire within a building can be restricted by subdividing the building into compartments, separated from one another by walls and / or floors of fire-resisting construction. The same approach can be applied to prevent fire spread between buildings that are close together. Compartmentation, horizontal or vertical, can also be used as part of an escape strategy to create areas of relative safety. Further, compartmentation contributes to business continuity by limiting the extent of fire damage, which can have direct and consequential benefits for post-fire recovery.

Compartment sizes are dictated by the use of the space.

For the office block:

- Compartment floors are provided throughout; and
- BS 9999 places no limit on compartment sizes for an A1 risk profile. However, compartmentation should be provided to separate tenancies within buildings.

For the small hotel block (which does not contain bedrooms):

- Compartment floors are not a minimum requirement for life safety; and
- BS 9999 places a compartment size limit of 8000 m<sup>2</sup> for a B2 risk profile in buildings under 18 m. This limit will not be exceeded in the design.

For the main hotel block:

- All floors are to be compartment floors;
- All penetrations through floors, e.g. stairs, risers, lifts etc. are formed as individual fire compartments;
- Circulation corridors are to be separated from the bedroom accommodation by a minimum of 30-minute fire rated construction.

For the residential blocks:

- All floors are formed as compartment floors;



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- All penetrations through floors, e.g. stairs, risers, lifts etc. are formed as individual fire compartments;
- On floor levels, all apartments and common corridors are to be separated from each other by 60-minute fire rated construction.

Across all buildings, fire stopping will be suitable for the locations at which it is provided, including being accompanied by appropriate test evidence, with all installers to be third-party accredited.

The maintenance of all the associated fire safety features within the building will be in line with the relevant sections of BS 9999 and BS 9991, the manufacturer's recommendations, and other requirements of the Building Regulations.

## 8.3 Detection and Alarm Systems

### 8.3.1 Typical Specification

Detection and alarm systems will be specified in accordance with:

- BS 5839-1 [11] for the office and hotel blocks, and the common access portions of residential blocks; and
- BS 5839-6 [9] for residential demises.

### 8.3.2 Extent of Coverage – Non-residential

The following extent of coverage will be provided as a minimum:

- Office block – L1 system, alongside a voice alarm / public address system to optimise the means of escape design; and
- Hotel block – L1 system.

The above constitutes automatic detection throughout the demises, with detectors installed as per the relevant British Standard.

### 8.3.3 Extent of Coverage – Residential

An LD2 system will be installed throughout, uprated to an LD1 system for open plan flats / duplexes with an open stair.

The above constitutes automatic detection throughout the demise, with detectors installed as per the relevant British Standard.

Common portions of the residential blocks will be provided with a BS 5839-1 L5 system, comprising detection within specific locations, including all common corridors, reception spaces and hazard rooms.

### 8.3.4 Links to Other Fire Safety Systems / Interconnectivity

The CIE for the BS 5839-1 detection and alarm system within each block will be located at Fire Service access level, in proximity to building entrance points.

CIE will have the ability to interact with other fire safety systems, including smoke control systems, automatic door closing systems, shutdown of air handling or other plant systems, and lifts.

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## 8.4 Automatic Fire Suppression Systems

Fire suppression systems provide an automatic means of fire detection and suppression. They are designed to detect a fire and either extinguish it in its early stages of development or control it / limit its growth such that extinguishment can be completed by other means (e.g. firefighter intervention).

Each block will be provided with sprinkler protection. For the office and hotel blocks, this will be a commercial grade system designed in accordance with BS EN 12845 [12] with the enhancements to improve system reliability detailed in Annex F. For the residential blocks, the system will be in accordance with BS 9251 [10], with additional features to enhance the resilience of the system. The additional features will include dual pumps and back-up power supplies.

## 8.5 Smoke Control

### 8.5.1 Hotel

To support the single-direction travel distances in the main hotel block and protect the escape stair, a mechanical smoke extract system will be provided. The system will incorporate two extract points at the remote ends of the circulation corridor, with a centrally located inlet shaft to mitigate smoke ingress into the escape stair. The detailed design of the system will be undertaken at a later design stage and confirmed through computational fluid dynamic (CFD) modelling.

### 8.5.2 Residential

A mechanical ventilation system will be provided to protect the communal corridors and the stair. The extract rates and suitability of the system will be confirmed through CFD modelling.

## 8.6 Power Supplies

All life safety systems (i.e. detection and alarm systems, sprinkler systems, smoke control systems, emergency lighting and fire dampers) will be provided with robust power supplies, including back-up power supplies, as per BS 8519:2010 [13].

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## 9 ACCESS AND FACILITIES FOR THE FIRE AND RESCUE SERVICE (FRS)

### 9.1 Access for the FRS

The main vehicle access route to the site will be via Gray's Inn Road, Wicklow Street and Swinton Street, with an access points identified in Figure 2. Appliance access will be provided within 18 m of the dry riser main inlet points for each building. Typically, multiple access points are available for the responding FRS, affording flexibility in incident response.

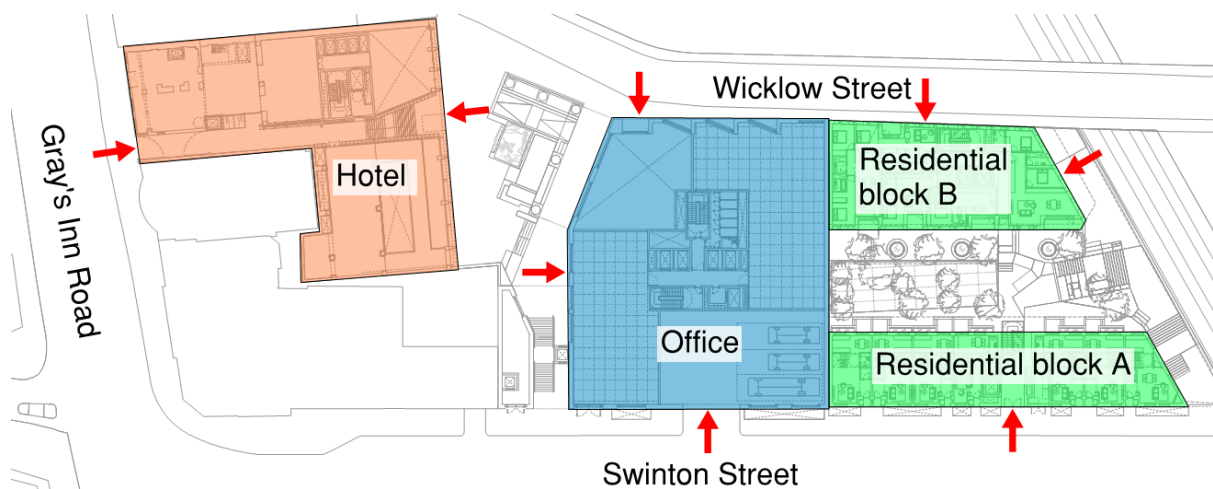


Figure 2 - Firefighting access

### 9.2 Firefighting provisions

As well as supporting the building occupant life safety objectives, the provision of both passive and active fire safety systems also provides substantial benefits to firefighter operations. These includes the provision of a means to quickly identify the location of a fire and facilities from which to coordinate a response (i.e. firefighting shafts).

Internally firefighting is facilitated through the firefighting shafts, equipped with dry riser mains intended to simplify and add speed to incident response. As the floor plate of the office is over 900 m<sup>2</sup>, two firefighting shafts will be provided. The main hotel block and both residential blocks will be provided with one firefighting shaft each.

Each firefighting shaft will contain a firefighting stair, ventilated firefighting lobby (formed as the common corridor within the residential demises) with a dry riser main outlet and a firefighter lift installation. The firefighting lifts will also serve as passenger lifts during normal day-to-day operations.

### 9.3 Water Supplies

There are existing hydrants in the vicinity of the area. The condition of these hydrants is to be confirmed as the design develops.

If hydrants are more than 90 m away from the fire main inlet, the Fire and Rescue Services Act 2004 states that it is the duty of the fire authority to source firefighting water supplies. In order to do this, they can either enter into an agreement with a water supplier under Section 39 of that Act or with another individual to put in another source of water (tank, private main etc) under Section 41.

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The sprinkler systems for the development are to be provided with water storage tanks, sized to provide the requisite duration of supply stated in the relevant guidance.

## 10 BASEMENT LEVELS

The development contains two basement levels that share services / amenity spaces between the office and hotel. A separate single basement level is provided for the residential blocks.

The office / hotel basement comprises plant and storage rooms for both buildings, a bike store, a gym spanning over both levels and changing rooms. The design of the basement will provide a level of safety commensurate with BS 9999 with regards to means of escape, compartmentation and FRS provisions.

The residential basement comprises plant and storage rooms for both residential blocks, two bike stores, residential amenity space and affordable office space (accessed via the affordable office space at ground floor). The design of the residential basement will provide a level of safety commensurate with BS 9992 (or BS 9991, where applicable) with regards to means of escape, compartmentation and FRS provisions.

## 11 FUTURE MODIFICATIONS

This fire statement documents the fire strategy principles at RIBA stage 2. These proposals herein may be subject to further specification / change as the design progresses. In due course, a detailed fire strategy will be produced with a level of information suitable for Building Regulations approval. The detailed fire strategy will also form part of the information pack handed over to the building operator(s) under Regulation 38 to assist the responsible person to carry out the necessary fire safety risk assessments and implement and maintain a fire management plan in accordance with the Regulatory Reform (Fire Safety) Order 2005 "FSO".

Any future alterations to the scheme shall not compromise the fire strategy of the building, with approval from the relevant authorities required to be attained where and as necessary.

## 12 NEXT STEPS

In due course, the fire strategies which are under development will be taken to the point of conclusion to reflect the outputs of the ongoing and future consultations and demonstrate full compliance with Part B of the Building Regulations. The strategy reports will set out the physical fire precautions within the building and the equipment that is necessary to enable safe management of the premises whilst also highlighting key fire management requirements to help ensure safe ongoing operation of the building.

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## 13 REFERENCES

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- [2] HM Government, 'The Building Regulations 2010, incorporating 2018 amendments', Ministry for Housing, Communities & Local Government, 2019.
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- [6] ABCB, 'International Fire Engineering Guidelines', Australian Building Codes Board, Canberra, ACT, Edition 2005, 2005.
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