



**BUREAU  
VERITAS**

Fire Safety Strategy Report  
for  
Meadow High School, Uxbridge

Reference: S20041766

Issue No: 04

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## Revision History

|                                                                                               |                                                  |                                         |
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## Client Details

|                        |                                                                                                             |
|------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Client:</b>         | Galliford Try                                                                                               |
| <b>Client Address:</b> | Galliford Try Building - Southern<br>Wonersh House, The Guildway, Old Portsmouth Road<br>Guildford, GU3 1LR |
| <b>Project:</b>        | Meadow High School, Uxbridge                                                                                |

## Validity

This report is produced on the basis of the information and experience available at the time of preparation. It is applicable to the above-mentioned project only in accordance with the client's instructions. It is only valid provided no other modifications are made other than those for which a formal opinion has been sought and given by Bureau Veritas UK.

## Table of Contents

|          |                                                        |           |
|----------|--------------------------------------------------------|-----------|
| <b>1</b> | <b>Introduction.....</b>                               | <b>3</b>  |
| 1.1      | Background.....                                        | 3         |
| 1.2      | Purpose of Report .....                                | 3         |
| 1.3      | Sources of Information .....                           | 4         |
| <b>2</b> | <b>Statutory Requirements .....</b>                    | <b>4</b>  |
| 2.1      | The Building Regulations .....                         | 4         |
| 2.2      | Guidance .....                                         | 4         |
| 2.3      | The Regulatory Reform (Fire Safety) Order 2005.....    | 4         |
| 2.4      | Construction, Design and Management Regulations.....   | 4         |
| 2.5      | Regulation 38 .....                                    | 5         |
| <b>3</b> | <b>Risk Profile .....</b>                              | <b>5</b>  |
| 3.1      | Occupancy Characteristic .....                         | 5         |
| 3.2      | Fire Growth Rate .....                                 | 5         |
| 3.3      | Risk Profile.....                                      | 5         |
| 3.4      | Automatic Water Fire Suppression Systems (AWFSS) ..... | 5         |
| <b>4</b> | <b>Means of Warning &amp; Escape .....</b>             | <b>6</b>  |
| 4.1      | Evacuation Strategy .....                              | 6         |
| 4.2      | Fire Detection & Alarm Systems .....                   | 6         |
| 4.3      | Occupancy.....                                         | 7         |
| 4.4      | Horizontal Evacuation .....                            | 7         |
| 4.5      | Vertical Evacuation.....                               | 10        |
| 4.6      | Final Exit and Final Exit Widths (Merging Flows).....  | 10        |
| 4.7      | Disabled Evacuation.....                               | 10        |
| <b>5</b> | <b>Internal Fire Spread (Linings).....</b>             | <b>11</b> |
| <b>6</b> | <b>Internal Fire Spread (Structure).....</b>           | <b>11</b> |
| 6.1      | Fire Resistance of Elements of Structure.....          | 11        |
| 6.2      | Compartmentation.....                                  | 12        |
| 6.3      | Places of Special Fire Hazard.....                     | 12        |
| 6.4      | Fire Doors .....                                       | 12        |
| 6.5      | Concealed Spaces .....                                 | 12        |
| 6.6      | Extensive Cavities .....                               | 13        |
| 6.7      | Protection of Openings and Fire-stopping.....          | 13        |
| 6.8      | Ductwork.....                                          | 13        |
| 6.9      | Air Transfer Grilles .....                             | 13        |
| <b>7</b> | <b>External Fire Spread .....</b>                      | <b>14</b> |
| 7.1      | Roof Coverings .....                                   | 14        |
| 7.2      | Space Separation between Neighbouring Buildings.....   | 14        |
| <b>8</b> | <b>Access and Facilities for Fire fighting .....</b>   | <b>15</b> |
| 8.1      | Access to Buildings .....                              | 15        |
| 8.2      | Firefighting Water Supply.....                         | 15        |
| <b>9</b> | <b>Fire Safety Management.....</b>                     | <b>16</b> |
| 9.1      | Management Level .....                                 | 16        |
| 9.2      | Management Requirements.....                           | 16        |
| 9.3      | Fire Safety Manual .....                               | 16        |
|          | <b>Appendix A – Lift Traffic Assessment.....</b>       | <b>17</b> |

# 1 Introduction

## 1.1 Background

The Meadow High School is an existing SEN educational facility located in Uxbridge. The proposal involves the extension and refurbishment of the existing school.

The existing part of the school is a one storey building consisting of science studios, art rooms, a workshop, the library and some therapy rooms. This part will undergo light refurbishment works. Adjacent to this part, a new sports hall, along with changing facilities, will be built. Linking to the existing building will be a new 2 storey build, which will consist of classrooms, a main hall, a dining hall and a kitchen, as well as offices and resource centre. The plans for the building are shown below.



Figure 1: Ground floor: Sports Hall extension to existing building



Figure 2: Ground floor: new build wing



Figure 3: First floor: new build wing

The height of the topmost occupied floor less than 5m. The building will be served by two protected escape stairs.

## 1.2 Purpose of Report

This report outlines the fire safety strategy for the proposed new school building and is intended to highlight the key design issues and the proposed solutions to meet the challenges of compliance with the Building Regulations Part B.

British Standard 9999 (BS 9999:2017) will be used as a guidance document for this development in order to achieve statutory approval under Part B of the Building Regulations 2010.

*Where no specific provision is mentioned in this fire strategy regarding any particular aspect reference should be made to BS 9999:2017.*

This document will, therefore, act as the basis of discussions between the design team and Approval Authorities, in order to obtain approval in principle for the design in respect to fire safety compliance.

### 1.3 Sources of Information

This Fire Strategy should be read in conjunction with the drawings provided by Pozzoni Architecture.

**Note:** The figures within this report are only to illustrate the fire safety principles; for confirmation of layout or other details reference should be made to the current project drawings.

Table 1: Documents Used within this Report

| Drawing                             | Reference No.           | Revision |
|-------------------------------------|-------------------------|----------|
| Phase 2 Ground Floor Fire Strategy  | MHS-POZ-01-GF-DR-A-2220 | C03      |
| Phase 5 Ground Floor Fire Strategy  | MHS-POZ-03GF-DR-A-2230  | C03      |
| Phase 2 First Floor Fire Strategy   | MHS-POZ-01-01-DR-A-2221 | C03      |
| Proposed Roof Plan                  | MHS-POZ-XX-R1-DR-A-1203 | A        |
| Proposed Elevations – North & South | MHS-POZ-XX-XX-DR-A-1350 | A        |
| Proposed Elevations – East & West   | MHS-POZ-XX-XX-DR-A-1351 | A        |
| Site Plan                           | MHS-POZ-XX-XX-DR-A-1100 | -        |

## 2 Statutory Requirements

### 2.1 The Building Regulations

The building is subject to the statutory requirements of the Building Regulations 2010. It is, therefore, necessary for the building to meet the functional requirements of Part B of Schedule 1 of these Regulations. These requirements can be seen in the figure below:



Figure 4: Part B of The Building Regulations

### 2.2 Guidance

For the building, compliance with the above requirements will normally be achieved by adopting a design approach which follows the recommendations with BS 9999:2017 where appropriate and supplementing this with fire engineering solutions where necessary to ensure that the key fire safety objectives for the design are achieved.

The document is primarily concerned with life safety, property protection is not specifically considered although the fire protection provisions for the building will offer some degree of property protection.

As with all British Standard Codes of Practice, BS 9999:2017 provides guidance and recommendations relating to its subject matter. It does not contain mandatory clauses or prescriptive requirements, and it is acceptable to deviate from the recommendations made, provided such deviations are supported by adequate evidence that the functional requirements will still be met. The Standard also acknowledges that in some circumstances it may be necessary to use one guidance document to supplement another, and confirms that this is acceptable provided the overall approach is fully integrated into the final design solution.

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

Once the building is completed and occupied, the Regulatory Reform (Fire Safety) Order [RR(FS)O] becomes the controlling fire safety legislation. The Order came into force in 2006, revoking amongst other legislation the Fire Precautions Act and the Workplace Regulations.

It is necessary, among other things, under this order for the owner/occupier of the building to carry out and maintain a fire safety risk assessment. The building's management team will also be responsible under this order to ensure that the building's fire safety provisions are appropriately managed, maintained and tested over the whole life of the building.

### 2.4 Construction, Design and Management Regulations

Projects undertaken within the UK are subject to the requirements of the Construction, Design and Management Regulations (CDM).

This report defines the strategy for meeting the functional and performance requirements for fire safety in the finished building. Where any conclusions or recommendations have been arrived at which specify particular materials, products or forms of construction these will have been assessed, in accordance with CDM Regulation 9 (Duties for Designers). In the event that these involve significant residual risks or health and safety critical assumptions, this information will be made available, to the Principal Designer. Where the architect or other consultants use the standards put forward in this report to specify works, they are understood to be competent in alerting the Client, Principal Designer, and Contractor and Building Occupiers of CDM issues.

## 2.5 Regulation 38

Regulation 38 of the Building Regulations requires that the fire safety information in respect to a 'relevant building' should be passed to the 'responsible person' upon completion of the work or when the building is first occupied (whichever is earlier). For definition of relevant building under Regulation 38 please see below.

1. This regulation applies where building work:
  - a. Consists of or includes the erection or extension of a relevant building; or
  - b. Is carried out in connection with a relevant change of use of a building, and Part B of Schedule 1 imposes a requirement in relation to the work.
2. The person carrying out the work shall give fire safety information to the responsible person not later than the date of completion of the work, or the date of occupation of the building or extension, whichever is the earlier.
3. In this regulation:
  - a. "Fire safety information" means information relating to the design and construction of the building or extension, and the services, fittings and equipment provided in or in connection with the building or extension which will assist the responsible person to operate and maintain the building or extension with reasonable safety;
  - b. A "relevant building" is a building to which the Regulatory Reform (Fire Safety) Order 2005 applies, or will apply after the completion of building work;
  - c. A "relevant change of use" is a material change of use where, after the change of use takes place, the Regulatory Reform (Fire Safety) Order 2005 will apply, or continue to apply, to the building; and
  - d. "Responsible person" has the meaning given by article 3 of the Regulatory Reform (Fire Safety) Order 2005.

A suggested but not exhaustive list is given below:

- This fire strategy report.
- Management information proposed as part of this fire strategy report.
- Active (Fire Alarm Systems, emergency signage and lighting, fire curtains, dry risers etc.) and Passive (compartmentation, fire doors, cavity barriers etc.) Fire Protection System details with relevant maintenance schedules and operational details.
- O&M Manuals for building systems, including commissioning information and certification.
- Any information related to facilitating the evacuation of disabled occupants where applicable.

## 3 Risk Profile

### 3.1 Occupancy Characteristic

During school hours the building is categorized as **Occupancy Characteristic A** consisting of people who are awake and familiar with the building layout.

During out-of-hours use the building is categorized as **Occupancy Characteristic B** consisting of people who are awake and unfamiliar with the building. The plan below shows the area of the building available for community use. Only certain rooms at ground floors will be available for community use.



Figure 5: Areas of the building available for community use

### 3.2 Fire Growth Rate

A fire growth rate of **Medium (Category 2)** is applicable.

### 3.3 Risk Profile

The building is therefore **Risk Profile A2** during school hours and **Risk Profile B2** for out-of-hours public use.

### 3.4 Automatic Water Fire Suppression Systems (AWFSS)

As a result of the height and use, the building is not required to be provided with a sprinkler system in accordance with BS 9999:2017.

## 4 Means of Warning & Escape

### 4.1 Evacuation Strategy

The means of escape has been designed based on the following assumptions:

- Any fire in the building is assumed to be unintentional and therefore it is unlikely to start in two different locations at one time;
- The building will be evacuated by simultaneous evacuation in the event of a fire; and
- Suitable evacuation muster points will be identified & agreed with the school management and these will form part of the evacuation procedures for the school.

The School will operate a simultaneous evacuation on sounding of the fire alarm system will result in the evacuation of the whole school building.

### 4.2 Fire Detection & Alarm Systems

The minimum recommended fire alarm system as recommended by Table 7 in BS 9999 is a category L3 automatic fire detection and alarm system in accordance with BS5839-1: 2013. It is recommended that an L2 system is provided.

This category of the system requires detectors to be located in all escape routes, circulation spaces, all rooms accessed directly from an escape route and any other rooms considered to represent a high fire risk. In this instance, high-risk areas will include rooms containing a credible fire hazard.

Table 2: Fire Detection and Fire Alarm System

| Accommodation | Minimum Acceptable System | Recommended System             |
|---------------|---------------------------|--------------------------------|
| A2            | L3                        | L2 in accordance with BS5839-1 |

Optical type smoke detectors will be provided throughout the building with the exception of rooms that may contain naked flames or within which smoke or steam (plant rooms and the kitchen) may be expected. In these cases, heat detectors will be provided as an alternative to the smoke detectors. However, heat detectors are not suitable for use within escape routes or circulation routes and optical type smoke detectors will be provided throughout these areas.

Table 3: Fire Detectors

| Areas       | Detector        |
|-------------|-----------------|
| All Areas   | Smoke Detectors |
| Kitchen     | Heat Detectors  |
| Plant Rooms | Heat Detectors  |

Type A (direct operation) manual call points, designed in accordance with BS EN 54-11:2001 and installed in accordance with BS 5839-1: 2013, will be located at all storey and final exits between 1.2m and 1.4m from the finish floor level.

Audible alarm sounders designed to comply with BS 5839-1: 2013 will be provided throughout the building. The alarm signal will be distinct from any other alarms or signals used in the school.

It should be ensured that the fire alarm takes priority over any other sound system or sound effect to be used in the main hall, and the evacuation signal or tone will be distinct from other sounders.

In addition to audible alarms, visual alarms devices (VADs) will be provided to isolated areas such as Toilets or plant rooms etc. The visual alarm devices must comply with BS EN 54 part 23; 2010.

All inner rooms will be provided with means of warning such as sounders, doors or walls with adequate vision panels. The access rooms will be provided with appropriate fire detection systems.

Furthermore, it will be necessary for the fire detection and alarm system to be linked to other systems and equipment as necessary to ensure operation or activation in a fire scenario as follows:

- Hold-open devices on fire doors to be released;
- Air handling plant to shut down;

#### 4.2.1 Security Doors

All doors on escape routes fitted with a lock or fastening will be readily operated, without the use of a key and without having to manipulate more than one mechanism. Where the door is likely to be used by more than 60 persons, panic

hardware complying with BS EN 1125 will be installed on the side approached by persons making their escape. All electrically powered locks will automatically unlock on actuation of the fire alarm system.

The door leaf of any doorway or exit should be hung to open in the direction of escape, and should always do so if the number of persons that might be expected to use the door at the time of a fire is more than 60.

#### 4.2.2 Protected power circuits

The cables for fire alarm circuits should conform to BS 5839-1:2013.

The cables for voice alarm circuits should conform to BS 5839-8:2013.

The cables for emergency voice communication circuits should conform to BS 5839-9:2011.

The cables for all other circuits that require a resistance to fire, either for life safety, fire-fighting or property protection should conform to BS 8519.

#### 4.2.3 Lifts

Generally, lifts are not included in the evacuation procedures in buildings. However, the proposed design incorporates an evacuation lift serving the first floor of the new build wing, as part of the accessibility requirements. This is above and beyond the requirements to achieve compliance with Building Regulations, providing an additional level of fire safety. The lift will be enclosed in 60min fire rated construction and will be provided with a lobby with the same level of fire resistance, as shown below. A lift traffic assessment is undertaken in Appendix A of this report to assess the time for the proposed number of wheelchair users to be evacuated. If more wheelchair users will be using the first floor, additional measures such as evacuation chairs should be considered in conjunction with the evacuation lift.

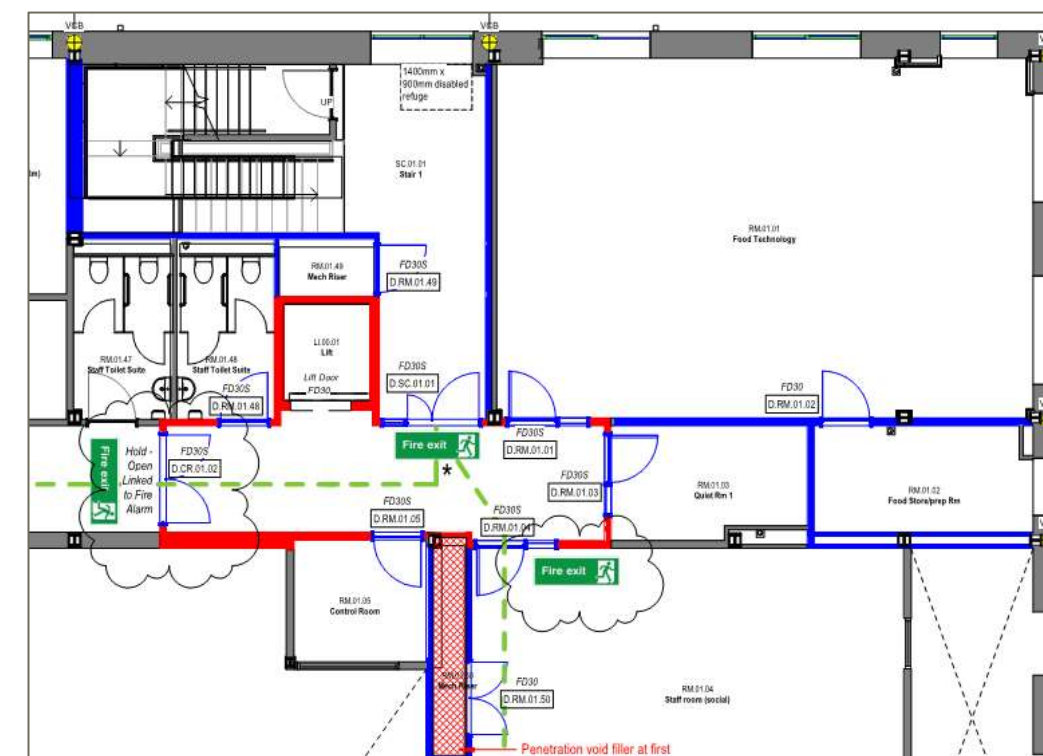


Figure 6: Evacuation lift

#### 4.2.4 Cause-and-Effect

A full cause-and-effect matrix of operations will need to be developed by the M&E Engineering Consultants/detection installers as the design progresses, which should also incorporate the interface and operation of other systems, e.g. door release mechanisms and plants that may need to shut down in the event of a fire, etc.

It is recommended that the fire alarm system is linked to an offsite alarm receiving centre, therefore ensuring that the fire service can be alerted in the event of a fire when the school is unoccupied. This arrangement should be agreed with the school and the local fire authority.

## 4.2.5 Secondary Power Supplies for Fire Safety Systems

All essential electrical cables supplying power to fire safety equipment will be fully robust and their routes will be cautiously chosen to limit the potential for damage. Secondary power supplies will be required to all equipment essential for functioning during a fire, including the fire detection alarm systems, the emergency lighting system and the evacuation lift.

The secondary power supply will comply with BS 8519: 2010 - *Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications. Code of practice*

Where possible all insulation and casing on cables should be of the zero halogens low smoke (OHLS) type to minimise the risk from toxic and corrosive fumes and smoke.

## 4.2.6 Emergency Lighting & Signage

Emergency lighting will be provided in all escape routes, in accordance with BS 5266: Part 1; 2016 and BS EN 1838; 2013.

Escape and other fire safety signage will be provided in accordance with the recommendations of BS 5499: Part 1; 2016.

Emergency lighting will be provided to comply with the table below.

**Table 4: Emergency Lighting**

| Building Characteristic | Areas Requiring Emergency Lighting                                                |
|-------------------------|-----------------------------------------------------------------------------------|
| A                       | Windowless accommodation                                                          |
|                         | Stairways                                                                         |
|                         | Internal Corridors more than 30m long                                             |
|                         | Open plan areas more than 60m <sup>2</sup>                                        |
| B                       | All escape routes (including external escape routes)                              |
| Any Risk Profile        | All sanitary accommodation with a floor area over 8m <sup>2</sup>                 |
|                         | Windowless sanitary accommodation with a floor area not more than 8m <sup>2</sup> |
|                         | Electricity ad generator rooms                                                    |
|                         | Switch room/ battery room for emergency lighting                                  |

Escape and other fire safety signage will also be provided in accordance with BS ISO 3864 Part 1: 2011 and BS 5499 Part 4: 2013.

The signage will be consistent throughout the building and will comply with the recommendations of BS ISO 3864 Part 1 and comprise a graphical symbol, directional arrow and supplementary text.

## 4.3 Occupancy

Correspondence with GT and Pozzoni Architecture provided the expected occupancy within all areas of the school. The expected occupancy of the classrooms is 15 occupants for the existing building and 12 occupants per classroom. The main hall has a maximum occupancy of 291 occupants, the new build sports hall has a maximum occupancy of 104 people, and the dining hall has a maximum occupancy of 55 people. The food technology room at first floor in the new build has an occupancy of 16 people.

The occupancy in the individual learning rooms, small group rooms, sensory rooms and staff social rooms have not been counted separately as it is assumed that they will be used by the same occupants in the classrooms or staff work rooms.

During out of hours public use it is assumed that the sports hall, dining, main halls and library on ground floor will be occupied.

Table 5 below summarises the maximum occupancy levels per floor.

**Table 5: Total Expected Occupancy Levels**

| Level  | Expected Occupancy  |                         |
|--------|---------------------|-------------------------|
|        | During School Hours | Out-of-hours Public Use |
| Ground | 188                 | 450                     |
| First  | 148                 | 0                       |

## 4.4 Horizontal Evacuation

### 4.4.1 General Requirement

In accordance with the BS 9999: 2017 the following should be adopted:

- The horizontal escape routes are required to be kept free from obstacles, such as steps or raised thresholds, which delay or impede travel in an emergency evacuation or escape. Where such obstacles occur, a suitable ramp should be provided. All escape routes which will be utilised by wheelchair users, including external, where applicable should be flat or suitably ramped.
- Regardless of risk profile the exit door width should be not less than 800mm.
- Corridors at all levels will not be less than 1,200mm in clear width and cross-corridor doors will not be less than 1,050mm.
- Cross-corridor fire doors (FD30s) will be provided where a corridor is greater than 12m in length and/or serves more than one exit, this will limit the spread of smoke, therefore, minimising the chance of two escape routes being compromised as a result of a fire.
- All dead-end greater than 4.5m in length will be protected with 30 minutes fire resistance and door opening into the corridor will be FD30S doors with self-closers in lieu of a cross corridor door.

### 4.4.2 Travel Distance

The maximum applicable travel distance in accordance with BS 9999:2017 is shown in the table below.

**Table 6: Maximum travel distance requirements when minimum fire protection measures are provided**

| Area/Zone                         | Risk Profile | One Way Travel Distance (Direct/Actual) | Two Way Travel Distance (Direct/Actual) |
|-----------------------------------|--------------|-----------------------------------------|-----------------------------------------|
| Staff and Student Areas           | A2           | 15/22 m                                 | 37/55 m                                 |
| Areas accessible to community use | B2           | 13/20 m                                 | 33/50 m                                 |

**Note 1:** Any room or area that is provided with a single exit should be restricted to a maximum of 60 occupants.

**Note 2:** Direct travel applies where the layout is unknown, actual travel distance applies where it is known.

All travel distances in the building are compliant.

### 4.4.3 Inner rooms and Access rooms

The proposed building contains rooms where the only escape is through another room. This inner room scenario is present at ground floor and first floor for individual learning room, all which open into classrooms. Additionally, the terrace at first floor has a similar inner room arrangement as escape must be done via the staff room.

Analysis of the provided layouts indicates the building complies with the requirements for inner room scenarios.

A category L2 alarm and detection system is proposed to be installed in the building in accordance with BS 5839 Part 1. As a result, the access rooms will be fitted with an automatic fire detection and alarm system that serves to warn occupants of the inner room.

In all scenarios, the occupant capacity of the inner rooms should not exceed 60 people.

### 4.4.4 Dead End and Recesses off Corridors

Dead end corridors or recesses that exceed 2m in length should be constructed as protected corridors. The proposed layouts indicate recesses off corridors on ground floor and first floor, therefore in order to comply with the above requirements the corridor should be built with walls achieving 30 min fire resistance.

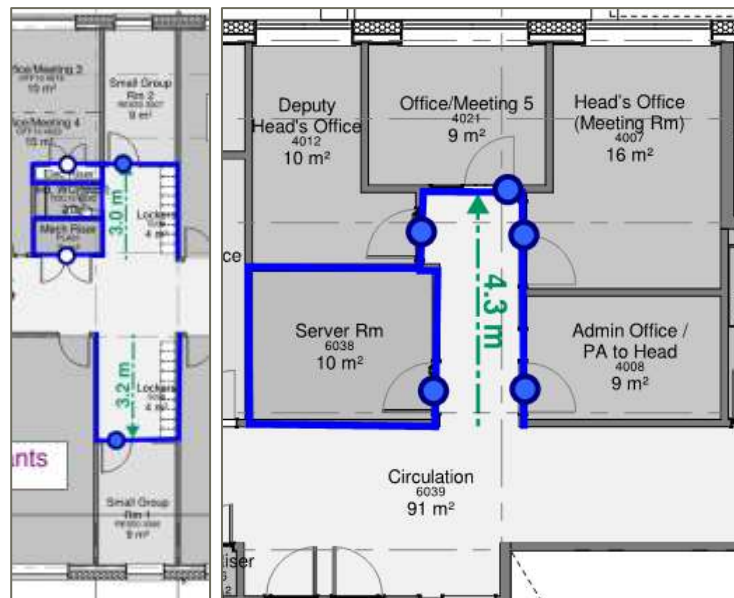


Figure 7: Recesses off corridors at first floor

For dead ends more than 4.5m, the corridor needs to be enclosed in 30 min fire rated construction. There is one instance of a dead end longer than 4.5m at ground floor, as shown above. The proposed arrangement is compliant.

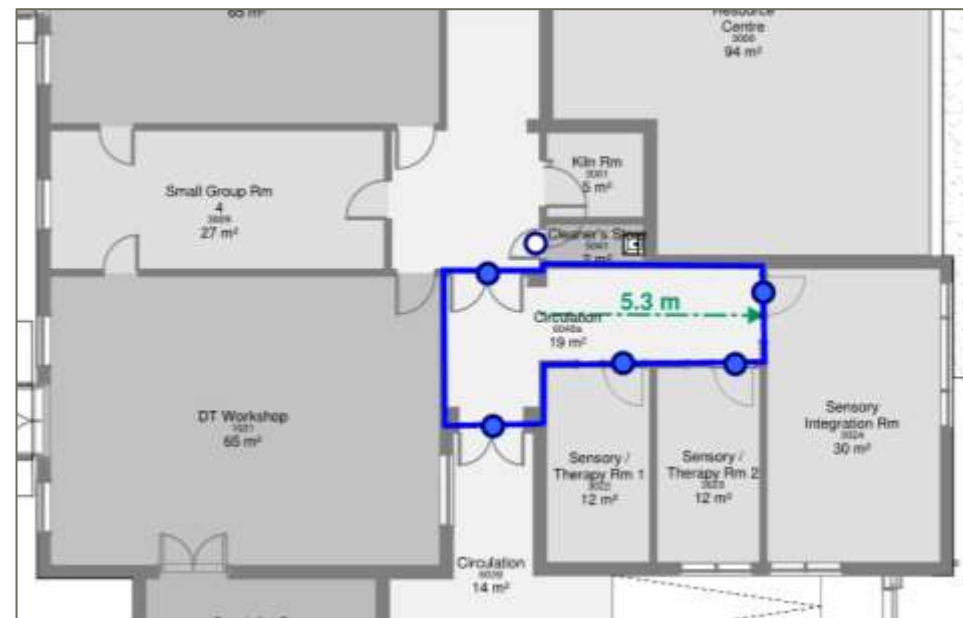


Figure 8: Dead end corridor longer than 4.5m at ground floor

#### 4.4.5 Escape Door Widths

Any room serving less than 60 occupants can be provided with one exit with a minimum clear width of at least 800mm and 850mm for wheelchair users.

Where the floors are expected to have more than 60 occupants they will have more than one exit, with the doors opening in the direction of escape, and a clear width representative of the expected occupancy levels.

Where there is access to more than one exit, it will be assumed that the largest exit is unavailable due to the location of the fire and the remaining exits will be sized such that there is sufficient capacity for all the anticipated occupants.

Table 7: Minimum Number of Exits/ Routes

| Maximum Number of Persons | Minimum Number of Exits or Escape Routes |
|---------------------------|------------------------------------------|
| 60                        | 1                                        |
| 600                       | 2                                        |
| More than 600             | 3                                        |

Escape door widths are calculated using the maximum occupancy multiplied by the minimum door width required per person from Table 13 in BS 9999:2017.

Refer to Table 8 summarising applicable variables for door width calculations.

Table 8: Minimum Door Width Per Person

| Zone                      | Risk Profile | Min. door width per person (min. fire protection measures) |
|---------------------------|--------------|------------------------------------------------------------|
| Staff and Student Areas   | A2           | 3.6 mm                                                     |
| Sports, Main, Dining Hall | B2           | 4.1 mm                                                     |

**Note:** Minimum door widths per person has not been provided for the Plant room as the occupancy is considered so low within the spaces they will require a minimum exit width of 800mm.

**Note:** 800mm is the minimum required door width in accordance with BS 9999:2017 for Part B compliance. Larger exits may be required to satisfy other parts of the Building Regulations such as Part M.

For the purposes of this report, the width of a doorway is the clear width of the opening between the door leaf and frame (or projecting building hardware or the width between two opening door leaves in the case of double doors) assuming that the door leaf is free to open 90 degrees or more,

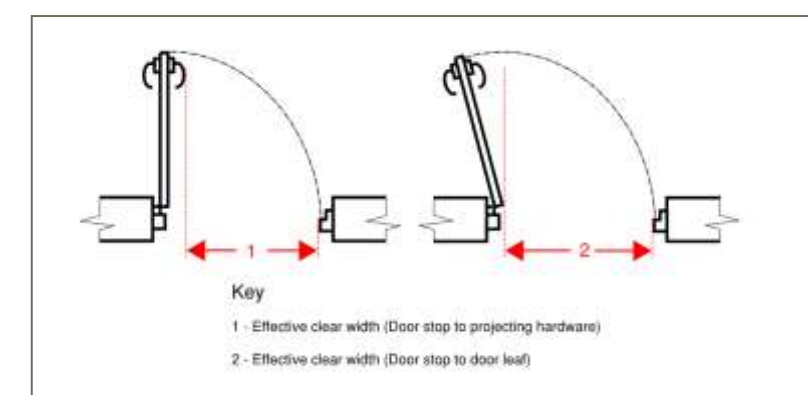


Figure 9: Door Clear Width Calculation

Ground floor



Figure 10: New Build Ground Floor – Escape Doors

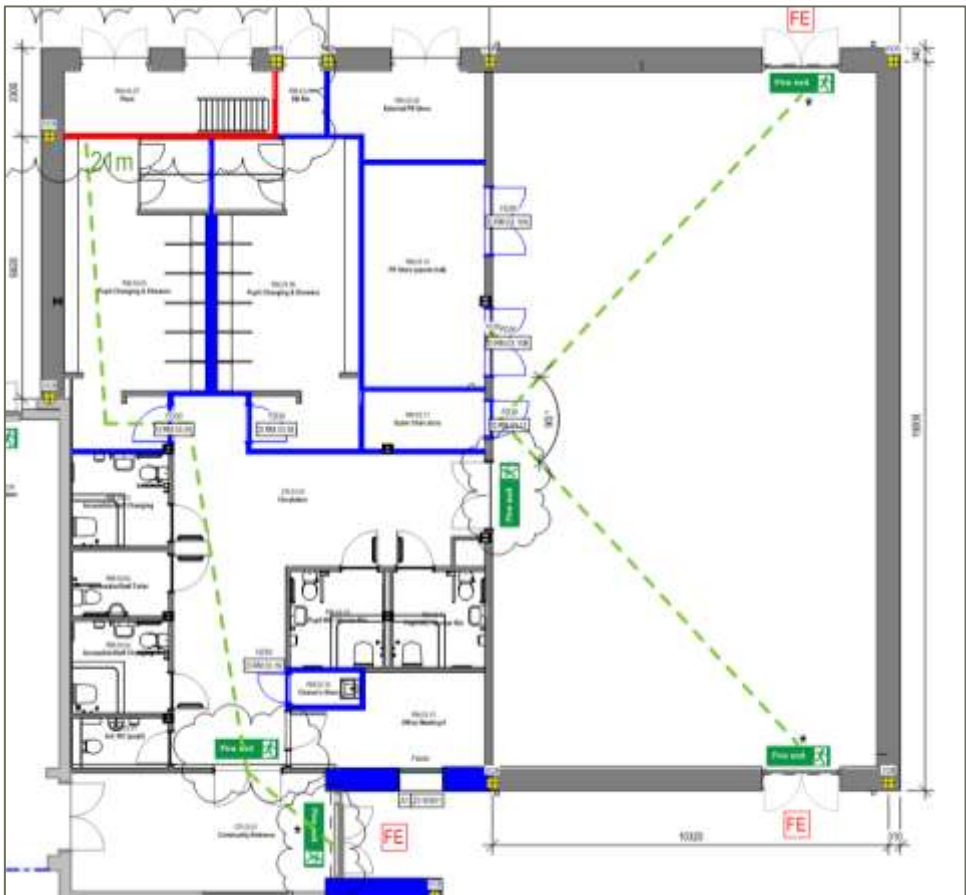


Figure 11: New Build Sports Hall – Escape Doors

Table 9: Ground Floor – Clear Exit Width Calculation

| Area                      | Occupancy | Number of Exits                | Clear Width Calculation After Discounting Process | Minimum clear Width Required per Exit | State of Compliance |
|---------------------------|-----------|--------------------------------|---------------------------------------------------|---------------------------------------|---------------------|
| New build classrooms wing | 104       | 1 final exit<br>3 storey exit  | $104 \div 3 = 34$                                 | 800mm                                 | Acceptable          |
| Main Hall                 | 291       | 2 final exits<br>1 storey exit | $291 \div 2 = 145$                                | 1050mm                                | Acceptable          |
| Sports Hall               | 104       | 2 final exits<br>1 storey exit | $104 \div 2 = 52$                                 | 800mm                                 | Acceptable          |

**Note:** Rooms with less than 60 people occupancy with an exit directly to the external are not considered in this calculation.

First floor

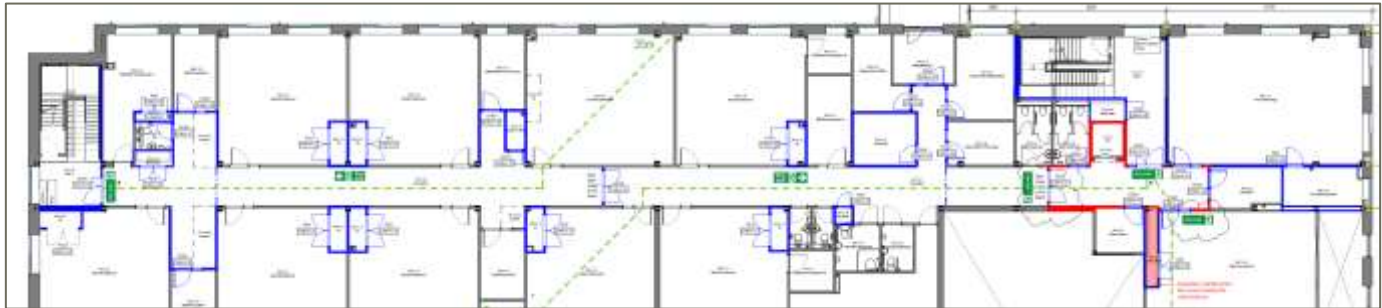


Figure 12: First Floor – Escape Doors

Table 10: Ground Floor – Clear Exit Width Calculation

| Occupancy | Number of Exits | Clear Width Calculation After Discounting Process | Minimum clear Width Required per Exit | State of Compliance |
|-----------|-----------------|---------------------------------------------------|---------------------------------------|---------------------|
| 148       | 2 storey exits  | $148 \div 1 = 148$                                | 1050mm                                | Acceptable          |

**Note:** Rooms with less than 60 people occupancy with an exit directly to the external are not considered in this calculation.

**Note 2:** The main hall and sports hall are not assumed to be occupied at the same time as the classrooms, so the assessment of the main hall storey exits is done in the section related to the public use of the ground floor.

## 4.5 Vertical Evacuation

### 4.5.1 Escape Stair Widths

The minimum required stair width has been based on the preceding occupancy approximations above and the following assumptions:

- 148 expected occupancy on the upper floor.
- The stair width factor for an A2 risk profile building over two upper floors in accordance with Table 13 in BS 9999:2017 is 4.50mm/pers.

The school is provided with two protected stairs with a width of 1350mm.

As mentioned in Section 4.2.3, the evacuation lift will also assist in the vertical evacuation of wheelchair users.



Figure 13: Internal Protected Escape Stairs

Table 11: Internal Protected Stair width Calculations

| Stair   | Max. Occupancy | Number of Floors Served | Minimum Stair width per person | Minimum Required Stair Widths | State of Compliance |
|---------|----------------|-------------------------|--------------------------------|-------------------------------|---------------------|
| Stair 1 | 148            | 1                       | 4.5mm                          | 1000mm                        | Acceptable          |
| Stair 2 | 148            | 1                       | 4.5mm                          | 1000mm                        | Acceptable          |

## 4.6 Final Exit and Final Exit Widths (Merging Flows)

The final exit from a stair should be at least the same width as the stair.

Where a ground floor storey exits shares a final exit with a stair, the width of the final exit should be able to accommodate the number of occupants evacuating from that storey exit and all upper levels.

Merging flows are present at the ground level of both stairs.

The proposed building satisfies the criteria for merging flows in accordance with the requirements of BS 9999:2017

Table 12: Merging flows at level exits

| Area    | Occupants served (N) | Distance to exit (D) | Proposed Final Exit Width | Minimum Required Final Exit Widths | State of Compliance |
|---------|----------------------|----------------------|---------------------------|------------------------------------|---------------------|
| Stair 1 | >60                  | >2                   | 1700mm                    | 1350mm                             | Acceptable          |
| Stair 2 | >60                  | >2                   | 1700mm                    | 1350mm                             | Acceptable          |

## 4.7 Disabled Evacuation

The means of escape for disabled persons is largely dependent upon the school management. No reliance will be placed on the fire service to assist in the evacuation process. Disabled evacuation procedures will coincide with normal evacuation procedures.

Disabled occupants on the ground floor will be able to evacuate or via the nearest exit to place of ultimate safety outside the building.

Disabled occupants on the upper floors will evacuate using the evacuation lift, where they can get to the ground floor and evacuate the building. Any occupants in wheelchairs will require an adequate number of trained staff available to assist in the evacuation.

Additionally, each protected stair will be provided with a disabled refuge space which will be a minimum of 900mm x 1400mm and this will be located within the stair landing area on both upper levels, and will not reduce the clear width of the escape route.

An Emergency Voice Communication (EVC) system will be provided which will communicate with a master station suitably located (internally on the ground floor or the main school reception), to allow staff to coordinate the evacuation of occupants waiting in refuges.

An evacuation chair will be provided at each refuge for use by trained staff when evacuating any disabled occupants that are not being evacuated using the evacuation lift.

**Note:** Staff will need to be available to offer assistance to disabled individuals evacuating the upper floors if required.

## 5 Internal Fire Spread (Linings)

The surface finishes should satisfy the following classifications shown in the table below, when tested under either the National Classifications (in accordance with BS 476) or under the European Classifications (in accordance with BS EN 13501-1:2002).

**Table 13: Wall and Ceiling Lining Requirements**

| Location                                   | National Class | European Class |
|--------------------------------------------|----------------|----------------|
| Small rooms not exceeding 30m <sup>2</sup> | 3              | D-s3,d2        |
| Other Rooms                                | 1              | C-s3,d2        |
| Circulation Spaces                         | 0              | B-s3,d2        |

**Note:** When a classification includes 's3, d2' this means that there is no limit on the production of smoke or flaming droplets/particles.

The surface linings of the walls and ceilings should generally conform to the classification recommended above for the appropriate location. Parts of walls may have a poorer performance than specified above (but never less than National Class 3 or European Class D-s3,d2) provided the total area of those parts in any one room does not exceed one half of the floor area of the room, subject to a maximum of 60m<sup>2</sup>.

## 6 Internal Fire Spread (Structure)

### 6.1 Fire Resistance of Elements of Structure

The building is not more than 5m measured from access level to the height of the top occupied storey.

All elements of structure should be provided with 30 minutes of fire resisting construction.

**Table 14: Fire Resistance Requirements**

| Part of the Building                                                                                       | Minimum provisions when tested to the relevant part of BS 476(minutes) |                      |                      | Method of Exposure       |
|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------|----------------------|--------------------------|
|                                                                                                            | Loadbearing Capacity                                                   | Integrity            | Insulation           |                          |
| <b>Structural Frame, Beam or Column</b>                                                                    | 30                                                                     | N/A                  | N/A                  | Exposed faces            |
| <b>Load bearing Wall</b>                                                                                   | 30                                                                     | N/A                  | N/A                  | Each side separately     |
| <b>Floors</b>                                                                                              | 30                                                                     | 30                   | 30                   | From Underside           |
| <b>Roofs</b><br>Any part forming an escape route                                                           | 30                                                                     | 30                   | 30                   | From Underside           |
| <b>External Walls</b><br>Any part more than 1000mm from the relevant boundary <sup>1</sup>                 | 30                                                                     | 30                   | 15                   | From inside the building |
| <b>Enclosure</b><br>Protected escape stairs<br>Evacuation lift<br>Evacuation lift lobby<br>Services risers | 30<br>60<br>60<br>30                                                   | 30<br>60<br>60<br>30 | 30<br>60<br>60<br>30 | Each side separately     |
| <b>Fire resisting construction<sup>2</sup></b><br>Place of special fire hazard                             | 30                                                                     | 30                   | 30                   | Each side separately     |
| <b>Cavity Barriers</b>                                                                                     | N/A                                                                    | 30                   | 15                   | Each side separately     |

**Notes:** <sup>1</sup> Excluding permitted unprotected areas in section 6.2.

<sup>2</sup> Refer to Section 6.3 for more information on places of special fire hazard.

Any element of structure supporting a section of the roof, which does not form the function of a floor, is not required to be fire rated.

### 6.2 Compartmentation

There are no limitations on the size of a compartment for a building with **Risk Profile A2** having a height of less than 30m. However, compartment sizes on each floor level should be restricted to 8000m<sup>2</sup> for a building with **Risk Profile B2** having a height of less than 18m. Analysis of the public use areas within the building indicates no requirements for compartmentation.

Areas of ancillary accommodation should be enclosed in fire rated construction consisting of either 30 or 60 minutes depending the level of hazard within these areas. Refer to Section 6.3 for more information.

The protected escape stairs should be enclosed in 30 minutes of fire rated construction with self-closing FD30S fire doors therein. 30 minutes of fire rated construction should also be utilised to provide subdivision between the accommodation stair and other escape stairs.

The proposed building satisfies the criteria for compartmentation in accordance with the requirements of BS 9999:2017.

### 6.3 Places of Special Fire Hazard

All storage areas and kitchens containing cooking facilities are considered to be places of special fire hazard and should be enclosed with construction having not less than 30 minutes fire resistance. Similarly, all plant areas should be enclosed in walls having not less than 60 minutes fire resistance, depending on the equipment operating in the room.

Table 15: Fire Resistance Requirements for Ancillary Accommodations

| Area                                                                                      | Minimum Fire resistance (minutes) |
|-------------------------------------------------------------------------------------------|-----------------------------------|
| Store rooms                                                                               | 30                                |
| Cleaner's stores                                                                          | 30                                |
| Server and hub rooms                                                                      | 30                                |
| Kitchen                                                                                   | 30                                |
| Food Tech Rooms                                                                           | 30                                |
| Dressing rooms or changing rooms                                                          | 30                                |
| Engineering services installation rooms                                                   | 30                                |
| Transformer, switchgear, and battery rooms for low-voltage or extra-low-voltage equipment | 30                                |
| Boiler rooms                                                                              | 60                                |
| Transformer and switchgear rooms for equipment above low voltage                          | 60                                |

### 6.4 Fire Doors

Fire doors should be provided in all fire rated enclosures in accordance with BS 476-Part 22:1987 and specified with cold smoke seals (only where smoke seals are required) in accordance with the recommendations of BS 476 Section 31.1. The fire resistance requirements for the doors are shown in the table below:

Table 16: Fire Doors

| Position of Door                                    | Rating (When Tested in Accordance With BS 476-22) | Rating (When Tested in Accordance With BSEN1634-1) |
|-----------------------------------------------------|---------------------------------------------------|----------------------------------------------------|
| Lift                                                | FD 30                                             | E 30                                               |
| Enclosing an escape stair                           | FD 30S                                            | E 30S <sub>a</sub>                                 |
| Enclosing a services riser                          | FD 30 <sup>1</sup>                                | E 30 <sup>1</sup>                                  |
| Enclosing protected corridors or dead end corridors | FD 20S                                            | E 20S <sub>a</sub>                                 |
| Enclosing place of special fire hazard              | Same fire resistance as the wall it is fitted in  | Same fire resistance as the wall it is fitted in   |
| Sub-dividing corridors                              | FD 30S                                            | E 20S <sub>a</sub>                                 |
| Within a cavity barrier                             | FD 30S                                            | E 30S                                              |

<sup>1</sup>Smoke seals should be provided if the position of door is within a protected escape route.

Fire doors on circulation routes may be held open by devices which release automatically when the fire alarm activates. The control of such hold-open devices should conform to BS 7273-4. It is recommended that doors on hold-open devices close at night to prevent warping of doors over time.

Fire doors should incorporate self-closing mechanisms (or be kept locked shut when not in use), and cold smoke seals should be provided where the suffix (S) is indicated in the table above.

Fire doors should be identified by appropriate standard signs "Fire Door – Keep Closed" or "Fire Door – Keep Locked Shut".

### 6.5 Concealed Spaces

Concealed spaces or cavities in the construction of a building provide a ready route for smoke and flame spread. This is particularly so in the case of voids in, above and below the construction of a building, e.g. walls, floors, ceilings and roofs. As the smoke or flames would be concealed, it presents a greater danger.

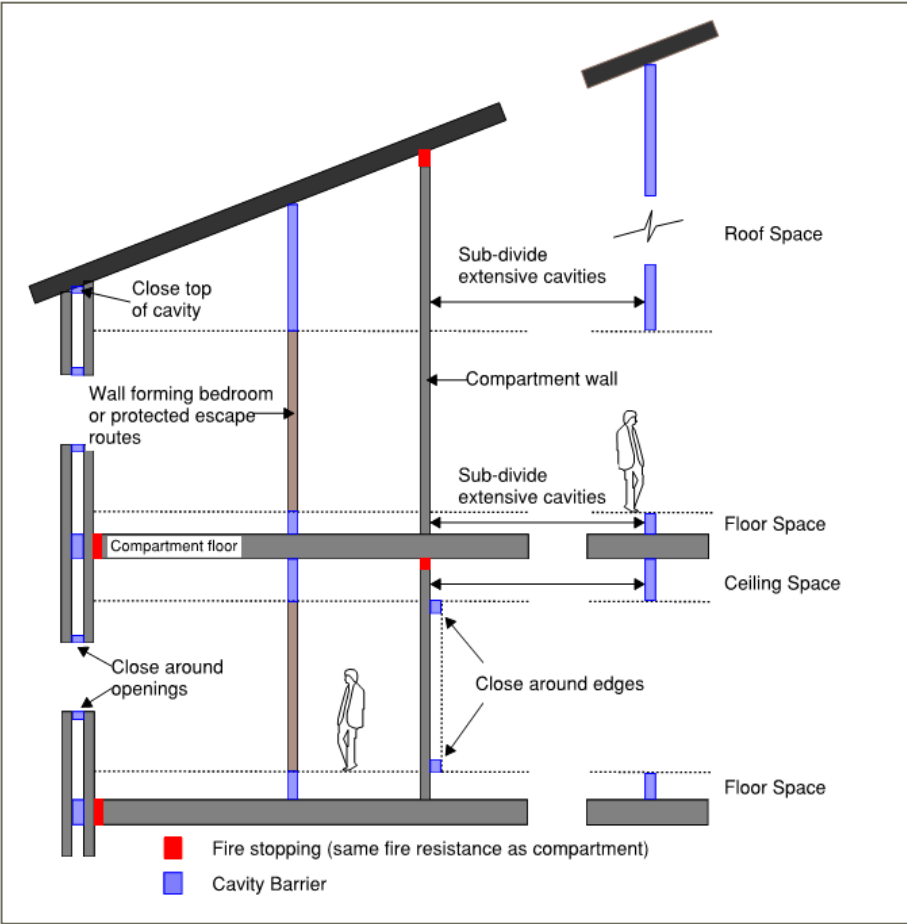


Figure 14: Cavity barrier locations

Cavity barriers should be provided to close the edges of cavities, including around new openings. The figure above shows where cavity barriers should be provided.

Cavities that may exist above or below any fire resisting construction because the construction is not carried to full storey height or, (in case of the top storey) to the underside of the roof covering should be either:

- Fitted with cavity barriers on the line of the partitions (as indicated within the previous figure); or
- For cavities above the partitions, enclosed on the lower side by a fire resisting ceiling which extends throughout the building, compartment or separated part.

Every cavity barrier should be constructed to at least 30 minutes fire resistance. It may be formed by any construction provided for another purpose if it meets the provisions for cavity barriers. Cavity barriers in a stud wall, or provided around openings may be formed of the following;

- Steel at least 0.5 mm thick;
- Timber at least 38 mm thick;
- Polythene-sleeved mineral wool, or mineral wool slab, in either case under compression when installed in the cavity
- Calcium silicate, cement based or gypsum-based boards at least 12 mm thick.

The cavity barriers where ever possible be tightly fitted to a rigid construction and mechanically fixed in position. Where this is not possible the junction should be fire stopped.

## 6.6 Extensive Cavities

Cavity barriers should be used to subdivide any new cavity, including any roof space, so that the distance between cavity barriers does not exceed the dimensions given in table below.

Table 17: Maximum Dimension of Cavities

| Location of Cavity         | Class of surface /product exposed in cavity (excluding the surface of any pipe, cable or conduit, or any insulation to any pipe) |                                                                              | Maximum dimension in any direction in metres |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------|
|                            | National Class                                                                                                                   | European Class                                                               |                                              |
| Between a roof and ceiling | Any                                                                                                                              | Any                                                                          | 20                                           |
| Any other cavity           | Class 0 or class 1                                                                                                               | Class A1; or<br>Class A2-s3, d2; or<br>Class B-s3, d2; or<br>Class C-s3, d2. | 20                                           |
|                            | Not class 0 or class 1                                                                                                           | Not any of the above classes                                                 | 10                                           |

**Note:** The national classification do not automatically equate to the equivalent classifications in the European column, therefore products cannot typically assume a European class unless they have been tested accordingly.

When a classification includes “s3, d2”, this means that there is no limit set for smoke production and/or flaming droplets/particles.

## 6.7 Protection of Openings and Fire-stopping

If the fire separating element is to be successful, every joint or imperfection fit, or opening to allow services to pass through the element, should be adequately protected by sealing or fire stopping so that the fire resistance of the element is not impaired. Pipes that pass through a fire separating element, should meet either of the following provisions;

- **Proprietary seals** - Provide a proprietary sealing system which has been shown by test to maintain the fire resistance of the wall, floor or cavity barrier,
- **Restricted pipe diameter** - Where a proprietary sealing system is not used, fire stopping may be used around the pipe, keeping the opening as small as possible. The nominal internal diameter of the pipe should not be more than the relevant dimension given in the table below.

Table 18: Maximum nominal internal diameter of pipes passing through compartments

| Situation                                                             | Pipe material and maximum nominal internal diameter (mm) |                                      |                    |
|-----------------------------------------------------------------------|----------------------------------------------------------|--------------------------------------|--------------------|
|                                                                       | Non-combustible material                                 | Pb, Al, Al alloy, uPVC, fibre cement | Any other material |
| Structure enclosing a protected shaft which is not a stairway or lift | 160                                                      | 110                                  | 40                 |
| Any other situation                                                   | 160                                                      | 40                                   | 40                 |

- **Sleeving** – A pipe of lead, aluminium, aluminium alloy, fibre-cement or uPVC, with a maximum internal diameter of 160 mm, may be used with a sleeving of non combustible pipe as shown in figure below. The opening in the structure should be as small as possible and provide fire stopping between the pipe and structure. The sleeve should extend be no less than 1000 mm either side of the structure.

## 6.8 Ductwork

Ductwork must be designed in accordance with the recommendations of BS 9999. Fire dampers must be provided within the thickness of the fire separating elements where non-fire resisting ductwork passes through fire resisting construction.

Adequate means of access must be provided to allow inspection, testing, and maintenance of both the fire damper and its actuating mechanism.

Where ductwork runs through any fire-resisting elements, fire/smoke dampers must be provided.

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

There are four basic methods in order to prevent smoke and flames spread through the fire separating elements, each of the options are listed below. In most ductwork systems, a combination of the four methods is best.

The requirements for each option are indicated below;

### Method 1 – Thermally actuated fire dampers;

- Fire dampers that are thermally operated can be provided where ductwork goes through fire resisting construction.
- Fire dampers are not suitable for protected escape routes

**Note:** Fire dampers must be tested to BS EN 1560:2010. They must have an E classification equal to or greater than 60 minutes.

**Note:** Method 1 is not suitable for ductwork serving kitchen extracts.

### Method 2 - Fire resisting enclosures;

- The fire resisting enclosures must achieve the same fire resistance as the wall the ductwork penetrates which forms a fire-resisting enclosure known as a protected shaft. This allows a multiplicity of services to be transferred together with the duct to traverse a number of fire-resisting enclosure within the building without the need for further sub divisions. Fire dampers (thermally or actuated by AFD) will only be required where the ductwork enters or leaves the protected shaft.
- Method 2 can only be used on ductwork that passes through an escape route providing the ductwork does not serve the escape route it passes through.

### Method 3 - Protection using fire resisting ductwork

- The ductwork itself forms a protected shaft. The ductwork must achieve the same fire resistance as the wall the ductwork penetrates. The fire resistance can be achieved by the ductwork material itself, or through the application of a protective material.
- Method 3 can only be used on ductwork that passes through an escape route providing the ductwork does not serve the escape route it passes through.

**Note:** The supporting hangers must be capable of supporting the ductwork for not less than the period of fire resistance of the ductwork.

### Method 4 – Automatically actuated fire and smoke dampers triggered by smoke detectors

- Method 4 may be used for extract ductwork passing through the enclosures of protected escape routes, both where the ductwork does and does not serve the escape route.

**Note:** Method 4 is not suitable for ductwork serving kitchen extracts.

**Note:** Fire and smoke dampers must be tested to BS EN 1560:2010. They must have an ES classification equal to or greater than 60 minutes.

## 6.9 Air Transfer Grilles

Any air transfer grilles required as part of the ventilation system should not be provided within any wall, door, floor or ceiling enclosing a protected stairway or entrance hall. Air transfer grilles located in any fire hazard rooms should be provided with both fire and smoke containment. Any transfer grilles fitted in fire doors will need to be accompanied by a test certificate provided by the door manufacturer.

## 7 External Fire Spread

External surfaces of the walls should be constructed in order to adequately resist the spread of fire across the façade of the building. The building is not more than 18m high with all facades greater than 1m from the relevant boundary.

**Table 19: Provisions for External Surfaces or Walls**

| Distance from Relevant Boundary | Height of the Wall | External Wall Surface Classification |
|---------------------------------|--------------------|--------------------------------------|
| 1m or more                      | <18m               | No provisions required               |

<sup>1</sup>The index I relates to tests specified in BS 476-6.

### 7.1 Roof Coverings

Roof coverings refer to the external material layers, not the roof structure as a whole. The table below describes the separation distances according to the type of roof covering.

**Table 20: Roof Covering Spacing**

| Designation of Covering of Roof or Part of Roof |                        | Minimum Distance from any Point to Relevant Boundary |                              |                           |                              |
|-------------------------------------------------|------------------------|------------------------------------------------------|------------------------------|---------------------------|------------------------------|
| National Class                                  | European Class         | Less than 6 m                                        | At Least 6m                  | At Least 12 m             | At Least 20 m                |
| AA, AB or AC                                    | B <sub>ROOF</sub> (t4) | Acceptable                                           | Acceptable                   | Acceptable                | Acceptable                   |
| BA, BB or BC                                    | C <sub>ROOF</sub> (t4) | Not acceptable                                       | Acceptable                   | Acceptable                | Acceptable                   |
| CA, CB or CC                                    | D <sub>ROOF</sub> (t4) | Not acceptable                                       | Acceptable <sup>(1)(2)</sup> | Acceptable <sup>(1)</sup> | Acceptable                   |
| AD, BD (or CD <sup>(2)</sup> )                  | E <sub>ROOF</sub> (t4) | Not acceptable                                       | Acceptable                   | Acceptable <sup>(1)</sup> | Acceptable                   |
| DA, DB, DC (or DD <sup>(2)</sup> )              | F <sub>ROOF</sub> (t4) | Not acceptable                                       | Not acceptable               | Not acceptable            | Acceptable <sup>(1)(2)</sup> |

<sup>1</sup> Not acceptable on any buildings with a volume of more than 1500m<sup>3</sup>.

<sup>2</sup> Acceptable on buildings not listed in Note 1, if part of the roof is no more than 3m<sup>2</sup> in area and is at least 1500mm from any similar part, with the roof between the parts covered with a material of limited combustibility.

### 7.2 Space Separation between Neighbouring Buildings

To prevent the risk of external fire spread to and from buildings opposite, the amount of unprotected area that is allowed on an elevation should be limited or the separating distance increased such that the risk is reduced. It is necessary to calculate the amount of unprotected area that is allowed on the building's façade using the enclosing rectangle method from BR 187 (Second Edition).

The space separation calculations are based on the following information;

- Floor to floor height is approximately 6.9m
- There are no compartment floors;
- The building is not sprinkler protected.

The provide site layout indicated only the south elevation in the main hall area may be at risk of external fire spread, therefore the other elevations have sufficient distance from the boundaries to be allowed 100% unprotected areas.

Therefore the development is compliant with the requirements for external fire spread.

**Table 21: BR 187 Allowable Unprotected Areas**

| Elevation          | BR 187 Enclosing Rectangle | Actual Distance to Relevant Boundary | Allowed Unprotected Area | Proposed Unprotected Areas | State of Compliance |
|--------------------|----------------------------|--------------------------------------|--------------------------|----------------------------|---------------------|
| South (Main Hall)  | 12 × 9 = 108m <sup>2</sup> | 1.8m                                 | 23.76m <sup>2</sup>      | 3.7m <sup>2</sup>          | Acceptable          |
| South (Plant Room) | 6 × 9 = 54m <sup>2</sup>   | 1.8m                                 | 15.12m <sup>2</sup>      | 3.7m <sup>2</sup>          | Acceptable          |

# 8 Access and Facilities for Fire fighting

## 8.1 Access to Buildings

The total area of the building is more than 2,000m<sup>2</sup> but less than 8,000 m<sup>2</sup>, and is less than 11m in height. Therefore, vehicle access for a pump appliance should be provided to 15% of the building perimeter.

The specifications for the access routes should be in accordance with the table below.

Table 22: Typical Vehicle Access Requirements

| Appliance type | Min. width of road between kerbs | Min. Width of gateways | Min. Clearance height | Min. Carrying capacity | Min. Turning circle |               |
|----------------|----------------------------------|------------------------|-----------------------|------------------------|---------------------|---------------|
|                |                                  |                        |                       |                        | Between kerbs       | Between walls |
| Pump           | 3.7m                             | 3.1m                   | 3.7m                  | 17.5 tonnes            | 16.8m               | 19.2m         |

**Note:** The size and mass of fire appliances is not standardised. The dimensions of access routes and hardstands will vary according to the fire appliances that are used in a particular fire authority area.

Dead-end fire service access roads may be up to 20 meters long without being provided with a turning bay (i.e. a fire service vehicle will not have to reverse further than 20m).

As shown in the figure below, the scheme complies with the 15% perimeter access requirement (62.5m required, approx. 112m available).



Figure 15: Fire vehicle perimeter access

## 8.2 Firefighting Water Supply

Where there is no existing fire hydrant located within 100 metres of an entrance to the building a new a hydrant designed and installed in accordance with BS9990 should be provided.

Where a building, which has a compartment of 280m<sup>2</sup> or more in area, is being erected more than 100m from an existing fire-hydrant additional hydrants should be provided as follows:

- For buildings not provided with fire mains, hydrants should be provided within 90m of an entry point to the building and not more than 90m apart.
- Each fire hydrant should be clearly indicated by a plate, affixed nearby in a conspicuous position, in accordance with BS 3251:1976. Where no piped water supply is available, or there is insufficient pressure and flow in the

water main, or an alternative arrangement is proposed, the alternative source of supply should be provided in accordance with the following recommendations:

- a charged static water tank of at least 45,000 litre capacity; or
- a spring, river, canal or pond capable of providing or storing at least 45,000 litres of water at all times of the year, to which access, space and a hard standing are available for a pumping appliance; or
- Any other means of providing a water supply for fire-fighting operations considered appropriate by the Fire and Rescue Authority.

There are two fire hydrants in the vicinity of Meadow High School, as shown below. The fire hydrant placed to the north of the school is less than 100m from the entrance to the new build sports hall, while the fire hydrant to the south of the school is less than 100m from entrance to the new build area and to the new sports hall.



Figure 16: Existing fire hydrant location to the north of the development



Figure 17: Existing fire hydrant location to the south of the development

## 9 Fire Safety Management

### 9.1 Management Level

The fire strategy assumes that there will be appropriate fire safety management of the premises when in use. BS 9999:2017 recommends that this building should have Level 2 management level. This requires conformity with requirements of legislation (i.e. RRFSo: 2005).

### 9.2 Management Requirements

Effective arrangements should be put in place to manage all aspects of fire safety in the premises and the details of those arrangements need to be recorded, e.g. within a fire safety management plan. The arrangements should include the following key areas that are provided within BS 5588-12:

- Development of a suitable emergency procedure;
- Staff training plan and appropriate staffing levels for the occupancy;
- Maintenance contracts for essential fire safety systems and equipment;
- Schedule of in-house checks and tests;
- Display of appropriate fire safety notices and signs;
- Communications arrangements;
- Liaison with the fire service;
- Fire prevention, including control of works on site (e.g. hot work permits);
- Contingency plans;
- Preparation of personal emergency evacuation plans (PEEPs) for staff, occupants and visitors as necessary. To ensure an appropriately resourced response, tailored to the individual needs of the disabled person and the specific features of the building. This plan will also need to consider the evacuation of disabled visitors.
  - **Individual PEEP for disabled people who are regularly in the premises** – Following discussions with the individual, a plan can be developed for their specific needs which should contain details of how they will evacuate the premises.
  - **PEEPs for visitors to the premises who will make themselves known to staff** – visitors who are likely to require assistance in the event of an evacuation should be encouraged to make themselves known to staff.
  - The plan should ensure that reliance is not placed upon the fire service for the evacuation of disabled and wheelchair bound occupants.

*Note: The above list is not intended to be exhaustive, only to highlight some key areas.*

### 9.3 Fire Safety Manual

A Fire Safety Manual should be created to contain design information and operational records. The design information forms the basis of an ongoing history document to which additional material is added when the building is occupied and at regular intervals thereafter. The fire safety manual should;

- Provide a full description of the assumptions and philosophies that led to the fire safety design, including explicit assumption regarding the management of the building, housekeeping and other management functions;
- Provide the nature of the fire safety planning, construction and systems designed into the building, and their relationship to overall safety and evacuation management;
- Provide documentation produced at the design stage to describe the use of the various protection systems in each type of incident, and the responsibilities of the staff;
- Provide a continuously updated record of all aspects of the building and the building users that affect its fire safety.

# Appendix A – Lift Traffic Assessment

## A1 Introduction

This appendix provides the evacuation assessment of the mobility impaired occupants of the first floor of Meadow High School. The lift is sited in the location shown in the figure below, it is enclosed in 60 minute fire resistant construction and it is provided with a protected lobby with the same level of fire resistance.

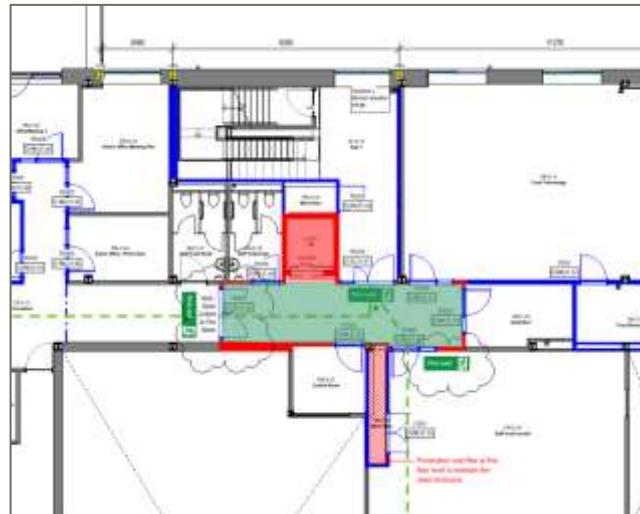


Figure 18: Evacuation lift at first floor

The evacuation strategy is based on the mobility impaired occupants being assisted by trained staff, who will move them towards the lift lobby upon fire alarm activation and begin the evacuation process. Other occupants are expected to use the stairs to evacuate.

## A2 Occupancy Numbers

Based on correspondence with the school, it is not expected to have more than three mobility impaired occupants at the first floor.

## A3 Assessment

The evacuation sequence is as follows: a fire is detected and the alarm is raised. The trained staff at first floor prepares to evacuate the mobility impaired occupants by moving them to the lift lobby, which represents the pre-movement time. As there will be no investigation period for the fire once the automatic detection and alarm system goes off, as well as a high number of staff-to-student ratio, it is assumed that this period will last around 3 minutes. Once in the lift lobby, the trained staff will then assist the mobility impaired occupants to evacuate, by first calling the lift. Once the lift arrives, they will move the first occupant into the lift, go down to the ground floor and assist the wheelchair user to a place of relative safety outdoors. Whether they need to assist the student to the assembly point, it will be established in the fire safety management plan. Once the lift is free, the lift is called up to the first floor to evacuate the following student and the cycle continues, until all wheelchair bound students are evacuated. The lift lobby is large enough to accommodate the three wheelchair users and the trained staff while they wait to evacuate without compromising the escape flow of other evacuees.

The evacuation calculation is only based on evacuating the students to the outside of the building (not to the assembly point) and is based on the following assumptions:

Table 23: Calculation assumptions for lift traffic assessment

|                                            |      |                                                                         |
|--------------------------------------------|------|-------------------------------------------------------------------------|
| Lift speed (allows for deceleration) (m/s) | 1    | Kone specification states 1m/s; information provided by the Design team |
| Time to load lift with occupant (s)        | 15   |                                                                         |
| Time to unload lift on ground floor (s)    | 15   |                                                                         |
| Travel height for lift (m)                 | 3.75 |                                                                         |
| Fire detection time (min)                  | 1    |                                                                         |
| Investigation time (min)                   | 0    |                                                                         |

|                                                                      |    |                                                                               |
|----------------------------------------------------------------------|----|-------------------------------------------------------------------------------|
| Pre-movement time (min)                                              | 3  |                                                                               |
| Time to travel horizontally from lift to outside on ground floor (s) | 15 | *Based on a travel distance of 11m and a conservative travel speed of 0.7m/s. |

The total evacuation time will be the sum of the detection time, investigation time, pre-movement time, lift evacuation time and horizontal travel time for the last student to evacuate to outside on ground floor.

Table 24: Lift cycle calculation

|                                                               |        |                                                                                                                    |
|---------------------------------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------|
| One evacuation cycle (s)                                      | 37.5s  | Obtained by calculating the time it takes for the lift to go up, be loaded, go down, be unloaded (3.750/1x2+15+15) |
| Estimated number of mobility impaired students using the lift | 3      | Value provided in client correspondence                                                                            |
| Total lift cycle (s)                                          | 112.5s | Approx. 1 min and 53 seconds                                                                                       |

Therefore the total evacuation time is 6.125 min.

## A4 Conclusion

The total evacuation time is illustrated below.

Table 25: Summary of lift evacuation time

| Evacuation Sequence                                              | Min.         |
|------------------------------------------------------------------|--------------|
| Fire Starts                                                      | -            |
| Fire detection time                                              | 1            |
| Investigation time                                               | 0            |
| Pre-movement time                                                | 3            |
| Time to travel horizontally from lift to outside on ground floor | 0.25         |
| Lift evacuation time                                             | 1.875        |
| <b>Total evacuation time</b>                                     | <b>6.125</b> |

Based on the calculation above, the evacuation time for the mobility impaired occupants of the first floor of Meadow High School will be 6.125min. While the lift enclosure and lift lobby have a fire resistance of 60 min, the building has a structural fire resistance of 30 minutes. Therefore there is a 23 min safety margin in the evacuation time.

Based on the above it is concluded that the proposed number of wheelchair users can be evacuated safely.

It is assumed that there will be a sufficient number of trained staff assisting in the evacuation. The total evacuation time should be verified using on site evacuation drills. If the estimated number of wheelchair users is increased, this assessment has to be revisited.