**Residential Extension**
**Westminster House**
**Richmond**
**London**


# Fire Strategy

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# 1.Legislative requirements

This fire strategy will demonstrate the function of the building and its occupants in case of fire.

As a residential building the common areas of the premises will be subject to the Regulatory Reform (Fire Safety) Order 2005 when completed and occupied.

The fire strategy will facilitate compliance with the requirements of this legislation.

The whole design and construction process prior to occupation, is subject to the Building Act(1984) and the Building Regulations. (2010).

This fire strategy will suggest how the premises meet the functional requirements of those regulations.

# 2.Objectives

The primary objective of this fire strategy is to demonstrate that the building is designed and can be managed in such a manner that it can be safely and effectively evacuated in case of fire.

Not all premises comply strictly with the guidance documents, as designers often wish to meet the functional requirements in some other way, it is therefore necessary to make adjustments as to how the functional requirements are met.

Adjustments of this kind may form part of this strategy.

The general guidance to the building regulations is taken from Approved Document B, Vol1. Dwellings 2019 edition incorporating 2020 and 2022 amendments. (Hereafter ADB).

Approved Document B Volume 2 has also been referred to when considering the commercial area.

# 3. Building Description

The proposed development consists of a building with

Basement, ground and 5 upper floors.

The basement is a proposed gym (generally plant and open plan)

The ground floor is individual stand alone retail units.

The first,second and third floor are office accommodation

The fourth and fifth floors are 7 new residential units (duplex).

The flats are purpose group 1(a).

The height of the top floor above ground is less than 18m , the building is therefore not a relevant building as described in Regulation 7 (4(a)).

The height of the top floor above ground is in excess of 11m and will therefore attract sprinkler protection.

The addition of residential accommodation constitutes a “change of use “as the premises contains dwellings where previously it did not.

It is therefore subject to the functional requirements B1-B5 as described in schedule 1 of the Building Regulations 2010

# 4.Scope

The report will cover the following areas as identified in schedule 1 of the Building Regulations 2010

B1 Means of Warning and Escape

B2 Internal fire spread (Linings)

B3 Internal Fire spread (Structure)

B4 External Fire spread

B5 Access and facilities for the Fire service.

# 5. Methodology

## 5.1 Overview

### 5.1.1 Basement

The basement is not a complete basement and has an entrance at ground level at the rear.
The basement is appropriately fire separated from other occupancies and has a simultaneous evacuation strategy.
The basement is to be occupied as a gym and will be low risk.

The basement is deemed to be compliant.

### 5.1.2 Ground Floor

The ground floor are existing individual self-contained separated retail units.

Each unit has a simultaneous evacuation strategy.

The ground floor units are considered to be compliant internally and are appropriately separated from the rest of the building.

No further analysis of the units will be considered.

### 5.1.3. First, second and third Floors

The first, second and third floors are existing and are occupied as office accommodation.

They are separated from other floors and have a simultaneous evacuation strategy

### 5.1.4 Fourth and fifth floors

The fourth and fifth floors are to be developed to provide new residential accommodation.

The residential accommodation will have a “defend in situ” (stay put) evacuation strategy.

# 6. B1. Means of warning and escape

## 6.1 Means of warning.

### 6.1.1 Detection and Alarm.

#### 6.1.1.1. Basement

The basement is covered by a BS5839 Part 1 Category L3 system.

This has manual call points at the exits and has automatic detection covering the open area.

The alarm will sound in the gym, in the office and in the residential area.

The evacuation will be simultaneous in all areas.

The basement connects to the Northern stair, which also serves the offices and residential.

Although the stair is protected to the standard for flats by ventilation it is imperative that the occupants of (all) upper floors are aware that a fire in the basement may affect one of their escape stairways, and receive an alarm.

The system will also sound locally in the gym.

#### 6.1.1.2 Ground floor

The ground floor retail units are all separated from one another and from other parts of the building by compartment walls and compartment floors.

The units all have independent escape routes and do not share escapes with any other occupancy.

Each occupancy therefore has its own independent alarm. (no one else should be affected by a fire in a unit).

#### 6.1.1.3 Office (First, second and third floor).

The office accommodation is covered by a BS5839 Part 1 with Category L3 system automatic detection.

The office staff are awake and familiar with the premises, and it is accepted within BS5839 Part1 that the risk is adequately covered by a manual system.

An occupant discovering a fire will simply operate a manual call point and raise an alarm to make other occupants aware of the fire.

In this case when the office is unoccupied and a fire occurs, it is necessary to warn the occupants of the residential accommodation above that there is a fire beneath them and they should evacuate.

Automatic detection to L3 standard is therefore required within the office accommodation.

The alarm must therefore also sound in the residential units as well as the office area.

#### 6.1.1.4 Floors Four and five (Residential Units).

The residential units are covered by a BS5939 Part 6 Category LD2 system with Grade D2 detectors.

Each unit has an independent system, which sounds within the unit of origin only.

This supports the stay put evacuation strategy

There is an additional sounder within each dwelling, which will sound on actuation of the Part 1 L3 system within the offices.

This will prompt a simultaneous evacuation of all the residential units.

The basic recommendation within the building regulations guidance for flats is automatic detection and alarm To BS5839 Part6 Grade D , Category LD3.

The guidance in BS5839 Part 6 2019 (2020 amendments) recommends LD2 coverage.

LD3 coverage would consist of an automatic detector in the circulation space of each flat.

LD2 coverage would consist of an automatic detector in the circulation space of each flat plus a heat detector in the kitchen area (high risk area).

The building regulations can be met by the installation of an LD3 system within each flat.

## 6.2 Means of Escape

### 6.2.1 Flats Horizontal Escape

#### 6.2.1.1 Within Flats

##### 6.2.1.1.1 Duplex Flats/maisonettes

Guidance within ADB suggests that a protected stair should be provided in multi storey flats along with the appropriate automatic detection.

If a sprinkler system is installed (Para3.21 (c) LD2 or 3 coverage is appropriate.

The provision is described as being similar to a 2 storey house in that all habitable rooms have access to the protected stair.

The protected stair leads to a final exit (Flat exit).

##### 6.2.1.1.2 Single storey flat.

There is a single storey open plan flat which complies with ADB Para 3.18 (b) and diagram 3.3.

The travel distance to the final exit door is restricted to 9m and the cooking facilities are located remote from the main entrance door.

#### 6.2.1.2. Common areas.

The flats all have access to the common protected corridor on the fourth floor.

The corridor is served by two stairways –one at each end.

The permitted travel distance is 30m from the flat door to the nearest storey exit(stairway).

This is easily met – the maximum travel from the middle flat is approx. 12m.

### 6.2.2 Flats Vertical Escape

The residential floors have 2 stairways serving the protected corridor on the fourth floor.

The stairs serving the fourth floor have no specific size recommendation, but are suggested to be designed for "everyday use"

The stairway protection is such that all floors are protected to the residential standard.

The fourth floor protected corridor has vents on the external wall in each half of the protected corridor.

The vents are described as protecting the common stair.

Each vent is 1.5m$^2$ minimum free area.

There is also a vent to the outside from the top storey of the stair.

The vent is 1m$^2$ minimum free area.

The protection on the lower floors served by the stairs is also designed to facilitate appropriate means of escape from the residential occupancy.

So on the lower(Office) floors;

The stairs are protected by fire resisting construction (see section on B3) and additionally when compared to other buildings, by ventilation.

The guidance (ADB) indicates that the ventilation is provided, "and so protect the common stair".

A smoke shaft within the protected lobby *adjacent* to the stair provides the ventilation. (it is not possible to ventilate the lobby direct to open air as it is not on an outside wall).

The vents are described in the following (verbatim from ADB) paragraphs.

**1) They should discharge into a vertical smoke shaft, closed at the base that meets all of the following criteria.**

**a) The shaft should conform to the following conditions.**

- **Have a minimum cross sectional area of 1.5m$^2$(minimum dimension of 0.85m in any direction)**
- **Open at roof level, minimum 0.5m above any surrounding structures within 2m of it horizontally.**
- **Extend a minimum of 2.5m**

**b) The free area of all the following vents should be a minimum of 1m$^2$ in the following places.**

- **From the corridor or lobby into the shaft.**
- **At the opening at the head of the shaft**
- **At all internal locations within the shaft.**

**c) The smoke shaft should be constructed from a Class A1 material. All vents should either be smoke leakage ($S_a$) rated fire doorsets or fitted with a smoke control damper achieving the same period of fire resistance and designed to operate as described below. The shaft should be vertical from base to head, with a maximum of 4m at a maximum inclined angle of 30 degrees.**

**d) If smoke is detected in the common corridor or lobby, both of the following should occur.**

- **Simultaneous opening of vents on the storey where the fire is located, at the top of the smoke shaft and to the stair.**
- **Vents from the corridors or lobbies on all other storeys should remain closed, even if smoke is subsequently detected on storeys other than where the fire is located.**

**A vent to the outside with a minimum free area of 1m² should be provided from the top storey of the stair.**

Although it is only recommended to have the ventilation system operated by smoke detection in a single stair condition, it is suggested this system will be operated by smoke detection due to the complex use of the building.

The BS5839 Part 1 L5 system will actuate the smoke ventilation system as described.

The internal BS5839 Part 6 system within each dwelling will be independent.

There will be no alarm in the common areas.

### 6.2.3 Office Horizontal Escape

On the first second and third floors the occupancy is office accommodation.

There are 2 protected stairs available from each floor, which provide storey exits.

#### 6.2.3.1 Travel distance

The guidance suggests a travel distance of 45m to reach the nearest storey exit of which 18m may be in a single direction.

This is easily met and is compliant.

The second and third floors contain inner rooms, which have vision panels and automatic detection as a compensatory feature.

#### 6.2.3.2 Exit Widths

There are 2 storey exits on each floor of 850mm and 1400 mm.

Guidance suggests that one exit (the largest) should be discounted in case it is affected by fire.

Discounting the 1400mm exit leaves an exit width of 850mm.

An 850mm exit is appropriate for 110 persons.

The area of the office is approx. 360 $m^2$ per floor.

Using the suggested 6$m^2$ typical space factor per person, estimates an occupancy of 60 persons per floor (360/6=60).

The means of escape is therefore appropriate for the number of persons located on each floor.

The maximum occupancy of a floor should be 110 persons.

### 6.2.4 Vertical Escape.

Although the stair serving the fourth floor should simply be sized for everyday use- there is no numerical calculation as the stay put policy reduces the number of people using the stair in an emergency to a single household-,
The office stairs should be wide enough to accommodate the numbers involved in a simultaneous evacuation.

The stairs are both 1200mm wide.

For just the office accommodation over 3 floors served the capacity of a 1200mm stair is 330 persons.

Because the stairs are lobby protected, it is not necessary to discount a stair, and both stairs would be included in the calculation.

The two stairs can therefore accommodate 330 persons each giving 660 in total.

This is far in excess of the expected 60 persons per floor (180 persons in total).

If the residential floor is added in and the assessment taken as 4 floors served, the total figure would be 375 persons.

This demonstrates that in a worst case scenario, if the offices and residential areas had to evacuate together there is a large safety margin and only roughly half of the stairway capacity would be used.

The stairs discharge into open air at ground floor level independent of the ground floor units.

The stairs are suitably separated from the basement area.

#### 6.2.4.1 Evacuation lift

It is suggested the project is located such that it is subject to the London plan as introduced and implemented by the Mayor of London.

Under London Plan policy D5, if a lift is installed in a development, then at least one evacuation lift should be provided.

The BS EN 81-76 has not been published yet but relevant information can be found in BS9999.2017 Annex G regarding evacuation lifts.

An evacuation lift will be provided.

### 6.2.5 Emergency Escape lighting

The common areas will be provided with emergency escape lighting –BS5226 Part 1 provides an acceptable standard.

The areas covered will principally be the common corridors/lobbies , the stairways and external routes.

### 6.2.6 Escape signage

The exit routes in the common areas should be indicated by signage.

BS5499 Part 4 provides an acceptable standard.

### 6.2.7 Sprinklers

The top floor of the premises is more than 11m above ground level, therefore the project attracts sprinklers.(ADB Para 7.4).

The sprinklers are fitted within the individual flats; they do not need to be provided in the common areas such as stairs, corridors or landings when these areas are fire sterile.

ADB suggests that BS9251 should be the Code of practice used for the sprinkler system.

BS9251.2021 is the current version and the sprinklers provide “life safety” in residential occupancies.

BS9251.2021 suggests that this block of flats should be covered by a Category 2 System (this will allow 2 sprinklers to run for 30 minutes).

If any other type of suppression system is proposed, it should be ensured that it is approved by Building Control and a competent Fire Engineer before installation.

The sprinkler information is included within the “Means of escape” section of this document as they are provided to assist means of escape **within a flat.**

It is clearly identified within BS9251 that the system is for “life safety purposes”

It is for this reason that it is not required to fit the BS9251 system within the common corridors and stairs.
The system is simply designed to support means of escape up to the flat exit door.

The stairs are protected by fire resisting construction and ventilation which is a more onerous provision than would be required for the offices.

The stair protection is therefore at the residential standard. To facilitate safe evacuation through the office floors.

The office floors do not attract sprinkler protection, as this would be a “property protection system”.

The offices do not attract a sprinkler system.

The residential pattern sprinklers within the flats operate with a relatively low design density (2.8mm.min) and a flat spray pattern that wets the walls and protects escaping occupants.

A commercial property protection system functions differently and has a high design density (5mm.min) and a conical spray pattern to wet fuel load.

The different systems are not consistent and do not form a cohesive level of protection.

Sprinkler protection is therefore only required in the residential occupancy (in flats).

# 7. B2. Internal Fire spread (Linings).

It is important that the wall and ceiling linings do not contribute to the spread of fire.

Internal rooms

Rooms below 4m$^2$ should have wall and ceiling surfaces that meet a D-s3, d2 classification.

Rooms larger than this should have a wall and ceiling surface that meets a C-s3, d2 classification.

Circulation spaces should have wall and ceiling linings that meets B-s3, d2.

There is a relaxation tat d-s3,d2 materials may be applied to walls in *rooms,* up to 50% of the floor area and a maximum of 20m$^2$.

NB. This relaxation does not apply to circulation spaces.

ADB suggests the following

**4.1** The surface linings of walls and ceilings should meet the classifications in Table 4.1.

**Table 4.1 Classification of linings**

| Location | Classification |
|---|---|
| Small rooms of maximum internal floor area of 4m$^2$ | D-s3, d2 |
| Garages (as part of a dwellinghouse) of maximum internal floor area of 40m$^2$ | |
| Other rooms (including garages) | C-s3, d2 |
| Circulation spaces within a dwelling | |
| Other circulation spaces (including the common areas of blocks of flats) | B-s3, d2[1] |

NOTE:

1. Wallcoverings which conform to **BS EN 15102**, achieving at least class C-s3, d2 and bonded to a class A2-s3, d2 substrate, will also be acceptable.

The fire performance is indicated in European Classification.

This has previously been expressed in National Classification (Class 0, Class1 etc.).

Transposition to national class can be achieved using Table B1 in ADB annex B if required.

Generically in flats the walls within flats should be Class C or better.

In circulation spaces (common areas) Class B or better.

There is also guidance on Thermoplastic lighting which should be adhered to if diffusers are constructed of thermoplastic materials.

# 8. B3 Internal Fire Spread (Structure).

## 8.1 Compartmentation (Flats)

Compartmentation should be provided in the following areas

1. Any floor and wall separating a flat from any other part of the building

2. Any wall enclosing a refuse storage chamber.

3. Separating parts of the building used for different purposes (Communal areas and offices).

This means in practical terms that all floors within the residential area should be compartment floors, and all walls around flats, including between the flat and the corridor should be compartment walls.

All elements of structure should have the appropriate period of fire resistance.

Table B4 in the guidance (ADB) identifies that for a block of flats with a sprinkler system with a top floor level above 11m but less than 18m from the ground level, the fire resistance period should be 60 minutes.

Item 6 in Tables B3 identifies that the fire resistance performance should apply to Loadbearing (R)(if required), Integrity (E) and Insulation (I).

The stairway forms a protected shaft as it passes through compartment floors.

Table B3 Item 8 (b) identifies that between the stairs and the corridor 30 minutes fire resisting walls are indicated.

Item 8(c) identifies the rest of the shaft should be in compliance with Table B4 (previously identified at 60 minutes).

Service shafts, which pass through compartment floors, will also attract the fire resistance period for Item 8(c)

The separation between the flats and the commercial office areas is an imperforate 60-minute compartment ceiling (floor).

### 8.1.2 Internal Separation

The lobby within the single level flat is designed as a fire-resisting lobby.

Guidance suggests this should be of 30-minute construction with FD20 doors.

The stair in the duplex flats is designed as a protected stair

Guidance suggests this should be of 30-minute construction with FD20 doors.

Compartmentation between flats and between flats and the escape route should be continued to the floor above or in the case of the top floor to the underside of the roof.

### 8.1.3 Cavity Barriers

Unless the walls are constructed of two brick or concrete leaves each of at least 75mm,

Cavity barriers should be provided;

a) At the edges of cavities, including around openings (such as windows, doors and services)

b) At the junction between an external cavity wall and every compartment floor and compartment wall.

c) At the junction between an internal cavity wall and every compartment floor, compartment wall or other wall or door assembly forming a fire-resisting barrier.

## 8.2 Fire Doors

The front doors to the flats are to be FD30S self-closing doors.

The doors internally to the flats around the protected entrance hall and stairs are a minimum of FD20.

The doors to the main common stairway are identified in Table C1 as FD30S.

Doors to service risers FD30.

# 9. B4 External Fire spread.

## 9.1 Surface Spread of flame

The premises are below 18m to the height of the top floor and therefore do not qualify as a relevant building as described in Regulation 7 (4).

There is therefore no provision regarding the external cladding.

It is suggested however that the functional requirement still states that the building should adequately resist the spread of flames over its surface, and that the cladding should form part of the Fire Risk Assessment carried out under the Fire Safety Order.

An amendment to the Functional Regulation 7 in 2022 added Regulation 7 (1A)

"Building work shall be carried out so that relevant metal composite material does not become part of an external wall, or specified attachment, of any building."

Therefore Aluminium Composite Material (ACM) cannot be used on the exterior of the building.

## 9.2 Space separation

The building is existing and has unprotected areas, that relate to office provision.

The office provision assumes that there is no compartmentation between the floors and the floors are open.

The enclosing rectangle would therefore extend the full length of the floor and 3 storeys in height.

The boundary distance for an enclosing rectangle with (say) 80% unprotected area of dimensions 9m x 30m is 10.5m to the boundary.

The relevant face on to the road would meet this half way across the road and therefore be compliant.

Analysis of a single flat say 3m high x 6m wide reveals a distance to the boundary of 3m for 100% unprotected areas.

The office calculation is clearly dominant and will not alter.

# 10. Access and facilities for the fire service

## 10.1 Vehicle Access

It is proposed to install a dry rising main in one of the stairways, to allow a distance of 45m to the furthest point on each floor to be reached.

The access requirement is therefore for a pump appliance to within 18m of the main inlet.

The rising main inlet will be visible from the access.

## 10.2 Fire mains and hydrants

It is proposed to install a dry rising main in one of the stairways, to allow a distance of 45m to the furthest point on each floor to be reached.

The rising main will be designed and constructed to BS 9990

There is a fire hydrant on Kew road within 100m

## 10.3 Access for firefighting personnel.

The premises do not qualify for a firefighting shaft; access is via the means of escape.

## 10.4 Basement Ventilation

ADB 16.2 indicates that because the basement area has a door to the outside it does not attract basement ventilation for the fire service.

ADB 16.3 indicates that because the floor is not more than 3m below ground level it does not meet the criteria for basement ventilation for the fire service.

# 11. Further Requirements

## 11.1 Regulation 38

It is a legal requirement under the Regulatory Reform (Fire Safety) Order 2005 to provide the responsible person on occupation with fire safety Information to allow them to manage the building fire safety correctly.

This document forms the major part of that information and should be forwarded to the occupier.

## 11.2 Wayfinding Signage for the fire service.

There is a new recommendation for floor identification and flat indication signage within blocks of flats over 11m.

The guidance takes the following format;

1) To assist the fire service to identify each floor in a block of flats with a top storey more than 11m above ground level, floor identification signs should be provided.
2) The floor identification signs should be located on every landing of a protected stairway and every protected corridor/lobby into which a firefighting lift opens (not applicable here).
3) The text should be 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.
4) The signs should be mounted between 1.7m and 2m above floor level and as far as practicable, all the signs should be mounted at the same height.
5) The text should be on a contrasting background, easily legible and readable in low level lighting conditions or when illuminated with a torch.

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

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

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

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

## 11.3 Secure Information Box

A box containing appropriate information should be provided for the fire service as described below.

Blocks of flats with a top storey more than 11m above ground level, should be provided with a secure information box.

The box should meet all of the following conditions.

a) Sized to accommodate all the necessary information
b) Easily located and identified by firefighters
c) Secured to resist unauthorised access but readily accessible by firefighters
d) Protected from the weather

Best practice guidance can be found in sections 2 to 4 of the *Code of Practice for the provision of premises information boxes in residential buildings* published by the Fire Industry Association (FIA).