

# FIRE STRATEGY REPORT

## Dolphin Square

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AFF\_20424\_02\_Dolphin Square Stage 4\_FSR\_01

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# 1 INTRODUCTION

## 1.1 Introduction

Dolphin Square Estate is an existing residential development located in Pimlico, London. It comprises:

- 12 blocks of rental apartments (Beatty to Raleigh House) with a top storey height more than 18m but less than 30m. These blocks will be refurbished, however it is not proposed to undertake any material change of use or material alteration under Building Regulations 2010.
- 1 block of serviced apartments (Rodney House) with a top storey height less than 18m. The apartments will be converted to standard rental apartments, therefore this will be a material change of use under Building Regulations 2010. Furthermore, the office space at first floor will be extended and converted to flexible working space and café plus roof gardens will be introduced above the existing gym/swimming pool at ground floor.

## 1.2 Scope

This Fire Strategy Report (FSR) has been prepared in support of the tendering process for RIBA Stage 3 of Dolphin Square, so as to provide **strategic design and performance criteria** which, when met by the design of the building, are designed to enable all stakeholder requirements to be met. As this report only summarises the fire strategy measures to support the tendering process it is not intended for submission to the fire authorities or construction.

## 1.3 Relevant Stakeholders

This Fire Strategy Report has been developed collaboratively with the relevant stakeholders as identified below:

Table 1: Relevant Stakeholders

Name	Role	Organisation
<b>Ben Nixon</b> <b>Sonny Cook</b>	Client/Project Manager	Bailey Garner
<b>Ilaria Ferraboli</b> <b>Tori Ellis</b> <b>Tom Armitage</b>	Architect	GRID Architects
<b>David Wills</b>	MEP Engineer	Cundall
<b>Abeel Hussain</b>	Building Control	Sweco
<b>TBC</b>	Enforcing Authority	London Fire Brigade

## 1.4 Stakeholder Requirements

The following stakeholder requirements have been identified for this project:

Table 2: Stakeholder Requirements

Class	Regulation / Stakeholder	Requirement
	The Building Act 1984	Life safety is to be demonstrated in accordance with the requirements of Parts B1 and B5 of the Building Regulations 2010 as they apply to material alterations.
	The Building Regulations B1	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 the case of fire from the building to a place of safety outside the building capable of being safely used at all material times.
	The Building Regulations B2	<p>To inhibit the spread of fire within the building the internal linings shall:</p> <ul style="list-style-type: none"> <li>a) Adequately resist the spread of flame over their surfaces: and</li> <li>b) Have, if ignited, a rate of heat release or rate of fire growth, which is reasonable in the circumstances.</li> </ul> <p>Where internal lining means the material or products used in the lining of any partition, wall, ceiling or other internal structure.</p>
	The Building Regulations B3	<p>The building shall be constructed so that in the event of fire its stability will be maintained for a reasonable period of time.</p> <p>A wall common to two or more buildings shall be designed and constructed so that it adequately resists the spread of fire between those buildings.</p> <p>Where reasonably necessary to inhibit the spread of fire within the building, measures shall be taken to an extent appropriate to the size and intended use of the building, comprising either or both of the following:</p> <ul style="list-style-type: none"> <li>a) Sub-division of the building with fire-resisting construction.</li> <li>b) Installation of a suitable automatic fire suppression system.</li> </ul> <p>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.</p>
	The Building Regulations B4	<p>The external walls of the building shall adequately resist the spread of fire over the walls from one building to another, having regard to height, use and position of the building.</p> <p>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.</p>

Life Safety

Class	Regulation / Stakeholder	Requirement
	The Building Regulations B5	The building shall be designed and constructed so as to provide reasonable facilities to assist firefighters in the protection of life.
Property Protection	None	None
Environmental Protection	The Environment Agency	The guidance of PPG18 Managing Fire Water and Major Spillages should be adopted in regard to management of waste fire water. This is to be addressed by the relevant civils designer.
Other	None	None

## 1.5 Method

### 1.5.1 The Building Regulations 2010

The Building Act 1984 is the primary legislation under which the Building Regulations and other legislation are made. The Building Regulations 2010 is the Statutory Instrument which seeks to ensure that the policies set out in the Act are implemented.

Alterations to an existing building shall be required to comply with the requirements of the Building Regulations B1 – B5 where:

- There is a material change in use resulting from the alteration.
- Where the alteration shall result in the performance of the building being less than existing in regards to the requirements of B1, B3, B4 or B5.

Compliance with the requirements of the Building Regulations B1 – B5 may be demonstrated via the following:

#### **Meeting Standard Guidance**

Demonstrating that design meets the recommendations of the Approved Documents B1 or B2, or other suitable design guidance documents. It must be noted that these guidance documents are specifically created to provide solutions for generic/common buildings, and guidance documents may only relate to specific building or occupancy types.

#### **Development of an Alternative Approach**

Any other approach may be adopted to demonstrate that the functional requirements of the Building Regulations have been met. These alternative approaches are commonly referred to as Fire Engineered Solutions.

As a matter of good practice Fire Engineered Solutions should be developed in accordance with the guidance BS 7974 which set out a consistent framework for robustly determining whether the Fire Engineered Solutions will achieve the functional requirements.



In this instance the following approach is adopted; wherever practicable the design of the building will be demonstrated as meeting the relevant guidance of BS 9991:2015 and, where applicable, BS 9999:2017. Where the design of the building falls outside the application of this guidance an alternative approach will be developed.

Determination of compliance with the requirements of the Building Regulations is at the jurisdiction of the Approvals Authority, and all design guidance or performance criteria set out within this report are at approvals risk until agreed with the authority.

### 1.5.2 The Building Regulations 2010 – Regulation 7

The Building Regulations, Regulation 7 requires that materials which are used are; appropriate for the circumstances in which they are used, adequately mixed or prepared, and are applied, used or fixed so as to adequately perform the functions for which they are designed. It is noted that report provides performance specifications against which the selection and application of materials must be determined by the design team or principal contractor.

It is noted that the requirements of Building Regulations shall apply to all building works including material alterations and material change of purpose.

The Building Regulations 2010 (incorporating the 2018 Amendments) place additional specific regulatory requirements upon materials incorporated into external wall construction for any construction which:

- Has an uppermost storey of >18m, when measured from lowest possible adjoining ground level to the top of the uppermost floor surface of the uppermost storey.

#### **AND**

- Has any of the following:
  - One or more dwellings.
  - Contains an institution<sup>1</sup>.
  - Contains a room for any residential purpose (excluding any hostel, hotel or boarding house).

Where these requirements apply these will be highlighted in this report.

### 1.5.3 The Regulatory Reform (Fire Safety) Order 2005

The Regulatory Reform (Fire Safety) Order (RRO) requires that all buildings are managed and maintained so as to afford an adequate standard of life safety for all legal occupants (including visitors) of a building and to provide adequate access and facilities for the Fire Service to undertake their activities within the building.

This Fire Strategy **must** be provided to the Responsible Person under the requirement of the Building Regulations Regulation 38. Additionally:

- This strategy should form part of the Fire Safety Arrangements under the RRO for the building once occupied.

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<sup>1</sup> Means an institution (whether described as a hospital, home, school or other similar establishment) which is used as living accommodation for, or for the treatment, care or maintenance of persons:

- suffering from disabilities due to illness or old age or other physical or mental incapacity. Or
- under the age of five years.

Where such persons sleep on the premises.

- This strategy should be provided, and referred to, as part of the Fire Risk Assessment process for the building.
- Any performance requirements made in regard to the management of the building should be adopted, or otherwise considered and appropriately modified.

Whilst the RRO does not come into force until after a building has been constructed, reasonable provision should be made in the design and construction of the building to allow for the building to be safely managed and operated in accordance with the RRO. To this end the Approvals Authority has a statutory duty to consult with the relevant Enforcing Authority (London Fire Brigade) whom are required to advise on:

- Matters which have to be complied with under the RRO once the building is occupied.
- Matters which have to be complied with to meet any other fire legislation, other than the Building Regulations.
- Advisory but non-enforceable matters, including commentary on the application of the Building Regulation should they choose to do so.

Where the views Enforcing Authority that the design of the building is such that the requirements of the RRO cannot be met they should set down its concerns and recommendations in a formal written case, which may include details of any enforcement action it may take upon occupation.

Determination of compliance with the requirements of the Regulatory Reform (Fire Safety) Order solely is at the jurisdiction of the Enforcing Authority, and all design guidance or performance criteria set out within this report are at approvals risk until agreed with the authority.

#### **1.5.4 The Construction (Design and Management) Regulations 2015**

The Construction (Design and Management) Regulations (CDM) require that all parties involved in the design of a building, or whose advice may effect a change upon the design of the building shall be required to:

- Take account of any pre-construction information provided by the client (and principal designer, if one is involved).
- Eliminate foreseeable health and safety risks to anyone affected by the project (if possible).
- Take steps to reduce or control any risks that cannot be eliminated.

This is generally communicated via a Designers Risk Assessment (DRA) which identifies elements of the design which may present construction hazard and identifying what measures may be taken to eliminate the risk or otherwise reduce the hazard presented.

It is noted that this Fire Strategy sets out the minimal performance requirements for the building design and design decision made to meet these performance requirements may not be safely eliminated from the final design. Advice is however provided to the design team in consideration of these risks, and where possible to do so recommendations are made which limit the level of risk during construction, management, maintenance and upkeep of any specific fire safety systems which may be recommended to the design. It is however noted that ultimately Affinity does not provide the design of these systems and a full Risk Assessment process must be undertaken by the designer of that system.

## **1.6 Limitations**

In this instance the Fire Safety Strategy is developed based on applicable limitations and assumptions for the development which are listed as follows. Affinity Fire Engineering (UK) Ltd. accept no liability for where this report is applied outside the limitations stated:

- The information contained in this document is provided for the sole use of Bailey Garner LLP and applies only to the .No reliance should be placed on the information by any other person or for any other project.
- This Fire Strategy provides strategic design advice and performance criteria **only**. This Fire Strategy does not constitute a design document, and the detailed design shall be provided by other parties. Where this document does not provide clear performance criterions all elements of design shall be required to be designed to meet the relevant guidance as set out in **Section 1.5** above and any applicable standards made reference to within.
- This Fire Strategy has been developed based upon the understanding of the building design and usage. Any changes in the design or usage of the building may alter the basis upon which the Fire Strategy was developed.
- This Fire Strategy has been developed based upon the information stated in **Section 1.7** below. Any changes to the design of the building subsequent to this information will not be reflected within this Fire Strategy document.
- This Fire Strategy has been developed to meet the fire safety needs of the building as an entire system, and elements of this strategy must not be partially implemented of, or cherry picked.
- This Fire Strategy has been developed on the basis that fire strategy systems within the building are managed and maintained in such a manner that they shall (so far as is reasonable) operate as intended in the instance of fire.
- Fire safety considerations during construction must be addressed under the Construction (Design and Management) Regulations 2015 by the principal contractor, and are not addressed under this report, and this report may not be utilised for the purpose of demonstrating compliance with these regulations unless explicitly otherwise stated.
- Unless explicitly otherwise stated this Fire Strategy does not address any fire safety requirements (or recommendations) in regards to compliance with COSHH (Control of Substances Hazardous to Health Regulations 2002) or DSEAR (Dangerous Substances and Explosive Atmosphere Regulations 2002).

## 1.7 Sources of Information

This report is based on the following sources of information:

Table 3: Sources of Information

Name	Author	Date
DSQ-GRI-B-00-DR-A-10900 to DSQ-GRI-N-09-DR-A-10909, Revision T1 (full set)	GRID Architects	23.06.2021
DSQ-GRI-P-00-DR-A-10900 to DSQ-GRI-P-09-DR-A-10909, Revision T1 (full set)	GRID Architects	11.03.2021
DSQ-GRI-A-00-DR-A-10161 to DSQ-GRI-A-01-DR-A-10168 (full set)	GRID Architects	19.04.2021
Basement Floor Plan - Proposed All Zones	GRID Architects	06.10.2021

## 1.8 Setting Out and Formatting

This report will set out the guidance and performance criterions following the general structure of the Building Regulations, i.e. guidance required to demonstrate compliance with the requirements of The Building Regulations B1 shall be provided within **Section 4 – B1 Means of Warning and Escape**.

Any guidance or performance specifications which set out at standard of provision greater than that minimally required to achieve the Stakeholder Requirements will be prefaced with **[Enhancement]**. These recommendations are provided to the design team to provide best practice guidance, which whilst not required to achieve the required standard of fire safety provision, may provide benefits to the ongoing management and maintenance of the building.

## 2 MATERIAL ALTERATION AND CHANGE OF USE

The fire strategy described in this report has been developed on the basis described in the sections below.

### 2.1 Material Change Of Use

Any material change of use should be limited to Rodney House only. According to Building Regulations 2010 (see **Section 1.5.1**) examples of material change of use are (but not limited to):

- 1) The building is used as dwelling, where previously was not.
- 2) The building, which contains at least one dwelling, contains a greater or lesser number of dwellings than it did previously.
- 3) The building is used as a shop, where previously it was not.

It is understood at the time of writing this report that in the existing blocks there are few apartments which have been subdivided to increase the number of dwellings without planning permission. Therefore, according to Item 2 above this partition is classed as a material change of use. On this basis, in all blocks other than Rodney House the partition should be removed to retain the number of dwellings that were present when the development was originally built.

### 2.2 Material Alteration

No material alteration will be undertaken in the entire development. For the purposes of Building Regulations 2010 an alteration is material if the building work, or any part of it, being carried out would at any stage result:

- In a building or controlled service or fitting not complying with a relevant requirement where previously it did; or
- In a building or controlled service or fitting which before the work commenced did not comply with a relevant requirement, being more unsatisfactory in relation to such a requirement.

For the purpose of this fire strategy report relevant requirement is any of the following applicable requirements of Building Regulations 2010:

- Paragraph B1 (means of warning and escape)
- Paragraph B3 (internal fire spread—structure)
- Paragraph B4 (external fire spread)
- Paragraph B5 (access and facilities for the fire service)

# 3 SUMMARY OF ALTERNATIVE APPROACHES

The following table has been provided to summarise the alternative approaches as set out in the rest of this document. The document must be read in full to understand these alternative approaches in context however.

Table 4: Summary of Alternative Approaches

Section	Variation from Guidance	Summary of Alternative Approach
4.3	<p><b>Guidance recommendation</b></p> <p>Sprinklers should be provided in every part of the development undergoing a material change of use or material alteration, as each building is taller than 11m.</p> <p><b>Proposed approach</b></p> <p>Watermist is being considered as an alternative to sprinklers, provided a relevant fire test protocol exists. Furthermore, it is proposed to omit automatic fire suppression in basement plant rooms where water discharge may cause a hazard (e.g. electrical plant rooms) based on enhanced compartmentation of the rooms.</p>	<p>This approach is deemed to meet the requirements of Building Regulations:</p> <ul style="list-style-type: none"> <li>• B3 - a suitable automatic fire suppression system and sub-division of the building with fire resisting construction are provided to inhibit the fire spread of fire within the building.</li> <li>• B1 - watermist and enhanced compartmentation keep the common escape routes usable in a safe and effective manner</li> <li>• B5 - watermist systems are reasonable facilities to assist fire-fighters in the protection of life.</li> </ul>
4.5.1	<p><b>Guidance recommendation</b></p> <p>All corridor sections providing access to common stairs in Rodney House should be provided with smoke venting.</p> <p><b>Proposed approach</b></p> <p>Smoke venting in some corridor sections in the Basement, Ground and First Floor of Rodney House is to be omitted given the constraints of the existing structure. This is on the basis that:</p> <ul style="list-style-type: none"> <li>• The corridors do not serve dwellings.</li> <li>• Some of the stairs served by the corridors are to be protected against smoke via fire/smoke curtains</li> <li>• If the remaining stairs served by the corridors are affected by smoke adequate means of egress and fire-</li> </ul>	<p>This approach is deemed to meet the requirements of B1 and B5 as adequate means of escape and fire-fighting access that can be used safely and effectively are provided at all times.</p>

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fighting access is provided via the smoke-protected stairs.

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**4.5.2****Guidance recommendation**

A 1m<sup>2</sup> automatically opening vent should be provided at the head of each common stair.

**Proposed approach**

The 2 Rodney House stairs terminating at First Floor are to be provided with 1.5m<sup>2</sup> automatically opening vents at the bottom of the stair given the constraints of the existing structure.

Given that the proposed vents still assist the smoke control system serving the common corridors it is deemed that the requirements of B1 and B5 are met. This is on the basis that adequate means of escape and fire-fighting access that can be used safely and effectively are provided at all times.

**6.2.2.3****BS 9991 recommendation**

Compartmentation between Rodney House and the rest of the development should achieve at least 90 minutes fire resistance rating for integrity and insulation.

**Proposed approach**

To minimise onerous intervention on the existing structure it is proposed to provide compartmentation achieving 60 minutes for integrity and insulation.

On the basis described in **Section 6.2.2.3** the requirements of B3 are deemed met as walls separating Rodney House from the rest of the development would adequately resist the spread of fire between buildings.

**8.5****BS 9991 recommendation**

The basement should be provided with dedicated smoke clearance to assist fire-fighting operations.

**Proposed approach**

Given the constraints of the existing structure and services it is proposed to omit dedicated smoke clearance in the basement.

On the basis described in **Section 8.5** it is deemed that the requirements of B5 are met as the basement will undergo no material change of use and basement facilities to assist fire-fighters in the protection of life are to be no more unsatisfactory than those in the existing layout.

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# 4 B1 MEANS OF WARNING AND ESCAPE

## 4.1 Evacuation Strategy

The fire strategy design of all blocks has been developed to facilitate a 'Stay Put' evacuation policy, whereby:

- Occupants of the unit of fire origin are reasonably expected to evacuate as soon as they are aware of a fire within their premises.
- Occupants of all other units are not automatically made aware of fire within another unit, and as such are afforded suitable protection against the spread of fire such that they should be able to remain within their own unit in relative safety. This is not to imply that residents should 'stay put' should they wish to evacuate, and suitable provisions are made to allow for occupants to safely egress from the building at any time.

The 'Stay Put' evacuation strategy has been implemented with this building so as to limit the risk that occupants will ignore alarm signals if there are repeated false, or nuisance, alarm activations within the building.

However, each flat should also be provided with heat detectors sending an alarm signal to management staff in the shared security room, which is manned 24/7. Staff would investigate the alarm and, if deemed necessary, evacuate residents. Each flat shall also be provided with alarm sounders to allow management staff and fire fighters to warn residents and commence evacuation, if needed.

## 4.2 Fire Detection and Alarm Systems

To facilitate the 'Stay Put' evacuation strategy the following detection and alarm system is to be afforded:

Table 5: Fire Alarm and Detection

Location	Minimum System Category <sup>A</sup>	Comments
Apartments where Bedrooms are accessed from the Living Areas	Grade D Category LD1	Alarm to be raised in unit of detection and heat detectors to send warning to security room. Sounders to be provided on apartment terraces and linked to smoke detection in the apartment.
Other Apartments	Grade D Category LD2	Alarm to be raised in unit of detection and heat detectors to send warning to security room. Sounders to be provided on apartment terraces and linked to smoke detection in the apartment (including the Rodney roof areas accessed by Duncan and Keyes residents, which will be delimited via a balustrade).



Common Residential Corridors, House Entrances and Rear Entrances from Courtyard	Category L5	To actuate smoke control only, no alarm in any location.
Other Ancillary Residential Locations, including Roof Plant	Category M	Alarm to be raised in the ancillary location to alert occupants. Heat detectors sending warning to security room to be provided. Sounders activated by security staff or smoke detection in residential common corridors/house entrances to be provided.
Commercial Areas, including all Basement Areas (used by residents or not) and Rodney House Flexible Working Space/Reception	Category L2	Alarm to be raised in the entire area to alert occupants and warning to be sent to security room.

**Note A:** Domestic alarm and detection systems are to be designed and installed in accordance with BS 5839-6, common residential areas, residential ancillary locations and commercial areas are to be designed and installed in accordance with BS 5839-1.

### 4.3 Automatic Fire Suppression

A sprinkler system designed in accordance with BS 9251 needs to be provided in:

- All Rodney House dwellings and other dwellings that contain exposed faces of elements of structure supporting the Rodney House apartment levels (Category 2).
- All Rodney House common areas and other common areas that contain exposed faces of elements of structure supporting the Rodney House apartment levels, with the exception of corridors and staircores (Category 3).
- Dwellings where it is proposed to change the layout to open plan i.e. making bedrooms accessible via living areas (Category 1).
- Common corridors and staircases do not need sprinklers as these should be spaces sterile of any fire load.

A sprinkler system designed in accordance with BS EN 12845 should be provided in:

- All commercial areas (including but no limited to those in the basement/ground floor such as concierge/flexible working space at ground floor) containing exposed faces of loadbearing elements of structure supporting the Rodney House residential areas (containing apartments).
- All basement rooms where the fire risk is going to increase (i.e. proposed refuse stores and toilets being converted to store rooms).

It should be noted that:

- The compartment containing the gym/swimming pool (which needs to be fire separated from the adjacent Rodney House entrance lobby) does not need sprinklers, provided that the compartment contains no elements of structure supporting the Rodney House apartments.

- In some plant rooms (e.g. LV switchrooms) water based fire suppression is not suitable. A fire engineering case to omit automatic fire suppression in those rooms can be built based on enhanced compartmentation (-/120/120 mins fire resistance rating of the room enclosure, which is higher than the minimum recommended by guidance).
- The UKPN room is currently provided with gas fire suppression, which is to be retained.
- Watermist systems designed and installed in accordance with BS 8489-1 are a viable alternative to sprinklers where a relevant fire test protocol exists.

## 4.4 Persons of Restricted Mobility

### 4.4.1 Refuge Locations

Disabled refuges are needed in the Rodney House commercial areas that do not have step-free escape routes to outside (e.g. the roof gardens above the gym/swimming pool). Refuge spaces need to meet the following performance criteria:

- Each refuge space is to provide a location of no less than 900mm x 1400mm of free space which is accessible in accordance with Approved Document M.
- The refuge space is to be designed such that it does not cause a narrowing in the egress route from all other locations.
- The refuge location is located within an open air space, protected corridor or lobby directly accessible from the storey exit, or evacuation lift.

### 4.4.2 Emergency Voice Communication Points

An Emergency Voice Communications (EVC) system is to be provided within all blocks in accordance with BS 5839-9, to achieve the following performance criteria:

- Each refuge location is to be provided with a Type B outstation.
- A Type B outstation is to be provided within the stair enclosure for each storey exit.
- The masterstation is to be co-located with the Fire Alarm Panel (FAP).

### 4.4.3 Evacuation Lifts

It is recommended to provide:

- The Rodney House residential areas with at least 2 evacuation lifts, one at the northernmost core and the other at the southernmost core.
- The residential areas of all other blocks with at least 1 evacuation lift.

Evacuation lifts need to be designed and installed in accordance with the relevant provisions of BS EN 81-20 and BS EN 81-70.

## 4.5 Smoke Control

### 4.5.1 Common Corridors

The following corridors are to be provided with dedicated smoke venting, either via a single mechanical smoke shaft or automatically opening vent (AOV) achieving at least 1.5m<sup>2</sup> of free area:

- All common corridors leading to the 4 residential stairs in Rodney House. However, a fire engineered case to omit smoke vented corridors/lobbies to the 2 Rodney House central stairs at Basement, Ground and First Floor is proposed. This is on the basis that the 2 central stairs are to be provided with fire/smoke curtains at Basement (descending upon detection of smoke in the corridor). See **Figure 1** below. Furthermore, in the event of a fire at Ground or First Floor Rodney House residents can escape via the 2 stairs at each end of Rodney House.

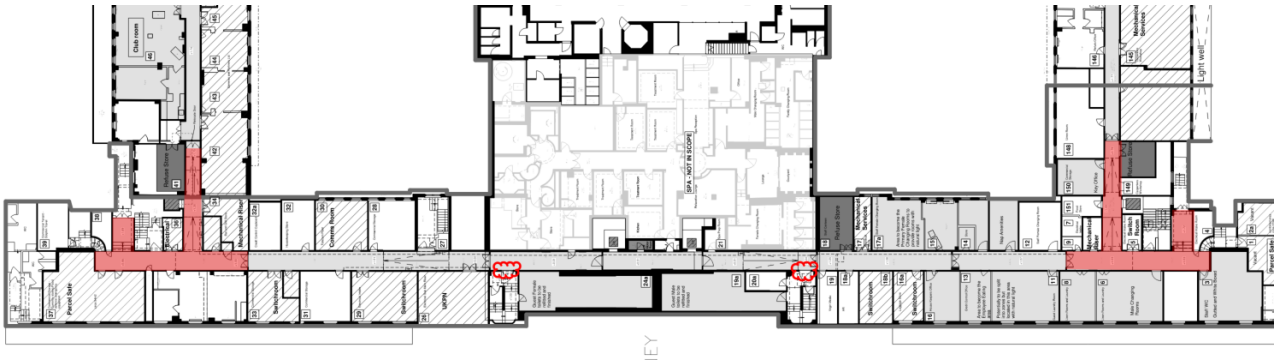


Figure 1: Rodney House basement – corridor smoke venting shaded in red and fire/smoke curtains clouded in red

- The mechanical smoke shafts are to be validated via a CFD analysis assessing the Rodney House apartment levels.
- The common corridor sections in all blocks other than Rodney House at ground floor and basement linked to the residential stair used for fire-fighting access (stairs provided with dry fire mains, see **Section 8.3.1**). However, a case to omit dedicated smoke venting to these corridors can be developed based on removing the basement door (see clouded in red in **Figure 2**) to the accommodation stair (discharging onto the house entrance lobby) or providing it with a fire curtain. On this basis, in the event of a basement fire residents would be able to escape via the accommodation stair which would be protected against smoke in the basement (there would be no link between the stair and basement in any basement fire scenario).

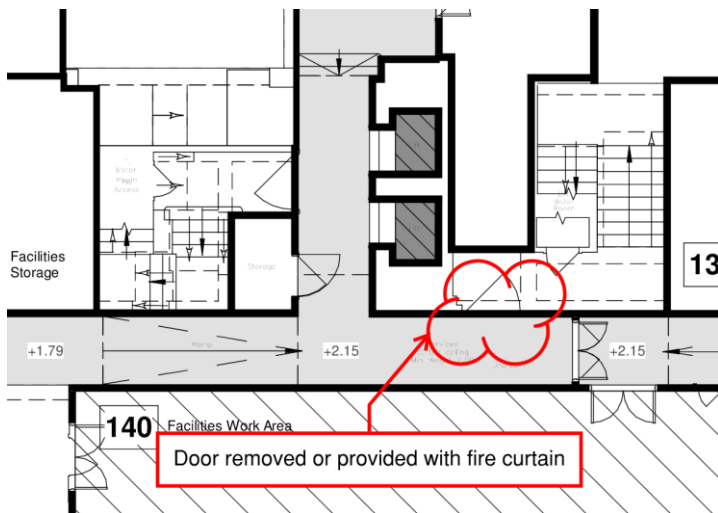


Figure 2: Typical block other than Rodney House - basement

- The common corridors in all blocks other than Rodney House at first floor and above providing access to both residential stairs. It should be noted that a CFD analysis will be undertaken to demonstrate that this proposed solution will keep smoke conditions in the common stairs no worse than those that would occur in the event of a fire in the existing layout.

### 4.5.2 Common Stairs

The residential stairs of all blocks are to be provided with an AOV at the head of the stair with a free area of at least 1m<sup>2</sup>.

Exceptions are the stairs terminating at First Floor in Rodney House (clouded in red in **Figure 3**), where it is not feasible to provide any AOV at the head of the stair due to the constraints of the existing structure (i.e. the stairs have no external elevation and there are dwellings above the head of each stair). However, it should be noted that the main function of the stair vent is to provide make-up air assisting the smoke exhaust system in the corridors, rather than vent smoke in the stair.

Therefore, it is proposed to provide the final exits to outside of the 2 stairs with doors opening automatically upon detection of the smoke in the common areas. The doors are to provide a minimum free vent area of 1.5m<sup>2</sup>.

It should be noted that the West staircase of Rodney House connects to Level 9 of Duncan House. No internal separation between the two sections of the stair is needed and a single 1m<sup>2</sup> AOV at the head of the stair is sufficient.

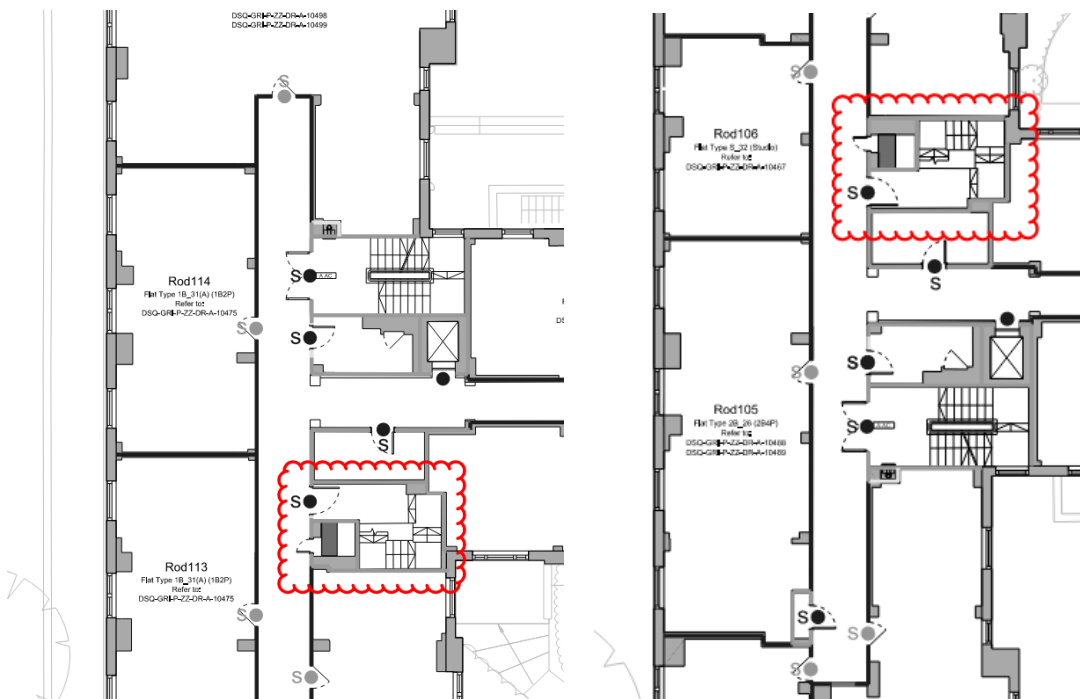


Figure 3: Rodney House stairs – first floor

### 4.6 Apartment Layouts – All Blocks

The apartment layout of all blocks has been reviewed in detail and comments have been provided in the following fire strategy sketches:

- AFF\_20424\_02\_Dolphin Square\_FSK\_01
- AFF\_20424\_02\_Dolphin Square\_FSK\_03

It should be noted that it is recommended to maintain a minimum distance of 2m between the cooking facilities and a 800mm wide escape route within the apartment. This is discussed in detail in **Appendix A**.

## 4.7 Rodney House Common Corridors

All common corridors serving apartments in Rodney House should be reconfigured to keep travel distances to reach any of the 4 escape stairs shown in **Figure 3** within 15m in a single direction and 60m where more than one direction of escape is available.

## 4.8 Swimming Pool/Gym

The design intent for the ground and basement levels of the swimming pool/gym compartment is to avoid any material alteration to the existing means of escape. On this basis:

- The existing escape corridors and stairs are to be retained
- Any alteration of fitout should not extend travel distances and should not reduce the clear width of escape corridors and stairs
- The occupancy of the gym/swimming pool should not increase after refurbishment.
- No access for occupants unable to negotiate stairs is to be introduced to the squash courts/studios in the basement.
- Any new element of construction introduced is to meet the recommendations in **Section 6.2.2.3** for fire rating.
- The final exit doors at Ground Floor serving the swimming pool/gym and reception and opening against direction of escape are to open automatically upon confirmation of fire or power failure.

See fire strategy comments in **Appendix B**.

# 5 B2 INTERNAL FIRE SPREAD (LININGS)

## 5.1 Surface Spread of Flames

### 5.1.1 General Linings

The surface linings of walls and ceilings are to be designed to meet the following limitations:

#### 5.1.1.1 Residential Areas

Table 6: Performance requirement for internal linings

Location	Minimum Classification
Garages <40m <sup>2</sup>	D-s3,d2
All other rooms <4m <sup>2</sup> within the dwelling	
Stairs and hallways within the dwelling	C-s3,d2
All other rooms within the dwelling <sup>1</sup>	
All common spaces including stairs	B-s3,d2

**Note 1:** Up to ½ (but no greater than 20m<sup>2</sup> total) of an individual rooms internal surface may be reduced to a D-s3,d2 classification.

#### 5.1.1.2 Commercial Areas

Table 7: Performance requirement for internal linings

Location	Minimum Classification
All rooms <30m <sup>2</sup>	D-s3,d2
All other rooms <sup>1</sup>	C-s3,d2
All circulation spaces including stairs <sup>2</sup>	B-s3,d2

**Note 1:** Up to ½ (but no greater than 60m<sup>2</sup> total) of an individual rooms internal surface may be reduced to a D-s3,d2 classification.

**Note 2:** Circulation routes within a large open space, i.e. an open plan office, or retail unit, do not count as circulation spaces for this assessment.

The following elements are excluded from application of these requirements:

- Doors and door frames.
- Window and window frames.

- Architraves, picture rails, mouldings, skirting boards and other similar narrow elements.
- Fitted furnishings.
- Fireplace surrounds and mantle shelves.

### 5.1.2 Vertical Shafts

Based on BS 9251 to allow for the omission of automatic fire suppression within vertical shafts (e.g. lifts or service shafts) in Rodney House any new and existing material within the shafts should conform to BS EN 13501-1 and achieve Class B-s3 or better, including sub categories such as d0, d1, d2.

### 5.1.3 Stairs

Any material (new and existing in Rodney House and new only in all other blocks) forming the flights and landing of every stair should be constructed to achieve no less than a Class A2-s3,d2 reaction to fire classification.

Additionally, any new textile floor covering proposed for the stair used for fire-fighting access in all blocks (stairs provided with dry fire mains, see **Section 8.3.1**) should achieve the following:

- When tested in accordance with BS 4790 (together with any underlay) achieve either:
  - No ignition. Or,
  - Have a radius of ignition of no greater than 35mm.
- Securely affixed to the stairs via a non-water-soluble mechanism.
- Be interrupted at the door threshold via a non-combustible strip of no less than 50mm in width.

## 5.2 Thermoplastic Material

The following applies to Rodney House and any new material being proposed in the remaining blocks.

### 5.2.1 Windows

External windows may be formed of class TP(a) thermoplastic material providing they are not located upon a circulation route.

### 5.2.2 Rooflights and Lighting Diffusers

Thermoplastics may be used in rooflights and lighting diffused providing that the following limits are met:

Table 8: Limitations on the use of thermoplastic rooflights and diffusers

Classification of the Lower Surface	Location <sup>A</sup>	Maximum Area of Each Element (m <sup>2</sup> )	Maximum Aggregate Area (m <sup>2</sup> )	Minimum Separation between each Element (m)
TP(a)	Any	-	-	-
TP(b) or D-s3,d2	Rooms	1	50	Equal to the largest plan dimension of the largest element
		5	50	3

Classification of the Lower Surface	Location <sup>A</sup>	Maximum Area of Each Element (m <sup>2</sup> )	Maximum Aggregate Area (m <sup>2</sup> )	Minimum Separation between each Element (m)
	Circulation Spaces	5	15	3

**Note A:** Thermoplastic rooflights and diffusers may not be located within protected stairs.

### 5.3 Content Control

Any new content proposed in the entrance lobbies of all blocks other than Rodney House should not be combustible. Any proposed post box should be enclosed in fire rated construction (see **Section 6.2.2.2**)



# 6 B3 INTERNAL FIRE SPREAD (STRUCTURE)

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## 6.1 General

The fire resistance levels in the following sections are specified in terms of R/E/I, where R, E and I correspond to the following and are measured in minutes:

R - Loadbearing Capacity;

E - Integrity and

I - Insulation.

Fire resistance requirements will need to satisfy either BS 476 Part 22 or the relevant European Standard (i.e. BS EN 1364,1365 or 1366).

## 6.2 Fire Resistance

### 6.2.1 Structural Fire Resistance

Any new and existing element of structure supporting Rodney House needs to achieve at least 60 minutes fire resistance for loadbearing capacity, as the top storey height of the building is less than 18m. The fire resistance achieved by the existing structure needs to be confirmed by the structural engineer.

Any new element structure proposed to support all blocks other than Rodney House (which have a top storey height more than 18m but less than 30m) needs to achieve at least 90 minutes fire resistance for loadbearing capacity.

Exceptions to the recommendations above are:

- New and existing structure that only supports an unoccupied roof - no fire resistance is needed.
- New structure that only supports the First Floor areas (i.e. flexible working space and gardens) of Rodney House - 30 minutes fire resistance is sufficient.

### 6.2.2 Fire Resisting Construction and Closures

#### 6.2.2.1 Rodney House

Fire resistance levels of all existing and new construction elements of Rodney House (having a top storey height less than 18m) need to satisfy the requirements of BS 9991. Key elements are specified in the table below.

Table 9: Fire resistance levels

Location	Minimum Periods of Fire Resistance (mins)	Minimum fire resistance of door in terms of integrity (mins)	Type of Exposure
<b>Structural Frame, Load Bearing Walls, Beams or Columns</b>	60/-/-	N/A	Exposed faces
<b>Floors</b>	60/60/60	N/A	From underside
<b>Walls enclosing Apartments</b>	-/60/60	FD30 S / E30 S <sub>a</sub>	Each side separately
<b>Walls enclosing Residential Ancillary Areas</b>	-/60/60	FD60 S / E60 S <sub>a</sub>	Each side separately
<b>Common Stairs/Corridors</b>	-/60/60	FD30 S / E30 S <sub>a</sub>	Each side separately
<b>Lift Shafts</b>	-/60/60	FD30 / E30	Each side separately
<b>Service Shafts</b>	-/60/60	FD60 S / E60S	Each side separately
<b>Separation between Rodney House Entrance Lobby and Gym/Swimming Pool</b>	-/90/90 <sup>A</sup>	FD90 S / E90 S <sub>a</sub> <sup>A</sup>	Each side separately
<b>Separation between Rodney House and rest of development</b>	-/90/90 <sup>A</sup>	FD90 S / E90 S <sub>a</sub> <sup>A</sup>	Each side separately

<sup>A</sup> **Note:** see Section 6.2.2.3.

#### 6.2.2.2 All Other Blocks

The recommendations in the table below only applies to new construction elements being proposed in all blocks other than Rodney House (which have a top storey height more than 18m but less than 30m). This does not imply that existing elements need to be upgraded. Furthermore, the recommendations below do not apply to portions of existing walls being reconstructed, provided the portion achieves a fire resistance rating no less than that of the existing wall where it is fitted in.

Table 10: Fire resistance levels

Location	Minimum Periods of Fire Resistance (mins)	Minimum fire resistance of door in terms of integrity (mins)	Type of Exposure
<b>Structural Frame, Load Bearing Walls, Beams or Columns</b>	90/-/-	N/A	Exposed faces
<b>Floors</b>	90/90/90	N/A	From underside
<b>Party Walls between Blocks</b>	90/90/90	FD90 S / E90 S <sub>a</sub>	Each side separately
<b>Walls enclosing Apartments</b>	-/60/60	FD30 S / E30 S <sub>a</sub>	Each side separately
<b>Apartment Entrance Hallways</b>	-/30/30	FD30 / E30	Each side separately
<b>Common Stairs</b>	-/90/90	FD60 S / E60 S <sub>a</sub>	Each side separately
<b>Common Corridors</b>	-/60/60	FD30 S / E30 S <sub>a</sub>	Each side separately
<b>Lift Shafts</b>	-/90/90	FD60 / E60	Each side separately
<b>Service Shafts</b>	-/90/90	FD60 S / E60 S <sub>a</sub>	Each side separately
<b>Post Boxes in Entrance Lobbies</b>	-/30/30	FD30 S / E30 S <sub>a</sub>	Each side separately

### 6.2.2.3 Basement/Ground Commercial Ancillary Areas – All Blocks

The following construction in the commercial ancillary areas of basement and ground levels in all blocks (i.e. the whole basement and the Rodney House swimming pool/gym, reception, flexible working space and retail areas) needs to meet the recommendations of Table 29 from BS 9999:

- New and existing construction of rooms where the fire risk is increased (i.e. the content introduced in the room requires a higher fire rating based on Table 29).
- New construction of rooms where the fire risk is not increased.

The recommendations above do not apply to existing construction of rooms where the fire risk is not increased.

## 6.3 Rodney House Compartmentation

All areas containing exposed faces of elements of structure supporting the Rodney House apartments need to be compartmented from the rest of the development via construction achieving at least -/90/90 mins fire resistance rating.

A fire engineered case to support -/60/60 mins fire resistance rating can be developed. This would be based on the following:

- -/60/60 mins fire resistance rating is sufficient for Rodney House should a fire occur in any of the adjacent blocks
- Although Rodney House will undergo a material change of use in the event of a fire in Rodney House the fire risk to people in the adjacent blocks is not going to increase (Rodney House will retain residential usage and will be provided with automatic fire suppression).

## 6.4 Remedial Works

The recommendations in **Sections 6.5, 6.6, 6.7** below apply to apply to:

- Existing and new elements of construction in Rodney House
- New elements of construction in all other blocks. However, if defects are identified on site within the existing elements remedial works to meet the recommendations in the sections below are recommended.

## 6.5 Continuity of Construction

### 6.5.1 General Provisions

All compartment walls and compartment floors should achieve both of the following:

- Form a complete barrier to fire between the compartments they separate.
- Have the appropriate fire resistance, as given in **Section 6.2.2** above.

Timber beams, joists, purlins and rafters may be built into or carried through a masonry or concrete compartment wall if the openings for them are both of the following.

- As small as practicable.
- Fire-stopped.

If trussed rafters bridge the wall, failure of the truss due to a fire in one compartment should not cause failure of the truss in another compartment.

### 6.5.2 Compartment Walls

Compartment walls common to two or more buildings should comply with both of the following.

- Run the full height of the storey in which they are situated.
- Be continued through any roof space to the underside of the roof.

## 6.6 Services and Penetrations

### 6.6.1 Protected Shafts

The construction enclosing a protected shaft should do both of the following.

- Form a complete barrier to fire between the compartments connected by the shaft.
- Have the appropriate fire resistance, except for uninsulated glazed screens.

## 6.6.2 Flues

The wall of a flue, duct containing flues or appliance ventilation duct(s) should have a fire resistance (REI) that is at least half of any compartment wall or compartment floor it passes through or is built into.

## 6.6.3 Pipes

Pipes passing through a fire-separating element, unless in a protected shaft, should meet one of the following recommendations:

### Proprietary Seals (Any Pipe Diameter)

Provide a proprietary sealing system that will maintain the fire resistance of the wall, floor or cavity barrier tested and installed in accordance with BS EN 1366-3 (18).

### Pipes with a Restricted Diameter

Where a proprietary sealing system is not used, firestop around the pipe, keeping the opening for the pipe as small as possible. The nominal internal diameter of the pipe should not exceed the dimensions outlined in **Table 11**.

Table 11: Maximum Nominal Internal Diameter of Pipes passing through a Compartment Wall / Floor

Situation	Pipe material and maximum nominal internal diameter (mm)		
	(a) High melting point metal <sup>(1)</sup>	(b) Lead, aluminium, aluminium alloy, uPVC, <sup>(2)</sup> fibre cement	(c) Any other material
<b>Structure (but not a wall separating buildings) enclosing a protected shaft that is not a stair or a lift shaft</b>	160	110	40
<b>Compartment wall or compartment floor between flats</b>	160	160 (stack pipe) <sup>(3)</sup> 110 (branch pipe) <sup>(3)</sup>	40
<b>Any other situation</b>	160	40	40

**Note 1:** Any metal (such as cast iron, copper or steel) which, if exposed to a temperature of 800°C, will not soften or fracture to the extent that flame or hot gas will pass through the wall of the pipe.

**Note 2:** uPVC pipes that comply with either BS 4514 or BS 5255.

**Note 3:** These diameters are only in relation to pipes that form part of an above-ground drainage system and are enclosed.

### Sleeving

A pipe with a maximum nominal internal diameter of 160mm may be used with a sleeve made out of a high melting point metal, if the pipe is made of one of the following.

- Lead.
- Aluminium.

- Aluminium alloy.
- Fibre-cement.
- uPVC (pipes should also comply with either BS 4514 or BS 5255).

A high melting point metal means any metal (such as cast iron, copper or steel) which, if exposed to a temperature of 800°C, will not soften or fracture to the extent that flame or hot gas will pass through the wall of the pipe.

## 6.6.4 Ducts

### General Provisions

If air handling ducts pass through fire-separating elements, the load-bearing capacity, integrity and insulation of the elements should be maintained using one or more of the following four methods.

1. Thermally activated fire dampers.
2. Fire resisting enclosures.
3. Protection using fire resisting ductwork.
4. Automatically activated fire and smoke dampers triggered by smoke detectors.

### Kitchen Extract

Methods 1 and 4 should not be used for extract ductwork serving kitchens. The likely build-up of grease within the duct can adversely affect dampers.

### Ducts passing through Protected Escape Routes

Method 1 should not be used for extract ductwork passing through the enclosures of protected escape routes.

### Installation and Specification of Fire Dampers

Both fire dampers and fire and smoke dampers should be all of the following.

- Sited within the thickness of the fire-separating elements.
- Securely fixed.
- Sited such that, in a fire, expansion of the ductwork would not push the fire damper through the structure.

Access to the fire damper and its actuating mechanism should be provided for inspection, testing and maintenance.

Fire dampers should meet both of the following conditions.

- Conform to BS EN 15650 (19).
- Have a minimum E classification of 60 minutes or to match the integrity rating of the fire resisting elements, whichever is higher.

Fire and smoke dampers should meet both of the following conditions.

- Conform to BS EN 15650 (19).
- Have a minimum ES classification of 60 minutes or to match the integrity rating of the fire resisting elements, whichever is higher.

Smoke detectors should be sited so as to prevent the spread of smoke as early as practicable by activating the fire and smoke dampers. Smoke detectors and automatic release mechanisms used to activate fire dampers and/or fire and smoke dampers should conform to BS EN 54-7 (20) and BS 5839-3 (2) respectively.

## 6.6.5 Fire Stopping

In addition to any other provisions for fire stopping, both of the following conditions should be met.

- Joints between fire-separating elements should be fire-stopped.
- Openings through a fire resisting element for pipes, ducts, conduits or cable should be all of the following.
  - As few as possible.
  - As small as practicable.
  - Fire-stopped (allowing thermal movement in the case of a pipe or duct).

Materials used for fire-stopping should be reinforced with (or supported by) materials rated class A2-s3, d2 or better to prevent displacement in both of the following cases.

- Where the unsupported span is greater than 100mm.
- Where non-rigid materials are used (unless subjected to appropriate fire resistance testing to show their suitability).

Other fire-stopping materials, subject to the type of application, include the following:

- Cement mortar.
- Gypsum-based plaster.
- Cement-based or gypsum-based vermiculite/perlite mixes.
- Glass fibre, crushed rock, blast furnace slag or ceramic-based products (with or without resin binders).
- Intumescent mastics.

## 6.7 Cavities

The recommendations for cavity barriers below:

- Apply to new and existing construction in Rodney House and new construction only in all other blocks; and
- Do not apply to external wall construction comprising two leaves of brick or concrete each at least 75mm thick. However, cavity closers (which do not need to achieve the fire performance set out in **Section 6.7.2**) are needed around openings.

### 6.7.1 Locations

Cavity barriers are to be provided in the following locations within an external cavity wall:

- Around all openings through the cavity wall, including but not limited to:
  - Doors.
  - Windows.
  - Vents.
  - Pipes.
- At the junction of every fire rated wall and the external cavity wall, including but not limited to:
  - Party walls between units.
  - Walls forming protected hallways.
  - Walls forming enclosure of stairwells.
- At the junction between the floor slab and the external cavity wall.

- So as to sub-divide extensive cavities within the external wall such that:
  - The maximum dimension within the cavity is 20m, where all materials (other than pipes, cables or conduits) achieve no less than an C-s3,d2 reaction to fire classification.
  - The maximum dimension within the cavity is 10m, where all materials (other than pipes, cables or conduits) achieve less than an C-s3,d2 reaction to fire classification.

### 6.7.2 Performance Requirements

Except where noted below all cavity barriers are to achieve no less than -/30/15 (REI) in accordance with BS 476-20 (22).

The following materials are also deemed to meet the performance requirements of a cavity barrier around openings without testing in line with the guidance of the Approved Documents:

- Steel of no less than 0.5mm thick.
- Timber no less than 38mm thick.
- Polythene-sleeved mineral wool installed in compression within the cavity. Good practice would dictate that this should be compressed no less than 10mm when fitted.
- Calcium silicate, cement-based or gypsum boards, no less than 12mm thick.

### 6.7.3 Fixing and Installation

All certified cavity barriers are to be designed, fixed and installed with the product certification and manufacturer's instructions.

Deemed to comply materials must be fixed such that the cavity barrier is not rendered ineffective by any of the following:

- Natural movement of the building from subsidence, shrinkage, temperature change or wind pressures.
- Failure of the supporting system or fixings during fire.
- Failure of materials against which the cavity barrier may abut.



# 7 B4 EXTERNAL FIRE SPREAD

## 7.1 Fire Spread to Boundary

A detailed assessment of the external elevations to minimise the risk of the external fire spread to adjacent buildings will be undertaken in the next stage. However, based on a preliminary assessment it is not anticipated there is the need for introducing fire rated areas on the external facades of the development.

## 7.2 Roof and Terrace Coverings

All roof and terrace coverings of Rodney House and any new roof/terrace covering proposed on all other blocks should meet the designation AA, AB or AC (National Class) as per BS 476-3 (24) or Broof (t4) (European Class) as per BS EN 13501-5 (25).

**Note:** It should be noted that for the purposes of this section the roof is defined as being the uppermost part of the building which are <70° from horizontal (regardless of whether they form a walkable surface or not). This includes elements of the roof which overhang or oversail the building to which they are attached such as eaves or canopies.

Any combustible insulation layer in the roofs/terraces of Rodney House should not span through compartment walls, unless the layer is separated from the walls via a slab (e.g. concrete) achieving a fire resistance rating no less than that of the walls.

Furthermore to avoid a material alteration combustible materials should not be introduced into the blocks (other than Rodney House) where previously they did not exist.

## 7.3 External Wall Construction and Cladding

Although the Rodney House block is <18m in building height all other blocks are > 18m in building height and some of them share external walls with Rodney House. On this basis, the following elements of external wall construction and cladding (new and existing elements of Rodney House and new elements of all other blocks) are to achieve no less than A2-s1,d0 reaction to fire classification:

- Insulation
- Fillers (including those incorporated into panelised systems such as ACM).
- Spandrel panels.

This does not include any fixings, sealants or gaskets used to affix the above.

## 7.4 Attachments

It is assessed that the following design items are designated as specified attachments to the building (if any are present in Rodney House or proposed in any of the blocks), and as such are required to achieve no less than an A2-s1,d0 reaction to fire classification.

- Balconies, if any.
- Solar Panelling.
- Solar Shading.

### 7.4.1 Green Roofs/Terraces

Green roofs/terraces (e.g. the roof gardens above the Rodney House gym/swimming pool) should:

- Have a growing layer with a depth no less than 80mm and organic content no greater than 50%.
- Be afforded automatic watering system so as to limit the risk that of the plants dying or drying out making the plants themselves a fire risk rather than just the supporting medium.

# 8 B5 ACCESS AND FACILITES FOR THE FIRE SERVICE

## 8.1 Vehicle Access

### 8.1.1 Access Requirement

The building is to be provided with dry fire mains to all blocks, as such all fire mains inlets are to be provided within 18m, and in sight of, a parking position for fire vehicles. Parking positions will be available along the roadways across the external perimeter of the development. Where inlets are not in sight of the roadways (i.e. inlets installed within the central courtyard) these should be made obvious to fire-fighters via signage and should be within 18m of the roadway measured on a route suitable for a laying hose.

### 8.1.2 Access Routes

Under the basis that the building is afforded dry fire main tender access is to be designed for **pump type** appliances. Accordingly the perimeter roadways required to achieve the access requirements are to meet the following dimensions:

Table 12: Roadway Criteria for Pump Appliance

Location	Guidance
Width of Road between Kerbs	3.7m
Width of Gateways	3.1m
Turning Circle Between Kerbs	16.8m
Turning Circle Between Walls	19.2m
Clearance Height	3.7m
Minimum Carrying Capacity	14 tonnes
Maximum Dead-End Travel Distance	20m

## 8.2 Water Supplies

Hydrants are to be located within 90m of each fire main inlet and no more than 90m apart. The location of the existing hydrants need to be confirmed to determine if the requirements above are met.

## 8.3 Access to Buildings

### 8.3.1 Dry Fire Mains

A dry fire mains system is to be provided in accordance with the guidance of BS 9990 where outlets are to be provided at each level within:

- All 4 residential stairs that extend to all apartment levels of Rodney House
- One of the 2 residential stairs serving the other blocks (the stair that is not open to the entrance lobby)

### 8.3.2 Fire Fighting Shafts

Fire fighting shafts are not proposed as these are not needed to meet the requirements of Building Regulations B5.

### 8.3.3 Fire Service Access and Information

A Premises Information Box (PIB) should be located in a prominent location adjacent to the main entrance. This information box should contain the information as recommended by the LFEPA Fire Safety Guidance Note No.70.

It is strongly recommended that these PIB's are provided with any necessary security overrides to provide the fire service free access into the building.

## 8.4 Way Finding Signage

To assist fire service, identify each floor level in blocks of flats >11m from Ground Floor Level, floor indicator signs and flat indicator signs are to be provided in accordance with the following sub sections.

### 8.4.1 Floor Identification Signage

The floor identification signs are to meet all the following points:

- The signs are to be located of every landing of a protected stairway and every protected corridor into which a firefighting lift opens.
- The text should be in sans serif typeface with a letter height of at least 50mm. The height of the numeral that designates the floor number should be at least 75mm.
- The signs should be visible from the top step of the firefighting stair and, where possible from inside a firefighting lift when the lift car door opens.
- The signs should be mounted between 1.7m and 2m above floor level and, as far as practicable, all signs should be mounted at the same height.
- The text should be on contrasting background, easily legible and readable in low level lighting conditions or when illuminated with a torch.

### 8.4.2 Wording for Floor Identification Signage

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

- The floor closest to the mean ground level should be designated as either Floor 0 or Ground Floor.
- Each number above ground floor should be number sequentially beginning with Floor 1.
- A lower ground floor should be numbered sequentially beginning with Floor -1.

- Each floor below the ground floor should be numbered sequentially beginning with Floor -1 or Basement 1.

### 8.4.3 Flat Indicator Signage

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

- The signs should be immediately below the floor identification signs, such that the top edge of the sign is no more than 50mm below the bottom edge of the floor identification sign.
- The wording should take the form Flats X-Y, with the lowest flat number first.
- The text should be in sans serif typeface with a letter height of at least half that of the floor indicator sign.
- The wording should be supplemented by arrows when flats are in more than 1 direction.
- The text and arrows should be on contrasting backgrounds, easily legible and readable in low level lighting conditions or when illuminated with a torch.

Note: in the case of multi storey blocks of flats with two or more entrances, the flat number should be indicated on the normal access storey.

## 8.5 Smoke Clearance

To meet the recommendations of BS 9991 and BS 9999 the two basement levels underneath the development need to be provided with dedicated smoke clearance to assist fire-fighting operations in the event of a basement fire. However, to meet the requirements of Building Regulation B5 it is not deemed necessary to provide dedicated smoke clearance on the basis described in the sections below.

### 8.5.1 Upper Basement

- No upper basement area will undergo any material change of use or material alteration. Therefore, conditions for fire fighters in the upper basement will be no worse than those in the existing layout.
- Exceptions to the above are basement rooms where the fire risk will increase (i.e. proposed refuse stores and existing toilets being converted to store rooms), which will be provided with dedicated smoke clearance, either natural (e.g. via existing basement windows, see below) or mechanical (i.e. system designed to extract gases of 300°C for not less than 1 hour and achieve no less than 10 air changes / hour) plus automatic fire suppression, as per **Section 4.3**.
- The existing upper basement is provided with a number of windows, which will be retained and can be used to vent smoke.
- The Rodney House upper basement is to be provided with automatic fire suppression, as per **Section 4.3**.
- The Rodney House upper basement is linked to the Rodney House apartment levels above (undergoing a material change of use) via 4 stairs. Only 2 of the 4 stairs (those at each end of Rodney House) are needed to support the escape and fire-fighting access strategy of the apartment levels and these will be separated from the upper basement via smoke vented corridor located underneath a building that will undergo a material change of use. Smoke venting to the corridor is to be provided by extending to the upper basement the mechanical smoke shaft venting the corridors above (see **Section 4.5.1**).

## 8.5.2 Lower Basement

- The existing lower basement level of Rodney House only contains a couple of plant spaces (including lift motor rooms), each of them accessed via a single residential stair. These will undergo no material change of use and no material alteration.
- Each plant space has a floor area of no more than 48m<sup>2</sup> and a ceiling height of no more than 2.82m. An unvented basement plant space meeting the recommendations of BS 9999 or BS 9991 may have a floor area up to 200m<sup>2</sup> and a depth of up to 3m. Therefore, the volume of each Rodney House plant space is significantly less than that of an unvented basement plant space in line with guidance.
- The lower basement section of the residential stair providing access to the plant space is separated from the stair section above via a door. It should be assessed that this is a smoke sealed fire door.
- The plant spaces are to be provided with automatic fire suppression, as per **Section 4.3**.
- In the event of fire in one of the two plant spaces and smoke leaking into the stair residents will always have at least one alternative stair to get out of the building.

# REFERENCES

1. **BSi.** *Timber-based fire door assemblies. Code of practice.* s.l. : BSi, 2016. BS 8214.
2. **Ministry of Housing, Communities and Local Government.** *The Regulatory Reform (Fire Safety) Order.* 2005. SI 2005/1541.
3. —. *The Building Regulations .* 2010. SI 2010/2214.
4. —. *The Building Act.* 1981. SI 1984/55.
5. **BSi.** *Stairs. Code of practice for the design of stairs with straight flights and winders.* s.l. : BSi, 2010. BS 5395-1.
6. —. *Stairs, ladders and walkways. Code of practice for the design of helical and spiral stairs.* s.l. : BSi, 1984. BS 5395-2.
7. —. *Stairs, ladders and walkways. Code of practice for the design of helical and spiral stairs.* s.l. : BSi, 1984. BS 5395-2.
8. —. *Smoke and heat control systems. Specification for smoke barriers.* s.l. : BSi, 2006. BS EN 12101-1.
9. —. *Smoke and heat control systems. Specification for pressure differential systems. Kits.* s.l. : BSi, 2005. BS EN 12101-6.
10. —. *Smoke and heat control systems. Specification for powered smoke and heat control ventilators (Fans).* s.l. : BSi, 2015. BS EN 12101-3.
11. —. *Smoke and heat control systems. Specification for powered smoke and heat control ventilators (Fans).* s.l. : BSi, 2015. BS EN 12101-3.
12. —. *Smoke and heat control systems. Smoke control dampers.* s.l. : BSi, 2011. BS EN 12101-8.
13. —. *Smoke and heat control systems. Smoke control dampers.* s.l. : BSi, 2011. BS EN 12101-8.
14. —. *Smoke and heat control systems. Power supplies.* s.l. : BSi, 2005. BS EN 12101-10.
15. —. *Smoke and heat control systems. Power supplies.* s.l. : BSi, 2005. BS EN 12101-10.
16. —. *Smoke and heat control systems. Natural smoke and heat exhaust ventilators.* s.l. : BSi, 2017. BS EN 12101-2.
17. —. *Services for fire safety systems and security systems.* s.l. : BSi, 2017. BS EN 16763.
18. —. *Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications. Code of practice.* s.l. : BSi, 2010. BS 8519.
19. —. *Safety signs. Code of practice for escape route signing.* s.l. : BSi, 2013. BS 5499-4.
20. —. *Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts. Firefighters lifts.* s.l. : BSi, 2015. BS EN 81-72:2015.
21. —. *Safety rules for the construction and installation of lifts. Examination and tests. Landing doors fire resistance test.* s.l. : BSi, 2003. BS EN 81-58.

22. **Network Rail.** *RIS-7700-INS: RAIL INDUSTRY STANDARD FOR STATION INFRASTRUCTURE.* s.l. : Rail Safety and Standards Board, 2013. RIS-7700-INS.
23. **BSi.** *Recommendations for graphic symbols and abbreviations for fire protection drawings.* s.l. : BSi, 1990. BS 1635.
24. —. *Protective clothing. Protection against flame. Method of test for limited flame spread.* s.l. : BSi, 2016. BS EN ISO 15025.
25. —. *Protective clothing against heat and flame. Determination of heat transmission on exposure to flame.* s.l. : BSi, 2016. BS EN ISO 9151.
26. —. *Non automatic fire-fighting systems in buildings. Code of practice.* s.l. : BSi, 2015. BS 9990.
27. —. *Non automatic firefighting systems in buildings. Code of practice.* s.l. : BSi, 2015. BS 9990.
28. —. *Methods of test for assessment of the ignitability of upholstered seating by smouldering and flaming ignition sources.* s.l. : BSi, 2006. BS 5852.
29. —. *Lighting applications. Emergency lighting.* s.l. : BSi, 2013. BS EN 1838.
30. **ICC, NRC-CNRC, Ministry of Housing, Communities and Local Government, ABCB.** *International Fire Engineering Guidelines.* s.l. : Chief Executive of the Department of Building and Housing, 2005.
31. **BSi.** *Improvement of the firefighting and evacuation provisions in existing lifts. Code of practice.* s.l. : BSi, 2016. BS 8899.
32. **BRE.** *Guidelines for the construction of fire-resisting structural elements.* s.l. : BRE, 1988. BR 128.
33. **Smoke Control Association.** *Guidance on Smoke Control to Common Escape Routes in Apartment Buildings (Flats and Maisonettes).* 2015 : Smoke Control Association.
34. **BSi.** *Guidance for the selection and use of safety signs and fire safety notices.* s.l. : BSi, 2014. BS 5499-10.
35. —. *Graphical symbols. Safety colours and safety signs. Design principles for safety signs and safety marking.* s.l. : BSi, 2011. BS ISO 3864-1.
36. —. *Flame arresters. Performance requirements, test methods and limits for use.* s.l. : BSi, 2016. BS EN ISO 16852.
37. —. *Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance.* s.l. : BSi, 2015. BS EN 12845.
38. —. *Fixed fire protection systems. Industrial and commercial watermist systems. Tests and requirements for watermist systems for the protection of low hazard occupancies.* s.l. : BSi, 2016. BS 8489-7.
39. —. *Fixed fire protection systems. Industrial and commercial watermist systems. Tests and requirements for watermist systems for local applications involving flammable liquid fires.* s.l. : BSi, 2016. BS 8489-4.
40. —. *Fixed fire protection systems. Industrial and commercial watermist systems. Fire performance tests and requirements for watermist systems for the protection of industrial oil cookers.* s.l. : BSi, 2016. BS 8489-6.
41. —. *Fixed fire protection systems. Industrial and commercial watermist systems. Fire performance tests and requirements for watermist systems for the protection of combustion turbines and machinery spaces with volumes up to and including 80m<sup>3</sup>.* s.l. : BSi, 2016. BS 8489-5.



42. —. *Fixed fire protection systems. Industrial and commercial watermist systems. Code of practice for design and installation.* s.l. : BSi, 2016. BS 8489-1.
43. —. *Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products.* s.l. : BSi, 1997. BS 476-7.
44. —. *Fire tests on building materials and structures. Method for determination of the fire resistance of non-loadbearing elements of construction.* s.l. : BSi, 1987. BS 476-22.
45. —. *Fire sprinkler systems for domestic and residential occupancies. Code of practice.* s.l. : BSi, 2014. BS 9251.
46. **Department for Communities and Local Government.** *Fire safety risk assessment: transport premises and facilities.* s.l. : Department for Communities and Local Government, 2011.
47. —. *Fire safety risk assessment: theatres, cinemas and similar premises.* s.l. : Department for Communities and Local Government, 2006.
48. —. *Fire safety risk assessment: small and medium places of assembly.* s.l. : Department for Communities and Local Government, 2006.
49. —. *Fire safety risk assessment: sleeping accommodation.* s.l. : Department for Communities and Local Government, 2006.
50. —. *Fire safety risk assessment: residential care premises.* s.l. : Department for Communities and Local Government, 2006.
51. —. *Fire safety risk assessment: open-air events and venues.* s.l. : Department for Communities and Local Government, 2007.
52. —. *Fire safety risk assessment: offices and shops.* s.l. : Department for Communities and Local Government, 2006.
53. —. *Fire safety risk assessment: means of escape for disabled people.* s.l. : Department for Communities and Local Government, 2007.
54. —. *Fire safety risk assessment: large places of assembly.* s.l. : Department for Communities and Local Government, 2006.
55. —. *Fire safety risk assessment: healthcare premises.* s.l. : Department for Communities and Local Government, 2006.
56. —. *Fire safety risk assessment: factories and warehouses.* s.l. : Department for Communities and Local Government, 2006.
57. —. *Fire safety risk assessment: educational premises.* s.l. : Department for Communities and Local Government, 2006.
58. —. *Fire safety risk assessment: animal premises and stables.* s.l. : Department for Communities and Local Government, 2007.
59. **BSi.** *Fire safety in the design, management and use of residential buildings. Code of practice .* 2015. BS 9991.
60. —. *Fire safety in the design, management and use of residential buildings. Code of practice.* s.l. : BSi, 2015. BS 9991.
61. —. *Fire safety in the design, management and use of residential buildings. Code of practice.* s.l. : BSi, 2015. BS 9991.

62. **Health and Safety Executive.** *Fire safety in construction.* s.l. : Health and Safety Executive, 2010. HSG 168.
63. **BSi.** *Fire safety engineering. General principles.* s.l. : BSi, 2009. BS ISO 23932.
64. —. *Fire resistance tests for service installations. Ventilation Ducts.* s.l. : BSi, 2014. BS EN 1366-1.
65. —. *Fire resistance tests for service installations. Fire dampers.* s.l. : BSi, 2015. BS EN 1366-2.
66. —. *Fire resistance tests for non-loadbearing elements. Walls.* s.l. : BSi, 2015. BS EN 1364-1.
67. —. *Fire resistance tests for loadbearing elements. Walls.* s.l. : BSi, 2012. BS EN 1365-1.
68. —. *Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware. Fire resistance characterisation test for elements of building hardware.* s.l. : BSi, 2008. BS EN 1634-2.
69. —. *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware. Smoke control test for door and shutter assemblies .* s.l. : BSi, 2004. BS EN 1634-3.
70. —. *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware. Fire resistance test for door and shutter assemblies and openable windows.* s.l. : BSi, 2014. BS EN 1634-1.
71. —. *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware. Fire resistance test for door and shutter assemblies and openable windows.* s.l. : BSi, 2014. BS EN 1634-1.
72. —. *Fire protection installations and equipment on premises. Guide for selection of installed systems and other fire equipment.* s.l. : BSi, 2011. BS 5306-0.
73. **BRE.** *Fire performance of external thermal insulation for walls of multistorey buildings.* s.l. : BRE, 2013. BR 135.
74. **BSi.** *Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame.* s.l. : BSi, 2015. BS 8414-2.
75. —. *Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building.* s.l. : BSi, 2015. BS 8414-1.
76. —. *Fire hydrant systems equipment. Specification for landing valves for wet risers.* s.l. : BSi, 1987. BS 5041-1.
77. —. *Fire hydrant systems equipment. Specification for landing valves for dry risers.* s.l. : BSi, 1987. BS 5041-2: .
78. —. *Fire extinguishing installations and equipment on premises. Selection and positioning of portable fire extinguishers. Code of practice.* s.l. : BSi, 2012. BS 5306-8.
79. —. *Fire extinguishing installations and equipment on premises. Recharging of portable fire extinguishers. Code of practice.* s.l. : BSi, 2015. BS 5306-9.
80. —. *Fire detection and fire alarm systems. Manual call points.* s.l. : BSi, 2001. BS EN 54-11.
81. —. *Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of voice alarm systems. British Standards Institute, 2013.* s.l. : BSi, 2013. BS 5839-8.
82. —. *Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises .* 2013. BS 5839-6.

83. —. *Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises.* s.l. : BSi, 2013. BS 5839-6.
84. —. *Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems.* s.l. : BSi, 2011. BS 5839-9.
85. —. *Fire detection and fire alarm systems for buildings. Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises.* 2017. BS 5839-1.
86. —. *Fire detection and alarm systems. Heat detectors. Point heat detectors.* s.l. : BSi, 2017. BS EN 54-5.
87. —. *Fire detection and alarm systems for buildings. Specification for automatic release mechanisms for certain fire protection equipment.* s.l. : BSi, 1988. BS 5839-3.
88. —. *Fire detection and alarm systems for buildings. Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises.* s.l. : BSi, 2013. BS 5839-1.
89. —. *Fire detection and alarm systems. Compatibility and connectability assessment of system components.* s.l. : BSi, 2017. BS EN 54-13.
90. —. *Fire classification of construction products and building elements. Classification using test data from reaction to fire tests.* s.l. : BSi, 2007/2009. BS EN 13501-1.
91. —. *Fire classification of construction products and building elements. Classification using data from fire resistance tests, excluding ventilation services.* s.l. : BSi, 2016. BS EN 13501-2.
92. —. *Fire classification of construction products and building elements. Classification using data from fire resistance tests on products and element used in building service installations: fire resisting ducts and fire dampers.* s.l. : BSi, 2005/2009. BS EN 13501-3.
93. —. *Fire classification of construction products and building elements. Classification using data from fire resistance tests on components of smoke control systems.* s.l. : BSi, 2016. BS EN 13501-4.
94. **BRE.** *External Fire Spread: Building separation and boundary distances.* s.l. : BRE, 2016. BR 187.
95. **BSi.** *Explosive atmospheres. Gas detectors. Performance requirements of detectors for flammable gases.* s.l. : BSi, 2016. BS EN 60079-29-1.
96. —. *Emergency lighting. Code of practice for the emergency lighting of premises.* s.l. : BSi, 2016. BS 5266-1.
97. —. *Emergency lighting. Code of practice for non-electrical low mounted way guidance systems for emergency use. Photoluminescent systems.* s.l. : BSi, 1999. BS 5266-6.
98. —. *Double acting hydraulic rescue tool for fire and rescue service use. Safety and performance requirements.* s.l. : BSi, 2016. BS EN 13204.
99. **BRE.** *Design principles for smoke ventilation in enclosed shopping centres.* s.l. : BRE, 1990. BR 186.
100. **BSi.** *Design of fans working in potentially explosive atmospheres.* s.l. : BSi, 2017. BS EN 14986.
101. **Structural Timber Association.** *Design guide for separating distances during construction.* s.l. : Structural Timber Association, 2017. Version 3.2.
102. **Department for children, schools and families.** *Design for fire safety in schools.* s.l. : Department for children, schools and families, 2014. Building Bulletin 100.

103. **BSi.** *Components for smoke control systems. Code of practice for planning, design, installation and maintenance.* s.l. : BSi, 2013. BS 7346-8.
104. —. *Components for smoke and heat control systems. Functional recommendations and calculation methods for smoke and heat exhaust ventilation systems, employing time-dependent design fires. Code of practice.* s.l. : BSi, 2005. BS 7346-5.
105. —. *Components for smoke and heat control systems. Functional recommendations and calculation methods for smoke and heat exhaust ventilation systems, employing time-dependent design fires. Code of practice.* s.l. : BSi, 2003. BS 7346-4.
106. —. *Components for smoke and heat control systems. Code of practice on functional recommendations and calculation methods for smoke and heat control systems for covered car parks.* s.l. : BSi, 2013. BS 7346-7.
107. —. *Code of practice for the operation of fire protection measures. Mechanical actuation of gaseous total flooding and local application extinguishing systems.* s.l. : BSi, 1992. BS 7273-2.
108. —. *Code of practice for the operation of fire protection measures. Electrical actuation of watermist systems (except pre-action systems).* s.l. : BSi, 2008. BS 7273-5.
109. —. *Code of practice for the operation of fire protection measures. Electrical actuation of pre-action watermist and sprinkler systems.* s.l. : BSi, 2008. BS 7273-3.
110. —. *Code of practice for the operation of fire protection measures. Electrical actuation of gaseous total flooding extinguishing systems.* s.l. : BSi, 2006. BS 7273-1.
111. —. *Code of practice for the operation of fire protection measures. Actuation of release mechanisms for doors.* s.l. : BSi, 2015. BS 7273-4.
112. —. *Code of practice for the design of stairs for limited access.* s.l. : BSi, 2011. BS 5395-4.
113. —. *Code of practice for fire safety in the design, management and use of buildings.* s.l. : BSi, 2008. BS 9999.
114. —. *Code of practice for fire extinguishing installations and equipment on premises. Hose reels and foam inlets.* s.l. : BSi, 2006. BS 5306-1.
115. —. *Building hardware. Panic exit devices operated by a horizontal bar, for use on escape routes. Requirements and test methods.* s.l. : BSi, 2008. BS EN 1125.
116. —. *Building hardware. Emergency exit devices operated by a level handle or push pad, for use on escape routes. Requirements and test methods.* s.l. : BSi, 2008. BS EN 179.
117. —. *Building hardware. Controlled door closing devices. Requirements and test methods.* s.l. : BSi, 1997. BS EN 1154.
118. **Ministry of Housing, Communities and Local Government.** *Approved Document M - Access to and use of buildings.* s.l. : Ministry of Housing, Communities and Local Government, 2016. ISBN 978 1 85946 487 8.
119. —. *Approved Document B - Fire Safety: Volume 2 - Buildings other than dwellinghouses (2006 edition incorporating 2010 and 2013 amendments).* 2013. ISBN 978 1 85946 489 2.
120. —. *Approved Document B - Fire Safety: Volume 1 - Dwellinghouses (2006 edition incorporating 2010 and 2013 amendments).* s.l. : Ministry of Housing, Communities and Local Government, 2013. ISBN 978 1 85946 488 5.
121. **BSi.** *Application of Fire Safety Engineering Principles to the Design of Buildings - Code of Practice.* s.l. : BSi, 2001. BS 7974.

122. —. *Active fire curtain barrier assemblies. Specification.* s.l. : BSi, 2013. BS 8524-1.
123. —. *Active fire curtain barrier assemblies. Code of practice for application, installation and maintenance.* s.l. : BSi, 2013. BS 8524-2.
124. **London Fire Brigade.** *Access for Fire Appliances.* s.l. : London Fire Brigade, 2011. Guidance Note 29.
125. **Structural Timber Association.** *16 Steps to fire safety, Promoting good practice on structural timber construction sites.* s.l. : Structural Timber Association, 2017. Version 4.1.
126. **McGrattan, Kevin, et al.** *Fire Dynamics Simulator User's Guide.* s.l. : National Institute of Standards and Technology, 2016. NIST Special Publication 1019.
127. —. *Fire Dynamics Simulator Technical Reference Guide, Volume 1: Mathematical Model.* s.l. : National Institute of Standards and Technology, 2016. Special Publication 1018-1.
128. —. *Fire Dynamics Simulator Technical Reference Guide Volume 3: Validation.* s.l. : National Institute of Standards and Technology, 2016. Special Publication 1018-3.
129. —. *Fire Dynamics Simulator Technical Reference Guide Volume 2: Verification.* s.l. : National Institute of Standards and Technology, 2016. Special Publication 1018-2.
130. **British Standards Institution.** *Fire safety in the design, management and use of residential buildings. Code of practice.* s.l. : BSi, 2015. BS 9991.
131. —. *Application of Fire Safety Engineering Principles to the Design of Buildings - Code of Practice.* s.l. : BSi, 2001. BS 7974.

# Appendix A COOKING FACILITIES IN APARTMENTS

# FIRE ENGINEERED APPROACH

## Location of Cooking Facilities Fire Engineered Approach

**Date:**  
31/08/2021

**Report Number:**  
AFF\_XXX\_Location of Cooking  
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01



**Australia | United Kingdom | Ireland**

Sydney | Melbourne | London | Cheltenham | Dublin

# REPORT DETAIL

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**Document** Fire Engineered Approach - Location of Cooking Facilities

**Report No.:** AFF\_XXX\_Location of Cooking Facilities\_CAN\_A\_01

## Report Revision History

Rev	Date Issued	Comment	Prepared by	Reviewed by	Verified by
1	17/06/20	Final Issue	<b>Evan Doherty</b>	<b>Jeremy Ockenden</b>	<b>Roderic Jones</b>

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# 1 INTRODUCTION

## 1.1 Intent

The purpose of this Consultants' Advice Note (CAN) is to demonstrate how the recommendation of Clause 9.4.2 (a) of BS 9991 for the location of cooking facilities is being met. The location of cooking facilities is subject to the following guidance in 9.4.2:

***Cooking facilities should be sited away from the flat entrance door and the internal escape route (see Figure 10a below);***

Figure 10 Flat with restricted travel distance

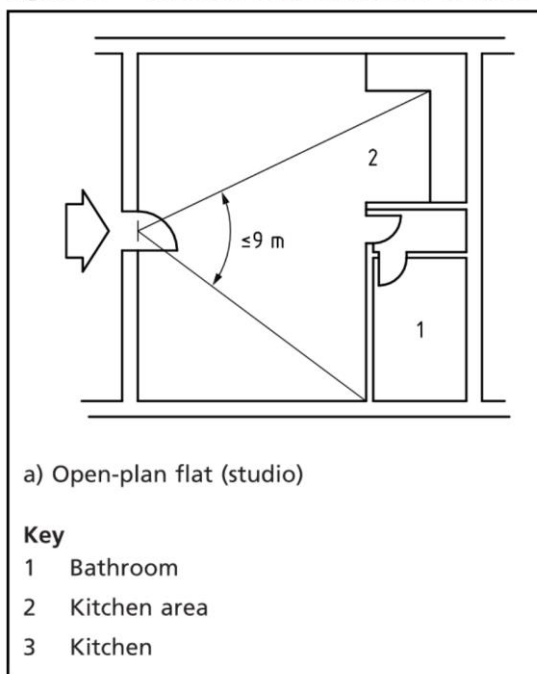


Figure 1: Figure 10 a) Extract from BS 9991 – Example of Open Plan Flat with Open Kitchen Subject to Clause 9.4.2

It is noted this guidance for location of cooking facilities is not entirely clear as to what an acceptable distance is between cooking facilities and the internal egress route. This advice note therefore provides an interpretation of this guidance as to what a suitable location of cooking facilities is based on a radiation analysis which is considered as meeting the intent of the Building Regulations B1.

This report will consider a number of available sources, including:

- The requirements of the Building Regulations 2010.
- The guidance of Approved Document B (ADB).
- The guidance of BS 9991:2011 and BS 9991:2015 (Fire safety in the design, management and use of residential buildings - Code of practice).
- Additional calculations using standard models and the guidance of BS 7974.

## 1.2 Regulatory Requirements

The design of apartments is required by the Buildings Act 1984 to comply with the requirements of the Building Regulations 2010 Part B (Fire) B1 – B5. Whilst an open plan apartment will be required to demonstrate compliance with all parts, this report shall relate only to the level of compliance with the requirements of Part B1 – Means of Warning and Escape, which states that:

**B1.** 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 times.

The following additional performance criteria are provided:

In the Secretary of State's view, the Requirement of B1 will be met if:

- a) There are routes of sufficient number and capacity which are suitably located to enable persons to escape to a place of safety in the event of a fire;
- b) The routes are sufficiently protected from the effects of fire where necessary.
- c) The routes are adequately lit.
- d) The exits are suitably signed; and
- e) There are appropriate facilities to either limit the ingress of smoke to the escape route(s) or the restrict the fire and remove smoke;
- f) All to an extent necessary that is dependent on the use of the building, its size and height: and
- g) There is sufficient means for giving early warning for persons to the building.

In the context of an apartment layout these requirements are reasonably interpreted as being:

- That means of egress within the apartment is configured such that occupants may reasonably gain access to the relative safety of the common corridors (or other places of safety) before the egress route(s) is rendered impassable by the action of smoke or fire within the apartment.

## 2 RADIATION MODELLING

The purpose of this advice note is to determine the location of cooking appliances which is considered as meeting the guidance of BS 9991 Clause 9.4.2 (a). Therefore, this report must establish two things:

- Is the radiation hazard from the cooking facilities to the internal egress route sufficiently low to allow occupants to evacuate from the flat?
- What is an acceptable distance from the cooking facilities to the internal egress route which allows for this evacuation and demonstrates compliance with the recommendations of BS 9991 Clause 9.4.2 (a).

To this end, radiation modelling was conducted on confined cooking fires. These are fires that are contained to the cooking appliance. The criterion for the distance of separation is that at the peak Heat Release Rate (HRR) of a confined cooking fire, occupants must be able to withstand the radiation from the fire whilst evacuating from their apartment.

### 2.1 Model

The radiation model used is the point source model as described in (3). The radiant heat flux ( $q''$ ) is given by:

$$q'' = \frac{\dot{Q}_r \cos\theta}{4\pi R^2}$$

where:

$R$  is the distance from the source (m)

$\theta$  is the angle between the normal to the target, and the line of sight from the target to the point source.

The location of the theoretical point source of energy is at the centre of the fire at the mid-height of the flame. The mean flame height,  $H$ , is measured by the Heskestad correlation.

$$H = 0.23\dot{Q}^{(2/5)} - 1.05D$$

$$\dot{Q}_r = \chi_r \dot{Q}$$

where:

$D$  is the effective diameter (m)

$\chi_r$  is the radiative fraction. This is the fraction of energy released from the fire that as radiation. - The point source is at  $H/2$ .

$$R = \sqrt{L^2 + H_{tx}^2}$$

There are two important assumptions made for this use of the model. The first is that the height of the target is the same as the height of the point source, which maximises the level of radiation received at the target. This is not in the interest of conservatism, but it is assumed that the height of the point source is less than the height of a person, and as we care about radiation levels on any point on a person's body, we will study the point on a person

that is the same height as the radiation source, where the person will receive the most radiation. Therefore  $H_{tx}$  is taken as zero for all tests.

The second is the angle. It is assumed that there is some point on a person's body with its normal facing toward the flame, therefore the maximum radiation received on a person will be with a value ( $\cos\theta = 1$ ). Therefore, the angle  $\theta$  is assumed to be zero for all tests.

Therefore, the model is simplified to:

$$q'' = (\chi_r \dot{Q}) / (4\pi L^2)$$

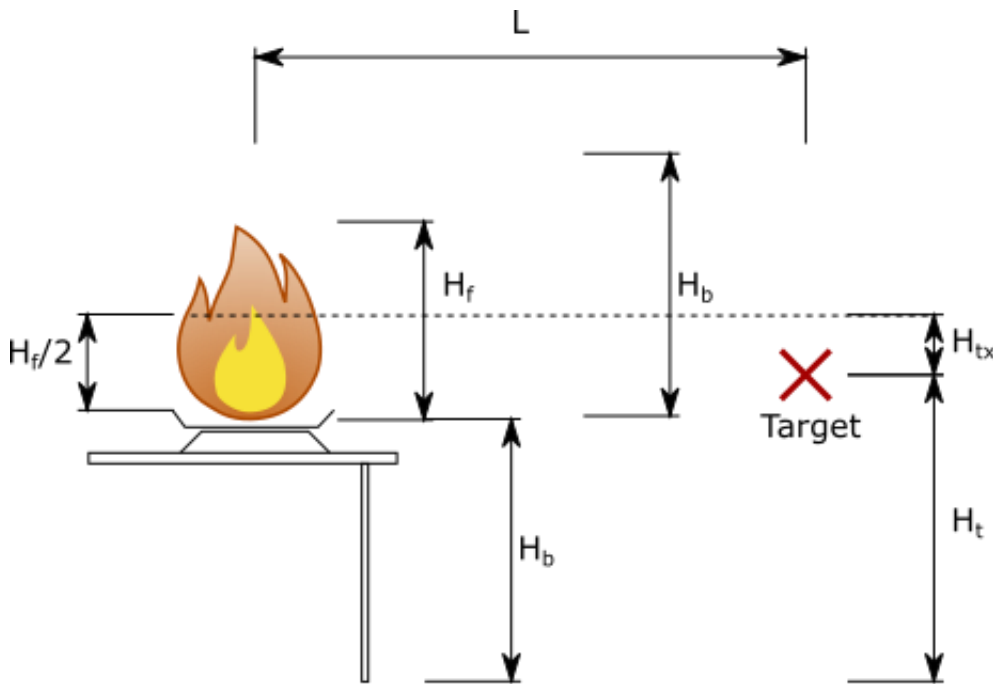


Figure 2: Layout of the radiation model.

## 2.2 Model Validation

The modelling methodology used for this point-source model is that described in [5] in which a number of radiation models were validated against experiments. In (3) it was found that the point-source model correlated best. The experiments used to validate these experiments were as small as 300 mm×300 mm in size, which correlates approximately to a large pan fire. also concluded the point source model showed the best correlation of those tested.

## 2.3 Input Variables

### 2.3.1 Radiative Heat Fraction - $\chi_r$

Radiative heat fraction is largely independent of HRR, and is governed more by the type of fuel and the efficiency of the fire, which are big factors in determining soot composition which is a critical factor in determining radiative fraction (Markstein 1976).

Radiative fraction is typically taken a 0.3 for typical fuel mixes (Drysdale, 2011) and this value has been used as the basis of the following analysis.

Beyler reports in the SFPE Handbook (4) values of up to 0.40 for higher order hydrocarbons. Whilst cooking oils are typically light fraction hydrocarbons, with lower radiative fractions, it was considered reasonable to undertake a sensitivity study using this value.

### 2.3.2 Heat Release Rate (HRR) - $\dot{Q}$

Heat release is the most significant intrinsic property of the fire when it comes to radiation levels, as the radiation emitted is directly proportional to the heat release rate. A key source was [7] from which the results in are quoted. The HRR used in this radiation modelling is based on the assumption that the fire is an oil-based fire in a pan or similar, with the fire not having escaped that confines of the pan. If the fire were to escape the confines of the vessel of origin, then other objects may become involved, such as cupboards and furniture. This assumption is supported by the fact that 94% of cooking fires remain confined to their vessel of origin, however, this assumption should only be used in flats with smoke detection systems are installed, in order to minimise the risk of occupants remaining in the flat after the fire escapes from the vessel of origin.

As the highest HRR found in these tests was 400 kW, a value of 400 kW was used in the model.

## 2.4 Results

Using the established constants, we can formulate a relationship between the radiation threshold (2.5 kW/m<sup>2</sup>) distance and the HRR of the cooking fire.

$$L = \sqrt{(0.3 \dot{Q}) / (4\pi 2.5)}$$

$$L = \sqrt{0.3 / (4\pi 2.5)} \times \sqrt{\dot{Q}}$$

$$L = 0.0977 \times \sqrt{\dot{Q}}$$

$$L = 0.0977 \times \sqrt{400}$$

$$L = 1.954$$

As noted above a sensitivity study has been undertaken using a radiative fraction of 0.4, which provides the following:

$$L = \sqrt{(0.4 \dot{Q}) / (4\pi 2.5)}$$

$$L = \sqrt{0.4 / (4\pi 2.5)} \times \sqrt{\dot{Q}}$$

$$L = 0.1128 \times \sqrt{\dot{Q}}$$

$$L = 0.1128 \times \sqrt{400}$$

$$L = 2.257$$

# 3 CONCLUSION

## 3.1 Overview

The purpose of this advice note was to demonstrate how the recommendation of Clause 9.4.2 (a) of BS 9991 for the location of cooking facilities is being met through a radiation analysis.

## 3.2 Intent of Guidance

The location of cooking facilities is subject to the following guidance of BS 9991 Clause 9.4.2 (a):

***Cooking facilities should be sited away from the flat entrance door and the internal escape route.***

It is noted this guidance for location of cooking facilities is not entirely clear as to what an acceptable distance is between cooking facilities and the internal egress route. This advice note therefore provides an interpretation of this guidance as to what a suitable location of cooking facilities is based on a radiation analysis which is considered as meeting the intent of the Building Regulations B1.

The radiation analysis conducted in this advice note demonstrates how this guidance of Clause 9.4.2 is being met and is considered as meeting the requirements of the Building Regulations B1.

The reason that cooking appliances are located away from the entrance is that the entrance is a single point of failure, and a cooking fire will block egress from the rest of the apartment.

## 3.3 Recommendations

The radiation modelling has demonstrated that a separation distance of 1.95 m from cooking appliances is necessary to reduce radiation risks to occupants, to less than 2.5 kW/m<sup>2</sup>. A sensitivity study undertaken indicates that if the fire consists of fuels with a high radiative fraction were present then this radial distance would be increased to 2.26 m.

It is therefore recommended that:

- A radial distance of **2 m** is maintained between the centre of the cooker and the closest part of the internal egress route.
- An additional **800 mm** is maintained for the internal egress route to allow occupants to pass at normal walking rates.

This is considered acceptable under the basis that:

- For normal fuel scenarios this will maintain the incident heat flux at less than 2.5 kW/m<sup>2</sup> for the entire egress route.
- Under the sensitivity analysis with high radiative value fuel types, either:
  - The egress route would be narrowed to 540 mm which is still wider than the average male human shoulder width of 470 mm. Or,

- Should occupants require the full 800 mm width they may need to pass through a region of elevated incident radiation for a distance of 2.1m with a peak incident radiation of 3.18 kW/m<sup>2</sup>. This is still far below the 4s exposure tenability stated in PD-7974 Part 6 of 10kW/m<sup>2</sup>, and even at a reduced walking speed of 0.6m/s occupants would be exposed to this elevated radiation for a period of only 3.5 s.

Both of which are considered acceptable for the purposes of a sensitivity study.



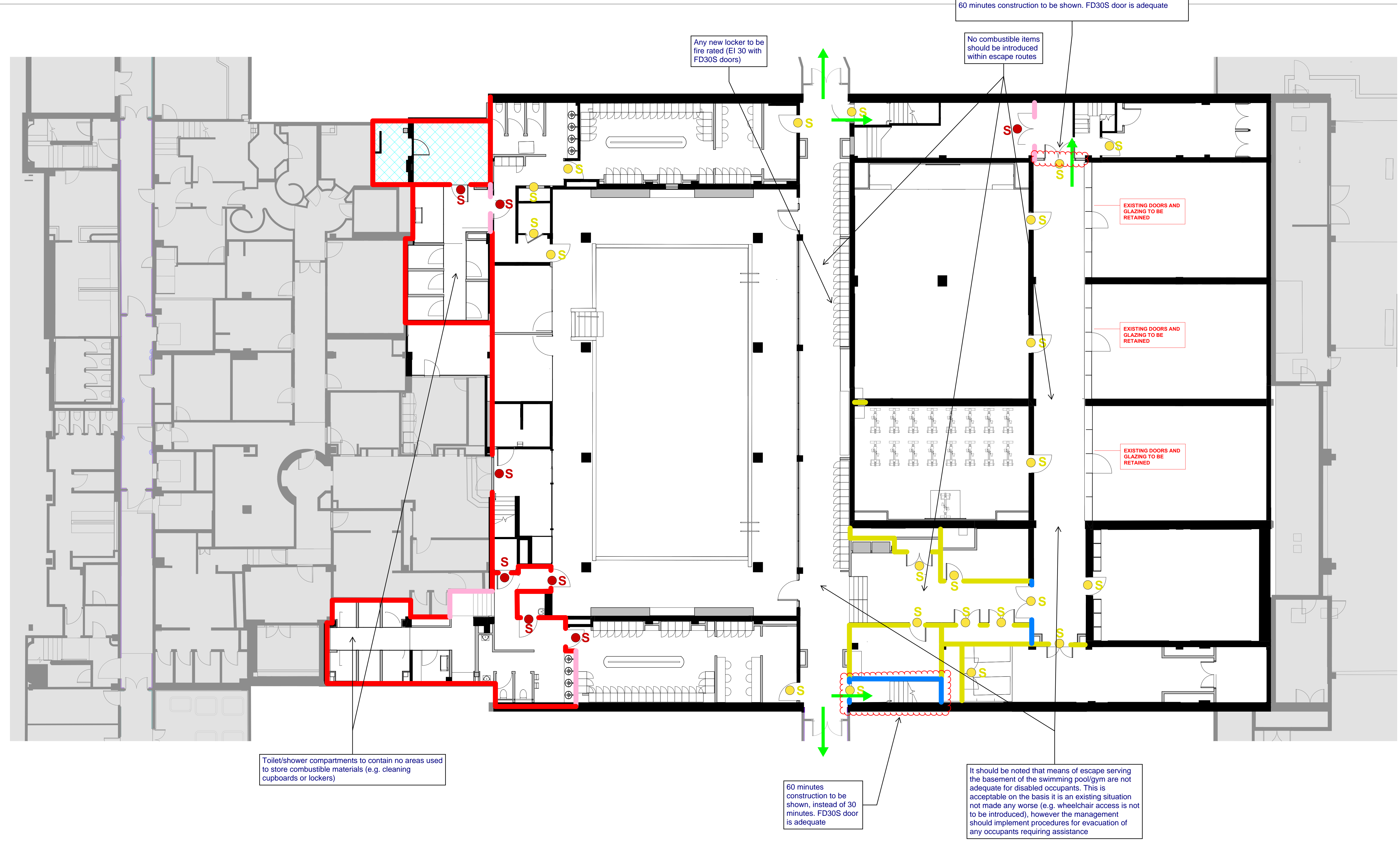
## REFERENCES

1. **British Standards.** British Standard 9991:2011 Fire safety in the design, management and use of residential buildings – Code of practice. 2011.
2. —. British Standard 9991:2015 Fire safety in the design, management and use of residential buildings – Code of practice. 2015.
3. **Fleury, Rob.** *Evaluation of Thermal Radiation Models for Fire Spread Between Objects*. s.l. : University of Canterbury, 2010.
4. **Society of Fire Protection Engineers.** *Handbook of Fire Protection Engineering*. 2002.
5. **U.S. Fire Administration.** *Cooking Fires in Residential Buildings (2008-2010)*. s.l. : FEMA, 2013.



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# Appendix B COMMENTS ON SWIMMING POOL/GYM



Legend: ↑ Exit

**Disclaimer:**  
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**Rev:** T1  
**Notes:** Issue for Tender  
**Date:** 09/12/2021  
**Dwn:** IF  
**Iss:** IF

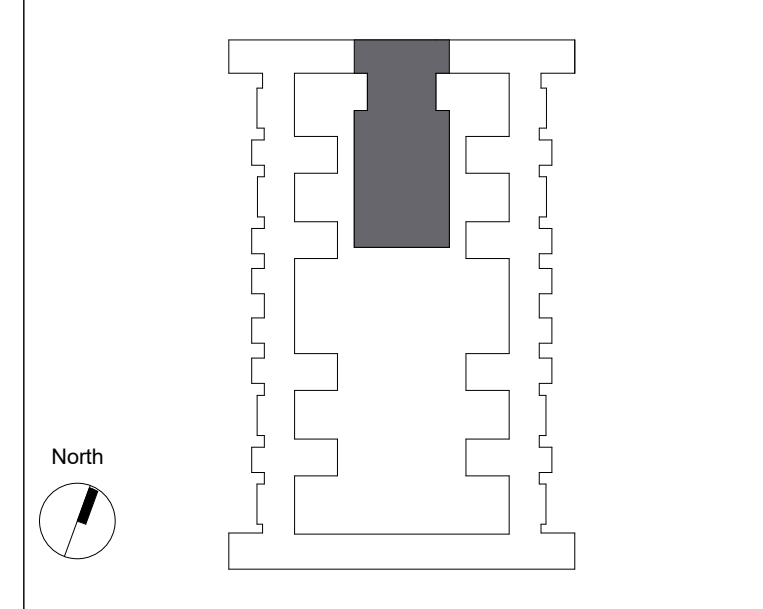
- KEY:**
- Existing
  - Proposed
  - Area within different scope
  - 60min Existing fire resistance construction
  - 30min Existing fire resistance construction
  - 60min Proposed fire resistance construction
  - 30min Proposed fire resistance construction
  - 60min fire resistant doorset S With smoke seal
  - 30min fire resistant doorset S With smoke seal
  - R Riser
  - Sprinkler Zone

To be confirmed if the existing construction achieves the required fire rating

All existing walls to be tested to confirm they do meet required fire resistance

Consultants:

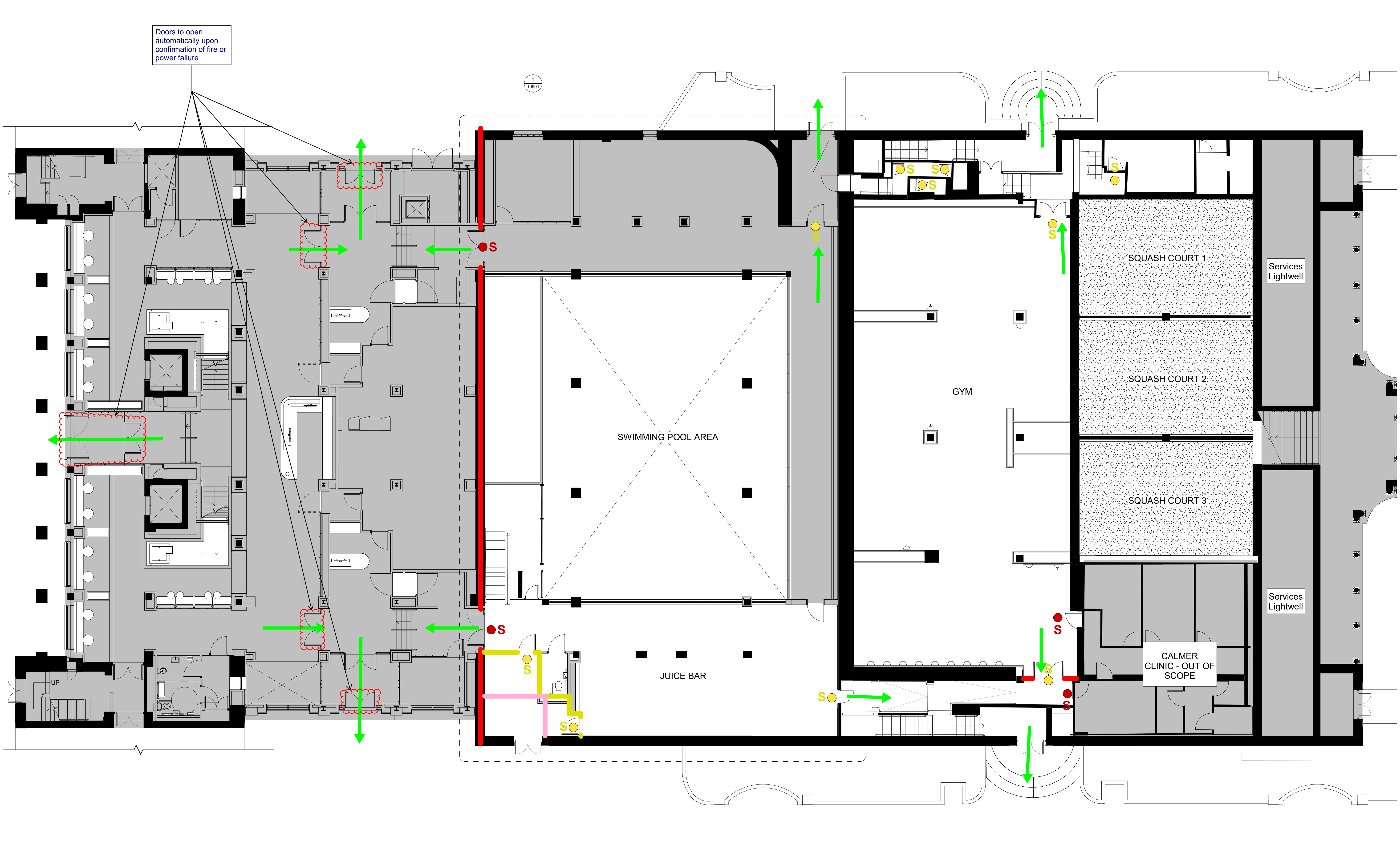
Key / Location: Dolphin Square



Purpose of Issue:

Project Name:	Dolphin Square
Drawing Name:	Swimming Pool/Gym Fire strategy Comments
Drawing Reference:	AFF_20424_02_Dolphin Square Gym/Swimming Pool Fire Strategy_FSK_06
Date:	10/12/21
Drawn By:	EIM
Checked By:	RJ
Approved By:	RJ





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**Rev:** T1  
**Notes:** Issue for Tender

**Date:** 09/12/2021  
**Dwn:** IF  
**Iss:** IF

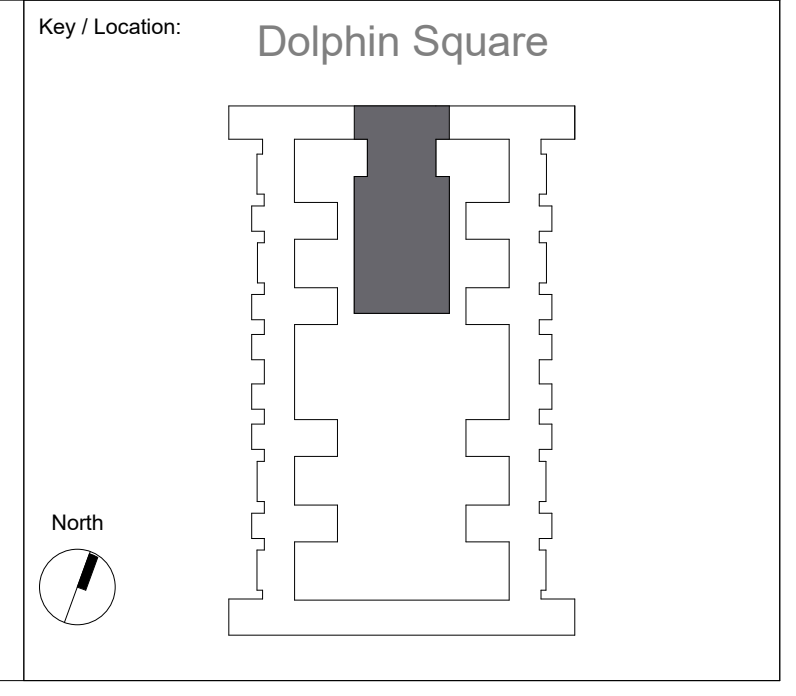
**Purpose of Issue:**

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	Existing
	Proposed
	Area within different scope
	60min Existing fire resistance construction
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	60min fire resistant doorset S With smoke seal
	30min fire resistant doorset S With smoke seal
	Riser
	Sprinkler Zone

All existing walls to be tested to confirm they do meet required fire resistance

To be confirmed if the existing construction achieves the required fire rating

**Consultants:**



Legend: Exit

<b>Project Name:</b> Dolphin Square	<b>Drawn By:</b> EIM	<b>Checked By:</b> RJ	<b>Approved By:</b> RJ
<b>Drawing Name:</b> Swimming Pool/Gym Fire strategy Comments			
<b>Drawing Reference:</b> AFF_20424_02_Dolphin Square Gym/Swimming Pool Fire Strategy_FSK_06			
<b>Date:</b> 10/12/21			



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