

COURTENAY AVENUE, LONDON

OUTLINE FIRE STRATEGY



LOKI ARCHITECTURE AND DEVELOPMENT

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PROPOSED DEVELOPMENT
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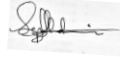
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OUTLINE FIRE STRATEGY
USING
BS9991:2015 & BS9999:2017

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0.0 SCOPE AND LIMITATIONS

0.1 Scope

0.1.1 This report considers the requirements of Part B1 to B5 of the building regulations. Compliance will be determined in line with BS 9991:2015 & BS 9999:2017 based on the drawings supplied by the client. See Appendix A for list of drawings.

0.1.2 This report applies to a proposed 3-storey 8-bedroom luxury dwellinghouse (eco-mansion). The residence also comprises two basement levels. Basement Level 1 mainly comprises recreational and leisure facilities. Basement Level 2 comprises a covered car park and several engineering services installation facilities. A centrally located stairwell serves all floors within the residence. There are also alternative exits provided at the basement levels.

0.1.3 The site is located at Sproughton, Courtenay Avenue, London, N6 4LR.

0.2 Limitations

0.2.1 The scope of this report is strictly limited to that set out in Section 0.1.

0.2.2 This report is formulated on the basis of information and industry experience available at the time of preparation.

0.2.3 It is applicable to the named project only in accordance with the Client's instructions.

0.2.4 This report may only be distributed in its entirety, without amendment. However, the Client may redact names of those involved in the production of the report, product trade names and other material that they consider sensitive.

0.2.5 The report does not constitute a certification of the project assessed.

0.2.6 This assessment is based on information provided by the client. This may include (but is not limited to) architectural drawings, data sheets, etc. Our advice is limited to the information given in those documents and is necessarily dependent upon the accuracy and completeness of that information.

1.0 PART B1: MEANS OF WARNING AND ESCAPE

1.1 Means of warning

- 1.1.1 In terms of early warning, for owner-occupied or rented, three storey houses with one or more floors greater than 200m² a Grade A Category LD2 system is required. The house under assessment falls in the above-described category as it a three-storey house with a floor area greater than 200m², therefore a Grade A Category LD2 system will be provided within the house. This is in accordance with BS 5839-6.
- 1.1.2 According to BS 9999, a Category M fire detection and fire alarm system is required for Risk Profile B1 (this is applicable to all recreational areas and boardroom at Basement Level 1 as well as the car park and engineering services installation rooms at Basement Level 2). A Category M system is also required for Risk Profile A1 (i.e., the catering kitchen and its storage room at Basement Level 1). The staff units containing bedrooms at Basement Level 1 and are assigned RP C(iii)1 and should be provided with a Category L1 system. This is in accordance with BS 5839-1.
- 1.1.3 Manual call points should be on all exits to open air. Nobody should have to travel for more than 45 metres to reach a call point. If necessary, further call points may need to be positioned within the building to achieve this. Call points may also be positioned in high risk areas.

1.2 Means of escape from basement floors

- 1.2.1 The basement floors comprise of spaces and facilities that are ancillary to the use of the house. Basement level 1 comprises a 2-bedroom staff quarters and several recreational or leisure facilities. Basement level 2 mainly comprises service installations and a 7-car garage.
- 1.2.2 Clause 5.2.3 states that, "*Means of escape from basements that are designed to be ancillary to the dwelling use (e.g., parking garages) should be in accordance with BS 9999*". Therefore, means of escape from the basement levels will be assessed as ancillary facilities in accordance with BS 9999.

- 1.2.3 Clause 5.2.1.2 of BS 9991 demonstrates the requirements for dwellings with multiple floor levels below ground. Clause 5.2.1.2 states: *For dwellings with multiple floor levels below ground floor level, at least one of the following should be provided:*
- a. *an alternative exit from every level below ground. A line of fire separation, comprising 30 min fire-resisting construction, should be provided between the living and sleeping areas of the basement, and the basement should have an alternative exit from the bedroom area; or*
 - b. *a protected stairway enclosure serving all habitable rooms and one alternative exit from each basement level; or*
 - c. *a protected stairway and an LD1 fire detection and fire alarm system in accordance with BS 5839-6:2013. The maximum depth of the basement should be not more than 7.5 m below the entrance to the dwelling; or*
 - d. *a protected stairway enclosure and an AWFSS (see 11.2, Table 2). The travel distance should not exceed 9 m from the foot of the protected stair to the door of any habitable room.*
- 1.2.4 At basement level 2, all habitable rooms have access to a protected corridor which gives access to the protected stair. There is also an alternative exit at basement level 2. This complies with point b above. At basement level 1, there are 4 alternative exits allowing occupants within any area to escape in an alternative direction depending on the location of the fire. All areas at basement level 1 are also provided with access to the main central protected stair enclosure. This complies with point b above. On this basis, basement levels 1 and 2 are compliant.
- 1.2.5 The central stairway will be a protected stair having no less than 30 minutes fire resistance in accordance with Table 3 of BS 9991. All doors giving access to the protected stair will be FD30 doors in accordance with Table 12 of BS 9991.
- 1.2.6 To assess travel distance compliance at the basement storeys, the risk profile of the spaces will first have to be established in accordance with Table 4 of BS 9999. Occupancy Characteristic B is appropriate for the recreational areas (i.e., the swimming pool area, pilates area, sauna, cinema, snooker area, club room etc), the boardroom and all spaces at Basement Level 2 (including the carpark) as occupants are expected to be awake and unfamiliar with the building. Occupants of the recreational areas and boardroom are designated as 'unfamiliar' based on the assumption that, other than household members, visitors will also be hosted within the recreational areas. The same applies to the spaces at Basement Level 2 as occupants are likely to be service engineers and technicians who

are unlikely to be familiar with the storey. The above-mentioned spaces are assigned a fire growth rate of 2 (medium) on the basis that the respective spaces and rooms are likely to have an “*evenly distributed low to mid-level fire load comprising a mix of combustible materials*”, (i.e., category 2, 0.012KJ/s^3). Therefore, the recreational areas, boardroom and all spaces at Basement Level 2 contain risk profile B2. However, if sprinklers are installed throughout the building, the risk profile can be reduced by one level (clause 6.5 of BS 9999). Sprinklers will be installed throughout the house. Therefore, the risk profile is reduced to B1.

- 1.2.7 The maximum permitted travel distance (actual) within the recreational areas and boardroom at Basement Level 1 (risk profile B1) is 24m for one direction of travel and 60m for more than one direction of travel. The travel distances within the recreational areas and boardroom at Basement Level 1 are compliant.
- 1.2.8 The maximum permitted travel distance (direct) within the engineering services installation rooms at Basement Level 2 (risk profile B1) is 16m for one direction of travel and 40m for more than one direction of travel. The travel distances within the engineering services installation rooms at Basement Level 2 are compliant.
- 1.2.9 The maximum permitted travel distance (actual) within the parking garage at Basement Level 1 (risk profile B2) is 20m for one direction of travel and 50m for more than one direction of travel. The travel distances within the parking garage are compliant.
- 1.2.10 Occupancy Characteristic A is appropriate for the catering kitchen and its storage room as occupants are expected to be awake and familiar with this area of the building. Occupants are deemed to be ‘familiar’ since they are expected to be employed staff who are likely to reside in the staff quarters. The catering kitchen and storage are assigned a fire growth rate of 2 (medium) on the basis that the respective spaces and rooms are likely to have an “*evenly distributed low to mid-level fire load comprising a mix of combustible materials*”, (i.e., category 2, 0.012KJ/s^3). Therefore, the catering kitchen and storage contain risk profile A2. This can be reduced to A1 as sprinklers will be introduced throughout the building.
- 1.2.11 The maximum permitted travel distance (actual) within the kitchen and storage (risk profile A1) is 26m for one direction of travel and 65m for more than one direction of travel. The travel distances within the catering kitchen and its storage room at Basement Level 1 are compliant.

1.2.12 The catering kitchen storage room is an inner room and should therefore comply with Paragraph 16.3.4 of BS 9999. In order for the storage room to comply with the aforementioned provision the following conditions should be met:

- a. *the occupant capacity of the inner room does not exceed 60 (30 where the occupants require assistance escaping);*
- b. *the inner room is not a bedroom;*
- c. *the inner room is entered directly from the access room;*
- d. *the escape route from the inner room does not pass through more than one access room;*
- e. *the travel distance from any point in the inner room to the exit(s) from the access room does not exceed the allowable one-way travel distance;*
- f. *the access room is not a place of special fire hazard and is in the control of the same occupier as the inner room;*
- g. *one of the following arrangements is made:*
 1. *the enclosures (walls or partitions) of the inner room stop at least 500 mm below the ceiling; or*
 2. *a suitably sited vision panel not less than 0.1 m² is located in the door or walls of the inner room, to enable occupants of the inner room to see if a fire has started in the outer room; or*
 3. *the access room is protected by an automatic smoke detector that either operates an alarm that is immediately audible in the inner room, to a sound pressure level in accordance with the minimum recommended in BS 5839-1:2013, or gives an immediate visual alarm conforming to BS EN 54-23 in the inner room if the ambient noise levels are so great as to make an alarm inaudible.*

1.2.13 The requirements of Points A to F of Clause 16.3.4 of BS 9999 have been met. One of the provisions of Point G of Clause 16.3.4 of BS 9999 should be implemented to achieve full compliance.

1.2.14 The living quarters for staff can be classified as a flat entered from a floor above the flat and should therefore comply with one of the provisions of Clause 9.4.4 of BS 9991 as follows:

- a) *an alternative exit should be provided from the bedroom area of the lower floor level. Where habitable rooms do not have direct access to an enclosed hallway or landing, fire-*

resisting construction and fire-resisting doors should separate the living and sleeping areas; or

b) a protected internal stairway and hallway or landing should be provided together with a Grade D LD1 fire detection and fire alarm system in accordance with BS 5839-6:2013.

- 1.2.15 The staff quarters will comply with Point A of Clause 9.4.4 of BS 9991 as alternative exits has been provided from each of the bedrooms. Fire-resisting construction of no less than 30 minutes will separate the living and sleeping areas.
- 1.2.16 In accordance with Clause 17 (a) of BS 9991, a compartment wall with 60 minutes fire resistance will separate the staff quarters from other parts of Basement Level 2.
- 1.2.17 The maximum permitted travel distance is 13m for one direction of travel and 27m for more than one direction of travel (for RP C1). The staff accommodation is compliant with respect to travel distance.
- 1.2.18 At Basement Level 1, the catering kitchen as well as its storage room and the cinema room will be separated from other parts of the storey with fire-resisting construction of no less than 30 minutes in accordance with Table 29 of BS 9999.
- 1.2.19 At Basement Level 2, it understood that all spaces (other than the workshop and the carpark) can be classified as engineering services installations with moderate fire risk. Therefore, all these spaces (or rooms) will be enclosed in fire resisting construction of no less than 30 minutes in accordance with Table 29 of BS 9991. The car park will be enclosed within fire-resisting construction of no less than 60 minutes [1]. The workshop is understood to be a hand tools repair workshop which bears minimal fire risk. However, the client explains that machinery may be introduced within the workshop in future. Therefore, in order to futureproof the workshop, it will be enclosed within fire-resisting construction of no less than 30 minutes [2].
- 1.2.20 There have been reports of electric vehicles as well as the charging stations spontaneously catching fire while these vehicles are being charged. As such the charging station (store and maintenance) can be considered as a place of special fire hazard. On this basis the charging station will be enclosed within 30 minutes fire-resisting construction in accordance with Table 22 of BS 9999. The charging cables passing through the wall separating the charging station from the car park will be fire stopped in accordance with Clause 24.4 of

BS 9999 to prevent the passage of fire and assist in retarding the movement of smoke between the charging station and the parking garage. See Section 3.1 of this report.

1.3 Means of escape from ground floor to 2nd floor.

1.3.1 Under assessment is a house (eco-mansion) with one floor more than 4.5m above ground level. There is a centrally located vertical void spanning the 1st and 2nd floors. The void has been designated as an atrium as per the drawings provided by the client. However, Clause 3.7 of BS 9991 defines an atrium as a *space within a building, not necessarily vertically aligned, passing through one or more **compartment** floor(s)*. Houses are not required to have compartment floors, as such the vertical void spanning the upper floors of the house cannot be classified as an atrium. Therefore, the house will not be assessed as an atrium building.

1.3.2 Clause 6.3 of BS 9991 requires that, houses with one floor more than 4.5 m above ground level should meet one of the following recommendations:

- a) the top storey or level of the house should be separated from the lower storeys by fire-resisting construction and should be provided with an alternative escape route leading to its own final exit; or*
- b) the internal stairway should be constructed as a protected stairway, connecting the ground and all upper storeys; and either deliver directly to a final exit or allow access to at least two independent escape routes leading to alternative final exits; or*
- c) where an open-plan arrangement exists at ground level, in order to separate the ground floor from the upper storeys, either:*
 - 1) a protected stairway should be provided; or*
 - 2) the house should be fitted throughout with an AWFSS (see 11.2, Table 2 of BS 9991), together with a fire-resisting partition and door to separate the ground floor from the upper storeys. The fire-resisting door should be arranged such that occupants on the upper floors can access an escape window at first floor level, in accordance with 5.1, in the event of a fire in the open-plan area.*

1.3.3 The house has an open-plan arrangement at ground level and should therefore comply with Point C of Clause 6.3 of BS 9991. However, the stairway is open at ground floor level and discharges directly into the open plan arrangement at ground level. Therefore, in the event of a fire on the ground floor, smoke would propagate throughout the building to the upper floors via the open stair and the void. The propagation of smoke will render the internal escape routes (including the stairwell) impassable, posing a significant risk to life

safety. This does not comply with Point C of Clause 6.3 of BS 9991. Thus, it is recommended that 30 minute fire resisting fire curtains are installed on the ground floor, such that in the event of fire, the central stairway will become enclosed to provide a protected escape route to the final exit. This will ensure that the open plan areas at ground floor will not affect the escape route via the stair from the upper or lower floors. The remaining parts of the central stair will have a fire resistance of no less than 30 minutes. Secondly, the entire house will be fitted with a sprinkler system conforming to BS 9251^[3]. The inclusion of a sprinkler system will significantly reduce the temperature of the fire as well as smoke production. Thirdly, emergency escape windows will also be provided to every habitable room on the ground and 1st floors ^[4]. The introduction of a fire curtain, the sprinkler system and escape windows will meet the requirements of Point C (2) of Clause 6.3 of BS 9991. Section 1.4 below provides a clear demonstration of how occupants will escape in the event of a fire on any floor within the house.

- 1.3.5 The fire curtain will be deployed upon the activation of the smoke detection system to form a fire rated enclosure around the stairwell at the ground floor level. The fire curtain will reduce the risk of smoke propagating throughout the house via the central stairwell in the event of a fire on the ground floor.
- 1.3.6 The fire curtain will comply with the requirements of Clause 23 of BS 9991 which states: *where active fire curtain/barrier assemblies are used, they should be in accordance with BS 8524 and should:*
- a) be deployed by an appropriate automatic fire detector;*
 - b) be capable of multi-stage deployment to initially act as a smoke barrier relevant to the risk, where deemed necessary;*
 - c) have emergency retract buttons relevant to the risk;*
 - d) have built in anti-obstruction detectors, full coverage of area to prevent furniture being positioned in the barrier's path;*
 - e) have controls and associated wiring that is appropriate to the risk and type;*
 - f) have deployment speeds in ranging between 0.06 m/s and 0.15 m/s;*
 - g) achieve the same standard of fire resistance, integrity, insulation or radiation and smoke separation as the element of structure being replaced;*
 - h) have automatic monthly testing and logging;*
 - i) have monitoring of the battery condition;*
 - j) have display panels having visual and audible provision to:*
 - 1) indicate any faults; and*
 - 2) indicate if the batteries (for emergency retract) need replacing.*

1.3.7 Emergency escape windows or doors will be provided to every habitable room on the ground and 1st floors. This will ensure that there is a secondary means of escape from the building (1st and ground floors) in an emergency situation. Escape windows and doors should comply with Clause 5.1 of BS 9991 as follows:

a) Escape windows should have an unobstructed openable area that is a minimum of 0.33 m², having the minimum dimensions of 450 mm in height and 450 mm in width.

b) The bottom of any openable area should be not more than 1 100 mm above the floor of the room in which it is situated.

c) Doors and windows that are provided for escape or rescue purposes from a room above ground level should meet the following recommendations.

1) If a window is a dormer window or a roof light, the distance from the eaves of the roof to the sill or vertical plane of the window or sill of the roof light should not exceed 1.5 m when measured along the roof.

2) Any doors (including a French window or a patio window) should be guarded with a protective barrier in accordance with BS 6180.

3) The ground beneath the window or balcony should be clear of any obstructions (such as iron railings or horizontally hung windows) and should be of a size and material that is suitable and safe for supporting a ladder.

4) For security purposes many windows are kept locked with a key. Occupants should be advised to keep the key close to the escape window where it can be easily located.

1.3.8 It is noted that there is a stair beneath the window to the family room. This is not an acceptable landing area for occupants escaping from the family room and is non-compliant with Point c3 Clause 5.1 of BS 9991. Therefore, occupants of the family room will escape via the emergency windows of 'his dressing' room. The same applies to occupants of the reading snug, since the with garden underneath the reading snug will obstruct safe escape. As such occupants of the reading snug will escape via the emergency windows of 'her dressing' room.

1.3.9 The central stairway will also be enclosed within 30 minutes fire resisting construction at the 1st and 2nd floor levels with FD30 doors in accordance with Table 12 of BS 9991.

1.4 Consideration of Means of Escape from Each Floor

1.4.1 The below list demonstrates how occupants of all floors will escape in the event of a fire on each floor:

1. **In the event of a fire on the ground floor.** The fire curtain will be deployed upon the activation of the smoke detection system to form a fire rated escape route from the stairwell at the ground floor level. The fire curtain will reduce the risk of smoke propagating throughout the house via the stairwell. At approximately 68-72 degrees Celsius, the sprinkler system will activate and suppress the fire and reduce the production of smoke. The sprinkler system will control the fire so that the conditions within the house do not reach untenable limits. Occupants of the ground floor will escape via the nearest final exit (or escape windows). Occupants on the 1st and 2nd floors will escape via the central stair or via escape windows on the 1st floor (whichever is less onerous). Occupants of the 1st and 2nd floor using the central stair will exit via the front door within a 30 minute fire rated enclosure.
2. **In the event of a fire on the 1st floor.** At approximately 68-72 degrees Celsius, the sprinkler system will activate and suppress the fire and reduce the production of smoke. The sprinkler system will control the fire so that the conditions within the room do not reach untenable limits. Occupants on the ground floor can escape from the house unaffected. Occupants on the 1st and 2nd floors can escape via the central stair or via escape windows on the 1st floors (whichever is less onerous).
3. **In the event of a fire on the 2nd floor.** At approximately 68-72 degrees Celsius, the sprinkler system will activate and suppress the fire and reduce the production of smoke. The sprinkler system will control the fire so that the conditions within the room do not reach untenable limits. Occupants on the ground and 1st floor can escape from the house unaffected. Occupants on the 2nd floor can escape via the central stair or via escape windows on the 1st floors (whichever is less onerous).
4. **In the event of a fire on the basement floors.** At approximately 68-72 degrees Celsius, the sprinkler system will activate and suppress the fire and reduce the production of smoke. The sprinkler system will control the fire so that the conditions within the room do not reach untenable limits. Occupants on the basement floors will escape via the central stair core or any of the alternative exits (depending on the location of the fire). Occupants of the upper floors can escape from the house unaffected.

2.0 PART B2: INTERNAL FIRE SPREAD (LININGS)

2.1 Linings

2.1.1 The surface linings of walls and ceilings should meet the classifications shown in Table 2.1 below.

Table 2.1: Classification of linings [5]

Location	European Class
Small rooms of maximum internal floor area of 4m ² Garages (as part of a dwellinghouse) of maximum internal floor area of 40m	D-s3, d2
Other rooms (including garages) Circulation spaces within a dwelling	C-s3, d2
Other circulation spaces	B-s3, d2

3.0 PART B3: INTERNAL FIRE SPREAD (STRUCTURE)

3.1 Fire Stopping

- 3.1.1 Any openings for services breaching compartment walls or floors will be fire stopped (unless protected throughout their entire length with fire resisting material) in accordance with Section 24.4 of BS 9991. This is to prevent the passage of fire and assist in retarding the movement of smoke.

3.2 Cavity barriers

- 3.2.1 Cavities offer a route for fire and smoke to spread, which may present danger to occupants of the building. Cavities are found in concealed spaces, i.e., voids in the floors, walls, ceilings etc.
- 3.2.2 Cavity barriers should be included in any large cavity with the potential for extensive unseen fire spread.
- 3.2.3 The cavity barriers will provide a minimum of 30-minute fire rating (i.e., 30 minutes integrity and 15 minutes insulation).

3.3 Sprinklers

- 3.3.1 Sprinklers are required in the house to achieve compliance with Point C of Clause 6.3 of BS 9991. See Paragraph 1.3.2 and 1.3.3 of this report.
- 3.3.2 For the residential areas, the category of system is determined by the type of building as shown in Table 1 of BS 9251:2021 (see Table 3.1 below). BS 9251 defines single family dwellinghouses as requiring a Category 1 sprinkler system. A Category 1 system is therefore required throughout the house.
- 3.3.3 It should be noted that there are various non-residential areas on the basement floors. BS 9251:2021 permits residential sprinkler heads (sprinkler heads conforming to BS EN 12259-14) to be provided to limited non-residential areas. Other areas – where residential sprinkler heads are not appropriate – can be provided with “commercial and industrial” sprinkler heads (sprinkler heads conforming to BS EN 12259-1). Table 3 of

BS 9251 outlines the examples of non-residential areas and the required BS 9251 category to be provided in each area. See Table 3.1 below.

Table 3.1 Design criteria for non-residential areas protected with BS EN 12259-14 sprinkler heads

Table 3 — Examples of classification of areas and design criteria for areas protected with "Residential" BS EN 12259-14 sprinkler heads

Occupancy	BS 9251 category (see Table 1)	Minimum density mm/min	Minimum number of design sprinklers
One or two car garage ^{a)} , where sprinkler protected, attached to a dwelling	1	2.10 ^{a)}	In accordance with Table 2
Car parking ^{a)} within or beneath a block of flats	2, 3 and 4	See Table 4	See Table 4
Bin store within or beneath the flats	2, 3 and 4	See Table 4	See Table 4
Limited office areas (e.g. concierge or site management) ^{c)}	2, 3 and 4	2.80	As per Table 2
Residents' storage sheds/tenant stores ^{a)}	2, 3 and 4	See Table 4	See Table 4
PTSN/CCTV/Electrical rooms	2, 3 and 4	2.80	As per Table 2
Plant rooms	2, 3 and 4	See Table 4	As per Table 2
Domestic laundry/utility room	1	2.10	As per Table 2
Laundry (with storage and processing of linen, e.g. institutional, care home)	2, 3 and 4	See Table 4	See Table 4
Laundry (communal facility)	2, 3 and 4	2.80	As per Table 2
Domestic kitchens	1	2.10	As per Table 2
Hairdressing room	2, 3 and 4	2.80	As per Table 2
Retail (e.g. shop or kiosk)	2, 3 and 4	See Table 4	See Table 4
Foyer/reception	2, 3 and 4	2.80	As per Table 2
Bar/restaurant/cafe	2, 3 and 4	See Table 4	See Table 4
Kitchens in student hub accommodation (e.g. self-catering)	3 and 4	2.80	As per Table 2
Kitchens ^{b)} in residential care or similar premises, e.g. care home	2 and 3	2.80	As per Table 2
≤50 m ²			
Kitchens ^{b)} in residential care or similar premises, e.g. care home	2 and 3	See Table 4	See Table 4
>50 m ²			

- 3.3.4 Where residential sprinkler heads are not appropriate, BS EN 12259-1 sprinkler heads are required. This is specified in Table 3 of BS 9251 by reference to Table 4. The area of operation of the commercial sprinkler heads should be in accordance with Table 4 of BS 9251. Table 4 demonstrates the maximum area that can be provided with commercial sprinkler heads. See Table 3.2 below.

Table 3.2 Design criteria for non-residential areas protected with BS EN 12259-1 sprinkler heads

Table 4 — Examples of classification of areas and design criteria for areas to be protected with BS EN 12259-1 sprinkler heads

Occupancy	Minimum density mm/min	Area of operation ^{A)}
Car parking ^{B)} within or beneath a block of flats	5.00	100 m ²
Bin store ^{B), C)} within or beneath the flats		72 m ²
Limited office areas (e.g. concierge or site management) ^{D)}		72 m ²
Residents' storage sheds/tenant stores ^{B)}		4 heads
PTSN/CCTV/electrical rooms		72 m ²
Plant rooms		100 m ²
Laundry (with storage and processing of linen, e.g. institutional, care home)		100 m ²
Laundry (communal facility)		72 m ²
Hairdressing room		72 m ²
Retail (e.g. shop)		100 m ²
Bar/restaurant/cafe		72 m ²
Kitchens in student hub accommodation (e.g. self-catering)		72 m ²
Kitchens ^{E)} in residential care or similar premises (e.g. care home) ≤50 m ²		72 m ²
Kitchens ^{E)} in residential care or similar premises (e.g. care home) >50 m ²		72 m ²

3.4 Structural fire resistance

- 3.4.1 Elements of structure require 60 minutes fire resistance in accordance with Table 4, BS9991 as the building will be more than 5m and less than 18m above ground level. Also, there are no basement levels 10m below ground level.

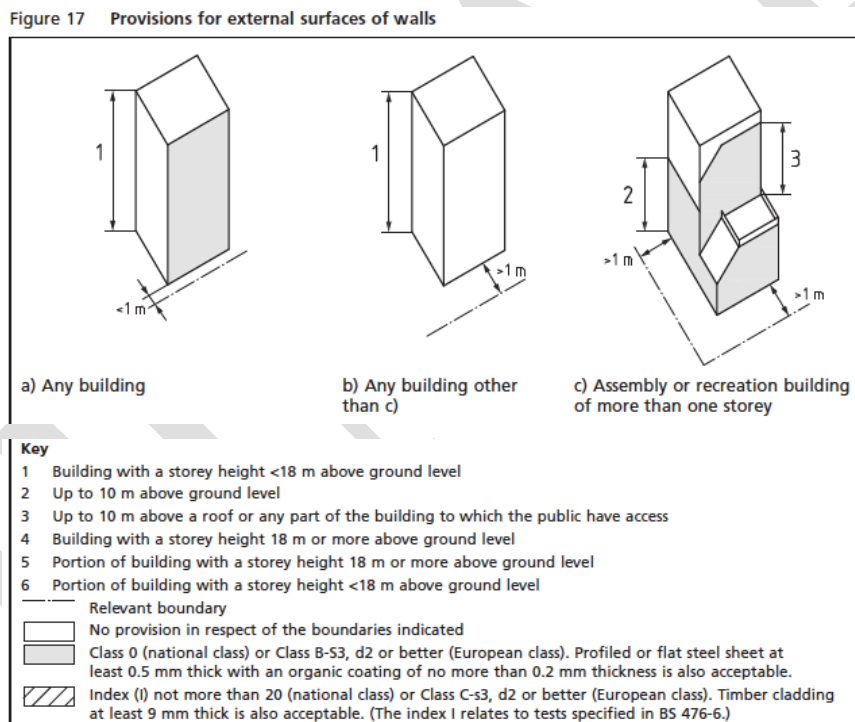
4.0 PART B4: EXTERNAL FIRE SPREAD

4.1 Resisting fire spread over external walls

4.1.1 External walls should be constructed using a material that does not support fire spread and therefore endanger people in or around the building.

4.1.2 The provision relates to the spread of fire across relevant boundaries. Limits therefore depend on the distance of the wall/roof from a relevant boundary. BS 9991 states that external surfaces of walls should be constructed in accordance with Figure 17 of BS 9991 (see Figure 4.1 below). The external surfaces of external walls will comply with Figure 17.

Figure 4.1 Provisions for external surfaces of walls



4.1.3 Regulation 7 requires that all materials which become part of an external wall or specified attachment should achieve class A2-s1, d0 or better [6]. Since the building is below 18m, Regulation 7 does not apply. However, since 1 December 2022, there has been a ban on combustible materials in the external walls of buildings with a storey above 11m. The building is below 11m (7.8m); therefore, the external surfaces of the external walls should have a reaction to fire classification of at least Class B-s3, d2 or better for elevations less than 1000mm from the relevant boundary.

4.2 Unprotected areas

4.2.1 Clause 18.4 of BS 9991 states the following:

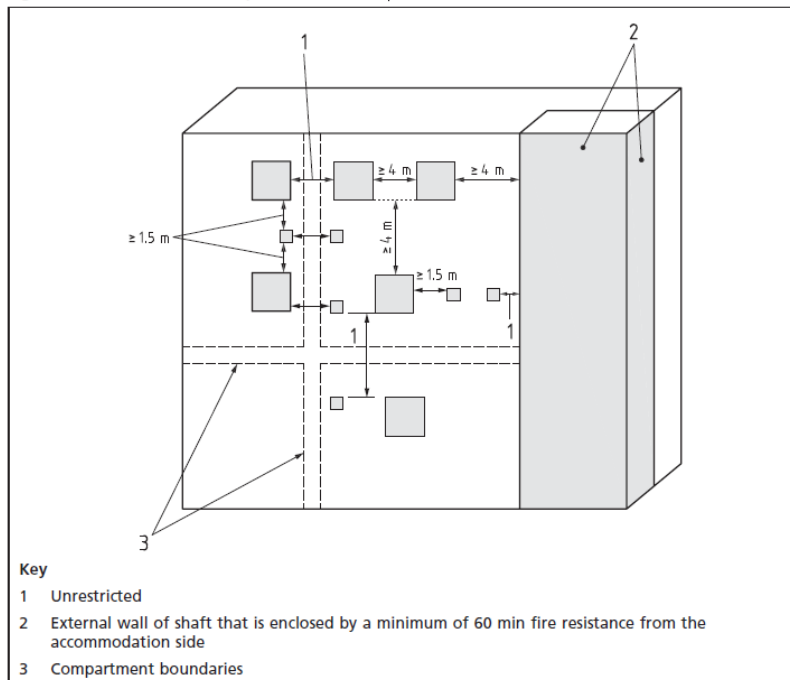
4.2.2 *The following factors should be taken into account when determining the extent of the unprotected area.*

- a) *For life safety, any part of an external façade that has a period of fire resistance less than the appropriate level recommended in Table 3 [of BS 9991] is counted as an unprotected area.*
- b) *Included in the unprotected area calculation is any section of external wall which has the appropriate standard of fire resistance, but has a combustible material more than 1 mm thick as its external surface. However, this section of wall is counted as having an unprotected area amounting to half the actual area of the combustible surface.*
- c) *The amount of unprotected area in the façades of buildings needs to be restricted according to the distance between these façades and the relevant (or notional) boundaries.*
- d) *The following do not contribute to the extent of unprotected area:*
 - a. *any part of an external wall of a stairway in a protected shaft;*
 - b. *parts of the external wall of an uncompartmented building that are more than 30 m above mean ground level;*
 - c. *small unprotected areas in an otherwise protected façade according to the constraints shown in Figure 21.*
- e) *Where a building is provided with automatic sprinklers in accordance with BS 9251:2014 or BS EN 12845 (see 11.2, Table 2), the amount of unprotected area may be doubled or the distance to the boundary for a given amount of unprotected area may be halved.*

4.2.3 External walls within 1m of the relevant boundary should be fire-resisting to 60 minutes each side separately and 100% protected except for small unprotected areas in accordance with Figure 21, BS 9991 [7] (see Figure 4.2 below).

Figure 4.2: Exclusions from unprotected area calculations

Figure 21 Exclusions from unprotected area calculations



- 4.2.4 No space separation calculations have been undertaken for the front and rear elevations of the building for the following reasons:
- 4.2.5 BR 187 demonstrates that residential buildings with a compartment height of 12m, a width of 21m, and 100% unprotected area are permitted to have a minimum separation distance of 10.5m. The front and rear elevations of the building are greater than 10.5m from their respective relevant boundaries. The front and rear elevations are permitted to have a 100% unprotected area. Therefore, the front and rear elevations are compliant in respect of space separation.
- 4.2.6 As shown in Table 4.1, the north and south elevations are also compliant in respect of space separation.
- 4.2.7 In summary, the BR 187 method for calculating boundary distance reveals that the risk of fire spreading from the proposed development to a relevant boundary is low on all elevations.

Table 2.1 Space separation assessment

Compartment	Width of compartment (m)	Height of compartment (m)	Actual separation distance (m)	Calculation	Result
North Elevation	27	12	9.5	Unprotected percentage $= (\text{Total unprotected area} \div \text{Area of enclosing rectangle}) \times 100$ $= 33.7 \div (12 \times 27) \times 100$ $= (33.7 \div 324) \times 100$ $= 10.4\%$	10.4% of the north elevation is unprotected area. This is rounded up to 20%. The façade width is rounded up to 27m. The façade height is rounded up to 12.0m. Table D of BR 187 (for 12m high enclosing rectangles) gives a minimum boundary distance of 2.5m. The actual separation distance is 9.5m. The north elevation is compliant.
South Elevation	27	12	10.6	Unprotected percentage $= (\text{Total unprotected area} \div \text{Area of enclosing rectangle}) \times 100$ $= 43.7 \div (12 \times 27) \times 100$ $= (43.7 \div 324) \times 100$ $= 13.4\%$	13.4% of the south elevation is unprotected area. This is rounded up to 20%. The façade width is rounded up to 27m. The façade height is rounded up to 12.0m. Table D of BR 187 (for 12m high enclosing rectangles) gives a minimum boundary distance of 2.5m. The actual separation distance is 10.5m. The south elevation is compliant.

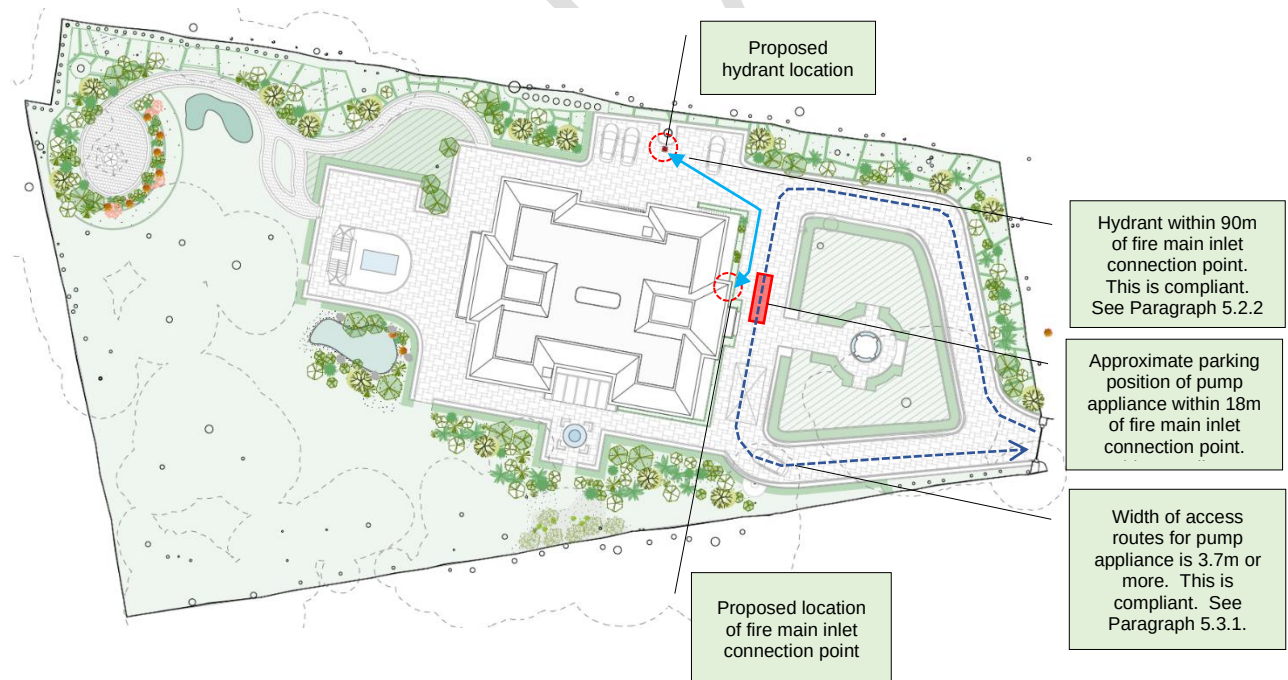
5.0 PART B5: ACCESS AND FACILITIES FOR THE FIRE SERVICE

5.1 Fire mains

5.1.1 Clause 50.1.2 of BS 9991 states that, “houses not fitted with fire mains should allow access for a fire appliance to within 45 m of all points within the house, measured on a route suitable for laying hose”. The 45m rule is not met. Therefore, a fire main will be provided within the building.

5.1.2 Access should be provided for the pumping appliance to within 18m of each inlet connection point. The inlets should be on the face of the building and should be visible from the pump appliance [8], “typically on the face of the building close to the entrance point leading to the [protected stair]”. Fire main inlets will be on the face of the building, within 18m of, and visible from, a fire appliance parking position in accordance with Clause 50.1.3.

Figure 5.1 Access and Facilities for Fire Service



5.1.3 Fire main outlets will be provided within the protected stair enclosure within 45m of every part of every storey as measured on a route suitable for laying hose in accordance with Clause 50.2.2 of BS 9991. This is compliant.

5.2 Fire Hydrants

5.2.1 BS 9991 states:

- a) For buildings provided with dry fire mains, hydrants should be provided within 90m of dry fire main inlets.
- b) For buildings not provided with fire mains (or where the building is fitted with a wet fire main), hydrants should be provided within 90m of an entry point to the building and not more than 90m apart [9].

5.2.2 A new private fire hydrant will be provided on the premises which is within 90m of the fire main inlet connection point as shown in Figure 5.1 of this report.

5.3 Fire Tender Vehicular Access

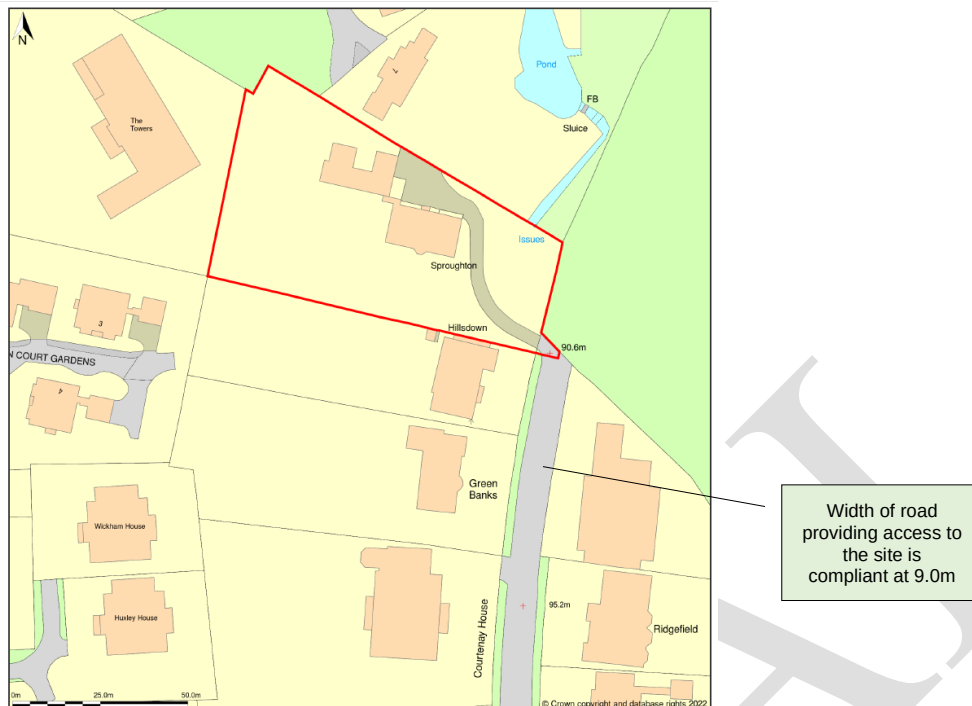
5.3.1 Clause 50.1.1 of BS 9991 states: *“Every building should be provided with suitable access for fire-fighting purposes; roadways should be constructed to allow access for fire appliances, and entry points to buildings should be readily identifiable to the fire and rescue service”*. The minimum fire and rescue service vehicle access route requirements is shown in Table 5.1. The minimum width of access roads is 3.7m. The access roads within the site providing direct access to the building are greater than the 3.7m limit as shown in Figure 5.1 above. Furthermore, the road providing access to the site is greater than 3.7m in width as shown in Figure 5.2 below. The access roads within and providing access to the site are therefore compliant.

Table 5.1: Typical fire and rescue service vehicle access route specification

Appliance type	Minimum width of road between kerbs (m)	Minimum width of gateways (m)	Minimum turning circle between kerbs (m)	Minimum turning circle between walls (m)	Minimum clearance height (m)	Minimum carrying capacity (tonnes)
Pump	3.7	3.1	16.8	19.2	3.7	12.5
High Reach	3.7	3.1	26.0	29.0	4.0	17.0

Notes:

- Fire appliances are not standardised. The building control body may, in consultation with the local fire and rescue service, use other dimensions.
- The road base can be designed to 12.5 tonne capacity. Structures such as bridges should have the full 17-tonne capacity. The weight of high reach appliances is distributed over a number of axles, so infrequent use of a route designed to accommodate 12.5 tonnes should not cause damage.

Figure 5.2: Site Access

5.4 Venting of smoke and heat from basements

5.4.1 Clause 27.2.1 of BS 9999 states that, smoke and heat ventilation is required for every basement storey that has:

- a) a floor area of more than 200 m²; or
- b) a floor more than 3 m below the adjacent ground level.

5.4.2 Both basement levels meet the criteria for requiring the provision of smoke and heat ventilation. Basement ventilation can be either natural or powered. It is understood that both basement levels are not open-sided to allow for natural ventilation. On this basis mechanical smoke ventilation control will be required at basement levels.

5.4.3 For natural smoke and heat ventilation, the requirements of Clause 27.2.2 of BS 9999 should be met as follows: *Smoke outlets (also referred to as smoke vents) provide a route for smoke to escape to the open air from the basement level(s). If a basement is compartmented, each compartment should have direct access to venting without having to open doors, etc. into another compartment. Smoke outlets should:*

- a) *be not less than 2.5% of the floor area of each storey;*
- b) *be sited at high level, either in the ceiling or in the wall of the space they serve;*

c) be as evenly distributed as possible around the perimeter of the building with no less than half the total vent area provided on two opposing walls, with the remaining half provided equally wherever possible, to discharge into the open air outside the building;

d) not be placed where they would prevent the use of escape routes from the building. If an outlet terminates at a point that is not readily accessible, it should be kept unobstructed, and should be covered only with a non-combustible grille or louvre. If an outlet terminates in a readily accessible position, it may be covered by a panel that can be manually opened. The position of such covered outlets should be suitably indicated.

5.4.4 For a powered smoke and heat ventilation, the requirements of Clause 27.2.3 of BS 9999 should be met as follows: A system of powered smoke and heat ventilation may be provided as an alternative to natural venting, to remove smoke and heat from basements, provided that the basement storey(s) are fitted with a sprinkler system. The sprinkler system should be in accordance with BS EN 12845 (new systems) or BS 5306-2 (existing systems) [it is not necessary in this particular case to install sprinklers on the storeys other than the basement(s) unless they are needed for other reasons]. If a powered extract system is used, it should:

- a) provide ten air changes per hour;
 - b) be capable of handling gas temperatures of 300 °C for not less than 60 min;
 - c) come into operation automatically either on activation of the sprinkler system or by an automatic fire detection system conforming to BS 5839-1:2013 (at least L3 standard).
- NOTE For further guidance refer to BS EN 12101-3.

In addition:

- 1) replacement air should be provided and open automatically, using the same activation method as that selected in 27.2.3c);
- 2) the system should have an independent power supply which would operate in the event of failure of the main supply;
- 3) the ductwork should be a fire-resisting duct system (Method 2 or Method 3; see 32.5.2) maintaining at least 75% of the cross-sectional area of the duct. The fire resistance should be not less than 60 min or equivalent to the fire resistance rating of any compartment boundary through which it passes, whichever is the greater;
- 4) all wiring associated with the fans should be in accordance with BS 8519.

A.0 Appendix A, List of Drawings

- 18_N64_A2.2 Proposed First Floor
- 18_N64_A-01/2 Proposed -1 Basement
- A1_Ground Floor Proposed
- 18_N64_A-02/1 Proposed -2 Basement
- A2_First Floor Proposed
- A3_Second Floor Proposed
- A4_Roof Plan_ Proposed
- 18-N64_PL-2 Front Elevation (Proposed) Post pre-planning changes
- 8-N64_B2 South Elevation (Proposed)
- B3_Rear Elevation_Proposed_1_100
- B4_North Elevation_Proposed_1_100
- 18-N64_D5 Longitudinal Section Proposed
- 18-N64_D5 Longitudinal Section Proposed
- 18-N64_F2 Current + Proposed Site Plans
- 18-N64_G1 Replaced Houses
- 8-N64_G2 Nolli Plan with Proposal
- Sproughton_DAS_FINAL_14 December 22_FULL FILE 38
- Sproughton_DAS_FINAL_14 December 22_FULL FILE 39

References

- ¹ BRITISH STANDARDS INSTITUTION, 2015. *BS 9991: 2015 – Fire Safety in the design, management and use of residential buildings – code of practice*. London: British Standards Institution Table 29
- ² BRITISH STANDARDS INSTITUTION, 2015. *BS 9991: 2015 – Fire Safety in the design, management and use of residential buildings – code of practice*. London: British Standards Institution Table 29
- ³ BRITISH STANDARDS INSTITUTION, 2015. *BS 9991: 2015 – Fire Safety in the design, management and use of residential buildings – code of practice*. London: British Standards Institution Table 2
- ⁴ BRITISH STANDARDS INSTITUTION, 2015. *BS 9991: 2015 – Fire Safety in the design, management and use of residential buildings – code of practice*. London: British Standards Institution Clause 5.1
- ⁵ BRITISH STANDARDS INSTITUTION, 2015. *BS 9991: 2015 – Fire Safety in the design, management and use of residential buildings – code of practice*. London: British Standards Institution Clause 20. 1
- ⁶ HMGovernment. Approved Document B. Fire safety. HM Government; 2019 Para 10.10
- ⁷ BRITISH STANDARDS INSTITUTION, 2015. *BS 9991: 2015 – Fire Safety in the design, management and use of residential buildings – code of practice*. London: British Standards Institution Clause 18.5.2
- ⁸ BRITISH STANDARDS INSTITUTION, 2015. *BS 9991: 2015 – Fire Safety in the design, management and use of residential buildings – code of practice*. London: British Standards Institution Clause 50.1.3
- ⁹ BRITISH STANDARDS INSTITUTION, 2015. *BS 9991: 2015 – Fire Safety in the design, management and use of residential buildings – code of practice*. London: British Standards Institution Clause 51.2