BUROHAPPOLD ENGINEERING

256 Gray's Inn Road

Fire Statement – Plot 1

041349

22 July 2022

Revision 01

Revision	Description	Issued by	Date	Checked
00	Fire Strategy For Planning	JDH	10/05/2019	BD
01	Fire Strategy Update (Planning Condition 18)	BD	22/07/2022	JLM

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This Fire Statement has been produced and reviewed by:

Contents

1 Introduction

1.1 Project Aim and Scope

This Fire Strategy report has been prepared by Buro Happold in connection with the proposed refurbishment and redevelopment of 256 Gray's Inn Road to deliver a new world-leading dementia and neurology research centre, as well as additional academic floor space for University College London.

This Fire Strategy report outlines the key requirements in terms of fire safety for the Institute of Neurology/Demetia Research Institute (IoN/DRI) on Plot 1. This report is intended for information purposes and to illustrate compliance with Policy D11 of the New London Plan.

Revision 01 is related to Planning Condition 18, and is an update to the original fire statement submitted to the Planning Authority and is issued before the commencement of superstructure works.

The primary focus for the fire strategy is to provide the key information to demonstrate how the functional life-safety requirements of the Building Regulations 2010 will be met.

The objective of this strategy is to provide a risk proportionate approach that balances occupant needs with an uplift in fire precautions. The strategy is based upon information supplied and is determined based on there being one fire seat in the building at any one time.

1.2 The Site

The site at 256 Gray's Inn Road is 1.207ha in area, and is bounded to the west by Gray's Inn Road, to the north by the Calthorpe Project and the New Calthorpe Estate, to the east by Langton Close, and to the south by Trinity Court and St Andrew's Gardens. The main part of the site is currently occupied by the Eastman Dental Hospital, who vacated the site and relocate to a new development at Huntley Street in 2019. The Eastman Dental Hospital is made up of a group of buildings comprising:

- the former Royal Free Hospital (Plot 1)
- the grade II listed Eastman Dental Clinic (Plot 2); and
- the Levy Wing (Plot 3).

The rear part of the site includes the existing student accommodation at Frances Gardner House. Figure 1—1 shows the site plan of the existing buildings and Figure 1—2 shows the site plan for the new development.

1.3 The Proposed Development

The first phase of the proposed development comprises the partial redevelopment of the former Royal Free Hospital (Plot 1) to deliver a world-leading medical research facility to tackle dementia and neurological diseases such as:

- Alzheimer's Disease;
- Multiple Sclerosis;
- Huntington's Disease;
- Parkinson's Disease;
- Motor Neurone Disease;
- Stroke; and
- Epilepsy.

The new dementia and neurology research facility would host the central hub of UK Dementia Research Institute (DRI) and University College London's Queen Square Institute of Neurology (IoN), alongside related neurological NHS outpatient services provided by University College London Hospitals NHS Foundation Trust. The project is rooted in central government's 2020 Challenge on Dementia and is backed by the Medical Research Council, Alzheimer's Research UK and the Alzheimer's Society. The aim is to provide the most comprehensive, coordinated neuroscience research centre in the world, from research at laboratory benches to patient care. The new research centre is collectively referred to as the IoN/DRI.

Subsequent phases of the proposed development comprise the refurbishment of the grade II listed Eastman Dental Clinic (referred to as Plot 2) and the erection of a new building on the site of the Levy Wing (referred to as Plot 3) to deliver additional academic space for UCL. This academic space is likely to be occupied by the newly established UCL Institute of Mathematics and Statistical Science, which will complement the University's vision for creating a world class environment for education and academic research. The new academic floorspace will form part of the wider complementary academic uses that will further strengthen London's cluster of academic institutions that form part of its Knowledge Quarter, whilst also collaborating with the dementia and neurology research.

The proposed development would also deliver a comprehensive landscaping scheme to open up new publicly accessible spaces within the site, and new public connections across it.

Only minor works are proposed to the existing student accommodation at Frances Gardner House, comprising the installation of photovoltaic panels on the roof, and alterations to the landscaping within the courtyard.

The description of development

a) Partial redevelopment of Eastman Dental Hospital, comprising:
b) Within the former Royal Free Hospital (Plot 1), the demolition of the New, Sussex and Victoria Wings and the retention of the Alexandra Wing, with a single storey upward extension and reinstatement of the southern pediment on the Alexandra Wing, and the erection of a five storey building (plus two storeys of plant above and two storey basement below) to the rear of the Alexandra Wing to provide a dementia and neurology research facility (Use Class D1);
c) Alterations to the Grade II listed Eastman Dental Clinic (Plot 2), including the part rebuilding of the northern façade, replacement of windows, and internal alterations associated with its conversion to education use (Use Class D1);
d) The demolition of the Levy Wing (Plot 3) and erection of a part 4 storey, part 7 storey building (plus single storey basement below) to provide education space (Use Class D1);
e) The relocation of the Grade II listed Riddell Memorial Fountain from the courtyard of the former Royal Free Hospital to the courtyard of the Eastman Dental Clinic;
f) The installation of photovoltaic panels on the roof of Frances Gardner House;
g) Associated landscaping arrangements including the creation of a new public square and pedestrian connections to St Andrew's Gardens, Cubitt Street and Langton Close;
h) Associated access, servicing, landscaping, and parking arrangements.

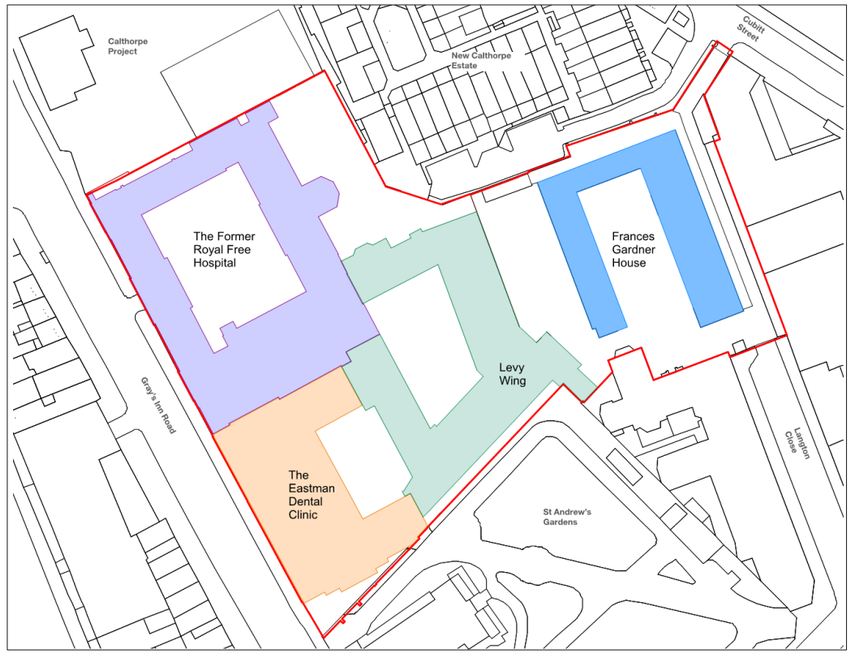


Figure 1—1 Site Plan Identifying Existing Buildings

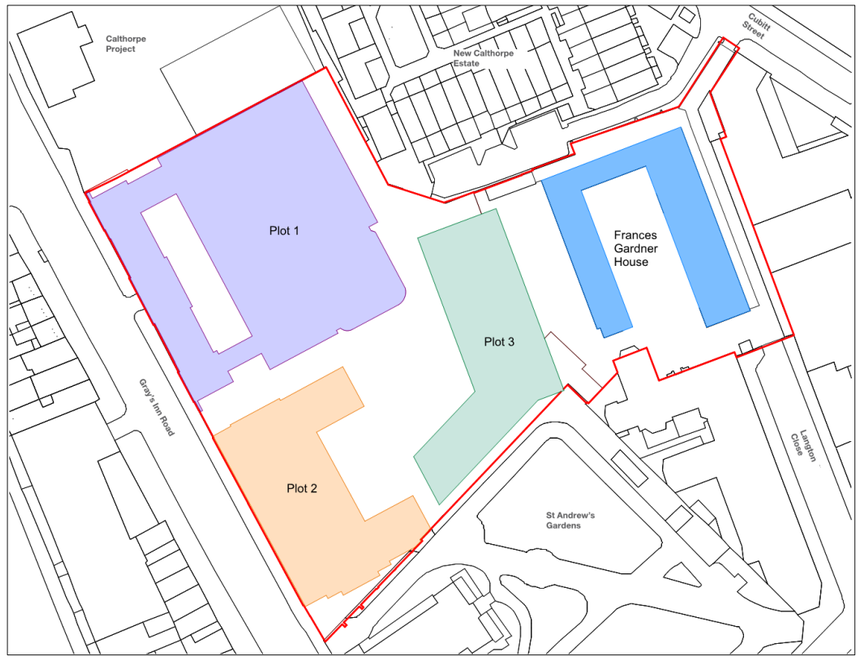


Figure 1—2 Site Plan Identifying New Plots

This report forms part of the submission of the application for planning permission and listed building consent and should be read in conjunction with the following supporting documents:

a) Completed planning and listed building application form;
b) Completed Community Infrastructure Levy Form;
c) Planning Statement prepared WSP | Indigo;
d) Health Impact Assessment prepared by WSP | Indigo;
e) Economic Impact assessment prepared by WSP | Indigo;
f) Application drawings prepared by Hawkins\Brown;
g) Design and Access Statement prepared by Hawkins\Brown;
h) Feasibility Options Appraisal prepared by Hawkins\Brown;
i) Draft Phasing Strategy prepared by Hawkins\Brown;
j) Statement of Community Involvement prepared by Comm Comm UK;
k) Lighting Strategy prepared by Hoare Lea;
l) Energy Statement prepared by Hoare Lea;
m) Eastman Dental Clinic Conservation Plan prepared by Alan Baxter Limited;
n) Heritage Statement prepared by Alan Baxter Limited;
o) Basement Impact Assessment prepared by Ramboll;
p) Structural Strategy Statement prepared by Ramboll;
q) Geotechnical Desk Study prepared by Ramboll;
r) Drainage Strategy prepared by Ramboll;
s) Flood Risk Assessment prepared by Ramboll;
t) Draft Construction Management Plan prepared by Blue Sky Building;
u) Site Waste Management Plan prepared by Blue Sky Building;
v) Transport Assessment prepared by Momentum;
w) Framework Travel Plan prepared by Momentum;
x) Draft Delivery and Servicing Management Plan prepared by Momentum;
y) Outline Construction Logistics Plan prepared by Momentum;
z) Arboricultural Report prepared by Thomson Ecology;
aa) Preliminary Ecology Appraisal prepared by Thomson Ecology;
bb) Landscaping Statement prepared by Plincke;
cc) Academic Needs Report prepared by Nicholas Hare Architects;
dd) Sustainability Statement incorporating BREEAM Assessments prepared by Expedition;
ee) Fire Strategy prepared by Buro Happold;
ff) Desk Based Archaeology Assessment by prepared by PCA
gg) Environmental Statement coordinated by Trium Environmental Consulting, and containing technical assessment chapters on:
    a. Socio-economics prepared by WSP | Indigo;
    b. Traffic and Transport prepared by Momentum;
    c. Air Quality prepared by Air Quality Consultants;
    d. Noise and Vibration prepared by Ramboll;
    e. Wind prepared by RWDI Consulting Engineers;
    f. Daylight, Sunlight, Overshadowing and Light Pollution prepared by GIA;
    g. Townscape and Visual Impact Assessment prepared by Peter Stewart Consultancy; and
    h. Built Heritage prepared by Alan Baxter Limited.

1.4 Building Description from a Fire Perspective (Plot 1)

The Plot 1 site was the former Royal Free Hospital, which comprised of four wings: the Sussex Wing, the Victoria Wing, the New Wing and the Alexandra Wing. The fabric of the Alexandra Wing is to be retained and refurbished, while the other wings are to be replaced by a highly efficient laboratory building that will be connected to the Alexandra Wing on the first basement level (Level B1) and on two above ground levels (Levels 1 and 2). The relationship between the Alexandra Wing and the new building is illustrated in Figure 1—3.

The new IoN/DRI building consists of 7 storeys, including 2 basement storeys. Level 5 is not considered to be an occupied storey, as it is solely for low-risk plant (air handling units, chillers, etc). The building has a plan area of approximately 2400 m^2 for the largest floor and is slightly in excess of 18 m in height (19.5 m) measured from fire-fighting access level to the topmost occupied floor (Level 4). The deepest level (Level B2) is a double height storey, and as such the building is also slightly deeper than 10 m (12.65 m).

The upper levels (Levels 1 to 4) of the building will be used as laboratory and write-up space for medical research. On the ground floor (Level 0) there will be a café and a lecture theatre. Approximately 800 m^2 of the floorplate at this level and approximately 900 m^2 of the floorplate of the first basement level (Level B1) will be a University College London Hospital (UCLH) outpatient clinic. The ground floor part of this facility will consist of waiting areas and consultation rooms, while in the basement there will be four MRI machines and their ancillary accommodation. There will be two further MRI machines on Level B1 which will be shared by UCL and UCLH. Above the UCLH clinic at Level 0, there is an interstitial floor for services (referred to as an ISV – Interstitial Service Void), which will be fully fire separated from the UCLH clinic below.

The bottom basement level (Level B2) is a floor dedicated to technical spaces and plant, with an interstitial floor (ISV) above the technical spaces. This interstitial floor will be independent of the primary structure for the rest of the building. The technical space will form its own evacuation zone and will include the ISV that serves it.

There will be an external goods yard to the rear (East) of the building with access to the top basement level (Level B1). The majority of the loading bay will be covered by a slab due to Plot 3 potentially being built above. The Goods Yard will have space for three vehicles. Accessed off of this Goods Yard are other rooms including the Refuse and Recycling Store, the Gas Bottle Store, the Life Safety Generator etc. Each of these rooms will be fire separated from the Goods Yard and the rest of the IoN/DRI building.

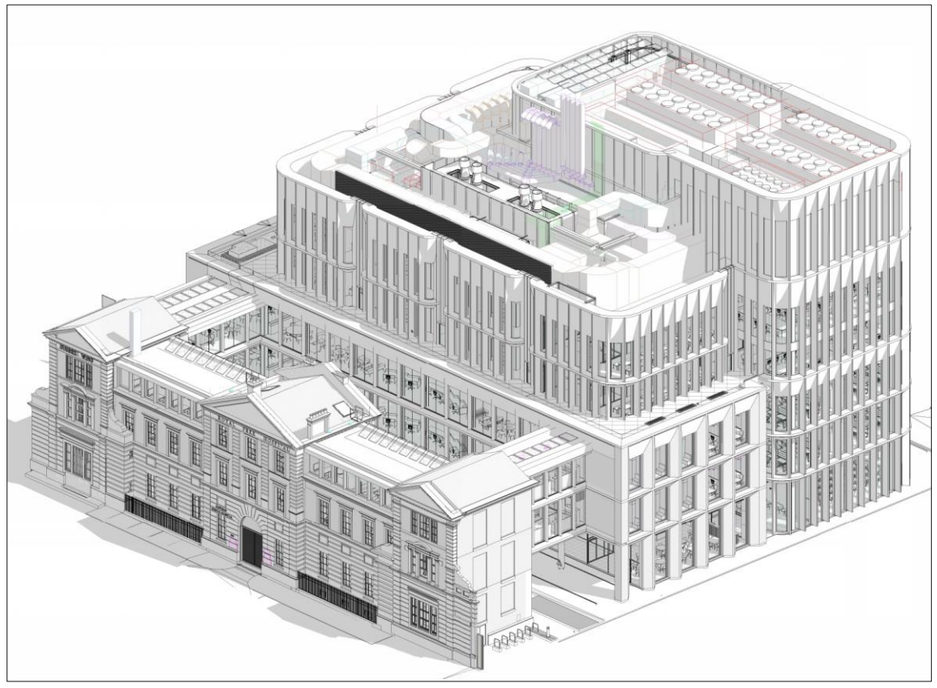


Figure 1—3 The IoN/DRI (Plot 1) – Illustrative Purpose Only

1.5 Approving Bodies

Approval of the following fire strategy will need to be agreed with the following key stakeholders:

- Approved Inspector (Bureau Veritas);
- London Fire Brigade (LFB);
- University College London's Fire Officer; and,
- The building's insurer (Zurich).

Meetings have taken place with the Approved Inspector from Bureau Veritas and the UCL Fire Officer at stages 2, 3 and 4, both of whom have agreed in principle with the fire strategy detailed in this report. Furthermore, the LFB have been consulted via the Approved Inspector and their comments have been considered and coordinated responses from the design team have been issued to both consultations. Meeting was held with the LFB on the 11/06/2020 to run through their comments, and LFB is satisfied with the proposals with comments, which are now being included.

An initial meeting has also been had with the Zurich, the building's insurer during stage 4. The key outcome of this meeting was their desire for the sprinkler protection system to comply with the Loss Prevention Council's (LPC) rules. Any derogations from these rules should be discussed and agreed with Zurich.

1.6 Documents Referenced

This report is based on a review of the proposed plans issued by Hawkins Brown Architects as illustrated in Table 1—1 below.

Table 1—1 Documents Referenced

Drawing No	Description	Rev	Date Received
Hawkins Brown Architects – Plans			
BEMP-HBA-P1-B2-DR-A-20-1100	Level B2 General Arrangement	P04	March 2022
BEMP-HBA-P1-B1- DR-A-20-1101	Level B1 General Arrangement	P04	March 2022
BEMP-HBA-P1-00- DR-A-20-1102	Level 0 General Arrangement	P03	March 2022
BEMP-HBA-P1-01- DR-A-20-1103	Level 1 General Arrangement	P02	March 2022
BEMP-HBA-P1-02- DR-A-20-1104	Level 2 General Arrangement	P02	March 2022
BEMP-HBA-P1-03- DR-A-20-1105	Level 3 General Arrangement	P02	March 2022
BEMP-HBA-P1-04- DR-A-20-1106	Level 4 General Arrangement	P02	March 2022
BEMP-HBA-P1-RF-DR-A-20-0107	Level Roof General Arrangement	P02	March 2022
BEMP-HBA-P1-UP-DR-A-20-0108	Upper Roof Level General Arrangement	P02	March 2022

1.7 Applicable Code Guidance

The building will be designed in accordance with the recommendations set out in BS 9999[1] in order to conform to the functional requirements of the Building Regulations 2010 for the purpose of achieving life safety objectives. However, some aspects of the building design do not comply with the recommendations set out in the code guidance. In these cases, fire engineering designs, in accordance with BS 7974[2], will be used to justify deviations from the code guidance and demonstrate that an equivalent level of safety is provided to a fully code compliant solution.

The clinical areas (i.e. the UCLH facility) will be designed in accordance with Approved Document B (purpose group 5), and supplemented by the additional recommendations contained in Health Technical Memorandum (HTM) 05-02[3], for DTS and DSS services (see Sections 1.6, 2.33 to 2.36 of HTM 05-02). This approach is in accordance with the recommendations contained in HTM and is on the basis that:

- The UCLH facility is an outpatient facility where patients will visit their clinicians via an appointment only. These patients will have consultations on the ground floor and may use the imaging services (MRIs) provided at B1 level. This includes 4 MRIs for UCLH (NHS), and 2 MRIs for UCL (research purposes).
- The UCLH facility will be a managed space which controls the number and arrival time of outpatients through appointments so there will not be an unexpected number or type of patients. It is also provided with its own reception to welcome patients and ensure they are directed to the relevant area.
- The spaces outside the UCLH areas at ground level and B1 level will not accommodate patients. They will be limited to UCL staff/student – this will be ensured through the provision of security lines etc. Please note a café is provided at ground, which is open to the public (with direct access/egress to external).
- As for any imaging services, the use of anaesthetic could be used to calm patients entering an MRI. These are understood and permitted under HTM 05-02, even for DTS and DSS facilities (Section 2.34 of HTM 05-02), and this is ultimately the driver for the provision of progressive horizontal within the UCLH facility.
- While this is an outpatient facility (where occupants attend via appointment only – there are no inpatient beds and therefore no overnight accommodation creating a sleeping risk), it has been assumed that a higher number of wheelchair users could use this part of the building. Therefore, the entire space has been designed assuming that all occupants could have mobility impairment and sufficient space for wheelchair refuges has been allowed for within each compartment to ensure that the progressive horizontal evacuation strategy (recommended by HTM 05-02 for these types of facilities) is feasible.
- The provisions for fire safety in the IoN/DRI building are in line with HTM 05-02 for DTS and DSS facilities and suitable for the proposed occupancy. In fact, in most aspects they exceed the recommendations of HTM 05-02 due to the provision of an automatic water suppression system and voice alarm system throughout the building.
- Please note that dementia is paramount to this project, and the UCLH facility will comply with best practice guidelines in HBN 08-02[4] and Design for Dementia.

Please see Section 2.2 within this report where the above is expanded upon and details on how this is achieved within the IoN/DRI building are provided.

All relevant UCL Technical Notes will be implemented and are available on UCL website. Only key recommendations are referred to within this report. Please refer to these notes for more details. Where this fire strategy report is silent on a particular issue, it is expected that the applicable design guidance stated in this section, or the referenced codes and standards within it, be followed accordingly.

[1] BS 9999:2017 Fire safety in the design, management and use of buildings – Code of practice
[2] BS 7974:2001 Application of fire safety engineering principles to the design of buildings – Code of practice
[3] Health Technical Memorandum 05-02: Firecode, Guidance in support of functional provisions (Fire safety in the design of healthcare premises), 2015.
[4] Health Building Note 08-02 Dementia-friendly health and social care environments, 2015.

1.8 Executive Summary

The key aspects of the fire safety design are summarised in Table 1—2 below.

Table 1—2 Key Strategic Outputs

Item	Fire Strategy Output	Reference
Means of Escape		
Evacuation Strategy	The basement technical spaces, plant areas, and clinical areas will form separate evacuation zones to the upper levels. The evacuation strategy on the upper levels/ground ancillary accommodation will be simultaneous. In the clinical areas at Levels 0 and B1, horizontal evacuation to adjacent compartments will be prioritised as recommended in HTM 05-02.	2.1
Vertical Escape	There are four escape stairs within the building: one fire-fighting stair and one protected stair in the new part of the building, and one fire-fighting stair and one protected stair in the existing Alexandra wing – one at each end. However, the escape stair in the North of the Alexandra Wing will only be a protected stair at Levels 0 and B1, on the levels above the stair is an unprotected accommodation stair (not used for escape). One evacuation lift will be provided within the Alexandra Wing to enable vertical escape of Mobility Impaired Patients in the UCLH facility at B1 level to external. The fire-fighting lifts will also be used as evacuation lifts to evacuate Mobility Impaired Persons prior to the arrival of the fire brigade.	2.3.5
Active Fire Safety Systems		
Alarm and Detection	An L1 detection system in accordance with BS 5839-1 will be provided throughout the building. A Type V4 voice alarm system in accordance with BS 5839-8 will be provided throughout the building. The fire alarm system will have double-knock functionality. All fire alarm signals will be relayed to UCL's 24 hr security centre/building.	7.2
Suppression	The building will be sprinkler protected throughout in accordance with BS EN 12845 including the additional recommendations of Annex F and the Loss Prevention Council rules. The MRI rooms will also be afforded sprinkler protection, although they will be pre-action in order to provide some level of property protection in the event of a false alarm. Pre-action sprinklers will be installed in the Technical Spaces at B2. Gaseous suppression will be provided in critical server rooms.	7.1
Smoke Control	The basement will be mechanically ventilated by a smoke extract system capable of 10 air changes per hour. The fire-fighting lobbies in the fire-fighting core will be ventilated by a mechanical smoke shaft.	7.3
Atrium Strategy		
Atrium	The atrium will be enclosed by smoke retarding construction at the top two levels in order to provide a smoke reservoir. A natural smoke clearance system will be provided, based on 10% of the largest combined void area of a floor.	3
Structure and Compartmentation		
Structural Protection	All elements of structure will be afforded a minimum of 90 minutes fire resistance – R90. All elements of structure supporting the fire-fighting core will be afforded 120 minutes fire resistance – R120.	5.1
Compartment Floors	All floors will be compartment floors and will achieve 90 minutes fire resistance (REI). The interstitial floor above the UCLH facility at the ground floor will be a compartment floor. B2 ISV is part of the Technical Spaces below, and not a compartment floor.	5.2
Between Occupancies	Since the clinic areas, plant areas, technical spaces and upper levels form separate evacuation zones, they will be fire separated from one another by 90 minutes fire resistance (REI90). Sub-compartments within the clinic areas will be fire separated by 60 minutes fire resistance (REI60).	5.2
Fire-fighting Core	The fire-fighting core including the final exit route/fire-fighting access route will be provided with 120 minutes fire resistance (REI).	5.2
High risk rooms	High risk rooms such as storage rooms will form separate fire compartments.	5.2
External Fire Spread		
Protected Area	The North façade is within 1m of the site boundary and will be afforded 90 minutes fire resistance from both sides (EI90). None of the other facades require any fire protection when considering fire spread from building to building.	6.1.1
External Walls	Materials of limited combustibility will be use for all key materials of the external walls. Fire stopping and cavity barriers will be provided throughout in line with code guidance	6.2
Firefighting		
Fire-fighting Core	Two fire-fighting cores will be provided. They will comprise a fire-fighting stair, ventilated fire-fighting lobbies at all served levels and a fire-fighting lift. Firefighting shaft 1 will serve all floors (B2 to roof). The fire-fighting lift will stop at Level 4 but the fire-fighting stair will continue up to the Level 5 plant space. Firefighting shaft 2 will serve B2 to L2 at Alexandra wing (in line with the consultation carried out with LFB).	8.2
Fire Main	A dry fire main will be provided in the fire-fighting lobbies of the central firefighting shaft, serving all levels including ground and rooftop plant levels. A dry fire main will also be provided in the Southern firefighting stair in the Alexandra Wing.	8.2.1

1.9 Fire Engineered Solutions

Where the design of the building does not meet the recommendations of the prescriptive code guidance, fire engineering will be used to design an alternative approach. This allows the design team to deliver the building they desire whilst ensuring that the fire safety design of the building is as safe as, or safer than, it would be if designed using the prescriptive code approach. Any engineered proposals are to be agreed with the Approved Inspector (Bureau Veritas) and the London Fire Brigade and therefore carry an approvals risk until such agreements are reached. Initial discussions have been held with the UCL Fire Officer and the Approved Inspector who have agreed in principle with the proposals herein. LFB have been consulted on the design and are satisfied with the proposal. The LFB consultation remains open until final technical points are agreed with the Approved Inspector and the LFB.

The key fire engineered solutions are summarised in Table 1—3 below.

Table 1—3 Fire Engineered Solutions

Item of Risk	Engineered Solution	Reference
Basement smoke clearance strategy	Guidance recommends that each compartment should be individually ventilated. This does not mean that all rooms should be ventilated. It is proposed that only the main corridors and large plant areas will be provided with smoke ventilation. Other smaller rooms will be smoke vented by the fire service personnel opening a single door onto the adjacent main smoke vented space/corridor. The 10 ACH requirement in this space will be based on the volume of the corridor and the largest room being indirectly vented off it. Additional compartmentation will be provided between the rooms in the basement levels to ensure that only one room accessed off the corridor will need to be ventilated. The corridor itself is also protected providing a protected route to the room of fire origin for the fire service personnel. This would help to contain the fire to a single room, and the fire will be controlled by the sprinkler system. Smaller rooms would likely be ventilated in the corridor at a rate well in excess of 10ACH due to the size difference between some of the rooms. The above reduces the complexity of the basement smoke clearance system, while affording significant additional protection to firefighters (corridors + rooms are fire protected).	7.3.3

1.10 Fire Safety Management

The fire strategy cannot completely rely on technology to ensure life safety, and thus a positive effort on the part of management is not only important, but essential, to meet the objectives set out in the Fire Strategy. All aspects related to management are highlighted in **RED TEXT** throughout this report.

Details of the required management for the risk profile are provided within the report in Appendix C.

2 Means of Escape

This section is divided into clinical (2.2) and non-clinical (2.3) means of escape sub-sections. These sub-sections are then further divided by evacuation zones, as discussed in section 2.1 below. Clinical areas are contained within evacuation zone 2 and non-clinical areas into the other three zones i.e. zones 1, 3 & 4.

2.1 Evacuation Zones and Strategies

There will be four separate zones in the IoN/DRI building, which will each follow their own evacuation strategy. These are summarised in Table 2—1. Where floor plates are separated into multiple zones they are shown in Figure 2—1, Figure 2—2, and Figure 2—3 (Levels 0, B1 and B2, respectively).

A double knock system is proposed in all areas. During the investigation period staff will be able to cancel the warning so that an evacuation signal is not given. The length of this delay will need to be reviewed and agreed with all stakeholders in order to reduce disruption during operation. Should the investigation period elapse, a single call point/sprinkler head, or if a second detector head is activated, the full evacuation of the fire affected zone will be initiated automatically. Please see Section 7.2 for more information on the double knock functionality of the fire detection and alarm system.

Figure 2—1 Level 0 Zones

Figure 2—2 Level B1 Zones

Table 2—1 Summary of the Zones and their Evacuation Strategies

Zone	Parts of the Building within the Zone	Evacuation Strategy for that Zone
Zone 1	Levels 1 to 5 and all parts of Level 0 that are not part of Zone 2	Simultaneous
Zone 2	UCL/UCLH Clinic on Level 0 and B1 including the ISV above the ground floor (see Figure 2—1 & Figure 2—2)	This zone is subdivided further into sub-compartments (see Figure 2—5 & Figure 2—6), to enable the implementation of a progressive horizontal evacuation to adjacent compartments. The ISV above ground will form its own evacuation zone.
Zone 3	The Technical levels on Levels B1 and B2. This includes the ISV above in Level B2A.	Simultaneous
Zone 4	The loading bay, all parts of Level B1 that are not part of either Zone 2 or Zone 3, and the plant rooms on Level B2.	Simultaneous

Figure 2—3 Level B2 Zones

Figure 2—4 Typical Upper Level Zones

2.2 Clinical Areas – Zone 2

2.2.1 Overview

Approximately 800 m^2 of the ground floor (Level 0) and approximately 900 m^2 of the first basement level (Level B1) will be a University College London Hospital (UCL-UCLH) outpatient clinic. The upper part of the UCLH facility will consist of waiting areas and consultation rooms, while in the basement there will be six MRI machines and their ancillary accommodation. There is approximately a further 350 m^2 of facilities containing two MRI machines that are shared between UCLH and UCL.

Since this is an outpatient facility, it is expected that the majority of patients will be independent and they will be able to physically leave the premises without staff assistance, or they experience some mobility impairment and rely on another person to offer minimal assistance. Any patients that arrive accompanied by a carer due to them requiring constant assistance will either be accompanied by that carer throughout the duration of their visit or they will be accompanied by a member of UCLH staff.

As any NHS facility, the likelihood of mobility impaired occupants (wheelchair users) is higher than in a typical building. Therefore, the fire strategy is based on the assumption that all patients are wheelchair users.

The UCLH facility is not designed to accommodate bariatric patients however one consultation room on the ground level has been designed for infrequent use by bariatric patients. If they are mobility impaired, then the facility is designed to accommodate the use of an adapted bariatric chair (i.e. not a bariatric bed). These patients would be limited to the ground floor so they would not need to go to Level B1 (the MRIs at Level B1 are not large enough to accommodate bariatric patients).

The UCLH facility will be highly managed with patients arriving by appointment only. Therefore, the number and type of patients in the facility can be controlled and planned for. The management of the UCLH facility will ensure that bariatric patients, should they be visiting, do not need to use facilities on level B1.

No beds will be provided within this facility as it for outpatients only.

2.2.2 Code Guidance

Part B of Schedule 1 of the Building Regulations 2010 details the functional requirements to provide for fire safety. Guidance on the application of the regulations is provided in the Approved Document B Volume 2 – Buildings other than Dwelling Houses, 2006 for common buildings, and in the Health Technical Memorandum 05-02: *Firecode, Guidance in support of functional provisions (Fire safety in the design of healthcare premises),* 2015, for Healthcare premises.

HTM 05-02 (2015) clause 1.6 states that, for facilities such as the UCLH one in the IoN/DRI building, which are classified as Purpose Group 5 under Approved Document B (non-residential day centres, clinics, health centres and surgeries, etc), *"the application of HTM 05-02 should be limited to those measures necessary to provide a safe patient environment for the time necessary to effect an evacuation. Such measures should be appropriate to the needs of the relevant persons in the building and their levels of dependency"*.

With respect to Doctor Treatment Services (DTS) and Diagnostic and/or Screening Services (DSS) uses such as that proposed in this building, HTM 05-02 provides additional guidance on which aspects of HTM 05-02 to use in addition to ADB guidance. These supplementary requirements are given in HTM 05-02 from clause 2.33 to clause 2.36, and are listed below:

- HTM 05-02 (2015) cl. 2.33: *"It is becoming more common for health centres, clinics and GP surgeries to provide facilities for minor invasive investigations or procedures that require the use of a local anaesthetic. These will be DTS and DSS services regulated by the Care Quality Commission – see Appendix H. Generally, the procedures will be undertaken in a minor procedure room, or treatment room possibly with an adjacent recovery area where patients may remain under observation until the effects of the anaesthetic have worn off."*

- HTM 05-02 (2015) cl. 2.34: *"In many cases the use of an anaesthetic will restrict mobility so that patients will require assistance to escape in the event of a fire. Therefore, in DTS and DSS premises the means of escape from relevant areas should be designed so that it is always possible, in the first instance, to escape:*
    - *Horizontally to a place of relative safety from where further horizontal or vertical evacuation is possible; or*
    - *Directly to a place of safety at ground level".*
- HTM 05-02 (2015) cl. 2.35: *"The place of relative safety should either be a separate 30 minute sub-compartment, or a refuge in an escape stairway that is enclosed in 30 minute fire-resisting construction, either of which should be large enough to accommodate the number of patients who at any one time could reasonably be expected to be receiving or recovering from minor invasive investigations or procedures."*
- HTM 05-02 (2015) cl. 2.36: *"It is also strongly recommended that these premises are provided with a fire detection and alarm system that complies with the relevant guidance in the HTM 05-03 series".*

Therefore, in order to comply with Building Regulations, the use of Approved Document B with the above additional requirements (to all areas where patients can be accommodated i.e. Evacuation Zone 2) is proposed.

2.2.3 Progressive Horizontal Evacuation

A progressive horizontal evacuation strategy will be implemented, whereby sufficient space will be available in the adjacent compartment to accommodate the likely number of wheelchair users/patients from the adjacent compartment.

L1 automatic fire detection will be provided throughout the UCLH facility in accordance with BS 5839-1 and UCL TN054, please see Section 7.2 of this report for more details on this system.

2.2.3.1 Compartmentation - subdivision

The clinical areas will be divided up into sub-compartments in order to enable the implementation of progressive horizontal evacuation. Each compartment will be provided with a minimum of two escape routes into two separate compartments and these routes will lead to a suitable lift for evacuation (evacuation lift or fire-fighting lift (which can be used for evacuation)).

The clinical areas on the ground floor will be separated into two compartments while the clinical areas on the level B1 will be separated into three compartments, as shown in Figure 2—5 and Figure 2—6, respectively. Note that if HTM 05-02 was to be applied in full to the UCLH facility the Ground Floor, which covers an area of circa. 800 m^2, would need to be designed in accordance with clauses 3.8 – 3.10 under the section *"Floors up to 12 m above ground level with an area of less than 1000 m^2."* Under clause 3.8 (b) the minimum number of compartments is two. Hence it is considered reasonable to sub divide the UCLH facility on Level 0 into two compartments rather than three.

Each of the sub-compartments will be afforded at least 60 minutes fire resistance with FD60S doors rather than the 30 minutes fire resistance recommended by HTM 05-02. This is, in part, due to the basement smoke ventilation proposal detailed in Section 7.3.3, but it also offers an uplift in the protection afforded to the occupants.

There is an ISV located above the ground level clinical areas. As the 60 minute wall between compartments A and B is not proposed to be carried through the interstitial level to the underside of the Level 0 floor slab, the interstitial floor will be a compartment floor (90 minutes), and will form its own evacuation zone from the clinical areas below it.

Escape from compartments A to E in Zone 2 is as per Figure 2—5 and Figure 2—6. Travel distances are as per section 2.2.3.5. Travel distances and escape from the zone 2 ISV compartment on the interstitial level is as per Figure 2—16.

Figure 2—5 Indicative Means of Escape from UCLH Clinic at Level 0 (Fire sub-compartments A and B)

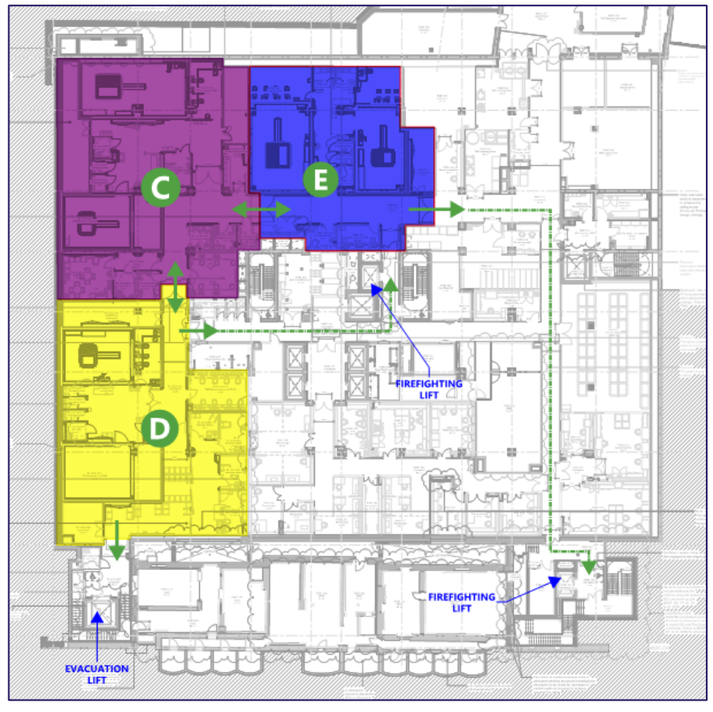


Figure 2—6 Indicative Means of Escape from UCLH Clinic at Level B1 (Fire sub-compartments C, D and E)

2.2.3.2 Occupant Numbers and Space Requirements

The expected number of patients in the UCLH facility is:

- 103 patients (ca. 55 per compartment) at ground level; and,
- 25 patients (ca. 9 per compartment) at B1 level.

These numbers of patients will be controlled by the management of the facility. There will also be 33 MRI Unit Staff at B1 level and 60 Outpatients Staff spread across the two levels but predominantly located at ground level.

The sub-compartments in the clinical areas evacuation zone (Zone 2) are shown in Figure 2—5 and Figure 2—6 for the ground level and the level B2 imaging floor, respectively. Each compartment will accommodate:

- Compartment A should have sufficient space to accommodate occupants from compartment B (ca. 55 patients + ca. 30 staff);
- Compartment B should have sufficient space to accommodate occupants from compartment A (ca. 55 patients + ca. 30 staff);
- Compartment C should have sufficient space to accommodate occupants from compartment D or E (ca. 9 patients + ca. 11 staff);
- Compartments D and E should have sufficient space to accommodate occupants from compartment C (ca. 9 patients + ca. 11 staff);
- The fire-fighting lift lobby should have sufficient space to accommodate occupants from Compartment E (ca. 9 patients + ca. 11 staff); and,
- The evacuation lift lobby within the Alexandra Wing should have sufficient space to accommodate occupants of compartment D (ca. 9 patients + ca. 11 staff).

The above assumes that access to the other adjacent compartment is blocked by fire, hence all occupants are assumed to escape in the same direction.

2.2.3.3 Escape from Compartments A and B on Level 0

On the ground floor, these occupants will be able to escape direct to external, via the adjacent compartment in the UCLH facility, or via the protected final exit routes of the fire-fighting stair (from Compartment A) or the central protected stair (from compartment B), as shown in Figure 2—5.

2.2.3.4 Escape from Compartments C, D, and E on Level B1

At B1 Level, the majority of these patients will most likely be able to escape using either the central fire-fighting stair or the firefighting stair in the North of the Alexandra Wing. However, it is conservatively assumed that all patients in each zone are mobility impaired and will need to use a lift to escape.

Occupants in compartment C can escape into one of compartments D and E, where there is sufficient space for 9 wheelchair refuges (1400 mm x 900 mm) in the corridors, and the route beside the refuges will be at least 850mm wide.

Occupants in compartment D can escape into compartment C where there is sufficient space for 9 wheelchair refuges in the corridor, and they can escape into the lobby in front of the evacuation lift in the Alexandra Wing where there is sufficient space for 9 wheelchair patients. This is shown in Figure 2—7.

Occupants in compartment E can escape into compartment C where there is sufficient space for 9 wheelchair refuges in the corridor and they can escape into the fire-fighting lobby and the UCL corridor. To avoid using the fire-fighting lobby as the primary waiting area signage will be installed to only show both adjoining corridors. From this corridor patients can navigate to the other side of the fire-fighting core and could travel to the evacuation lift in the Alexandra Wing through compartment D.

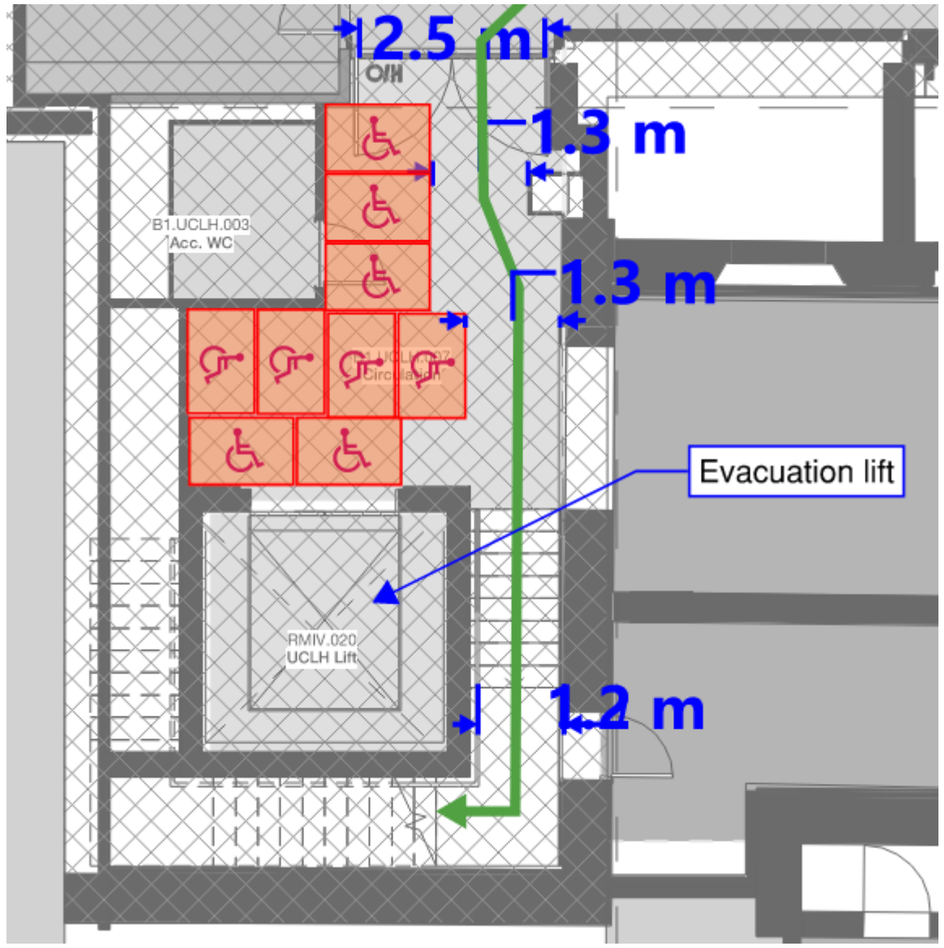


Figure 2—7 Refuge Space in front of the Evacuation Lift in the Alexandra Wing on B1 (9 Refuges each 900 mm x 1400 mm)

2.2.3.5 Travel Distances

Travel distances in the UCLH facility will be limited to 18 m in a single direction, and 45 m when more than one direction is available. Figure 2—8 and Figure 2—9 show the travel distances in Evacuation Zone 2 on level B2 and level 0, respectively.

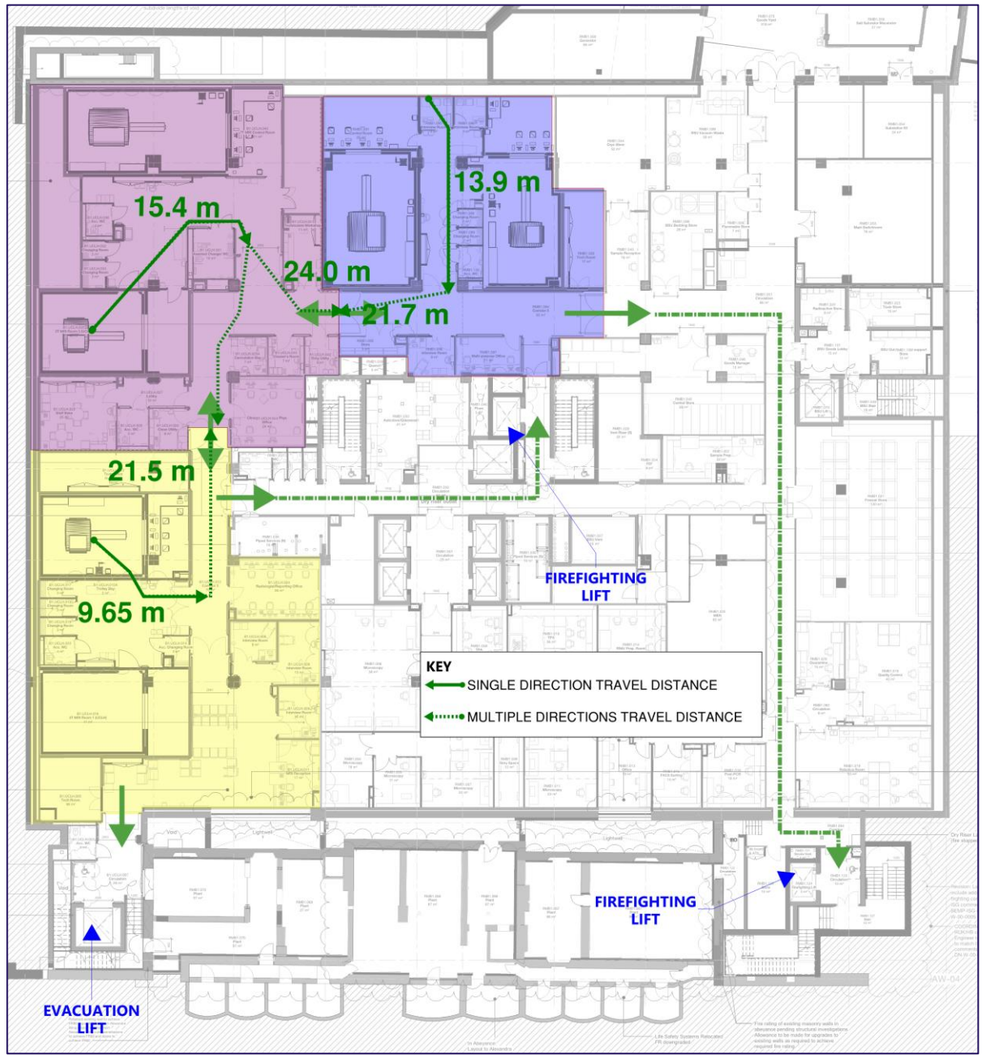


Figure 2—8 Level B1 (Zone 2) Travel Distances

Figure 2—9 Level 0 (Zone 2 – Includes 3 separate evacuation zones with the interstitial level) Travel Distances

2.2.4 Vertical evacuation

2.2.4.1 Evacuation via Lifts for Clinical Areas

As the imaging floor of the clinical areas will be located at basement level 1 (B1), it is recommended for vertical evacuation to be achieved using lifts and avoid the need for carry up procedures.

As such, an evacuation lift will be provided within the Alexandra Wing. In addition, it is proposed to share the central fire-fighting lift to evacuate the occupants unable to use the stairs, as permitted within the code guidance. This lift can be used to evacuate occupants with mobility impairments but should be operated under the control of the fire safety manager, or a delegated representative.

It is recommended that the fire-fighting lift be used to evacuate MIPs prior to arrival of the fire service. It should be noted that this floor is only one level below ground, therefore it is considered reasonable to use the central fire-fighting lift for evacuation in the instance where access to the evacuation lift is not possible (due to the location of the fire).

Evacuation of the UCLH facility will be a highly managed scenario with fire wardens directing patients to either the evacuation lift in the Alexandra Wing or the fire-fighting lift in the fire-fighting core, as appropriate.

2.3 Non-Clinical Areas – Zones 1, 3 and 4

2.3.1 Overview

The non-clinical area (i.e. Zones 1, 3 and 4) are designed in accordance with the recommendations of BS 9999 and each zone operates a simultaneous evacuation strategy as described in Section 2.1.

2.3.2 Occupancy Characteristic & Fire Growth Rate

On the upper levels of the building i.e. in the labs and write-up spaces, all occupants will be familiar with their surroundings or they will be accompanied by someone who is. The occupants of the Technical Spaces and the plant areas will also be familiar with their surroundings. On the ground floor of the building the café will be open to the public and the lecture theatre in the South East corner of the floorplate is likely to be used for events where people unfamiliar with the building are in attendance. The occupancy characteristics for the building are summarised in Table 2—2 below. Also summarised in Table 2—2 are the fire growth rates in each of the spaces based upon the expected fire load densities.

Table 2—2 Summary of Occupancy Characteristics and Fire Growth Rates

Space	Occupancy Characteristic	Fire Growth Rate
Plant Rooms	A	3 (High)
Laboratories	A	3 (High)
Technical space	A	3 (High)
Offices / Write-up spaces	A	2 (Medium)
Café	B	2 (Medium)
Lecture Theatre	B	2 (Medium)

2.3.3 Risk Profiles

Combining the occupancy characteristics with the fire growth rates gives the risk profiles of the spaces within the building. These are summarised in Table 2—3 below. BS 9999 allows for a reduction in the risk profile by one level when the building is sprinkler protected to BS EN 12845, and since sprinklers will be provided throughout (see Section 7.1), this reduction in risk profile has been applied.

Table 2—3 Summary of the Risk Profiles

Evacuation Zone	Risk Profile	
	Base	Sprinkler Protected
Zone 1 – Level 5 Plant Areas	A3	A2
Zone 1 – Level 1 to Level 4 *	A3	A2
Zone 1 – Level 0 Café and Lecture Theatre	B2	B1
Zone 1 – Level B1 outside clinical areas	A3	A2
Zone 3	A3	A2
Zone 4	A3	A2

* On Levels 1 to 4, where the floor plate is shared by labs and write-ups spaces, an A3 risk profile has been applied to the whole floor despite the write up spaces having a medium fire growth rate. This is because there will be no fire separation between the labs and the write-ups spaces, as such the entire floor is being designed to the more onerous risk profile (A3 reduced to A2 with sprinklers). This has been done to promote future flexibility in the building (the provision of fire separation, and the need to provide fire dampers, would limit the use of the space).

2.3.4 Horizontal Evacuation

2.3.4.1 Escape Away from the Void

Escape towards (within 4.5m) voids should be avoided where practical. Where smoke resistant partitions are provided the risk is considered to be minimised. However, where the void is not enclosed, such as around the atrium on Levels 1 and 2, it is proposed that the provision of the following may be used to mitigate this risk:

- Automatic fire alarm and detection, ensuring early warning for occupants, such that escape can be made to a protected escape route prior to significant quantities of smoke from restricting their escape;
- Sprinkler protection system to BS EN 12845 – this is likely to reduce the fire size and, depending on the fire's location, may extinguish or control the fire allowing longer time for the occupants to evacuate; and,
- Escape will generally be available in two directions to enable occupants to escape always from the fire, when this is not available it will be ensured that travel distances are relatively short, and that the space has a low occupancy.

Figure 2—10 shows the open connection around the atrium on Levels 1 and 2. It can clearly be seen that occupants can escape away from the void and do not need to pass within 4.5 m of the void edge.

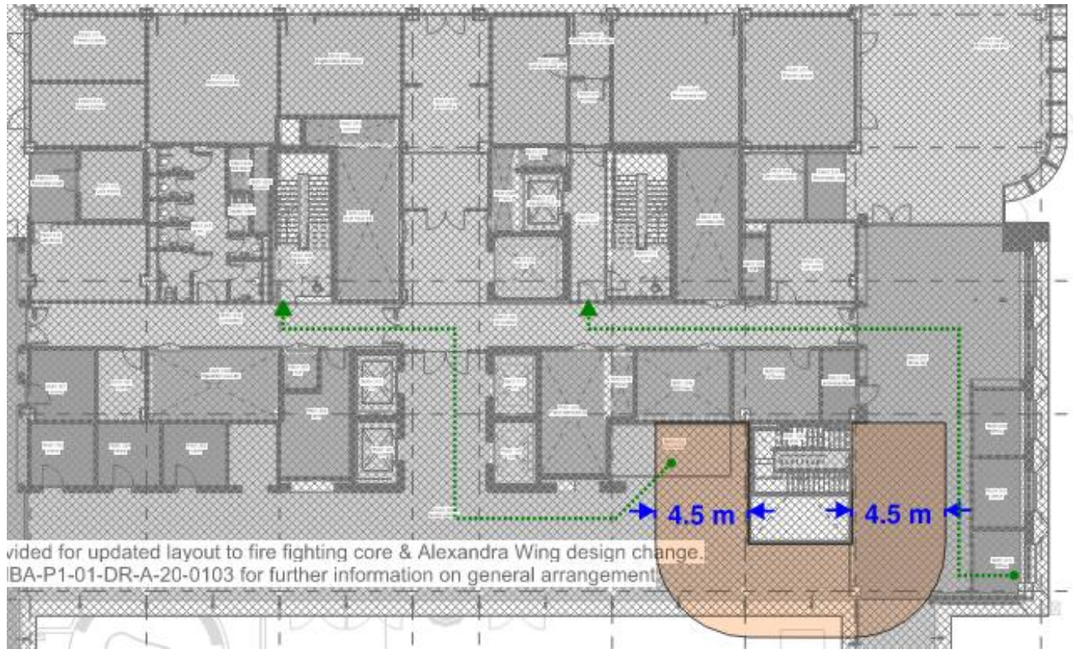


Figure 2—10 Escape Away from the Void on Levels 1 and 2

2.3.4.2 Travel Distances

Travel distances are limited as per BS 9999 and have been considered based on the risk profiles in Table 2—3 taking into account sprinkler protection. The maximum recommended travel distances (from BS 9999) for each of these risk profiles are detailed in the Table 2—4 below.

The minimum recommended fire detection and alarm system for a building with an atrium is a category L2 system. There will, however, be a category L1 fire detection system and a Type V4 voice alarm system provided throughout. On the basis that these systems provide a clear uplift in the fire safety provisions it is considered reasonable to increase these distances by 15% as permitted in BS 9999.

Table 2—4 Summary of Travel Distance Requirements

Risk Profile	Single Direction Travel [m]	Multiple Direction Travel [m]
B1 + 15% for an uplift in the automatic fire detection and alarm system	27.60	69.00
A2 + 15% for an uplift in the automatic fire detection and alarm system	25.30	63.25
External Spaces	60	100

Note, the travel distances in Table 2—4 are the actual travel distances i.e. on a suitable route for egress. If the fit-out layout is not known, direct travel distances i.e. those that do not consider the layout of the furniture, can be used for design, however, they should be 2/3 of the actual travel distances.

Figure 2—11 through to Figure 2—18 show the travel distances in the building.

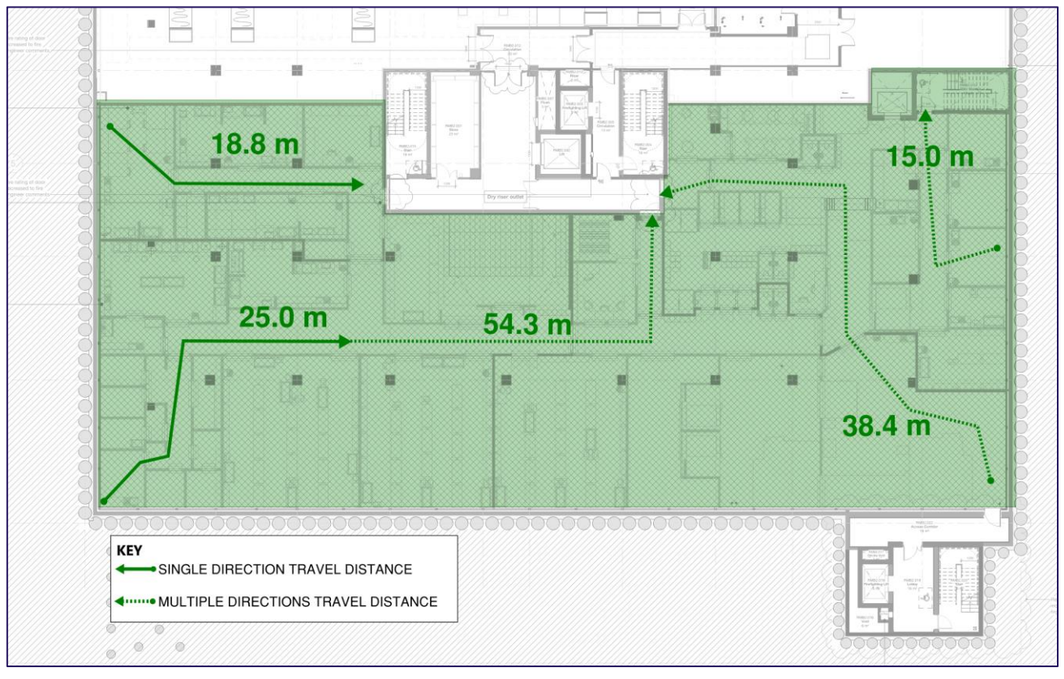


Figure 2—11 Level B2 (Zone 3) Travel Distances

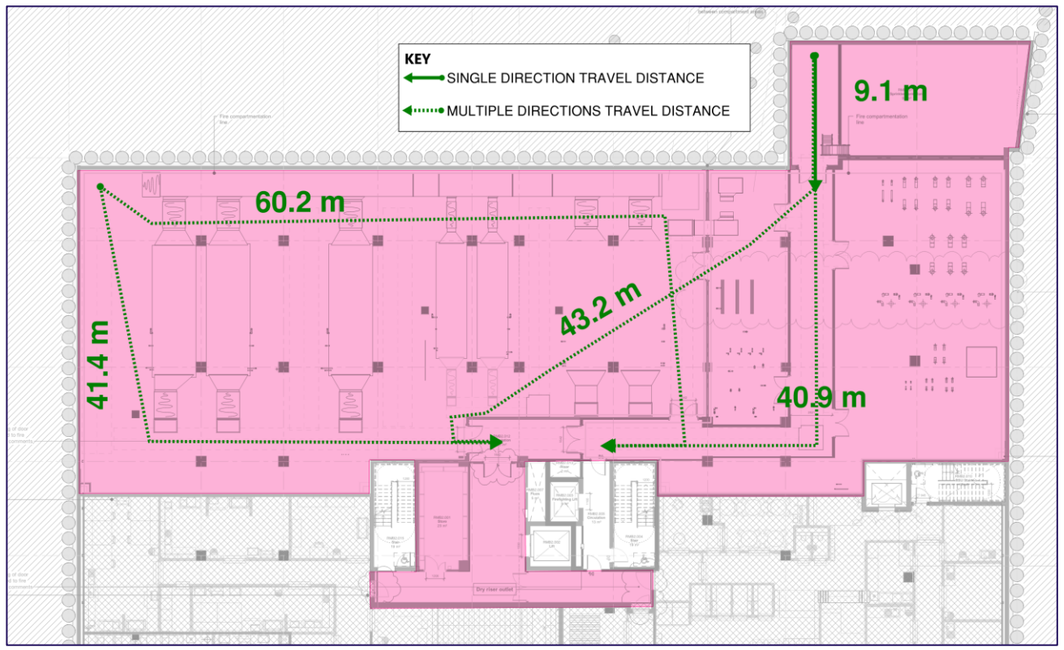


Figure 2—12 Level B2 (Zone 4) Travel Distances

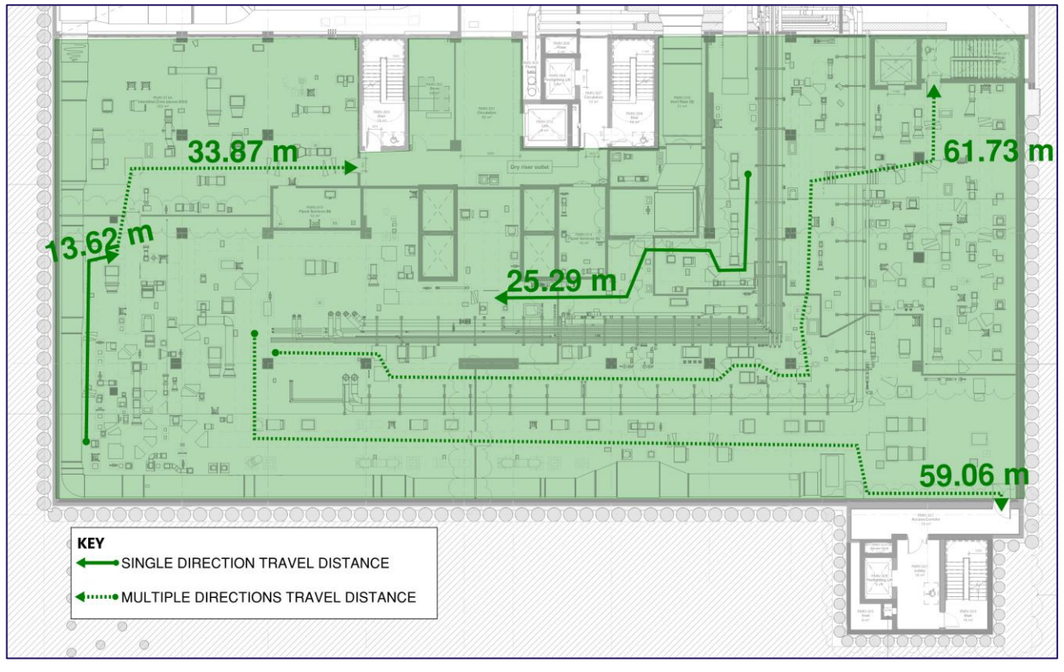


Figure 2—13 Level B2 Interstitial Floor (Zone 3) Travel Distances

Figure 2—14 Level B1 (Zone 4) Travel Distances

Figure 2—15 Level 0 (Zone 1) Travel Distances

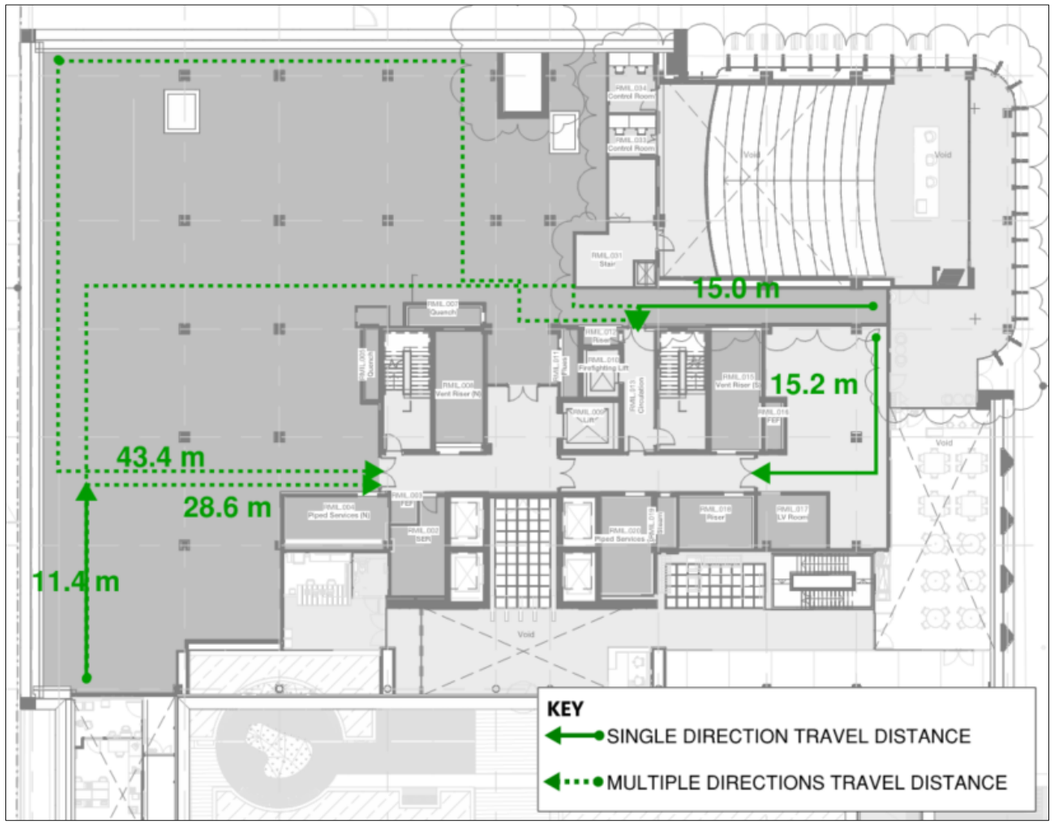


Figure 2—16 Interstitial Plant Level (Zones 1 & 2) Travel Distances

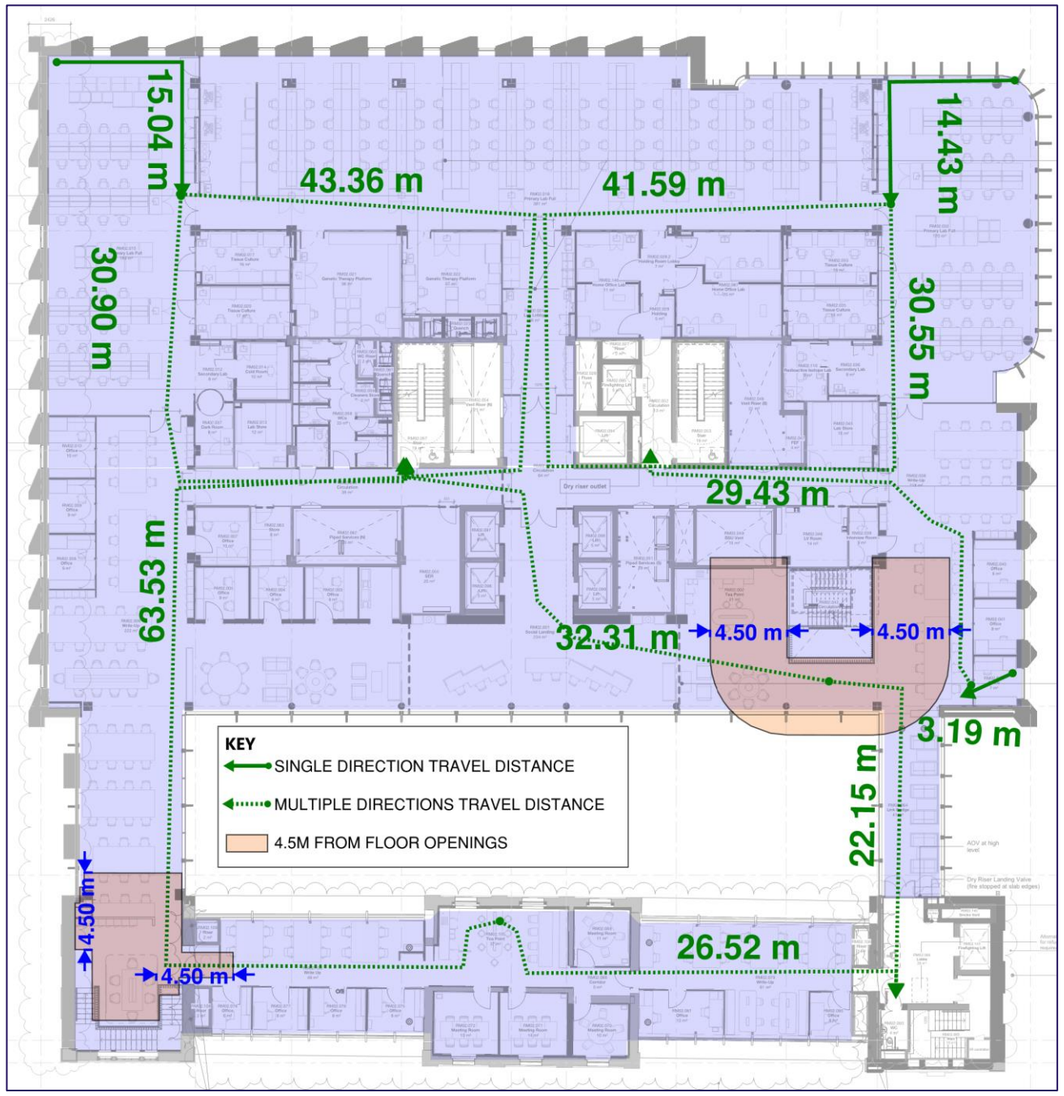


Figure 2—17 Levels 1 & 2 (Zone 1) Travel Distances

Figure 2—18 Level 3 & 4 (Zone 1) Travel Distances

The terrace on Level 03 can be accessed via the Social Landing space and the tea point area. Mobility Impaired Persons will have two escape routes and the single direction travel distance in the open air is permitted up to 60 m (ca. 51m) on the condition that they do not travel within 1.8 m from the façade. This is achieved as shown in the Figure 2—18.

2.3.4.3 Escape Widths

All horizontal escape widths (doors) will have an absolute minimum width of 850mm and be in accordance with Table 2—5. Note, these door widths have been reduced by 15% due to the uplift in fire detection and alarm system to a L1 detection system and the provision of a Type V4 voice alarm system. It is recommended that all doors serving more than 150 occupants to be at least 1050 mm wide.

Table 2—5 Summary of Escape Widths

Risk Profile	Minimum Door Width (mm/person)
B1 + 15% for an uplift in the automatic fire detection and alarm system	3.06
A2 + 15% for an uplift in the automatic fire detection and alarm system	3.06

2.3.4.4 Number of Escape Routes

The minimum number of exits from a room, tier, or storey are as per Table 2—6 below. Where there are more than 60 people in any location there should be a minimum of two escape routes with doors arranged to open in the direction of escape.

Level B2 is served by two protected stairs, Level B1 is served by four protected escape stairs, and Levels 1 to 4 are served by three protected escape stairs, so the occupant capacity is a function of the available exit widths and not limited to 60 people due to the number of escape routes.

Table 2—6 Minimum Number of Escape Routes

Maximum Number of Persons	Minimum Number of Escape Routes/Exits
60	1
600	2
More than 600	3

2.3.5 Vertical Evacuation

Four 1200 mm wide stairs are provided for escape: one fire-fighting stair and one protected stair in the centre of the new part of the building; and one firefighting stair and one protected stairs in the existing Alexandra Wing (one at either end); see Figure 2—19.

The North protected stair in the Alexandra Wing only serves Level B1. At the ground floor the protected stair discharges to external. Above it is an accommodation stair (open stair) serving the Alexandra Wing. This arrangement is shown in Figure 2—20.

The protected stair and the fire-fighting stair in the centre of the building serve all the occupied storeys including Level 4, which is more than 18 m above the fire-fighting access level. Therefore, both stairs are provided with lobby protection on all levels. The lobbies of the fire-fighting stair will also be mechanically smoke vented; see Section 8.2.

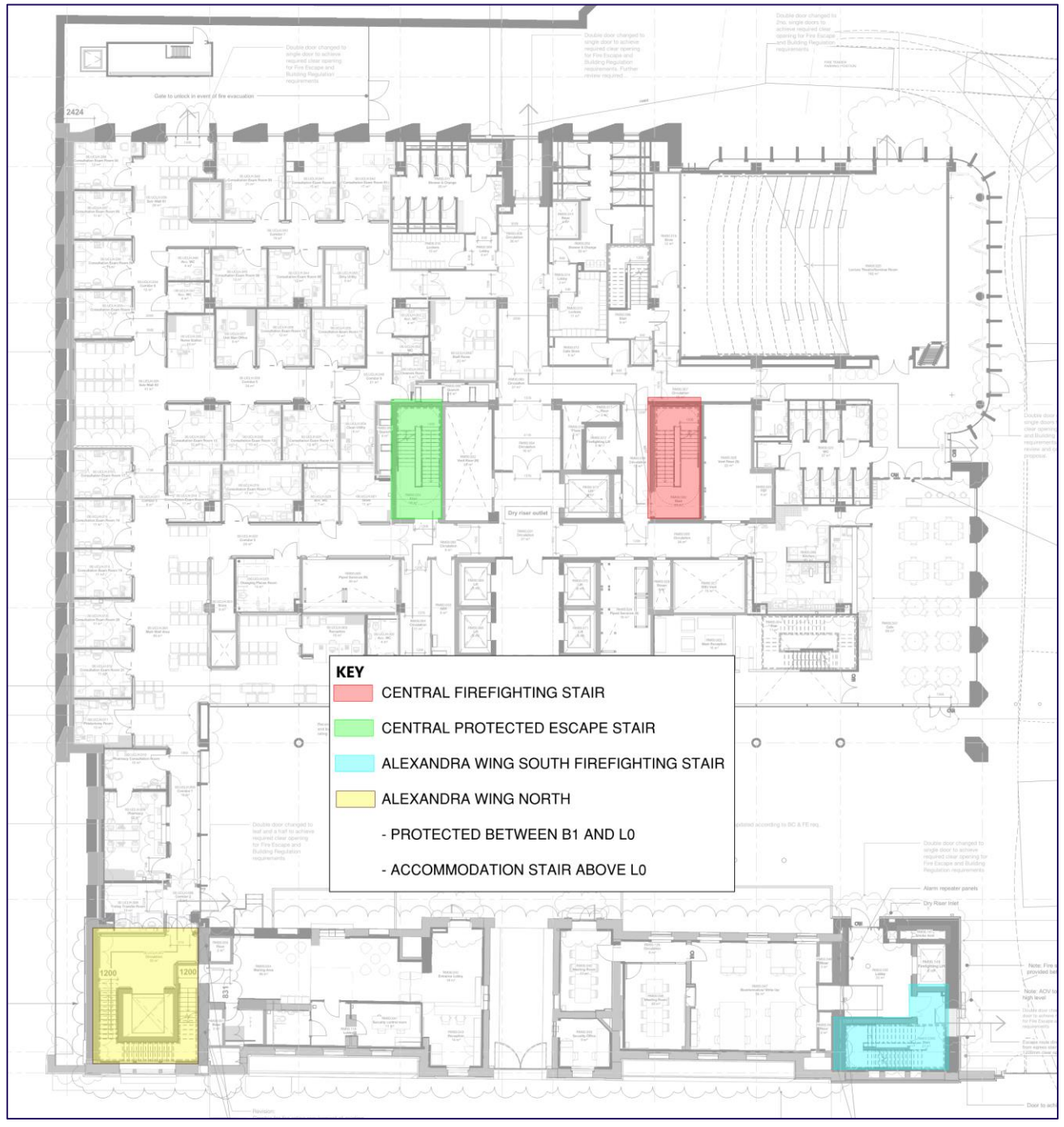


Figure 2—19 Protected Escape Stairs – Level 0

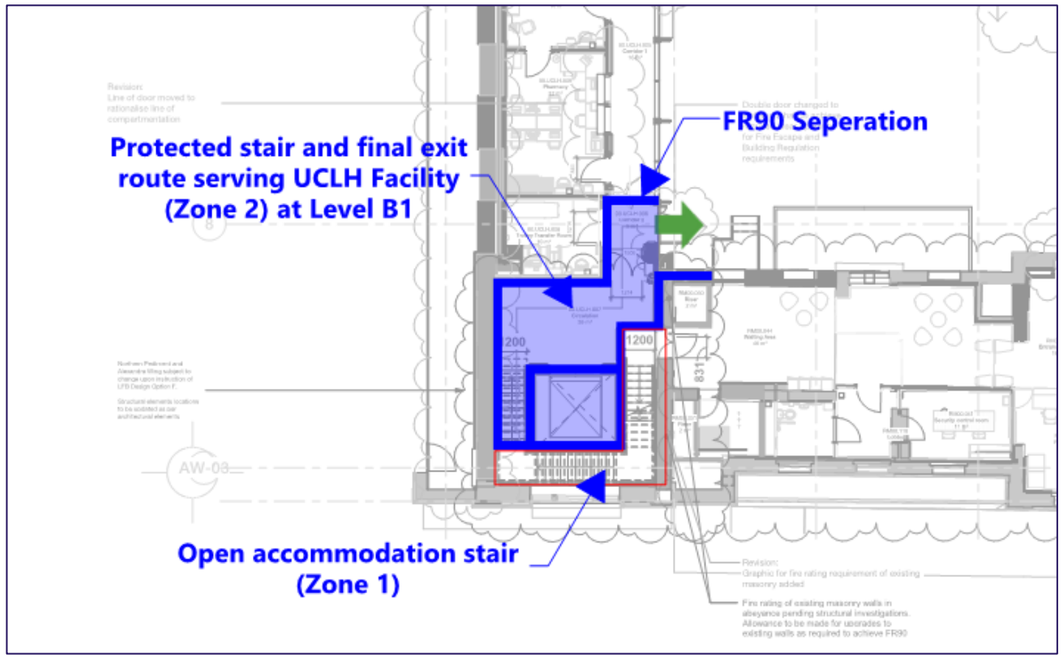


Figure 2—20 North Stair in the Alexandra Wing – Fire Separation between the Protected Stair Serving Level B1 and the Accommodation Stair Serving the Upper Levels

2.3.6 Occupant Capacity

The maximum occupant capacity provided is assessed both horizontally (i.e. based on door widths) and vertically (i.e. based on the capacity of the stairs). The confining factor, or the element that permits the fewest people, will be what the occupant capacity will be based on. This is described in further detail in the following sections.

2.3.6.1 Design Occupancy

The design occupancy for the non-clinical areas in the IoN/DRI building is as follows:

- 560 research staff; and,
- 12 support staff.

Note, this does not account for the occupants using the Café of the Lecture Theatre on the ground floor.

2.3.6.2 Horizontal Capacity

The horizontal occupant capacity available to each non-clinical evacuation zone is detailed in the following sections. The occupant capacity is based on the accumulation of all available exits, after discounting the largest, (based on a worst-case scenario of a fire impeding occupant access to, and through, the largest exit).

Zone 1

The horizontal capacity available on each floor is detailed in Table 2—7.

Table 2—7 Predicted Occupant Load per Storey

Storey	Horizontal Exits Available for Egress	Occupant Capacity [people]
Level 0 – Rooms not part of the UCLH clinic	2 x 1050 mm exit to external (through the lecture theatre) 2 x 1400 mm exit to external (through reception) 2 x 1050 mm exit to external (from the circulation space between the lecture theatre and the café) 1 x 1200 mm exit to external (from the café)	1,764 (Discount the 2 exits adjacent to each other in the reception; based on 3.06 mm/person)
Level 0 – Alexandra Wing North	1 x 1050 mm exit to external	60 (A single exit, therefore limited to 60 people)
Level 0 – Alexandra Wing South	1 x 1050 mm exit to external 1 x 1050 mm exit to external	60 (Discount 1 exit; remaining exit is via an access room therefore limited to 60)
Levels 1 & 2	1 x 850 mm exit into fire-fighting stair 1 x 850 mm exit into central protected stair 1 x 850 mm exit into Alexandra Wing South stair	326 (Discount 1 exit; exit width is less than 1050 mm so 500 mm assumed; based on 3.06 mm/person)
Levels 3 & 4	1 x 850 mm exit into fire-fighting stair 1 x 850 mm exit into central protected stair	163 (Discount 1 exit; exit width is less than 1050 mm so 500 mm assumed; based on 3.06 mm/person)

The lecture theatre has 2 exit routes: one route leading to 2 x 1050 mm exit direct to external, and 1 x 1200mm route leading to 2 x 1050 mm exits direct to external (between the café and the lecture theatre). Therefore, the occupant capacity of this room is limited to 390 people (discounting the one of the exits; based on 3.06 mm/person). When seats are down, an alternative exit (1050mm wide) is provided at the back of the space with suitable refuges. This additional route is not used to increase the occupancy, but only to provide an alternative exit from the top of the space.

The café has 1 x 1200mm door, and 1 route leading to 2 x 1050 mm exits to external (between the café and the lecture theatre). The maximum capacity of the café is currently 390 people based on the largest route being discounted.

Zone 3

The occupant loads of the Technical Spaces and associated basement areas will be low due to the nature of the spaces. At B1 level, the spaces are mainly used for storage and are unlikely to exceed 60 occupants.

The Technical Spaces have 3 x 850 mm exits, one into the dedicated accommodation stair, one into the fire-fighting stair, and one into the central protected stair. The horizontal occupant capacity is 326 people (discounting 1 exit; exit width is less than 1050 mm therefore 500 mm is assumed; based on 3.06 mm/person).

Zone 4

The plant rooms in Zone 4 at B2 level will never have more than 60 occupants therefore calculating a horizontal occupant capacity based upon the door widths is not necessary.

At Level B1, there are 3 x 850 mm exits, one into the fire-fighting stair, one into the central protected stair, and one into the South firefighting stair in the Alexandra Wing. The horizontal occupant capacity is 326 people (discounting 1 exit; exit width is less than 1050 mm therefore 500 mm is assumed; based on 3.06 mm/person).

2.3.6.3 Vertical Capacity

Egress from Levels above Ground (Zone 1)

Table 2—8 shows the capacity of each stair core for egress from levels above ground, based on an A2 Risk profile with additional protective measures, namely L1 fire detection and type V4 voice alarm.

Table 2—8 Stair Capacity – Egress from Levels above Ground

Stair	Clear Width [mm]	Number of Floors Served [-]	Minimum Width of Stair [mm/person]	Occupant Capacity [People]	Capacity per Floor [people]
Fire-fighting stair	1200	4	2.34	512	128
Central protected stair	1200	4	2.34	512	128
South Alexandra Wing protected stair	1200	2	3.23	371	185

The building is fully sprinkler protected so there is no recommendation to discount any of the protected stairs.

Vertical Capacity per floor [Levels 1 - 4] (assuming even distribution):

Levels 3 & 4 = 128 + 128 = 256 people per floor

Levels 1 & 2 = 128 + 128 + 185 = 441 people per floor

The horizontal capacity per floor is lower than the vertical capacity therefore the horizontal capacity is the limiting factor. The occupancy on **Levels 1 & 2 should not exceed 326 people per floor** and **Levels 3 & 4 should not exceed 163 people per floor.** Level 5 is plant only and it is not expected for it to be occupied except during maintenance work.

From Section 2.3.6.1 the total design occupancy of the IoN/DRI building is 572 people, which is 115 people per floor conservatively assuming an even distribution of people (although it is likely that Levels 1 and 2 would have more occupants than Levels 3 and 4 due to the larger floor plate on these levels). Therefore, there is sufficient capacity in the building for the design occupancy (total capacity of 1,394 people for the upper levels, versus an expected occupancy of 572 occupants).

Egress from Levels below Ground (Zone 3 or 4)

Table 2—9 shows the capacity of each stair core for egress from levels below ground, based on an A2 Risk profile with additional protective measures, namely L1 fire detection and type V4 voice alarm.

Table 2—9 Stair Capacity – Egress from Levels below Ground

Stair	Clear Width [mm]	Number of Floors Served [-]	Minimum Width of Stair [mm/person]	Occupant Capacity [People]	Capacity per Floor [people]
Central Fire-fighting stair	1200	2	3.23	371	185
Central protected stair	1200	2	3.23	371	185
North Alexandra Wing protected stair	1200	1	3.83	313	313
South Alexandra Wing firefighting stair	1200	1	3.83	313	313

The building is fully sprinkler protected so there is no recommendation to discount any of the protected stairs. In addition, these are also lobby protected or access from protected corridors, at basement levels.

Vertical Capacity per floor [Levels B1 & B2] (assuming even distribution):

Level B1 =185 + 185 + 313 + 313 = 996 people

Level B2 = 185 + 185 = 370 people

The horizontal capacity per floor is lower than the vertical capacity therefore the horizontal capacity is the limiting factor. The occupancy on **Zone 3 Technical Spaces should not exceed 326 people** and **Zone 4 should not exceed 326 people.**

2.3.7 Stair Discharge & Final Exits

All stairs discharge either direct to external or via a protected corridor to external, as shown in Figure 2—21. Internal protected routes are fire separated from the remainder of the building. All doors located on escape routes must open in the direction of escape, unless the occupant load is less than 60 people.

The final exit corridors will be at least as wide as the stairs they serve (i.e. 1200 mm). The final exit corridor of the fire-fighting stair will be at least 500 mm greater in width than is required for means of escape to accommodate counter flows created by the fire service (i.e. 1200+500 = 1700 mm). The final exit doors should be at least as wide as the stair they serve (i.e. 1200 mm). Access to accommodation at ground from the fire-fighting stair's protected corridor should be via protected lobbies, as shown in Figure 2—21.

A fire curtain is to be used instead of a door to separate the final exit route from the central protected stair and the main entrance, the location of which is shown in Figure 2—21. Please refer to Section 5.9 for information regarding the fire performance of the curtain.

Figure 2—21 Final Exit Routes

2.3.8 Mobility Impaired Persons

In order to meet Building Regulations, a suitable management plan should be put in place to aid evacuation for wheelchair users. Wheelchair user refuges are to be located within each protected stair on all levels above and below ground. A suitable two-way communication system will be provided to each wheelchair refuge. Management will need to be aware of wheelchair users within the building and be adequately trained to direct and assist occupants to an appropriate final exit.

2.3.8.1 Evacuation Plan

An appropriate Personal Emergency Evacuation Plan (PEEP) should be put in place to enable staff to be aware of occupants/staff members within the building who may require assistance escaping and be trained in how to assist in evacuating them safely. The PEEP should include:

- Individual PEEPs for disabled people who are regularly in the premises, for example staff and regular visitors. Following discussion with an individual, a plan can be developed for their specific needs which should contain details of how they will evacuate the premises. By taking into account the individual needs of a person when preparing a PEEP, management are able to make any reasonable adjustments to the premises or procedures that are necessary.
- 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 on arrival. Management should be encouraged to have, especially at reception, staff who are trained in disability awareness. This makes the process more comfortable for disabled people and more effective for management. The generic PEEPs should provide a wide range of guidance for differing disabilities and be adapted for the individual premises. They should include what the visitor needs to do in an evacuation, and what the management response will be. They should also reflect what specific fire safety provisions are provided for disabled people on the premises, e.g. specific evacuation chairs/uses of lifts etc. The generic PEEP should be discussed with each visitor and their particular needs taken into account where possible.
- PEEPs for visitors not previously identified to staff. The standard evacuation plan should include measures to make evacuations suitable for all persons on the premises. Information for disabled people should be noted in fire action notices and in the fire management plan. Staff should be trained so that they are aware of the facilities and their responsibilities to evacuate disabled people, and know how to use features such as evacuation lift or refuges. A sufficient number of staff should be available at all times to make sure that evacuation plans are viable.

2.3.8.2 Refuges

For the non-clinical areas, to comply with BS 9999 each refuge should be:

- Provided with clear space of at least 900 mm x 1400 mm, which should not impede evacuation of other occupants by, for example, reducing the clear exit width; and,
- Provided with a two-way communication system in compliance with BS 9999, which connects the refuge with the team who are organising the evacuation of the building who can reassure the occupants and then assist in carry-down procedures from the refuge(s) if necessary.

2.4 Inner Rooms

Wherever escape from a room is only available through another room, it should be ensured that the access room is provided with detection and/or there are vision panels between the access room and inner room, and the capacity of the inner room is limited to 60 people.

Due to the nature of the research which is taking place within this building vision panels are not always appropriate, as such in these instance the alarm will be linked between the access and inner room only (i.e. no vision panel will be provided).

2.5 Doors

The following applies to all doors on escape routes:

- They should be openable without the use of a key;
- Where serving more than 60 occupants they should open in the direction of escape; and,
- Panic hardware should be fitted to all doors serving more than 60 occupants if these occupants are unfamiliar with the space (i.e. the fire exits at the ground floor where members of the public are likely to be in the building).

Electronically locked doors and security gates (such as the speed gates indicated in Figure 2—22) on escape routes should failsafe unlock on activation of the fire alarm and in the event of a loss of power. Any electronically locked doors on escape routes should be openable through use of Green Break Glass Units located adjacent to the door from the escape side.

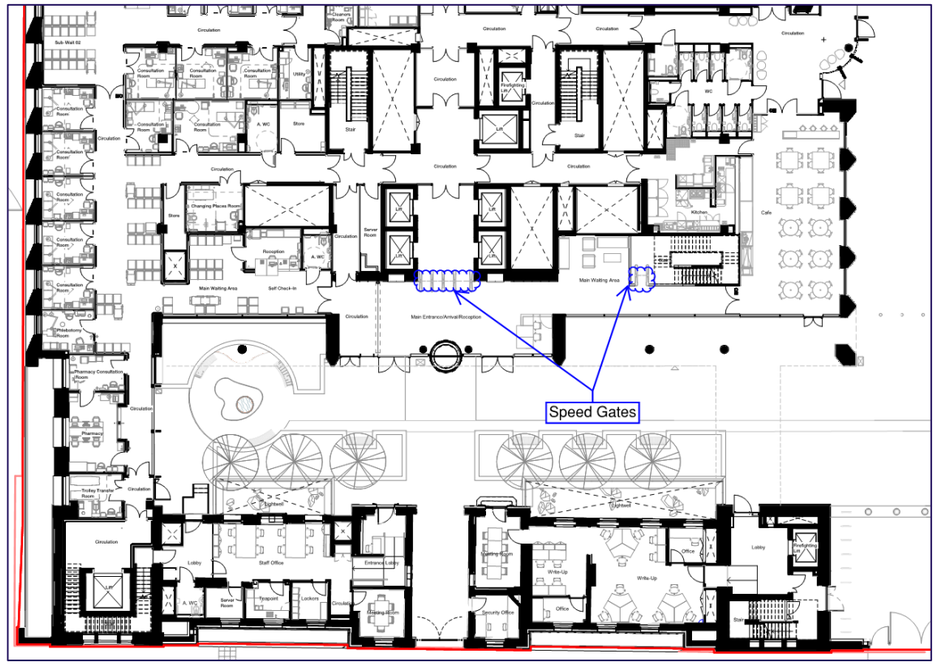


Figure 2—22 Speed Gate Locations

Please refer to UCL TN 059 for Technical Spaces.

2.6 Assembly Points

During an evacuation scenario, a combination of two categories of people might occur: those that are familiar with the particular building i.e. staff, researchers; and those that are unfamiliar with their surroundings i.e. members of the public at the ground floor café. While some members of the public can gather at assembly points if necessary to await information and/or meet with their friends/families etc., in general members of the public evacuating from a building will disperse away from building and can therefore be directed away from the building. On the other hand, people working within the building will tend to gather at assembly points for roll calls before re-entering the building following the fire service recommendations.

In the event of the fire alarm, only a limited number of people will evacuate simultaneously. This is due to the zoned evacuation strategy.

Assembly points will be located sufficiently far from the premises to minimize interference with the fire and rescue service or danger from falling debris, however, they will be accessible and not so far away as to discourage people from assembling.

2.6.1 Assembly Point Requirements

There are currently no specific recommendations within the prescriptive guidance document adopted pertaining to the provision and design of assembly points. Therefore, in the absence of prescriptive guidance, Buro Happold recommends that assembly points are provided on site and have the following features:

- The routes from final exits to the assembly point(s) should ensure a safe and rapid dispersal of occupants from the vicinity of the building. The routes from the buildings to the assembly points should be well defined;
- External escape routes and assembly points should have sufficient artificial lighting that will continue to illuminate the route should main power supply fail;
- Should not hinder fire tender access;
- The area provided should be adequate to accommodate the likely number of occupants evacuated in a fire scenario; and
- Ideally, assembly points should be in open air and be remote from the building in which the fire is located.

2.6.2 Assembly Point Locations and Capacity

The location of potential assembly points throughout the site are driven by the space available, and anticipated number of occupants expected to evacuate at any one time.

These assembly points are likely to vary over the lifetime of the building and should be reviewed as part of the ongoing RRO process. The following assembly point is proposed as shown in green on Figure 2—23. It is just under 300m², and sufficient to accommodate up to almost 1000 occupants (at 0.3m²/pers). This located along the main street and therefore well illuminated.

This is sufficient to accommodate all staff + likely members of the public.

Figure 2—23 Proposed Assembly Point

3 Atrium Fire Strategy

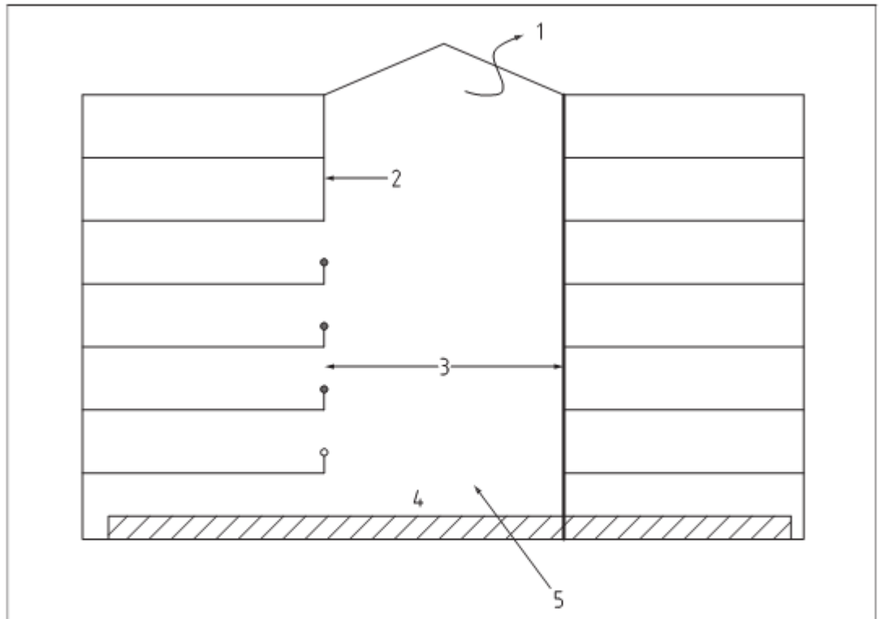
There is an open connection between all of the above ground storeys on the West side of the new building above the main reception area, adjacent to the café (not within the clinical areas). Due to the floors being constructed as compartment floors this open connection is considered to be an atrium under the BS 9999. The same applies with the accommodation stair within the Alexandra Wing. Both are considered to form a single atrium under BS 9999 since they do not necessarily have to be vertically aligned.

Based on the guidance provided in Annex B of BS 9999 and the exemplars in Annex C (based on an A type occupancy characteristic, an atrium height of between 18 m and 30 m and simultaneous evacuation) a natural smoke clearance system will be provided with the top two floors of the atrium (Levels 3 and 4) being enclosed by smoke retarding construction.

The smoke natural clearance system will be sized based on 10% of the void area of the largest floor (the void area is largest on Levels 1 and 2, approximately 40 m^2, therefore 4 m^2 of natural ventilation should be provided) and will open automatically upon detection.

For further details on the performance of the smoke retarding construction see Section 5.4.

Figure C.4 **Exemplar 1 – Occupancy characteristic A – Atrium height less than 30 m simultaneous evacuation**



Key

1 Natural or mechanical smoke clearance system

2 Smoke reservoir (smoke-retarding construction) equivalent in height to one storey for atrium 18 m or less or two storeys for atrium over 18 m (alternatively extend atrium roof above building by equivalent height)

3 Open or enclosed with fire-resisting and smoke-retarding construction (alternatively fire-resisting construction plus atrium pressurization or smoke control from each floor level)

4 Fire load comparable with use and contents within adjoining floors

5 Smoke clearance system replacement air

Figure 3—1 Exemplar 1 – Extract from BS 9999:2017

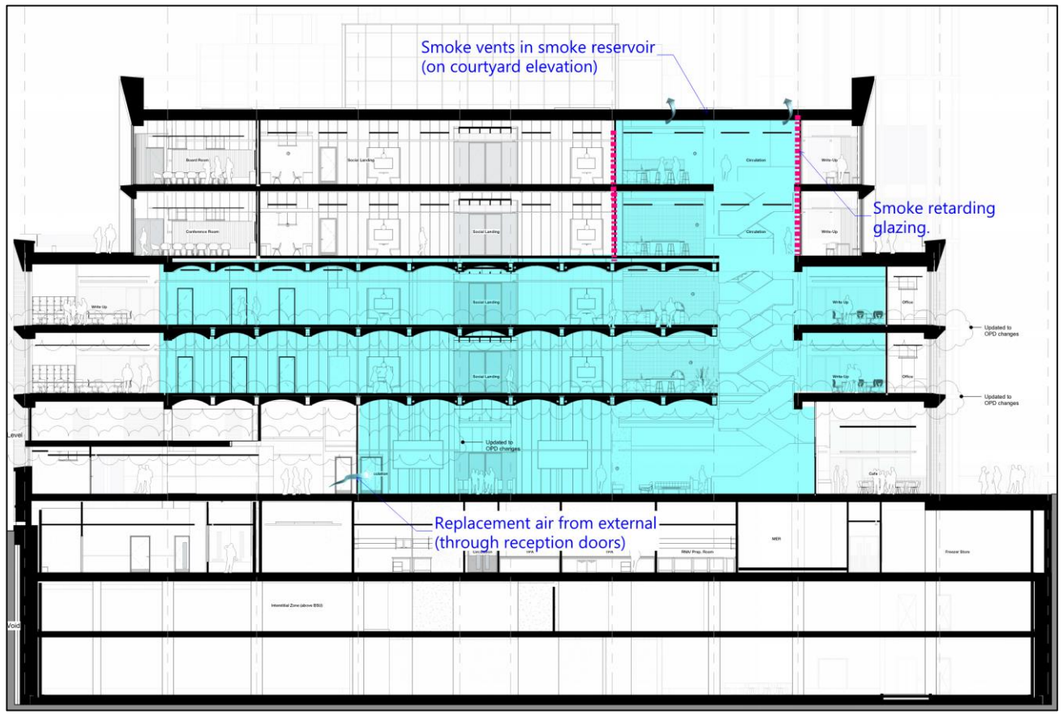


Figure 3—2 Section through the Atrium

4 Internal Fire Spread (Linings)

The internal linings for all wall and ceiling surfaces should achieve the classifications given in Table 4—1 below. All references to surface spread of flame are based on the performance tests results when the material and products are tested in accordance with BS 476 Parts 6[5] and 7[6] for national class or BS EN 13501-1[7] for European class. (Note: Class 0 has a better fire performance than Class 1. It is not identified in any BS test standard). A Class 0 product is either:

- Composed throughout of materials of limited combustibility; or,
- A material having a Class 1 surface spread of flame and which has a fire propagation index (I) of not more than 12 and a sub-index (i1) of not more than 6.

Table 4—1 Internal Fire Spread (Linings) – Classifications

Location	National Class	European Class
Circulation/escape routes including staircases	0	B-s3, d2
Rooms more than 30 m^2	1	C-s3, d2
Rooms less than 30 m^2	3	D-s3, d2

Note:

- The National classifications do not automatically equate with the equivalent classifications in the European column, therefore, products cannot typically assume European class, unless they have been tested accordingly; and,
- When a classification includes “s3, d2”, this means that there is no limit set for smoke production and/or flaming droplets/particles.

Parts of walls in a room (i.e. does not apply to stairs/circulation spaces) may be of poorer performance than specified in Table 4—1 above, but not less than Class 3 or D-s3, d2. This variation is limited to a total area not exceeding one half of the room’s floor area, subject to a maximum of 20 m^2 in bedrooms and 60 m^2 elsewhere.

The following are excluded from the performance requirements of surface spread of flame:

- Doors and door frames;
- Window frames into which glazing is fitted;
- Architraves, cover moulds, picture rails and similar narrow small members; and,
- Fitted furniture, i.e. demountable sanitary “back panels”.

The provisions do not apply to the upper surfaces of the staircases (i.e. tread and risers) because they are not significantly involved in a fire until it is well developed.

Where a room is an access room, although it provided circulation to other rooms, it is in accordance with recommendation for inner rooms and therefore the surface spread of flame used will be that applicable to the size of room.

[5] BS 476-6:1989+A1:2009 Fire tests on building materials and structures – Part 6: Method of test for fir propagation for products.
[6] BS 476-7:1997 Fire tests on building materials and structures – Part 7: Method of test to determine the classification of the surface spread of flame of products.
[7] BS EN 13501:2018 Fire classification of construction products and building elements – Part 1: Classification using date from reaction to fire tests.

5 Internal Fire Spread (Structure)

5.1 Structural Fire Protection

The topmost occupied floor of the building is marginally more than 18 m above the fire-fighting access level, and the lowest level is marginally deeper than 10m. Therefore, all loadbearing elements of structure should have a minimum of 90 minutes fire resistance (loadbearing i.e. R90). All loadbearing elements of structure that support the fire-fighting core should be afforded 120 minutes fire resistance (R120).

The Alexandra Wing is connected to the rest of the building via large, non-fire separated bridges on Levels 0, 1 and 2. In Stage 2, it was proposed that the structural elements only supporting the Alexandra Wing only be protected to 60 minutes (R60), on the basis that the Alexander Wing is less than 18m, and less than 10m deep. However, to achieve the architectural intent, there is no fire separation between the Alexandra Wing and the rest of the building, Therefore, the elements of structure in the Alexandra Wing should also have a minimum of 90 minutes fire resistance (loadbearing i.e. R90). This will need to be confirmed by a survey and structural elements upgraded if necessary. Note, the building is to be provided with sprinkler protection throughout in accordance with BS EN 12845; see Section 7.1 for details.

Fire resistance periods are to be tested in accordance with the BS 476 suite of standards.

Elements of structure provided with this standard of protection include the following, but are not limited to:

- Member forming part of the structural frame of a building or any other beam/ column/ brace;
- Load bearing wall or load bearing part of a wall;
- Any floor;
- A compartment wall, including any structural frame members providing support or restraint to that wall;
- Structure supporting a fire resisting external wall that is required to be fire resisting to limit external fire spread.

This should be confirmed by the structural engineer.

For secondary steelwork (e.g. lift bracket connections within steel frame lift shafts, secondary steels supporting riser floors or non-fire resisting cladding brackets, balustrades etc.), care needs to be taken to ensure that secondary elements do to not create 'hotspots' where they connect to fire protected structure. For example, it may be necessary to board/paint exposed secondary structure to an extent to limit the amount of exposed hot spots at connection points. The requirement for fire resistance rating of secondary steels is to be advised by specialist paint supplier/fire resisting board manufacturer.

Special consideration should be also given to the provision of a sufficient gap between the intumescent painted element and any other elements placed in the surrounding on the painted structural element (e.g. non fire rated plasterboard placed for aesthetical reasons around the painted structural element), in order to allow for intumescent paint to expand up to the thickness required to achieve the required fire resistance. The requirement for the minimum expansion gap to be allowed for is to be advised by specialist paint supplier.

It is recommended for secondary connections (partitions, services supports etc.) to be from the concrete slab and not fire protected steel members.

It is advised to refer to available guidance on fire protection of steel structures, such as ASFP – Fire protection for structural steel in buildings (Yellow Book). The specific guidance on the junction between protected and unprotected structural steel is given in the ASFP Technical Guidance Document 8.

5.2 Compartmentation

Table 5—1 summarises the proposed compartmentation for the building. Please refer to Hawkins Brown Architect's Fire Strategy Plans (67 series) for more information regarding the compartmentation of the building. All floors in the building will be compartment floors.

Table 5—1 Summary of Compartmentation

Part of the Building	Minimum Period of Fire Resistance[1] [min]	Fire Door Performance[2] [min]
Compartment floors	90 REI	-
Compartment walls separating evacuation zones	90 REI	FD90S
Sub-compartments within clinical areas (Zone 2)	60 REI	FD60S
Protected shafts i.e. stairs, risers, lift shafts etc. that breach compartment floors	90	FD60S
Fire-fighting core	120 REI	FD60S
Life safety plant rooms	120	FD60S
Boiler rooms	90	FD90S
Plant rooms containing transformers or switchgear for equipment above low voltage	90	FD90S
Plant rooms containing transformers, switchgear or batteries for low voltage or extra-low voltage equipment	30	FD30S
Plant rooms containing air handling units	30	FD30S
Refuse storage areas	90	FD90S
Fuel storage spaces	90	FD90S
Storerooms (less than 450 m^2)	30	FD30S
Storerooms (greater than 450 m^2)	60	FD60S
Basement Corridors[4]	60	FD30S
Separation to Loading Bay	120	FD60S
Substation	120[3]	FD60S
Cross corridor doors	-	FD30S

Note 1: All fire resistance is for Integrity (E) and Insulation (I) unless stated otherwise

Note 2: Minimum fire resistance of a fire door in terms of integrity (E)

Note 3: This should be confirmed by the energy supplier as they often require FR240 for property protection and business continuity.

Note 4: In the basement, a mechanical smoke clearance system will be provided that will extract from the corridors rather than each room, see Section 7.3.3. As a result, the corridors should be fire separated from the rooms accessed off of them and the rooms themselves should be fire separated from one another such that the combined size of the compartment does not exceed the size of the largest room for which the smoke clearance system will be designed to achieve 10ACH.

5.3 Interstitial Floors

There will be two interstitial floors (referred to as ISVs - Interstitial Servicing Voids) in the building: one above the technical Spaces at Level B2 and one above the UCLH facility at Level 0. As with all spaces throughout the building, these ISVs will be provided with sprinkler protection, L1 automatic fire detection and alarm, and voice alarm throughout.

5.3.1 Above the Technical Spaces

The ISV above the Technical spaces at Level B2 contains services for the space below. Due to the number of penetrations and the need for there to be other measures for fumigation at slab level, this slab will not be a compartment floor and the ISV will therefore be part of the evacuation zone below. This evacuation zone will evacuate simultaneously upon activation of the fire alarm in this zone. The smoke ventilation (inlet and extract) will automatically activate at both levels simultaneously. The structure of the floor will remain fire resisting (only the penetrations through the floor will be unprotected).

This floor will have an independent structure from the primary structure of the rest of the building. As such, it does not necessarily need R90 fire resistance. However, the structure supporting the interstitial floor will need to be fire protected locally to at least R60.

In order to reduce the volumes for the smoke clearance systems, this ISV level will be separated into 4 zones via REI60 partitions (aligned with the ones at B2 level).

5.3.2 Above the ULCH Clinic at Level 0

The interstitial floor above the UCLH Clinic on Level 0 will be constructed as a 90 minute compartment floor/walls to ensure that the 90 minute compartmentation with adjacent compartments is maintained; this is the preferred approach rather than continuing the 90 minute compartment walls up through the interstitial floor to the Level 1 compartment floor since there are three air handling units on this floor.

This will need to be locally increased to 120 minutes where it spans above the firefighting stair discharges.

This will form a separate evacuation zone to the clinical evacuation zones.

5.4 Smoke Retarding Construction

Smoke retarding construction will be provided around the atrium on Levels 3 & 4 in order to provide a smoke reservoir. The performance specification is that the smoke retarding glazing to these areas should be capable of withstanding smoke temperatures of up to 200ºC, while maintaining their integrity against smoke ingress. It is to be agreed with the Approved Inspectors that they do not expect to see any testing data or evidence for the partitions to prove the smoke retarding construction can withstand 200ºC smoke on the basis that the following will be achieved:

- Heat strengthened laminated glass;
- Mechanically restrained/fixed;
- Gaskets and seals; and,
- Doors to be provided with self-closing devices cold brush type smoke seals and to be tightly fitted to provide a seal against smoke.

5.5 Dampers & Fire Rated Ductwork

Where ductwork connects different fire compartments, fusible link fire dampers will be provided at the compartment lines. Where a system of common ductwork has openings which connect more than one evacuation zone (or an escape route), whereby cold smoke could spread between these different zones, motorised fire and smoke dampers should be provided to prevent this.

Where a ductwork does not serve the escape route it passes through, it may be protected by a fire resisting enclosure, or, the ductwork itself should be fire-resisting.

Note, services not directly serving the fire-fighting core should not pass through any part of the fire-fighting core, including the protected route to external at ground.

In the basement, where a mechanical smoke clearance system is provided, the smoke extract and inlet ductwork breaches compartmentation and should be fire resisting to maintain compartmentation as described in BS EN 12101 (i.e. at least EI 60 minutes fire resistance from both sides, or equivalent to the fire resistance rating of any compartment boundary through which it passes, whichever is greater). Smoke control dampers should be used in this smoke clearance system. See Section 7.3.3 for more information on the basement smoke clearance system.

Please refer to code guidance and supplier's information regarding fire stopping.

5.6 Fire Stopping

Fire stopping should be in accordance with the recommendations of code guidance. Fire stopping should be provided on the line of compartment and fire resisting walls and floors where gaps exist, which could allow smoke and flames to breach the compartment wall or floor. Joints between elements that serve as a barrier to the passage of fire should be fire stopped and all openings for pipes, ducts, conduits or cables to pass through any part of an element that serves as a barrier to the passage of fire should be:

- Kept as few as possible;
- Kept as small as practicable; and,
- Fire stopped (which in the case of a flue or duct should allow for thermal movement).

Please refer to code guidance and supplier's information regarding fire stopping.

5.7 Extensive Cavities

The maximum dimensions of cavities in the non-residential areas should be limited to 20m in any direction where the surface spread of flame classification of the exposed products is Class 0 or Class 1 (national class) or Class A1 or A2-s3, d2 or B-s3,d2 or Class C-s3, d2.

If none of the above classifications can be confirmed the maximum dimension should not exceed 10m in any direction.

Services should be adequately fire stopped through cavity barriers.

5.8 Fire Doors

Fire doors should either be certified fire resisting doorsets, or door assemblies with evidence that the assembly meets the fire resistance standards listed in Table 5—1. In all cases the frame, ironmongery, vision panels, etc. should be those relevant to the fire door to be installed.

Doors in fire resisting elements should have self-closing devices unless they are to a service cupboard which is kept locked shut.

Fire doors should have been tested in accordance with BS 476-22[8] or BS EN 1634-1[9]. Where specified as smoke sealing with a suffix S or Sa, door assemblies will comply with the recommendations of BS 476-31[10] or BS EN 1634-3[11], respectively.

The requirement (in either case) is for test exposure from each side of the door separately, except in the case of lift doors which are tested from the landing side only.

Note: Both BS 476-22 and BS EN 1634-1 acknowledge that it may not always be necessary to carry out tests from both sides of a doorset. Clause 13.4 of BS EN 1634-1 gives more detailed guidance on this issue, and Annex C of the guidance sets out the rationale for that guidance. Clause 13.4 of BS EN 1634-1 should be followed regardless of whether the doorset is being classified to BS 476-22 or BS EN 1634-1.

5.9 Fire & Smoke Curtain

A fire and smoke curtain will be provided between the reception space and the discharge route of the central protected stair on the ground floor. The fire curtain should be provided with smoke seals and be designed in accordance with BS 8524-1&2 (including all annexes).

The fire curtain should meet the following criteria:

- Must achieve 90-minutes integrity and radiation (EW) as well as a smoke rating.
- Will deploy on activation of the fire alarm in either adjacent evacuation zone.
- There should be notification mechanisms in place to warn:
    - Occupants when the curtain is descending (visually and by sound; flashing beacons + alarm)
    - Staff when the path of the fire curtain is obstructed (this can be done by installing a beam detection that detects when there is an object under the fire curtain that would block its descent).
- The curtain needs to be fail safe in the closed position, or be provided with dual power supply.
- There should be manual override buttons to re-open the curtains if necessary.

[8] BS 476–22:1978 Fire rests of building materials and structures. Part 22 – Method for determination of the fire resistance of non-loadbearing elements of construction.
[9] BS EN 1634-1:2014 Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware. Part 1 – Fire resistance test for door and shutter assemblies and openable windows (+A1:2018) (Incorporating corrigendum August 2018).
[10] BS 476–31.1:1983 Fire tests on building materials and structures. Part 31 – Methods for measuring smoke penetration through doorsets and shutter assemblies. Method of measurement under ambient temperature conditions.
[11] BS EN 1634-3:2004 Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware. Part 3 – Smoke control test for door and shutter assemblies.

6 External Fire Spread

6.1 Building Separation & Maximum unprotected Areas

The potential for fire spread between buildings has been assessed using the Enclosing Rectangle Tables Method from BRE 187, *External fire spread: building separation and boundary distances, methodology for two high risk façades*. This methodology allows the maximum unprotected area of the building façade to be calculated. The building is sprinkler protected in accordance with BS EN 12845, which effectively halves the required boundary distance. The floors are constructed as compartment floors, thus the size of the enclosing rectangle has been limited to the height of a single storey.

Figure 6—1 shows the relevant boundaries used in this external fire spread assessment.

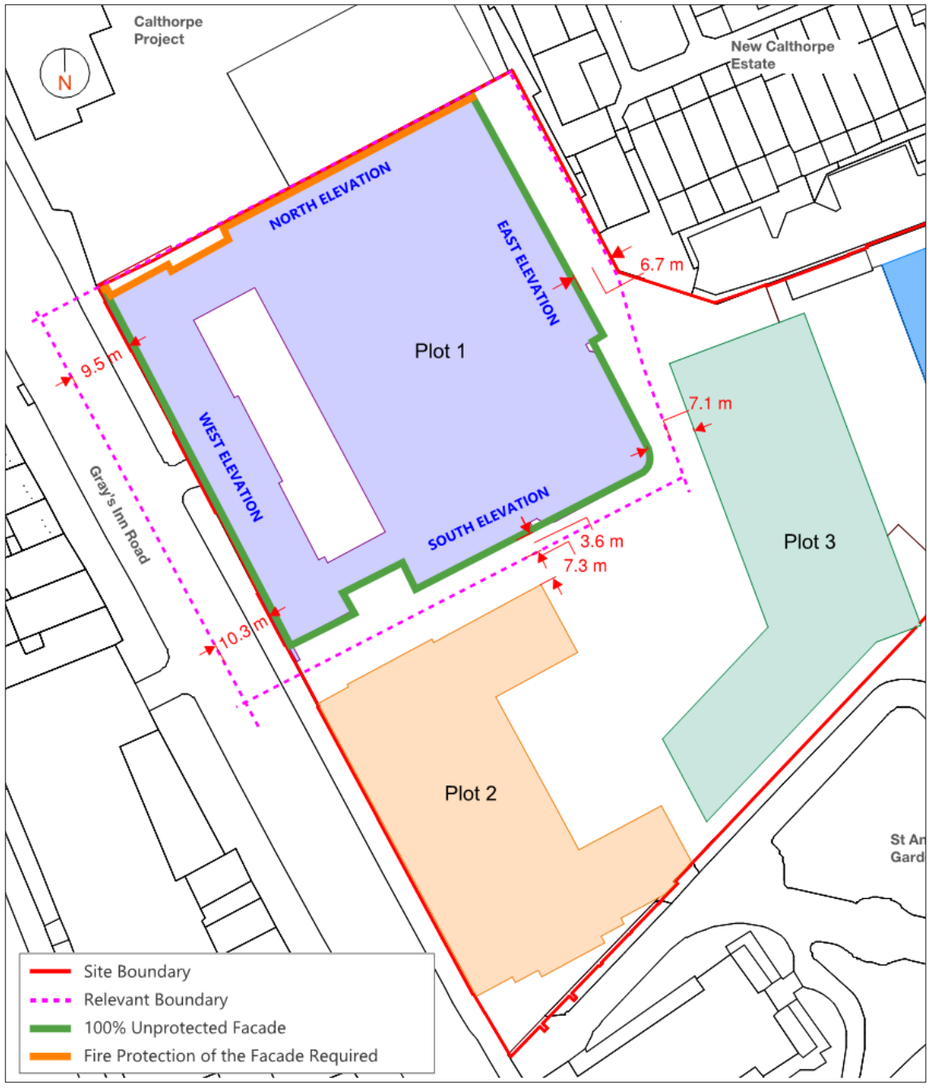


Figure 6—1 Relevant Boundary Distances

6.1.1 North Elevation

The North elevation is within 1 m of the site boundary. In order to comply with code guidance, it should be **100% protected**. Therefore, the entire façade should be provided with 90 minutes fire resistance (integrity and insulation) from both sides (inside-out and outside in).

Levels 3 and 4 are set back from the boundary by 7.5m and can be **100% unprotected**.

The adjacent site is a playing field which is part of the Calthorpe Project. If any of this façade is to be unprotected, a legal agreement should be in place to ensure there is no construction within a notional boundary, and that this is discussed and agreed with all stakeholders. Note, the notional boundary would need to be 3.20 m away from the building in order for the façade to be 100% unprotected. This is based upon an enclosing rectangle of 4.5 m x 59.3 m, an office type usage and sprinkler protection.

6.1.2 East Elevation

Based on an enclosing rectangle of 4.5 m x 59 m, an office/assembly type usage, sprinkler protection, and a boundary distance of 3.5 m, **100% of the façade can be unprotected**. The relevant boundary is the notional boundary halfway between Plot 1 and Plot 3, since this is more onerous than the distance to the site boundary.

6.1.3 South Elevation

Based on an enclosing rectangle of 4.5 m x 49.1 m, an office/assembly type usage, sprinkler protection, and a boundary distance of 3.6 m, **100% of the façade can be unprotected**. The relevant boundary is the notional boundary halfway between Plot 1 and Plot 2.

6.1.4 West Elevation

Based on an enclosing rectangle of 6.0 m x 53.4 m, an office/assembly type usage, sprinkler protection, and a boundary distance of 9.5 m, **100% of the façade can be unprotected**. The relevant boundary is halfway across Grays Inn Road.

6.2 External Faces of the Building

6.2.1 Code Guidance

External walls should be constructed using material that does not support fire spread. Flame spread over or within an external wall construction should be controlled to avoid creating a route for rapid fire spread bypassing compartment floors or walls.

It is recommended that combustible materials should be avoided in façade build ups, cladding systems and extensive cavities. In buildings with a storey 18m or more above ground level, all key components including external facing materials of the external wall build-up (both above and below 18m) should be of limited combustibility.

The code guidance given in the BS 9999 and ADB states that the external walls should either meet the performance criteria given in BRE Report BR 135 for cladding systems or meet the following recommendations:

- The external wall surfaces should meet the provisions of Figure 47 of BS 9999;
- In buildings with a storey 18m or more above ground level, any insulation product, filler material (not including gaskets, sealers and similar), etc. used in the external wall construction should be of limited combustibility. This restriction does not apply to masonry cavity wall construction that conforms to Figure 36 of BS 9999.
- Cavity barriers should be provided in accordance with Clause 33 of BS 9999 as described in Section 6.2.2 below.

Please note that the Department for Communities and Local Government (DCLG) and the Building Control Alliance (BCA) have interpreted item 2 above to apply to all key components of the façade including façade facing materials of the external envelope build up and not just insulation. The UCL Fire Officer also recommended the use of non-combustible materials within the façade build-ups.

Non-combustible materials will therefore be used for the key components of the facades.

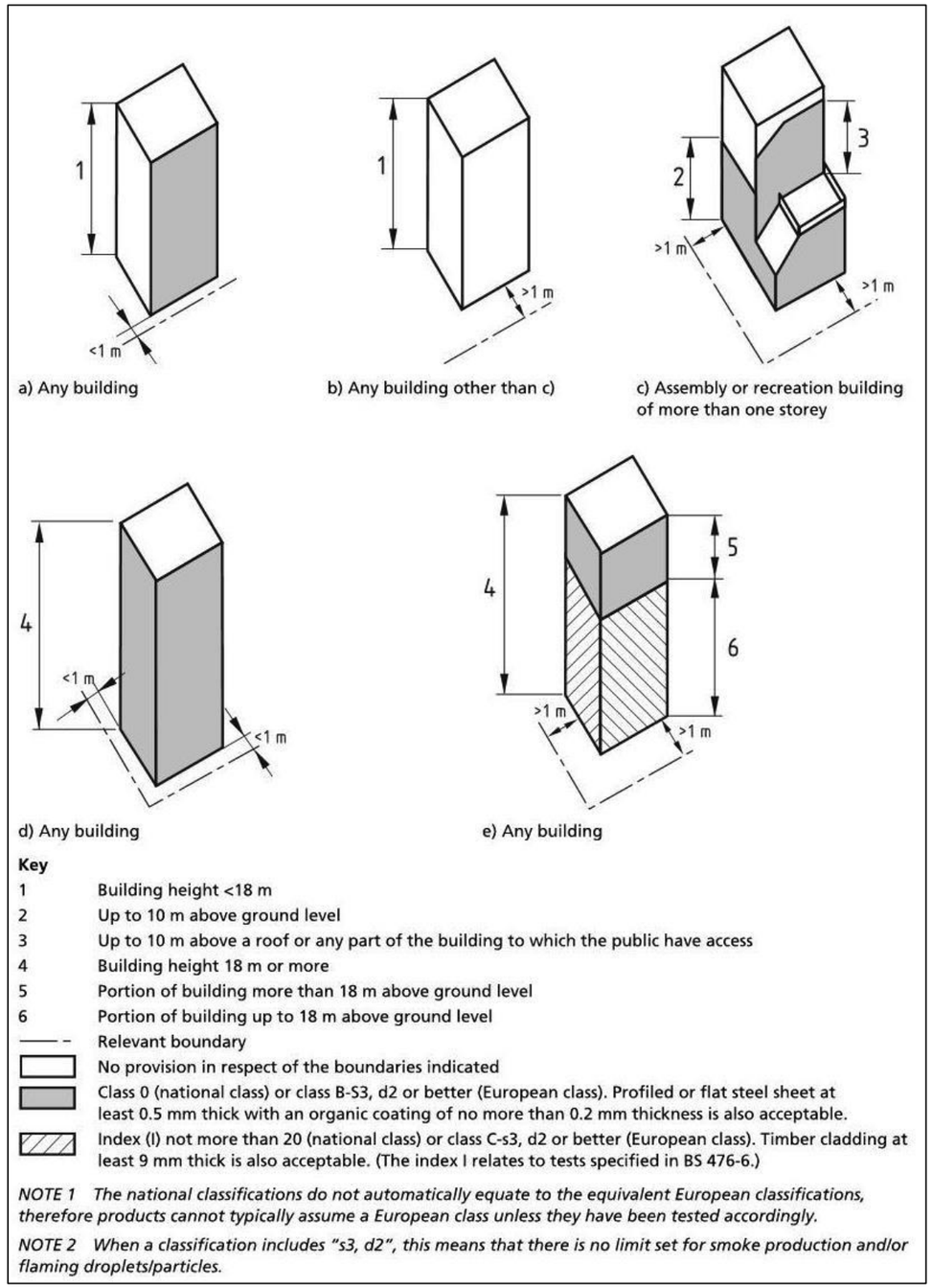


Figure 6—2 Figure 45 of BS 9999 – Provisions for External Surfaces of Walls

6.2.2 Cavity Barriers

Cavity barriers should be provided to close the edge of cavities including around openings. Cavity barriers should also be provided:

- At the junction between an external cavity wall (except where the cavity wall conforms to Figure 36 of BS 9999) and every compartment floor and compartment wall;
- At the junction between an internal cavity wall (except where the cavity wall conforms to Figure 36 of BS 9999) and every compartment floor, compartment wall, or other wall or door assembly which forms a fire resisting barrier. Provision of cavity barriers is shown in Figure 35 of BS 9999; and,
- Extensive cavities as per BS 9999 recommendations and Figure 35 of BS 9999.

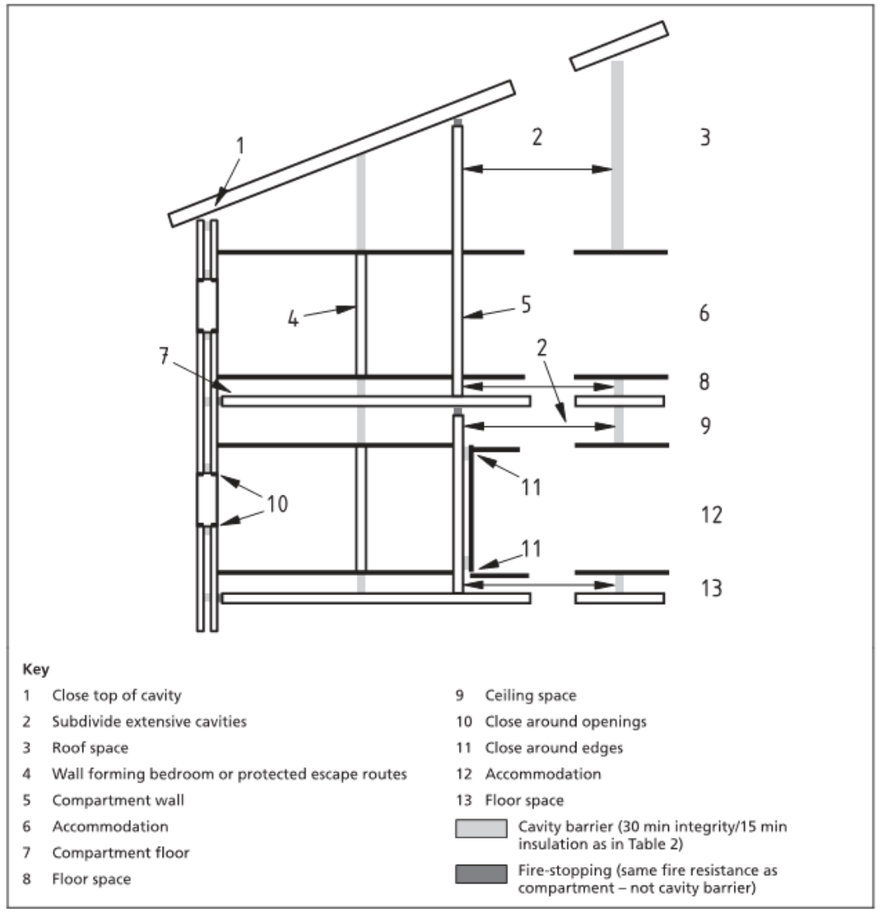


Figure 6—3 Figure 35 of BS 9999 – Provisions for Cavity Barriers – Extract from BS 9999

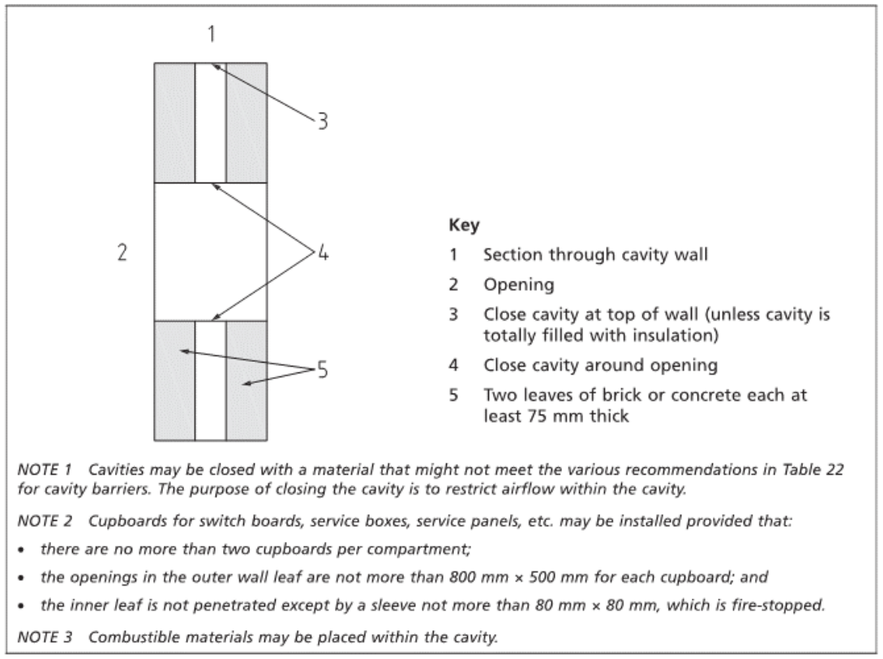


Figure 6—4 Figure 36 of BS 9999 – Cavity Wall Excluded from Provisions for Cavity Barriers – Extract from BS 9999

6.2.3 Roof Coverings

For restriction of fire spread over roofs the properties of a roof covering are in relevance if:

1. If the roof is close enough to a boundary to be a risk of ignition from a fire in other buildings; and
2. In the vicinity of a compartment wall, to avoid fire spread between compartments via a roof covering.

It is therefore recommended for roof coverings to achieve AA, AB, or AC when tested in accordance with BS 476-3[12], or, B_{roof} (t4) when tested in accordance with BS EN 13501-5[13], or be in accordance with the European Decision 2000/553/EC.

It should be noted that if the above performances are to be met using natural growing medium, guidance given by DCLG on green/brown roofs[14] should be used:

- In order for green roofs to comply with the external fire spread requirement of the Building Regulations 2010, the DCLG recommend that for all types of green roof the depth of the growing layer should be a minimum of 80 mm and the organic content should not exceed 50%. In addition they state that provided roof covering has the designation AA, AB, or AC (National class) or Broof (t4) (European class) then the testing has shown that the presence of a green roof above the roof covering should not affect the designation and the minimum distance from the relevant boundary given in Table 16 of Approved Document B are still applicable.
- In order for green roofs to comply with the internal fire spread requirement of the Building Regulations 2010, the DCLG recommend that that recommendations of existing guidance are followed and that fire breaks are provided in 1 m strips every 40 m across extensive green roofs.

[12] BS 476-3:2004 Fire tests on building materials and structures – Part 3: Classification and method of test for external fire exposure to roofs
[13] BS EN 13501-5:2016 Fire classification of construction products and building elements – Part 5: Classification using data from external fire exposure to roof tests

[14] Fire Performance of Green Roofs and Walls. Department for Communities and Local Government, August 2013.

7 Active Fire Safety Systems

7.1 Automatic Fire Suppression Systems

7.1.1 Water Suppression

The UCL IoN/DRI building will have a sprinkler protection system designed to meet the recommendations of BS EN 12845:2015[15]. It will include the necessary design features to meet the 'life safety' recommendations of the standard (i.e. Annex F: Additional measures to improve system reliability and availability). The sprinkler system has been designed for an OH3 ordinary hazard group, due to the hazard classification of the plant rooms within the building. The sprinkler tanks and pumps have been sized accordingly.

Note, the option of sharing the sprinkler tanks and pumps in this building (Plot 1) with the two other potential buildings on the Eastman Dental Hospital Site (Plots 2 and 3) has been considered. In the future, the sprinkler tanks in the basement could be shared with the other plots provided they fall into the same, or a less onerous, hazard group, however, additional pumps may need to be provided.

It is currently proposed that the MRI rooms in the basement of the building be sprinkler protected using non-ferromagnetic pipes and that the sprinklers in these spaces will be pre-action to reduce the likelihood of water damage from accidental discharge.

In accordance with BS EN 12845, where voids exceed 800 mm in height, the sprinkler system will be extended to cover these spaces. The two ISVs will be fully sprinkler protected.

Following discussions with an initial meeting with the building's insurers (Zurich) it was made clear that they expect compliance with the Loss Prevention Council (LPC) rules for property protection purposes. It is strongly recommended for these to be allowed for within the design of the sprinkler system.

Sprinkler plant room will be located within B2 and accessed off the firefighting core through a 120 minutes fire resisting corridor.

7.1.1.1 B2 Technical Spaces

At this Level it is recommended that the suppression system be pre-action sprinklers. This is intended to restrict losses to equipment in the event of accidental activation. This type of system is also proposed to be installed in LV switch rooms and Client defined "high value equipment" rooms.

7.1.1.2 Goods Yard

The Goods Yard is an external area to the rear (East) of the building. Although partially covered by a slab, the East side of the Goods Yard is open to external (similar to an external under croft). In the Goods Yard there are parking spaces for three vehicles taking up an area of approximately 91 m^2. Due to the height clearance and the location of the fire separated stores within Goods Yard, it would not be possible for these trucks to park elsewhere in the Goods Yard. Also, the aforementioned fire separated stores within the Goods Yard plus the stores on Level B1 of the building mean that the Goods Yard would not be used for storage; it is a transient space for the delivery and removal of supplies and waste, respectively. It is proposed that, for property protection purposes, the sprinkler system be extended to cover the parking spaces only. Note, careful consideration should be given to the location of the sprinkler heads; they should be located between the vehicles rather than above them in order to limit fire spread from vehicle to vehicle.

7.1.2 Gas Suppression

The MER Room at B1 will be provided with a local gas suppression system, rather than an automatic water suppression system, for property protection purposes.

7.1.3 Fume Cupboards

On request from the UCL Fire Officer, all fume cupboards in the building will be provided with a localised dry powder suppression system in accordance with UCL Technical Note 038A.

7.2 Automatic Detection and Alarm System

The building will be provided with an automatic fire detection and alarm system with manual call points sited adjacent to exit doors. Due to the presence of the atrium, the minimum required system is an L2 system. However, an L1(M) fire detection system and a Type V4 voice alarm system will be provided. These systems provide a clear uplift in the fire alarm and detection system, therefore, as allowed for in BS 9999, the minimum required door and stair widths per person have been decreased by 15% and the travel distances have been increased by 15%. This is only applicable in non-clinical areas.

The L1 fire detection system should be designed in accordance with BS 5839-1[16] and the type V4 voice alarm system should be designed in accordance with BS 5839-8[17] . These systems should also be designed in accordance with UCL Technical Notes 054 and 059.

All fire alarm signals will be relayed to UCL's 24 hr security centre/building.

A Type V4 voice alarm system will, upon activation of the fire detection and fire alarm system, automatically sound pre-programmed evacuation messages. The system may also have facilities for the manual selection and initiation of non-fire emergency messages, provided that these are automatically overridden by messages initiated form the fire detection and fire alarm system.

While the aim of the L1 (M) detection system is to provide the most reliable detection system, it is preferable that the building would not be evacuated on false alarms due to the nature of the work undertaken, particularly on the B2 level where technical work is being undertaken. As such the detection and alarm system will operate on a 'double knock' principle whereby an investigation delay period is incorporated when the warning of a fire is from a single, automatic smoke detector. During the investigation period staff will be able to cancel the warning so that an evacuation signal is not given. The length of this delay will need to be reviewed and agreed with all stakeholders in order to reduce disruption during operation. The system should be put on full alert if:

- The alarm is confirmed as a real fire by the person investigating;
- The alarm is not cancelled during the investigation period;
- If a second detector is activated; or,
- If a manual call point is activated.

Manual call points will be located by the escape stairs, final exits and also the entrance to protected escape routes in accordance with BS 5839-1.

The detection and alarm system should also comply with UCL Technical Note 059 at B2 level.

[15] BS EN 12845:2015 Fixed firefighting systems – Automatic sprinkler systems – Design, installation and maintenance
[16] BS 5839-1:2017 Fire detection and fire alarm systems for buildings. Part 1: Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises
[17] BS 5839-8:2013 Fire detection and fire alarm systems for buildings – Part 8: Code of practice for the design installation, commissioning and maintenance of voice alarm systems

Visual alarms meeting BS EN 54-23:2010[18] should be provided in the following locations:

- In all areas where the level of noise might cover the alarm sounders (e.g. labs, plant rooms etc.);
- In all areas where audible alarms are not acceptable (e.g. terraces etc.);
- In all disabled facilities (e.g. WCs, showers, etc.); and
- In all areas where a main fire panel is located, in order to help locate it.

Other requirements in the UCL Fire Technical Note 054 (i.e. sounds levels) should be met unless otherwise agreed with the UCL Fire Officer.

The fire alarm system will be open protocol and careful consideration will be given to the type of detection in spaces where point type detection may not be suitable due to ceiling height (i.e. in the atrium).

Where voids exceed 800 mm in height automatic smoke detection should be provided. The two ISVs in the building will also be covered by the fire detection system just like all other parts of the building.

It is recommended for the main fire panel to be provided within the firefighting core access corridor as per BS 5839-1. As per UCL recommendation, a repeater panel should be provided near the main reception space.

7.3 Smoke Management Systems

7.3.1 Fire-fighting Core

The fire-fighting lobbies will be smoke ventilated using a mechanical smoke shaft (typically 0.6-0.8 m^2 in area, to be confirmed by the specialist contractor), designed in accordance with BS EN 12101[19].

As per BS 9999 clause 27.1.3, the design of the proposed mechanical smoke ventilation system should limit pressure differentials so that door opening forces do not exceed 100 N at the door handle when the system is in operation, taking door closer forces into account where applicable. The primary objective of the system should be to maintain smoke-free conditions in the staircase during both means of escape and fire-fighting operations. The ventilation rate should be decided through an assessment of any specific risks within the building and should be validated through CFD analysis or mathematical calculation.

Within the modelling process, the following criteria should be considered:

1. fire locations (both close to and far from the point of extract.
2. pressure differences across the lobby door with a variety of extraction rates, where variable extract rates are used.
3. fire pressure and increasing fire growth.
4. glazing failure temperatures (where relevant).
5. a variety of door opening sizes for the stair or lobby door (when closed, partially open and fully open).

A separate CFD scenario will also be carried out to demonstrate that the basement smoke clearance system will not adversely affect the performance of the mechanical ventilation systems protecting the two firefighting shafts.

A head of stair AOV of at least 1 m^2 will be provided to the fire-fighting stairs.

7.3.2 Natural Atrium Smoke Clearance

Natural ventilation will be provided to the atrium as recommended by BS 9999 and BS EN 12101. The amount of natural ventilation to be provided to the head of the atrium is based on 10% of the maximum plan area of the largest void. The void area is largest on Levels 1 and 2, where it is approximately 40 m^2. Therefore at least 4 m^2 of natural ventilation will be provided. These vents will open automatically upon detection. These will be provided at high level within the smoke reservoir, on the elevation facing the courtyard.

The inlet will be provided at ground by fire service manually opening the main entrance doors.

A manual override for fire service should be available near the main entrance at the base of the atrium.

7.3.3 Basement Smoke Clearance

Smoke clearance systems should be provided to all basements deeper than 3 m to help with Fire Brigade operations. This can be achieved mechanically by providing 10 air changes per hour to all rooms, or naturally, by providing a vent to outside at high level. All smoke exhaust points should be located at least 3 m away from escape routes and assembly points.

A mechanical smoke extract and supply system will be provided capable of achieving 10 air changes per hour in each of the main spaces (e.g. main corridors/plants). Smaller rooms that open directly into these larger spaces will not be individually smoke vented but will be vented indirectly by the fire brigade manually opening a single door onto these vented main spaces. Therefore, the mechanical extract and supply can be sized on 10 ACH for the corridor plus the largest room accessed off of it. Note, following discussions with Bureau Veritas, it has been recommended for the dual inlet points to be provided in corridors serving the imaging floor.

Additional compartmentation will be provided between the rooms in the basement levels to ensure that only one room accessed off the corridor will need to be ventilated. The corridor itself is also protected providing a protected route to the room of fire origin for the fire service personnel. This would help to contain the fire to a single room, and the fire will be controlled by the sprinkler system. This approach reduces the complexity of the basement smoke clearance system, while affording significant additional protection to firefighters (corridors + rooms are fire protected).

In the shared technology space at B1 level (please refer to the Hawkins Brown Fire Strategy Drawings) it is proposed that, in order to avoid fire protecting the walls and doors between the corridor and the rooms accessed off of it, the entire space be treated as a single room with the 10ACH being achieved for its entire volume.

The entire smoke ventilation system – inlets and extracts (ductworks, fans, smoke control dampers etc.) should be designed in accordance with the relevant parts of BS EN 12101[20]. This has a significant impact on the performance of the system and is a requirement under the EU (harmonised product standards for ductwork etc do exist and should take precedence under Regulations 7). Any dispensation should be agreed with the Approved Inspector.

The Alexandra Wing at B1 level comprises low risk plant rooms (air handling units), and it is not proposed to provide mechanical smoke clearance. These areas are facing two external light wells and could be naturally ventilated manually if required.

In the technical spaces (B2 level), the ISV is not fire separated from the rooms below. Therefore, the ISV and the rooms below will need to be ventilated at the same time. To reduce the volume of the space for which the 10ACH needs to be provided, both levels will be separated to form 4 fire compartments. If a fire occurs in one of these 4 compartments, smoke extraction (and inlet) will be provided from the circulation spaces of the Technical Spaces in the fire affected compartment, and from the section of the ISV above, simultaneously. Each corridor ventilation system will be sized at 10 ACH including all adjacent rooms.

[18] BS EN 54-23:2010 Fire detection and fire alarm systems. Fire alarm devices – visual alarm devices
[19] BS EN 12101 Smoke and heat control systems
[20] BS EN 12101 Smoke and heat control systems

7.3.4 Goods Yard Smoke Clearance

As mentioned above, the Goods Yard is an external area to the rear (East) of the building, partially covered by a slab. BS 9999 recommends that in enclosed loading docks exceeding 200 m^2 should be provided with a system of smoke and heat ventilation. It should be noted that the Goods Yard is not fully enclosed (the East side of the yard is permanently open to external), and the parking zone is well below 200m^2 (i.e. approximately 100m^2), and therefore does not require smoke ventilation to comply with code guidance.

Despite this, clearance of heat and smoke has been considered: typically, natural smoke outlets should be 2.5% of the floor area and be as evenly distributed as possible around the perimeter of the building. Considering the loading area of the Goods Yard, as opposed to the transient circulation space between the parking positions and the entrance to the building as well as the loading area, the floor area is less than 200 m^2. The open East side of the Goods Yard, which is approximately 14 m x 3 m, gives a free area of approximately 21% of this floor area. This is considered to be sufficient natural ventilation for clearance of smoke and heat from the Goods Yard.

In addition, sprinklers have been extended to cover the loading bay.

7.4 Emergency Lighting

Emergency lighting should be designed in accordance with BS 5266-1[21] and UCL Technical Note 020. All escape routes should have adequate artificial lighting and should be on a separate circuit from that supplying any other part of the escape route. This should include external lighting where needed to reach a place of relative safety.

Emergency lighting should also comply with UCL Technical Note 059.

7.5 Power Supply

A secondary power supply will be provided to all life safety systems. The back-up power supply should be provided via diverse routes and the routes of supply fire separated from each other. Secondary and life-safety power supplies should be designed in accordance with BS 8519[22]. This British Standard recommends that both primary and secondary supplies to be via fire rated cables from the plant enclosure to the life safety systems and be diverse.

The secondary power supply will be achieved via a generator located adjacent to the East façade of the building at B1 level accessed from the loading bay.

7.6 Emergency Signage

Escape routes should be marked with suitable exit signage. An exit sign will mark every doorway or other exit providing access to a means of escape. The position of such signs will be agreed between the architect and the fire service and will then be reviewed as part of the ongoing RRO fire risk assessments.

Exit & safety signs will comply with BS 5499-10[23], BS EN ISO 7010[24], BS ISO 3864-1[25] and UCL Technical Note 090.

7.7 Fuel Store

A Generator Fuel store is located on Level B1 adjacent to, and accessed from, the external loading bay. This should be designed in accordance with UCL Technical Note 109. It is understood following conversations with Bureau Veritas that if this store is to contain more than 5000 litres of fuel, an automatic foam suppression system will need to be provided. This needs to be reviewed as the design progresses.

[21] BS 5266-1:2016 Emergency lighting – Part 1: Code of practice for the emergency lighting of premises
[22] BS 8519:2010 Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications – Code of practice
[23] BS 5499-10:2014 Guidance for the selection and use of safety signs and fire safety notices.
[24] BS EN ISO 7010:2012 +A7:2017 Graphical symbols – Safety colours and safety signs – registered safety signs
[25] BS ISO 3864-1:2011 Graphical symbols – Safety colours and safety signs. Part 1: Design principles for safety signs and safety markings.

8 Fire Service Access and Facilities

8.1 Fire Service Access

Fire Service vehicle access to the site will be provided via Grays Inn Road. The access route will conform to the dimensions in Table 8—1. Turning facilities will be provided since the dead-end distance is in excess of 20 m. Fire-fighting access to the fire-fighting core is at the rear of the building above the loading bay. The parking position will be within 18 m of the dry riser inlet, which will be adjacent to the protected entrance to the fire-fighting core.

Fire service vehicle tracking has been confirmed by the transport consultants and is shown on the ground floor fire plan produced by Hawkins Brown.

Figure 8—1 Fire Service Access

Table 8—1 Typical Vehicle Access Route Dimensions (from LFB GN 29 note)

Appliance Type	Min. with of road between kerbs [m]	Min. width of gateways [m]	Min. turning circle between kerbs [m]	Min. turning circle between walls [m]	Min. clearance height [m]	Min. Carrying capacity [t]
Pump	3.7	3.1	16.8	19.2	3.7	14.0

8.2 Fire-fighting Core

It is proposed that two fire-fighting shafts be provided on the basis that the floor area of the building exceeds 900 m^2 and as per the local FRS request. The prescriptive guidance recommends that two be provided in this situation. However, a single fire-fighting core is considered to be reasonable on the basis that:

The fire-fighting shafts will be provided with the following facilities:

- A fire-fighting stair;
- Fire-fighting lobbies (each with a fire main and smoke ventilation); and,
- A fire-fighting lift.

The two proposed firefighting shafts are as shown in Figure 8—1.

The central firefighting shafts serves all building levels including the roof. The south firefighting shaft serves levels B2 to L2.

8.2.1 Fire Main

A dry rising and falling main will be provided in the fire-fighting lobbies, which will serve all levels served by the relevant firefighting shaft. The dry riser inlet will be adjacent to the protected entrances to the fire-fighting cores as shown in Figure 8—1.

8.2.2 Fire-fighting Lobbies

The fire-fighting lobbies will be mechanically smoke vented. No risers, except those essential to the function of the fire-fighting core (e.g. the smoke shaft and the riser containing the fire main) should be accessible from the fire-fighting lobbies. It is proposed to provide a fire telephone system within each of the fire-fighting lobbies designed in accordance with BS 5839-9.

8.2.3 Fire-fighting Lift

The fire-fighting lift shall be designed in accordance with BS EN 81-72[26] and incorporate a lift communication system. There should be sufficient provision to minimise water ingress into the fire-fighting lift shaft. The fire-fighting lift should not be used for transporting goods at any time, as such a separate goods lift has been provided.

8.3 Hose Coverage

As the building is fully sprinkler protected all parts of the floor plan should be within 60 m of the dry riser outlets in the fire-fighting core, measured on a route suitable for laying hose. Figure 8—2 to Figure 8—4 show the hose coverage on different typical levels throughout the building.

Due to a shortfall within the Alexandra Wing (ca. 10m), a second dry riser will be provided within the South firefighting stair in the Alexandra Wing.

[26] BS EN 81-72:2015 Safety rules for the construction and installation of lifts – Particular applications for passenger and good passenger lifts – Part 72: Firefighters lifts (incorporating corrigendum July 2015).

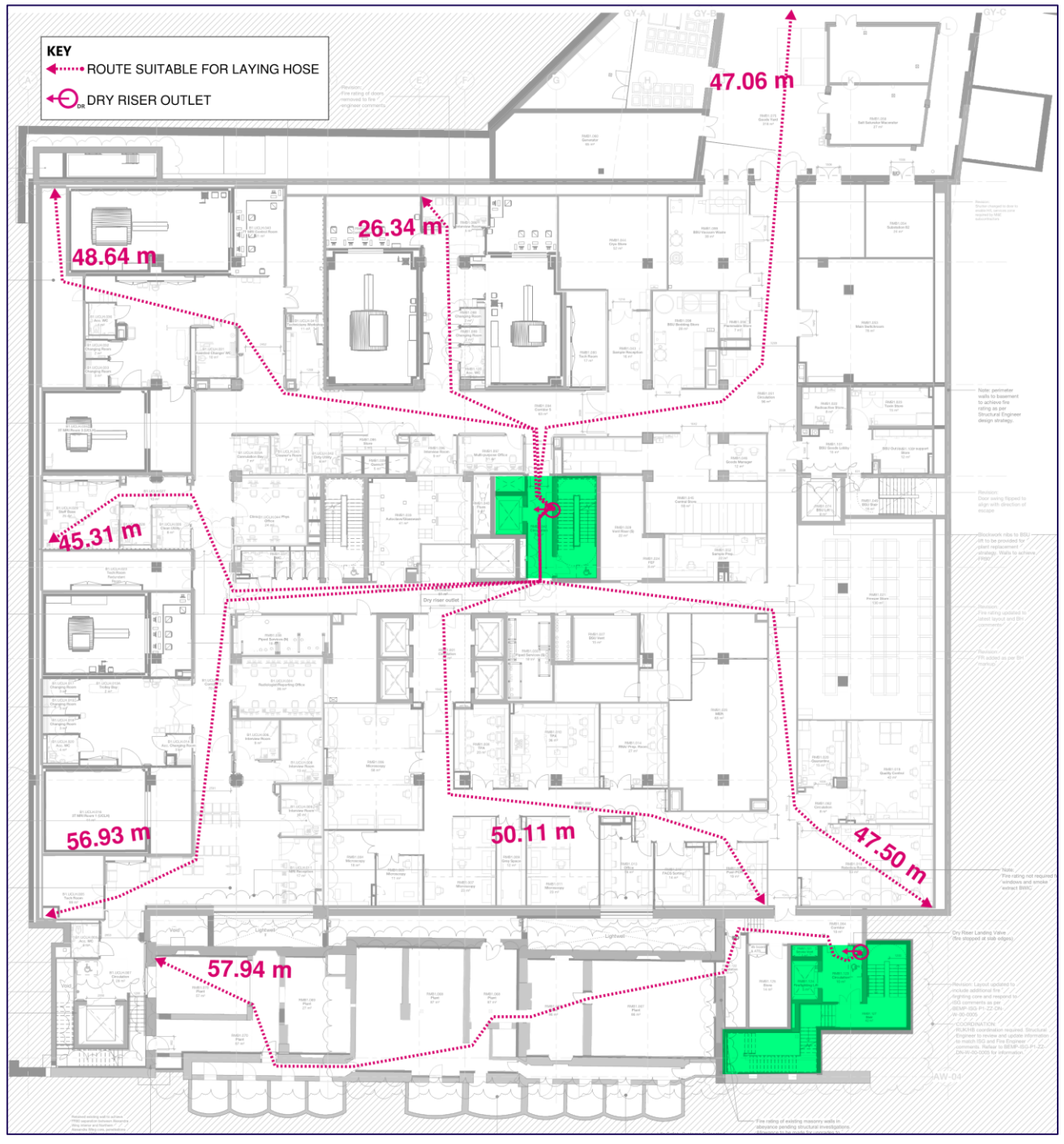


Figure 8—2 Hose Coverage – Level B1

Figure 8—3 Hose Coverage – Levels 1 & 2

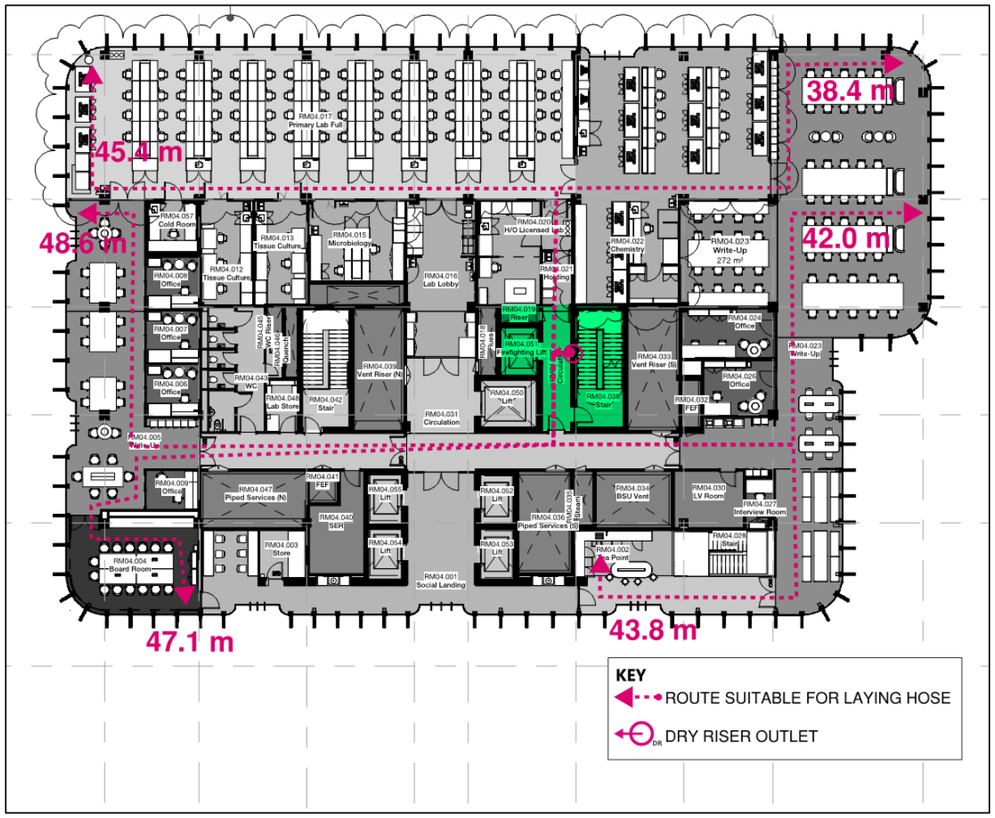


Figure 8—4 Hose Coverage – Level 3 & 4

8.4 Fire Hydrants

A fire hydrant should be located within 90 m of the dry riser inlet and should not be within 6 m of any building. It is therefore proposed for a new hydrant to be provided near the turning position and near the central firefighting core access of Plot 1. Please see Figure 8—1.

Appendix A External Fire Spread Calculations

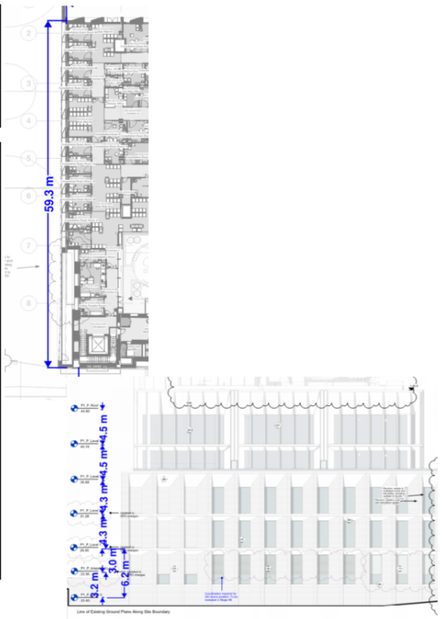
BUROHAPPOLD ENGINEERING				
	Project	UCL IoN / DRI	Sheet No	1
	Area of Project	UCL IoN / DRI	Revision	B
	Elevation Description	North Elevation	Prepared by	JDH
			Checked by	BD

Design Assumptions
1. In accordance to BR187 - 2014 using the Enclosing Rectangle Method
2. If sprinklers are taken into account, unprotected area or boundary distance is doubled,

○ Calculate allowable boundary distance
● Calculate allowable unprotected area

Input		
Building purpose *for Shop and commercial, Industrial, Storage or Other non-residential purposes enter* ***1*** *for Residential, Office or Assembly and recreational purposes enter* ***2***	2	
Is building sprinklered? *Enter* ***Y*** *if yes and* ***N*** *if No*	Y	
Height of enclosing rectangle	4.5	(m)
Width of enclosing rectangle	59.3	(m)
Assumed unprotected area	266.85	(m^2)

Allowable boundary distance		
Tables Method	3.20	(m)
Calculation Method	3.58	(m)



BUROHAPPOLD ENGINEERING				
	Project	UCL IoN / DRI	Sheet No	2
	Area of Project	UCL IoN / DRI	Revision	B
	Elevation Description	North Elevation Level 4	Prepared by	JDH
			Checked by	BD

Design Assumptions
1. In accordance to BR187 - 2014 using the Enclosing Rectangle Method
2. If sprinklers are taken into account, unprotected area or boundary distance is doubled,

○ Calculate allowable boundary distance
● Calculate allowable unprotected area

Input		
Building purpose *for Shop and commercial, Industrial, Storage or Other non-residential purposes enter* ***1*** *for Residential, Office or Assembly and recreational purposes enter* ***2***	2	
Is building sprinklered? *Enter* ***Y*** *if yes and* ***N*** *if No*	Y	
Height of enclosing rectangle	4.5	(m)
Width of enclosing rectangle	33.7	(m)
Distance to the boundary	7.4	(m)

Allowable percentage and area of façade unprotected			
Tables Method	100%	152	(m^2)
Calculation Method	100%	152	(m^2)

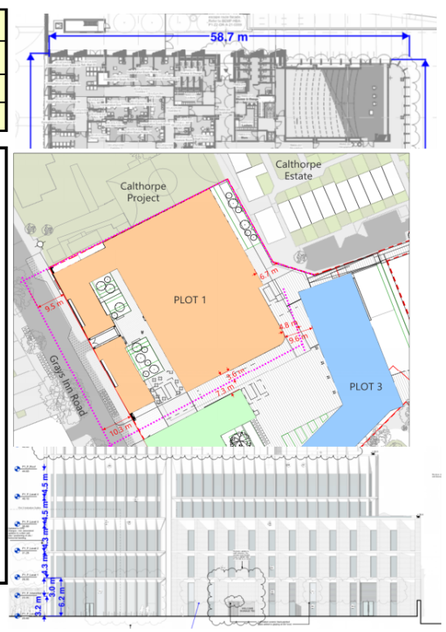
BUROHAPPOLD ENGINEERING				
	Project	UCL IoN / DRI	Sheet No	3
	Area of Project	UCL IoN / DRI	Revision	B
	Elevation Description	East Elevation	Prepared by	JDH
			Checked by	BD

Design Assumptions
1. In accordance to BR187 - 2014 using the Enclosing Rectangle Method
2. If sprinklers are taken into account, unprotected area or boundary distance is doubled,

○ Calculate allowable boundary distance
● Calculate allowable unprotected area

Input		
Building purpose *for Shop and commercial, Industrial, Storage or Other non-residential purposes enter* ***1*** *for Residential, Office or Assembly and recreational purposes enter* ***2***	2	
Is building sprinklered? *Enter* ***Y*** *if yes and* ***N*** *if No*	Y	
Height of enclosing rectangle	4.5	(m)
Width of enclosing rectangle	59	(m)
Distance to the boundary	4.8	(m)

Allowable percentage and area of façade unprotected			
Tables Method	100%	266	(m^2)
Calculation Method	100%	266	(m^2)



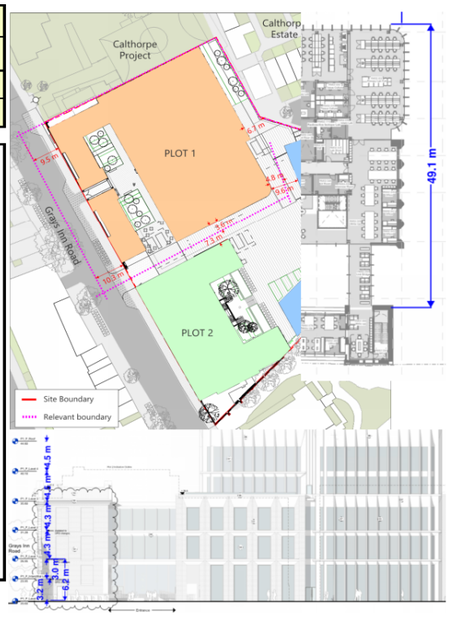
BUROHAPPOLD ENGINEERING				
	Project	UCL IoN / DRI	Sheet No	4
	Area of Project	UCL IoN / DRI	Revision	B
	Elevation Description	South Elevation	Prepared by	JDH
			Checked by	BD

Design Assumptions
1. In accordance to BR187 - 2014 using the Enclosing Rectangle Method
2. If sprinklers are taken into account, unprotected area or boundary distance is doubled,

○ Calculate allowable boundary distance
● Calculate allowable unprotected area

Input		
Building purpose *for Shop and commercial, Industrial, Storage or Other non-residential purposes enter* ***1*** *for Residential, Office or Assembly and recreational purposes enter* ***2***	2	
Is building sprinklered? *Enter* ***Y*** *if yes and* ***N*** *if No*	Y	
Height of enclosing rectangle	4.5	(m)
Width of enclosing rectangle	49.1	(m)
Distance to the boundary	3.6	(m)

Allowable percentage and area of façade unprotected			
Tables Method	100%	221	(m^2)
Calculation Method	100%	221	(m^2)



BUROHAPPOLD ENGINEERING				
	Project	UCL IoN / DRI	Sheet No	5
	Area of Project	UCL IoN / DRI	Revision	B
	Elevation Description	West Elevation	Prepared by	JDH
			Checked by	BD

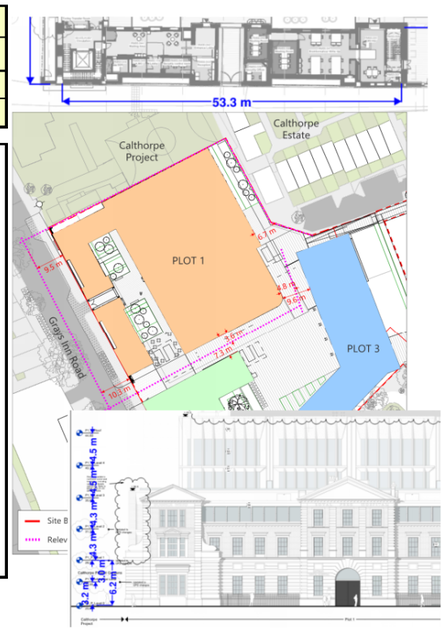
Design Assumptions

1. In accordance to BR187 - 2014 using the Enclosing Rectangle Method
2. If sprinklers are taken into account, unprotected area or boundary distance is doubled,

- Calculate allowable boundary distance
- Calculate allowable unprotected area

Input		
Building purpose *for Shop and commercial, Industrial, Storage or Other non-residential purposes enter **1*** *for Residential, Office or Assembly and recreational purposes enter **2***	2	
Is building sprinklered? *Enter **Y** if yes and **N** if No*	Y	
Height of enclosing rectangle	6.2	(m)
Width of enclosing rectangle	53.5	(m)
Distance to the boundary	9.5	(m)

Allowable percentage and area of façade unprotected			
Tables Method	100%	332	(m^2)
Calculation Method	100%	332	(m^2)



Appendix B Management Levels

Introduction

In order to ensure that there is a high standard of fire and life safety within the building it is proposed to adopt a number of active and passive design measures. These design measures are described within this document and include, but are not limited to the following:

- Automatic Fire Detection and Alarm (AFD) throughout to provide the earliest warning in event of fire;
- Enhanced compartmentation to high risk rooms, and all floors to ensure a fire is contained;
- Smoke clearance to the atrium;
- Voice Alarm;
- The provision of adequate number and location of suitable hand held fire extinguisher for use by trained staff;
- The provision of single full firefighting core with dry rising main, suitably ventilated smoke lobbies, and firefighting lifts and an additional dry riser within protected stair; and.
- A full sprinkler protection system to BS EN 12845.

Fire safety systems and design alone are not enough to reduce the risk of a fire occurring and ensuring safe evacuation from a building. In order to effectively address this risk there must be measures in place, which inherently control the likelihood of an incident occurring, and if a fire does occur, ensure that there are adequate measures in place to effectively deal with the incident. On this basis, robust fire safety management and evacuation procedures will need to be in place.

Therefore, it will be necessary for the management team to develop and implement a premises fire safety management plan, and carry out a continuous iterative review of this during the lifetime of the building through ongoing fire risk assessments.

The sections below outline some of the key management considerations to assist in developing and implementing this plan.

The information in this section should be read in full, however, any items which are of particular reference to fire safety management procedures and requirements within this fire strategy report have been highlighted **in red** for ease of reference for building users.

Legal Responsibilities

Under the Regulatory Reform (Fire Safety) Order 2005 (RRO) every owner, occupier, and operator of a premises is required to adequately manage the safety of the areas under their control. Under this legislation a 'responsible person, or persons' is required to be appointed in order for the necessary level of safety is maintained, with an inherent necessity for compliance in the area of fire safety.

The RRO has five key objectives:

1. Create a single regime based risk assessment;
2. Focus resources for fire prevention on premises which pose the greatest risk;
3. Improve compliance;
4. Focus on establishing a culture of fire prevention; and
5. Ensure that fire safety facilities and equipment are properly maintained.

This role will be allocated to the overall building management of UCL.

The local authority (LFEPA) enforces the Order for the building. This authority has the power to inspect the premises to check that the Responsible Person(s) comply with the duties under the Order and will look for evidence that the Responsible Person(s) has carried out a suitable fire risk assessment and acted upon the significant findings of that assessment.

The succinct handover of '*sufficient information for persons to operate and maintain the building in reasonable safety*' from the Design Team to the Operational Team is required under Section 38 of the Building Regulations 2010.

This Fire Strategy will inform the development of the fire safety management plan of the building, and both documents will form the basis for the requirements to be met upon operational commencement. This process is highlighted in Figure B-1.

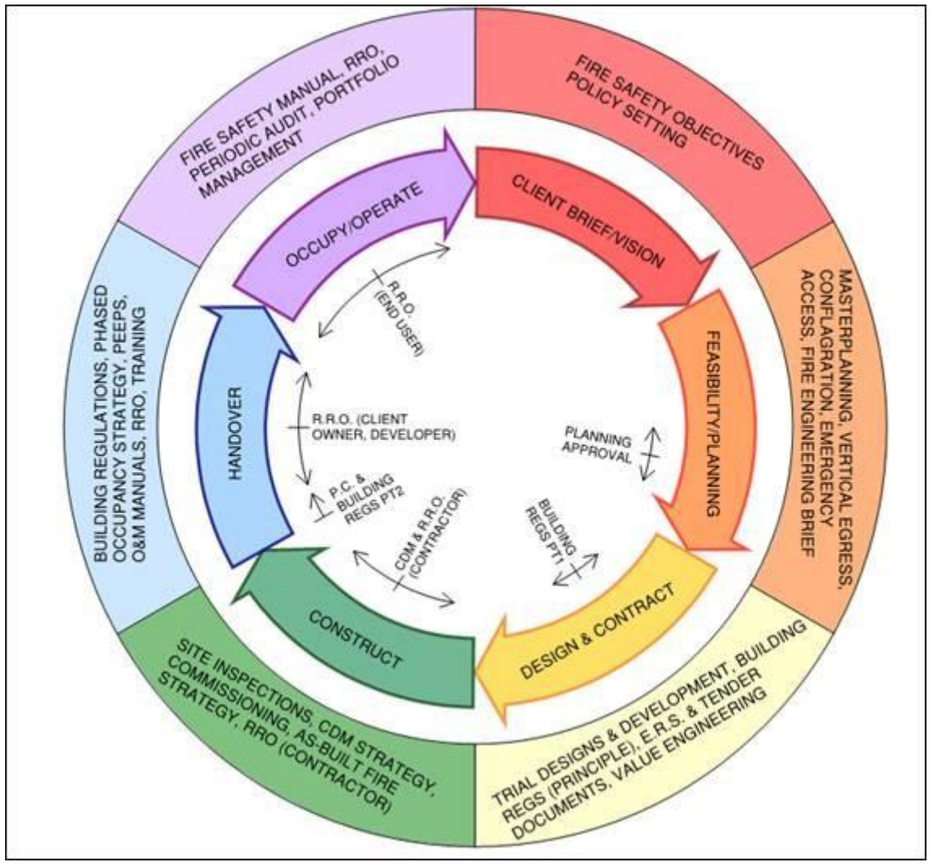


Figure B-1 Circle of Fire Safety

Proactive Measures of Management

The management of fire safety is driven by the operational processes throughout the life of the building. Effective management will contribute to the protection of the building and occupants by:

- Establishing a Fire Safety Policy;
- Developing and continuously reviewing the Fire Safety Plan and Manual;
- Preventing fires occurring;
- Being aware of evacuation procedures;
- Providing training for staff to respond to a fire incident in the appropriate manner; and
- Ensuring that all of the fire safety measures in the building are understood and maintained.

Level of Fire Safety Management

It is recommended that a Level 1 (enhanced) fire safety management system as defined by BS 9999 is in place. The following summarises the key features of Level 1 management system in the context of UCL. A management level 1 should include third-party certification of conformity with BS 9997:2019.

- **Planning for changes:** A Level 1 system anticipates and proactively identifies the impact of any proposed changes, including changes to the occupancy, periods of abnormal occupancy, and fire growth characteristics. The system identifies any alternative protection and management measures that will be required as a result, and ensures that they are implemented.
- **Resources and Authority:** The manager(s) with responsibility for fire safety will be empowered to ensure that legislative requirements are met i.e. Regulatory Reform (Fire Safety) Order (RRO). Also, to initiate testing, maintenance/repair, and, where necessary have direct control over staff responsible for these tasks. Such powers should be supported by the necessary, sufficient and appropriate resources and funds.
- **Staffing Level:** This system contains a staffing level which is specifically appropriate to the accommodation concerned in each separate area, including the use, the nature of the occupants, the management systems in place, and the active and passive systems provided. It also includes sufficient trained personnel to ensure that all occupants are assisted, or supported, to make their way out of the building effectively in an emergency, particularly any disabled occupants who may need assistance. A level 1 system may include, where appropriate, arrangement for security such as regular patrols, perimeter controls, entry control systems, and staff able to respond to an intrusion. A level 1 system will also provide for contingencies such as training, sickness, and other expected absences.
- **Fire Training:** All staff should be suitably and well trained, particularly those with large number of public, and the office area. This training should ensure that there are sufficient numbers of staff trained in all aspects of fire prevention, fire protection and evacuation procedures, and able to use the appropriate extinguishing equipment, so as to provide full coverage of the building, with provision for contingencies, sickness or holiday absences. Regular fire drills should be carried out.
- **Control of Work on site:** Work on site should be monitored. A work control system should be developed proactively with clear lines of responsibility, communicated to the contractors; a permit system; logging and audit processes and routine checking and supervision.
- **Communication Procedures:** The need for internal and external communication procedures should be determined, to ensure that all of those involved in management of fire risk, or who could potentially be involved in an incident, are provided rapidly and effectively with relevant information. These procedures should include defined lines of communication of significant findings arising from fire risk assessments, and should stress the importance of maintaining fire safety information. In addition the systems make use of alternative formats as necessary, with contingency plans for when systems fail.
- **Maintenance and Testing of Fire Safety Systems:** A level 1 maintenance system is one where there is dynamic monitoring of the fire safety systems, and the equipment is kept fully functional at all the times the building is in use. There will also be alternative procedures, etc., identified for those times when systems, equipment and other arrangements are not available or not functioning correctly.
- **Liaison with the Fire and Rescue Service:** In a level 1 system, the liaison is proactive in nature and includes effective arrangements for notifying the fire and rescue service of changes to the occupancy, periods of abnormal occupancy, fire growth characteristics, and other relevant factors. In particular it ensures that the fire and rescue service is able to have an appropriate pre-determined response strategy for the premises concerned, and enables the owner/end user to seek advice where appropriate on:

  a) how to prevent fires and restrict their spread in their buildings and other property;

  b) the means of escape from buildings and other property in the event of fire.
- **Procedures for identifying and responding to unplanned events,** potential emergencies or disasters should be established, documented and maintained. The arrangements should also consider a post-incident plan and contingency plan.

Fire Safety Plan

A fire safety plan should be developed as part of the wider fire safety policy for the building, which will inform the operational team (management and staff) of the necessary actions required. The philosophy for setting the management standard should follow the guidance set out in BS 9999.

One of the aims of any fire safety plan is to provide the confidence that, in the event of a fire alarm escalating into an evacuation, the management team will have the capability and resources to respond in an appropriate manner. Activation of the fire alarm will initiate a number of events, all of which will require specific staff actions. An understanding of potential fire scenarios, the staff structure, fire and life safety systems and communication systems, helps to define the responsibilities and required actions of management and staff in an emergency. The plan should outline the actual procedures in the event of fire.

The Fire Safety Plans for UCL need to take into account all of the above considerations, and in particular need to embrace the following assumptions, which have been made in line with the fire strategy requirements:

1. The protected escape routes and stairs serving the building must remain sterile and free from significant combustible content. This needs to be enforced throughout the occupation.
2. The basement Technical Spaces, plant areas, and clinical areas will form separate evacuation zones to the upper levels. The evacuation strategy on the upper levels/ground ancillary accommodation will be simultaneous.
   In the clinical areas at Levels 0 and B1, horizontal evacuation to adjacent compartments will be prioritised.
3. Staff should be aware of the fire strategy, compartmentation and fire safety systems. Procedures should be in place so they are aware of when they have entered a place of safety.

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