Echo Street, Manchester

Outline Fire Strategy

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Quality Management

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1 INTRODUCTION

1.1 Appointment

OFR Consultants Ltd (OFR) have been appointed by IQ Student Accommodation to develop the outline fire strategy for the Echo Street scheme in Manchester. Currently the project is at RIBA Stage 2.

The project involves the new-build of 3no. blocks of student accommodation, with a shared amenity level at the ground floor and a shared basement level.

This fire strategy document serves four key purposes:

- Detail how the relevant fire safety requirements of the Building Regulations 2010 (as amended) could be satisfied;
- Provide advice to the design team to ensure that they can incorporate any fire safety requirements into the aspects of the design for which they are responsible;
- Highlight where further design development is required;
- Submit as part of the Planning Gateway 1 application.

1.2 Applicable Legislation

Fire safety of building works is legislated by the Building Regulations 2010 (as amended) "the Regulations" [1]. The Regulations have been enacted under the Building Act 1984 [2] and are published by the Controller of HMSO. The Regulations impose requirements on people carrying out building work. The requirements are functional rather than prescriptive in nature which means that the designer is given the freedom to choose the method they use to satisfy the legislation.

This strategy has been developed to address the requirements of Part B of the Regulations that governs fire safety of building design. These requirements are segregated into distinct aspects of building design as follows:

- B1 – Means of warning and escape;
- B2 – Internal fire spread (linings);
- B3 – Internal fire spread (structure);
- B4 – External fire spread; and
- B5 – Access and facilities for the fire and rescue service.

The strategy primarily addresses life safety under the Building Regulations and has not been developed to address property protection. However, the features that are included for life safety, as required by the Building Regulations 2010 (as amended), are expected to contribute in some extent to business and property protection.

The strategy has been developed in cognisance of the Construction (Design and Management) Regulations 2015 (CDM 2015) [3], which sets out what designers are required to consider in order to protect anyone involved in the construction or ongoing use of a project. The strategy does not address site fire safety during the building works. The Health and Safety Executive (HSE) issues guidance on identifying and managing fire precautions during the works and they should be consulted by the appropriate party.

The Fire Safety (England) Regulations 2022 are being laid under article 24 of the Fire Safety Order 2005 [4]. Regulations under article 24 can impose requirements on responsible persons or others, including building owners and building managers, in relation to mitigating the risk to residents for specific premises. The Fire Safety Order applies to the common parts of multi-occupied residential buildings.

1.3 Design Basis and Guidance

BS 9999 states that where a building is mixed use and is partly residential, then it should wherever practicable be designed such that from the standpoint of fire safety the residential and non-residential uses are separated and independent from each other. Furthermore, it states that if this can be achieved, BS 9991 and BS 9999 may be applied independently to the parts of the building within their respective scope.

As such, the guidance document BS 9991:2015 [5] has been used as the primary guidance document for the residential levels in the building, and BS 9999:2017 [6] has been adopted for the ground floor amenity/basement levels. This is considered suitable as all floors are to be designed as fire resisting compartment floors.

BS 9991 allows for alternative fire engineering methods to be employed to support solutions where strict adherence to the codes would conflict with the wider aspirations for the scheme, or where the prescriptive expectations would be applied beyond their remit/scope.

On 29th November 2018, the Ministry of Housing, Communities and Local Government (MHCLG) issued an update to the English Building Regulations and associated guidance in relation to the control of external fire spread (Regulation B4). The new regulations came into force on 21st December 2018 and apply to this scheme.

On 1st June 2022, The Department for Levelling Up, Housing and Communities (DLUHC) (previously MHCLG) updated both Approved Document B Volume 1 and 2 which came into force on 1st December 2022. The amendments focused primarily on the ban of combustible materials in and on the external walls of buildings, secure information boxes and evacuation alert systems.

There are elements in the updated guidance (Approved Document B (Fire Safety), volume 1 – Dwellings (2019 edition incorporating 2020 and 2022 amendments)) (AD B v1) [7] that introduces beneficial features to building design that are not documented in BS 9991 and therefore we have introduced those into the scheme where applicable.

1.4 IQ Student Accommodation Employers Requirements

In addition to the standard guidance documentation outlined in Section 1.3, the IQ Student Accommodation employers' requirements documentation will also be followed. This document outlines recommendations above and beyond those typically recommended to align with the Building Regulations 2010 (as amended). Where this document has been followed, it will be outlined in the main body of this report.

1.5 Fire Statement

During the submission of detailed planning applications, there is a statutory requirement to provide a Fire Statement for 'relevant buildings' (i.e., inclusive of residential >7no. storeys), and to engage with the Health and Safety Executive (HSE) as a Statutory Consultee as part of Planning Gateway 1 (PG1). This has been made a requirement for any submissions made on or after 1st August 2021. The fire statement for this scheme is included in Appendix C.

1.6 Qualitative Design Review

BS 9991 Section 0.7 states that *'the increased design demand on structural integrity, services, fire safety systems, means of firefighting and evacuation generated by buildings in excess of 50m in height might mean that specific evaluation of all fire safety provisions is needed using a qualitative design review in accordance with BS 7974. This is to determine whether the recommendations in BS 9991 are appropriate, or whether a full fire engineered solution is required.'*

As a result, OFR have developed a Qualitative Design Review (QDR) document in collaboration with the wider design team as outlined in Appendix B. As part of this process, preliminary discussions with Greater Manchester Fire and Rescue Service (GMFRS) were undertaken, to discuss fire service access provisions to the site.

1.7 Reference Information

This fire strategy report is based on the drawings developed by Sheppard Robson Architects listed below in Table 1. During these preliminary stages, the studio layouts are in abeyance until signed-off by the Building Safety Regulator (HSE), Building Control Officer and the Building Insurers.

The ground floor amenity space layout is to be completed by Manalo + White Architects and the below drawings are preliminary design intent only.

Table 1: Fire safety documentation

Document Name	Description	Revision No.
ECHO-SRA-ZZ-00-DR-A-02100	General Arrangement – Ground Floor Plan	P08
ECHO-SRA-ZZ-00-DR-A-SK021	Ground Floor Core Layouts	P02
ECHO-SRA-ZZ-01-DR-A-02101	General Arrangement Level 01 Floor Plan	P07
ECHO-SRA-ZZ-02-DR-A-02102	General Arrangement Level 02 Floor Plan	P06
ECHO-SRA-ZZ-03-DR-A-02103	General Arrangement Level 03 Floor Plan	P06
ECHO-SRA-ZZ-04-DR-A-02104	General Arrangement Level 04 Floor Plan	P06
ECHO-SRA-ZZ-05-DR-A-02105	General Arrangement Level 05 Floor Plan	P06
ECHO-SRA-ZZ-06-DR-A-02106	General Arrangement Level 06 Floor Plan	P06
ECHO-SRA-ZZ-07-DR-A-02107	General Arrangement Level 07 Floor Plan	P06
ECHO-SRA-ZZ-08-DR-A-02108	General Arrangement Level 08 Floor Plan	P06
ECHO-SRA-ZZ-09-DR-A-02109	General Arrangement Level 09 Floor Plan	P06
ECHO-SRA-ZZ-10-DR-A-02110	General Arrangement Level 10 Floor Plan	P06
ECHO-SRA-ZZ-11-DR-A-02111	General Arrangement Level 11 Floor Plan	P06
ECHO-SRA-ZZ-12-DR-A-02112	General Arrangement Level 12 Floor Plan	P06
ECHO-SRA-ZZ-13-DR-A-02113	General Arrangement Level 13 Floor Plan	P06
ECHO-SRA-ZZ-14-DR-A-02114	General Arrangement Level 14 Floor Plan	P06
ECHO-SRA-ZZ-15-DR-A-02115	General Arrangement Level 15 Floor Plan	P06
ECHO-SRA-ZZ-16-DR-A-02116	General Arrangement Level 16 Floor Plan	P06
ECHO-SRA-ZZ-17-DR-A-02117	General Arrangement Level 17 Floor Plan	P06
ECHO-SRA-ZZ-18-DR-A-02118	General Arrangement Level 18 Floor Plan	P06
ECHO-SRA-ZZ-19-DR-A-02119	General Arrangement Level 19 Floor Plan	P06
ECHO-SRA-ZZ-20-DR-A-02120	General Arrangement Level 20 Floor Plan	P06
ECHO-SRA-ZZ-21-DR-A-02121	General Arrangement Level 21 Floor Plan	P06
ECHO-SRA-ZZ-22-DR-A-02122	General Arrangement Level 22 Floor Plan	P06
ECHO-SRA-ZZ-23-DR-A-02123	General Arrangement Level 23 Floor Plan	P05
ECHO-SRA-ZZ-24-DR-A-02124	General Arrangement Level 24 Floor Plan	P06
ECHO-SRA-ZZ-25-DR-A-02125	General Arrangement Level 25 Floor Plan	P06
ECHO-SRA-ZZ-26-DR-A-02126	General Arrangement Level 26 Floor Plan	P06
ECHO-SRA-ZZ-27-DR-A-02127	General Arrangement Level 27 Floor Plan	P06
ECHO-SRA-ZZ-B1-DR-A-02099	General Arrangement Basement Plan	P05
ECHO-SRA-ZZ-RF-DR-A-02128	General Arrangement Level Block C Roof	P05
ECHO-SRA-ZZ-RF-DR-A-SK025	Block A-B-C - Roof Layouts	P02
ECHO-SRA-ZZ-RF-DR-A-SK036	Proposed Roof Section	P01
ECHO-SRA-ZZ-XX-DR-A-00801	Existing Site Plan with Planning Application Boundary	P01
ECHO-SRA-ZZ-XX-DR-A-00803	Existing Site Plan with Proposed Building Footprint	P01
ECHO-SRA-ZZ-XX-DR-A-02201	General Arrangement North Elevation	P05
ECHO-SRA-ZZ-XX-DR-A-02202	General Arrangement South Elevation	P05
ECHO-SRA-ZZ-XX-DR-A-02203	General Arrangement West Elevation	P05
ECHO-SRA-ZZ-XX-DR-A-02204	General Arrangement East Elevation	P05
ECHO-SRA-ZZ-XX-DR-A-02205	General Arrangement Inner West Elevations	P05
ECHO-SRA-ZZ-XX-DR-A-02206	General Arrangement Inner East Elevations	P05
ECHO-SRA-ZZ-XX-DR-A-SK020	Core B - Multi-Functional Space	P01
ECHO-SRA-ZZ-XX-DR-A-SK027	Typical Floor Core Layouts	P02
ECHO-SRA-ZZ-XX-DR-A-SK033	Ceiling Depth Coordination Details Typical Floors	P01
B2D9B56B-3220-4F5D-AF8E-7CA4BA285611	IQ Student Accommodation Blueprint – Health and Safety Standards to be adopted for new builds	02.2020
Appendix 9 - Standard Fire Alarm CE	IQ Student Accommodation – Standard Fire Alarm Cause and Effect	V4

1.8 List of alternative solutions to the guidance documents

Table 2 below identifies items for the attention of the approvals body and relevant stakeholders. These items have been highlighted as they are likely to be alternative solutions to the recommendations in the guidance documents listed in Section 1.3.

Table 2: Items for the attention of the approvals body

Requirement	Related to.	Details of deviation from guidance documentation	Solution (Justification)	Report Section(s)
B1 – Means of Escape	Refuse Ventilation	BS 9999 recommends that rooms provided for the storage of refuse, should be approached either directly from the open air or by way of a protected lobby provided with not less than 0.2m^2 of permanent ventilation, or suitable mechanical alternative. Currently within the basement level, the bin store opens directly into the central basement area without additional lobby protection.	The central basement area is currently provided with a means for permanent natural ventilation via openings (10m^2 free area) in the ground floor slab above the basement level which discharge to the external. In addition to this, a minimum of 10m^2 free area will be provided to the basement area via the entrance ramp opening to the basement. The above provisions are considered an acceptable means for ventilating the basement refuse store without providing an additional ventilated (0.2m^2) lobby.	3.5.1
B1 – Means of Escape	Cooking Appliances	BS 9991 recommends that for the internal layout of flats, cooking facilities should be sited away from the flat entrance door and the internal escape route.	It is proposed to locate the cooking appliances centrally within the studio as shown as opposed to the extremity of the studio flat. Therefore, to compensate for this it is proposed to introduce both hob cut-off and suppression devices to all cooking appliances within the scheme to reduce the risk and potential radiation exposure to occupants escaping from the studios.	4.1.6.1
B1 – Means of Escape	Single direction travel distance	The residential common corridor serving the studios and cluster flats in Block A have an extended single direction travel distance of c.19m which exceeds the recommendations outlined in BS 9991 (maximum of 15m single direction travel distance with the introduction of sprinklers).	2no. smoke shafts are proposed for this section of the common corridor, configured in a 'push-pull' configuration, 1no. shaft located at each end of the common corridor. This is proposed to extract smoke away from the central stair lobby and a CFD study will be undertaken to demonstrate that tenable conditions are maintained within the common corridor during the means of escape phase. Preliminary 'proof-of-concept' modelling is shown in Appendix B.	4.1.8.1
B1 – Means of Escape	Smoke Control	In Blocks A, B and C for some corridor configurations, a mechanical smoke extract shaft is located close to the stair enclosure as opposed to the far end of the corridors as recommended in BS 9991.	The suitability of the mechanical smoke extract position will be demosntrated via Computational Fluid Dynamics (CFD) assessment at the next design stage by OFR. Said assessment should demonstrate that the stair remains tenable during the firefighting phase.	4.1.8.4
B1 – Means of Escape	Stair Exit Discharge	Stair B1 discharges into a central corridor with two separate escape routes and is not lobby protected from the accommodation for one of the escape routes.	It is proposed to introduce 2no. exit routes from this stair, separated via fire resisting construction and supplemented by dynamic signage. This layout is arranged such that a single seat of fire would not compromise both Stairs B1 and B2, and that in all instances, persons would have protection by 2no. layers of fire doorsets and a ventilated lobby.	4.2.4.2
B5 – Access and Facilities for the Fire Service	Entrance to firefighting Core B	Access to the central firefighting core (Core B) is not currently possible from the main fire service vehicle parking position on Granby Road. As such, access to Core B would have to be via the main reception area.	This arrangement is considered reasonable due to the following: • If there is a fire within the ground floor level, there would be no requirement for the fire service to access Core B. • If there is a fire on an upper level, the ground floor level is considered a place of relative safety. • If in the unlikely scenario the fire service were on an upper level, and a secondary fire broke out at the ground floor level, Core B discharges directly to outside.	7.1

			OFR and IQ Student Accommodation held a meeting with Greater Manchester Fire and Rescue Service (GMFRS) (Simon Whittaker and Neil Helmrich) via Microsoft Teams on 8th February 2023 to discuss the above proposals, and GMFRS agreed in principle.	

2 BUILDING DESCRIPTION

The project involves the construction of 3no. blocks of student accommodation. The number of storeys in each block varies and all three blocks are linked by connecting link blocks (Figure 1). The site is located in between Granby Row, Echo Street and Vimto Park as shown in Figure 2, with fire service vehicle access to both Granby Row and Echo Street

All upper floors comprise residential accommodation and will contain a mixture of studios and cluster accommodation. Student amenity and back-of-house areas are provided at the ground and basement levels.

Additional information for each block is contained in the below tables and figures overleaf.

Table 3: Block A building characteristics

Key Characteristics		Description
Block Height		51.9m (Measured to the top occupied storey)
Building Areas	Basement	Tank rooms, Storerooms, Generator, Refuse Stores, Cycle Hub
	Ground Floor	Residential Amenity
	Levels 01-15	Residential Studios, Residential Cluster Flats
	Roof Level	Plant

Table 4: Block B building characteristics

Key Characteristics		Description
Block Height		69.9m (Measured to the top occupied storey)
Building Areas	Basement	Tank rooms, Store Rooms, Generator, Refuse Stores, Cycle Hub
	Ground Floor	Residential Amenity
	Levels 01-21	Residential Studios, Residential Cluster Flats
	Roof Level	Plant

Table 5: Block C building characteristics

Key Characteristics		Description
Block Height		83.3m (Measured to the top occupied storey)
Building Areas	Ground Floor	Residential Amenity
	Levels 01-27	Residential Studios, Residential Cluster Flats
	Roof Level	Plant

Table 6: A-B and B-C Link building characteristics

Key Characteristics		Description
Block Height		36.8m
A-B Link	Ground Floor	Residential Amenity
	Levels 01-11	Residential Studios
B-C Link	Ground Floor	Residential Amenity
	Levels 01-15	Residential Studios

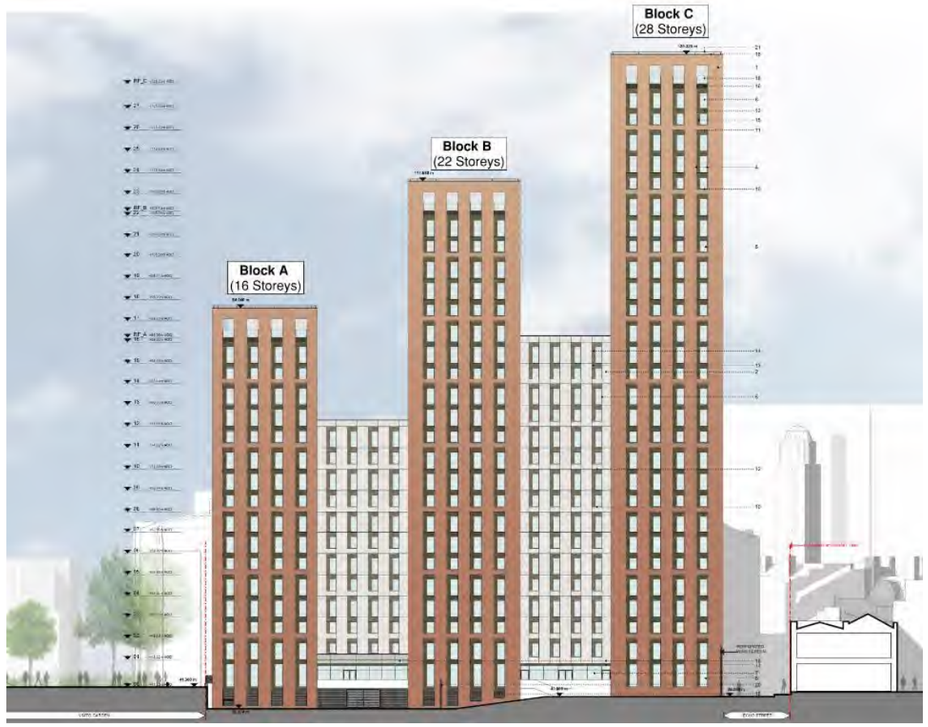


Figure 1: Block Diagram Legend

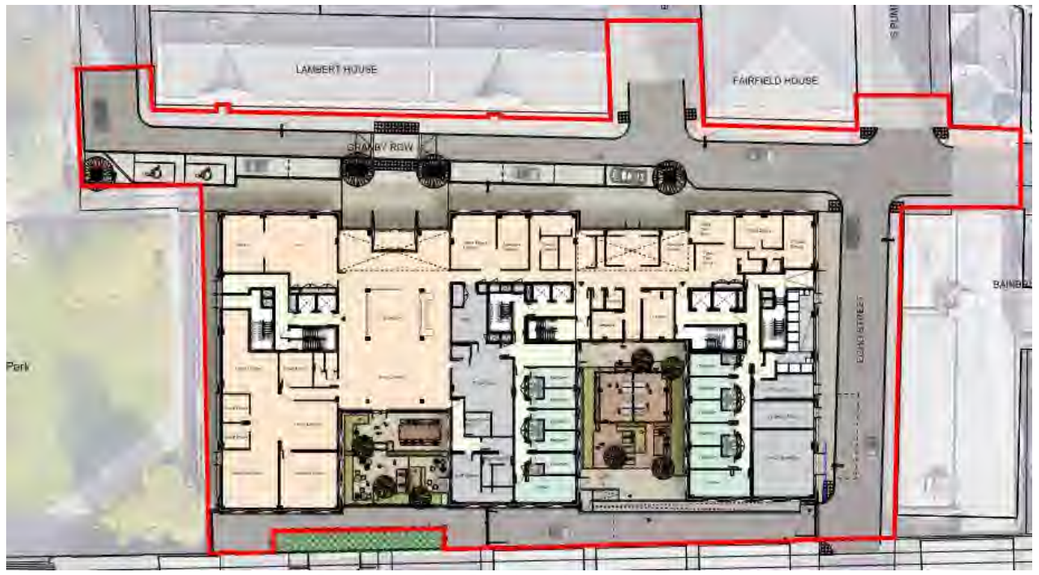


Figure 2: Site Plan (Echo Street Building highlighted)

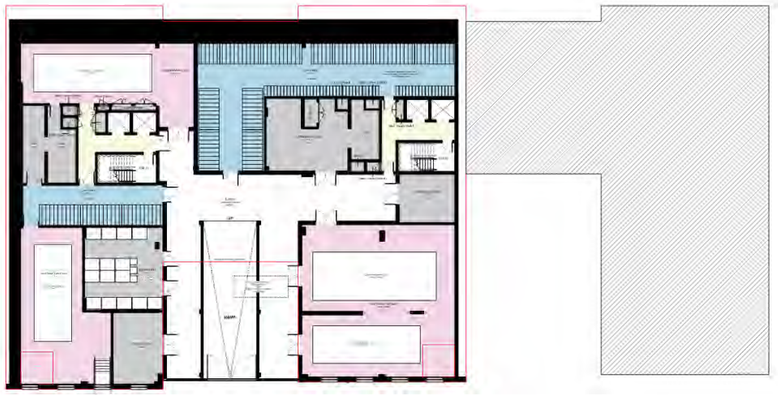


Figure 3: Basement - Proposed Layout



Figure 4: Ground floor - Proposed Layout

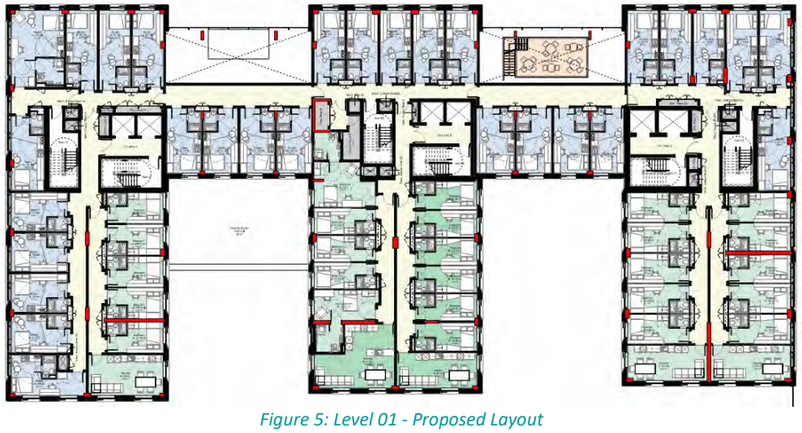


Figure 5: Level 01 - Proposed Layout



Figure 6: Levels 02-11 - Proposed Layout

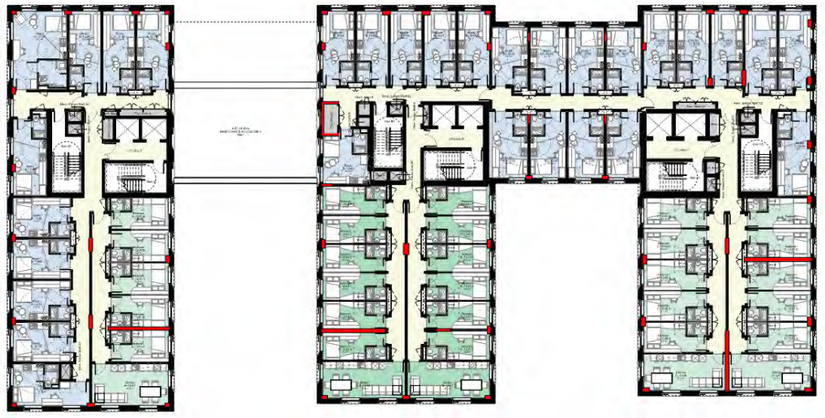


Figure 7: Building set-back (Block A - Level 13 indicative)



Figure 8: Roof layout example (Block A indicative)

2.1 Risk Profiles

2.1.1 Overview

BS 9999 has been adopted for the ground and basement levels on the basis that they are primarily non-residential areas. This is considered acceptable as these levels will be fire separated from the remainder of the building via fire resisting compartment floors.

All areas within these levels will be assigned a risk profile. The risk profile is a combination of the familiarity of occupants within the premises and the potential fire hazard (growth rate) in said areas.

The risk profiles can be categorised as per the following:

- A: Occupants who are awake and familiar with the building.
- B: Occupants who are awake and unfamiliar with the building.

Fire growth rates are given a numerical risk rating between 1 and 4 to describe the characteristic growth rate, with the relevant growth rates being:

- 1: Slow.
- 2: Medium.
- 3: Fast.

The relevant occupancy characteristics are shown in Table 7.

2.1.2 Variations of Risk Profile

2.1.2.1 General

BS 9999 permits variations to be made to travel distances, door widths and stair widths on the basis that the level of risk can be reduced by the provision of additional fire prevention/protection measures (Table 8).

2.1.2.2 Suppression

A BS EN 12845 commercial sprinkler system is currently proposed to extend to both the basement and ground floor levels. Therefore, BS 9999 recommends that the fire growth rate can be reduced by one level. This has been applied to all risk profiles.

2.1.2.3 Automatic Fire Detection System

The ground floor and basement levels will be provided with a Category L2 automatic fire detection system throughout (refer to Section 3) and as such is an enhancement over the minimum provisions recommended in BS 9999 for A1, A2 and B1 risk profile areas (Category M minimum).

Table 7: Risk Profiles

Level	Area	Risk Profile [i]	Commentary
Basement	Cycle Store/Hub	A1	Occupied only be persons who are awake and familiar with the building layout. Slow fire growth rate due to the provision of sprinklers throughout.
	Domestic Water Tank		
	Commercial Sprinkler Tank		
	Wet Riser Tank		
	General Stores	A2	Occupied only be persons who are awake and familiar with the building layout. Medium fire growth rate due to the provision of sprinklers throughout.
	Bin Store		
	Generator		
Ground Floor	Amenity Areas	B1	As this is a shared amenity area for students. There could be occupants who are awake and unfamiliar with the building layout. A B1 risk profile has been attributed as a conservative assumption. Slow fire growth rate due to the provision of sprinklers throughout.
i) Fire growth rate reduced due to the provision of a BS EN 12845 commercial sprinkler system for the basement and ground floor levels.			

Table 8: Additional fire protection measures

Description	Minimum Recommendation [a]	Proposed	Variation	Risk profiles applicable to
Fire detection and alarm system	Category M	Category L2	15%	A1, A2 and B1
a) As recommended in BS 9999:2017 edition for A1, A2 and B1 risk profile areas.				

2.2 Anticipated Occupancy

To appraise the suitability of the provided number of exits and exit widths, the anticipated occupancy within the building will be outlined in this section (Table 9). For the residential levels, this has been informed by the schedule of agreed terminology document issued to OFR as referenced in Table 1.

Table 9: Anticipated number of occupants

Block	Room Types	Number of Beds	Number of occupants	Total
A	150 Studios 15 cluster flats	150 75	225	1224
B	115 studios 43 cluster flats	115 255	370	
C	162 studios 55 cluster flats	162 275	437	
A-B Link	80 studios	80	80	
B-C Link	112 studios	112	112	

3 SUMMARY OF FIRE SAFETY SYSTEMS

3.1 Automatic Fire Detection and Alarm Systems

3.1.1 Studios

As recommended in the IQ Student Accommodation Blueprint document, all studios should be provided with a Category L2 automatic fire detection and alarm system in accordance with BS 5839-1 [8]. The system should be fully addressable. Studios are to be fitted with multi-detectors.

3.1.2 Cluster Flats

As recommended in the IQ Student Accommodation Blueprint document, all cluster flats should be provided with a Category L2 automatic fire detection and alarm system in accordance with BS 5839-1 [8]. The system should be fully addressable.

3.1.3 Residential Common Corridors

The residential common corridors should be provided with a Category L5 automatic fire detection system in accordance with BS 5839-1 [8]. The detection system will be linked to the smoke control system and the AOV's at the head of the stairs. The extent of protection will be akin to a Category L4 system in accordance with BS 5839-1.

3.1.4 Residential Ancillary/Non-residential Areas

A Category L2 automatic fire detection and alarm system will be provided for the residential ancillary/non-residential areas in accordance with BS 5839-1.

Flashing beacons are to be installed in the cinema rooms, interfaced to the screens to stop play in the event of the fire alarm sounding.

Manual call points will be fitted in accordance with BS EN 54-11 [10] (Type A) and BS 5839-1.

3.1.5 Evacuation Alert System

An evacuation alert system should be provided in accordance with BS 8629 [11].

3.1.6 Fire Alarm Panel

The location of the main fire alarm panel is proposed to be located in the main reception entrance, in proximity to the staff reception areas. This location is also the primary access point for the fire service and will be readily accessible. It is recommended that a repeater panel is provided in each stair core to Cores A, B and C. The detection systems should be configured such that the non-residential levels and the residentials are not linked.

As recommended by the IQ Student Accommodation Blueprint document, a Redcare monitoring system will be installed for the building.

3.1.7 Preliminary Fire alarm Cause & Effect

The following proposed fire alarm cause and effect has been developed by IQ Student Accommodation and OFR and is subject to review and approval by the Building Control Body and the Fire and Rescue Service. The cause and effect will be further developed during subsequent design stages.

3.1.7.1 Studios and cluster flat bedrooms

1. Single smoke detector triggered in any cluster flat bedroom or studio:
    a. Detector initially sounds locally in the cluster flat bedroom or studio
    b. An investigation period then commences (5 minutes investigation period), this is instructed via the following means:
        i. Fire alarm panel activation with full address of alarm point and location
        ii. Pager activation to building management
    c. If the investigation shows a false activation of a detector, then the system is reset
2. Second smoke detector triggered, or the investigation period expires
    a. Sounders activate to alert all occupants within a designated area (extent of evacuation and alarm area to be developed and agreed with IQ Student Accommodation)
    b. Fire alarm panel activation with full address of alarm point and location
    c. Pager activation to building management
    d. Signal to Redcare (Alarm Receiving Centre)
3. Single heat detector triggered
    a. Sounders activate to alert all occupants within a designated area (extent of evacuation and alarm area to be developed and agreed with IQ Student Accommodation)
    b. Fire alarm panel activation with full address of alarm point and location
    c. Pager activation to building management
    d. Signal to Redcare (Alarm Receiving Centre)

3.1.7.2 Cluster flat corridor

1. Single smoke detector triggered in the cluster flat corridor
    a. Detector initially sounds locally in the cluster flat, bedrooms and kitchen
    b. An investigation period then commences (5 minutes investigation period), this is instructed via the following means
        i. Fire alarm panel activation with full address of alarm point and location
        ii. Pager activation to building management
    c. If the investigation shows a false activation of a detector, then the system is reset

3.1.7.3 Residential Common Corridors

1. Single smoke detector triggered in the residential common corridor
    a. Activation of the smoke ventilation system on the floor of fire origin only
    b. AOV's at the head of the stair open
    c. No sounders to activate
    d. Lifts to remain in place and not ground until heat detector activation in the stair lobby

3.1.7.4 Basement and Ground Floor non-residential areas

1. Single smoke detector triggered:
    a. An investigation period then commences (5 minutes investigation period)
2. Second smoke detector, heat detector or a manual call point is triggered
    a. Simultaneous evacuation of the affected areas

3.2 Emergency Voice Communication Systems

Emergency voice communication systems (EVC's) will be provided at the basement level and the residential levels within the protected stair or protected lobbies respectively. EVC's should be installed in accordance with BS 5839-9 [12]. The minimum recommendation would be a Type B outstation communicating with a master station in the building control room or next to the fire detection and alarm panel. However, the adoption of a combined Type A and B outstation should be considered.

3.3 Sprinklers

Due to the height of the building exceeding 11m, the recommendations in Approved Document B: Volume 1 (2022) will be followed, as the recommendations are more onerous than those outlined in the 2015 edition of BS 9991. The following is proposed.

- Residential Areas
    - Category 4 residential sprinkler system in accordance with BS 9251 [13];
- Ancillary/non-residential areas
    - Category 4 residential sprinkler system for residential (ancillary) areas as per Table 3 in BS 9251 (2021);
    - BS EN 12845 [14] commercial sprinkler system for non-residential areas exceeding 100m^2 in area. Hazard classification to be determined by the M+E engineer and sprinkler specialist.

Section 5.4 in BS 9251 states that sprinkler protection may be omitted from bathrooms with a floor area less than 5m^2, with linings conforming to BS EN 13501-1, Class A1, A2-s3,d2 and B-s3,d2, and which are not prepared for white goods, such as washing machines, dryers, electric showers or water heaters.

3.4 Wet Risers

Due to the top storey of all 3no. blocks exceeding 50m in height, wet risers are proposed for all stairs within the development. As such, the wet risers should be provided in accordance with BS 9990 [15].

It is proposed to provide a dedicated wet riser tank to supplement said risers, which is located in the basement. As per BS 9990 recommendations, the capacity of the mains combined with the contents of the tanks should be such as to maintain a flow of water capable of supplying two fire-fighting jets for 45 minutes when water is being used at a total rate of 1500 L/m.

3.5 Smoke Ventilation Systems

3.5.1 Refuse Areas

As per BS 9991 recommendations, rooms containing refuse chutes or provided for the storage of refuse should be approached from a protected lobby having not less than 0.2m^2 of permanent ventilation or suitable mechanical alternative.

The bin store at basement level is not currently proposed to be provided with an independent lobby and 0.2m^2 permanent ventilation. This is due to the fact that the bin store opens into the basement area which is to be provided with cross-ventilation between the basement entrance and slab openings to the external above (refer to Section 7.5 for more information). The lobby separating the refuse store from the firefighting lobby at the ground floor will be provide with a means for mechanical ventilation.

3.5.2 Protected Stairs

All protected stairs within the scheme will be provided with an AOV at the head of the stair with a minimum free area of 1.0m^2. The suitability of this AOV size will be demonstrated by OFR via Computational Fluid Dynamics (CFD).

3.5.3 Stair Lobbies

At the ground floor level, the lobbies to the protected stairs are to be provided with a means for mechanical smoke ventilation. The size and extract rates are to be confirmed at the next design stage; however, it is recommended that a minimum free area of 1.0m^2 is allowed for during these preliminary stages.

3.5.4 Residential Common Corridors

The proposed smoke ventilation strategy for this scheme is to adopt mechanical shafts. The mechanical smoke shafts will be supplemented by the stair AOV's as described in Section 3.5.2.

3.5.5 Basement Ventilation

Basement ventilation will be provided via natural smoke outlets as described in Section 7.5.

3.5.6 Smoke Control Dampers

Smoke Control dampers used should as a minimum be classified to BS EN 12101-8 [16] as multi-compartment smoke control dampers. Sufficiently large openings should be allowed at any wall to allow the smoke control dampers to be installed if they are to be within the riser wall. Alternatively, they should be mounted in series with, or on the surface of, the multi-compartment smoke control duct.

3.5.7 Actuators and Ventilators

For natural smoke inlets / exhausts, aerodynamic free areas should be used based on the calculation method detailed in BS EN 12101-2 [17]. This aligns with the recent SCA guidance on specifying exhaust vents. Further any smoke vent should be certified to BS EN 12101-2 [17] as a complete assembly including both the actuator and opening.

3.6 Studio Kitchen Suppression

As recommended in the IQ Student Accommodation Blueprint document, all studio kitchens that are located next to the flat entrance door are to have Stove Guard or a suppression system installed.

3.7 Fire Resisting Ductwork

Where a lobby requires a means for mechanical ventilation, and the lobby is not located adjacent to an external wall, and pass through fire resisting construction, the integrity should be maintained via fire resisting construction.

3.8 Fire and Smoke Curtains

Where fire and smoke curtains are used on the scheme (Section 4.3), they should be designed and installed in accordance with BS 8524-1 [18] and BS 8524-2 [19]. The curtains should be fitted with smoke seals installed in accordance with BS EN 1634-3:2004 [20].

3.9 Firefighting Lifts/Evacuation Lifts

2no. firefighting lifts will be provided in each core designed to BS EN 81-72:2020 [21]. The firefighting lifts should be provided with a means for emergency power as per Section 3.13. It is proposed for 1no. of the lifts in each core to also be configured as an evacuation lift.

In lieu of any current standard for evacuation lifts in residential buildings, the design intent is such that the lifts will continue operating normally during a fire scenario to allow persons with reduced mobility (PRM) to use the lifts to escape. As such, upon activation of the smoke detectors within the common corridors, the lifts will not ground. They will only ground upon activation of the heat detectors located within the stair lobbies or manual recall initiated by the fire service. This should be agreed with the local Fire and Rescue Service.

3.10 Electrical Wiring

As per Section 422.2 in the recently updated BS 7671 IEE Wiring Regulations [22]:

'Cables or other electrical equipment shall not be installed in a protected escape route unless part of:

i) An essential fire safety or related safety system

ii) General needs lighting

iii) Socket-outlets provided for cleaning or maintenance'.

To align with these regulations, it was agreed with the wider design team upon advice from the M&E engineer that services other than the above will be enclosed within 60 minutes fire resisting construction, to fire separate the elements from the residential common corridors.

3.11 Emergency Lighting

Emergency lighting will be provided in accordance with the recommendations of BS 5266-1:2016 [23]. Emergency lighting should illuminate all occupied areas (including WC) and common evacuation routes (internal and external as necessary) as well as illuminating points of emphasis including fire exits, fire alarm call points, changes in level or direction, external assembly points and firefighting equipment.

3.12 Emergency Signage

Fire safety signs are to be installed within the building where necessary to provide clear identification of fire precautions, fire equipment and means of escape in the event of a fire. Every escape route should be distinctively and conspicuously marked with appropriate fire safety signage to comply with The Health and Safety (Signs and Signals) Regulations 1996, i.e. signage to be specified in accordance with BS 5499-4 [24], BS 5499-10 [25] and BS ISO 3864- 1 [26].

To assist the fire service to identify each floor of the building, floor identification signs and flat indicator signs should also be provided as per Sections 15.13 to 15.16 in AD B V1: 2019 (incorporating 2022 amendments).

Dynamic signage will be installed in accordance with BS ISO 23456-1 [27] (refer to Section 4.2.4.2).

3.13 Emergency Power

Emergency power supplies are required for all active fire safety systems including the following and all power and control cabling should comply with the relevant recommendations of BS 8519:2020 [28]:

- Fire detection and alarm systems;
- Emergency lighting and self-illuminated exit signage;
- Automatic water sprinkler suppression systems (AWSSS);
- Fire safety devices such as fire dampers, fire and smoke dampers and air transfer grilles;
- Firefighting provisions (lighting, lifts and communication);
- BS 9999 recommends that the general lighting in the firefighting shafts is provided on a separate circuit and is also provided with back-up power supplies;
- All smoke ventilations systems, including AOV's and fans;
- Fire and smoke curtains

As the building will be provided with a Category 4 sprinkler system in accordance with BS 9251:2021 edition, the recommendations outlined within BS 9251 and BS 9991 should be followed which states that *"The electrical supply should be provided with a back-up power supply and automatic changeover functionality, such as*:

a) An emergency generator; or

b) Uninterruptible power supplies; or

c) Two separate supplies where the secondary supply is a grid supply originating from a separate substation (separate from the primary supply); or

d) Where a diesel pump is selected as a secondary pump, as an alternative to a back-up power supply; the pump set should conform to BS EN 12845."

4 MEANS OF ESCAPE

4.1 Evacuation Strategy

4.1.1 Residential Ancillary/Non-Residential Areas

The evacuation strategy for the basement and ground floor ancillary/non-residential areas will be localised evacuation. Occupants within these areas should evacuate directly to outside in either of the following scenarios:

- Activation of the Category L2 automatic fire detection and alarm system in these areas; or
- Fire suppression system activation; or
- Activation of a manual call point in these areas.

The ancillary/non-residential alarm system should not be linked to the residential system at the above levels.

4.1.2 Residential Areas

The evacuation strategy for residential areas including studios and cluster flats will be a phased evacuation strategy. The proposed preliminary cause-and-effect for these areas is outlined in Section 3.1.7.

4.1.3 Basement

The various areas of the basement with regards to travel distances is dependent upon the risk profile of each room. As the basement will be provided with sprinkler protection, BS 9999 allows for a decrease in the risk profile for these areas.

As recommended in BS 9999, the provision of automatic fire detection in the building can allow for an increase in travel distances of 15% for areas with a risk profile of A1 and A2. The fire growth rates for the areas have been reduced due to the provision of a BS EN 12845 commercial sprinkler system. Maximum travel distances for the basement areas are shown in Table 10.

The travel distances have been measured either to the protected firefighting shaft serving the basement level, or directly to outside and meet the recommendations in BS 9999 as shown in Figure 9.

4.1.4 Rooftop Levels

As Blocks A, B and C are different heights, there are 3no. roof areas on the scheme. In accordance with Table F.1 in BS 9999, travel distances to the external rooftop areas considered to be a normal fire hazard and will be limited to 60m and 200m where a single and multiple directions of escape are permitted respectively. The roof layouts for the 3no. blocks are similar in design, with a central core with associated rooftop plant areas. The single direction travel distances on all 3no. roofs aligns with BS 9999 recommendations.

Table 10: Basement Areas - Risk Profiles

Area	Risk Profile [i]	Travel distance limitations (m) [ii]	
		Single direction	Multi-direction
Bin Store	A2	25.3	63.25
Generator			
General Stores			
Cycle Store/Hub [iii]			
Domestic Water Tank	A1	29.9	74.75
Commercial Sprinkler Tank			
Wet Riser Tank			

i) Fire growth rate reduced for all areas due to the provision of the BS EN 12845 commercial sprinkler system.

ii) Travel distance limitation extended by 15% due to the provision of a Category L2 automatic fire detection system.

iii) A3 risk profile (A2 after sprinklers) adopted due to potential use of electric cycles.

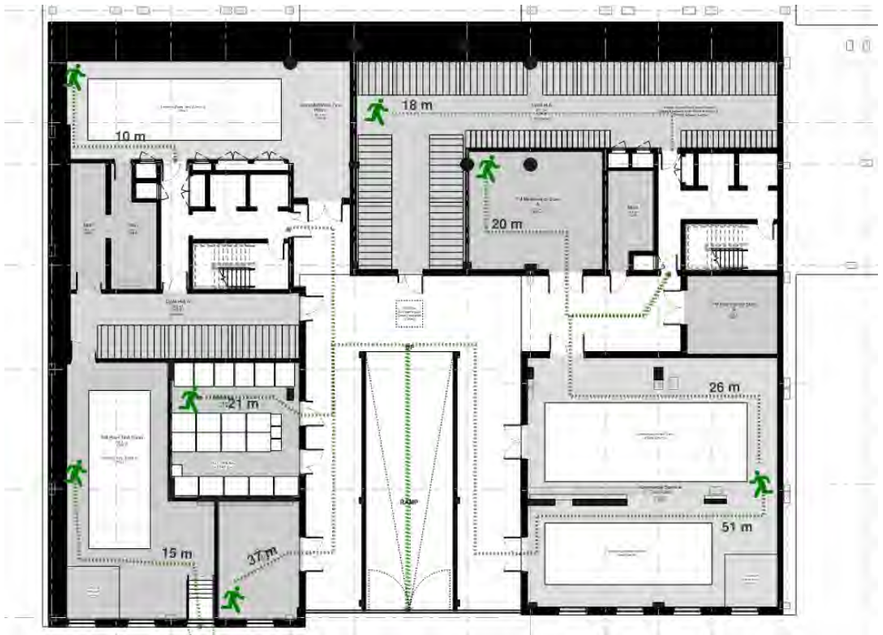


Figure 9: Basement - Travel Distances

4.1.5 Ground Floor – Residential Ancillary Areas

4.1.5.1 Overview

The ground floor contains various residential ancillary areas. There may be scenarios where students have invited friends to the accommodation. Therefore, a more conservative risk profile of B1 has been considered for the ground floor ancillary/non-residential areas.

The maximum allowable travel distances as recommended by BS 9999 are shown in Table 11 below. All areas of the ground floor align with the below recommendations. The maximum single direction travel distances within the ground floor are from the studio (Figure 10) and private dining rooms (Figure 11), with maximum single direction travel distances of c.18.3m and 21.6m respectively.

Table 11: Ground Floor - Risk Profiles

Area	Risk Profile [i]	Travel distance limitations (m) [ii]	
		Single direction	Multi-direction
Amenity Areas	B1	27.6	69

i) Fire growth rate reduced for all areas due to the provision of the BS EN 12845 commercial sprinkler system.

ii) Maximum travel distance has been increased due to the provision of automatic fire detection for a B1 risk profile area.

4.1.5.2 Mezzanine Dining Area

It is proposed to introduce a mezzanine dining area accessed from a stair at the ground floor level as shown in Figure 12. The stair is not proposed to be enclosed within fire resisting construction. This is considered to be acceptable as the maximum single direction travel distance to a point where occupants have a choice of escape is c.10.6m, measured from the extremity of the mezzanine area to the base of the stairs. This single direction travel distance aligns with BS 9999 recommendations.

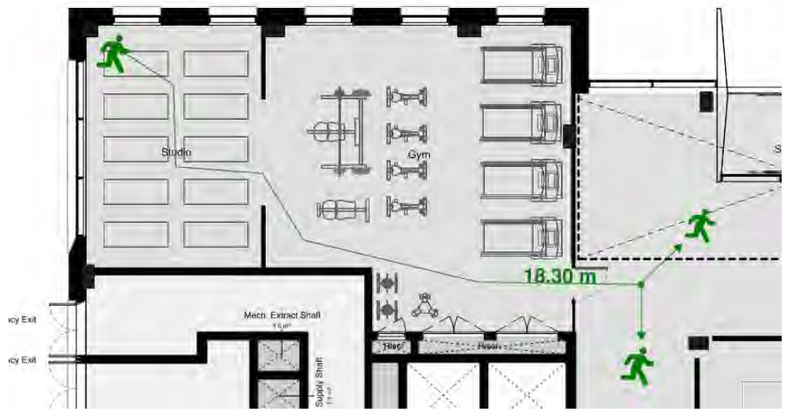


Figure 10: Maximum single direction travel distance from the studio

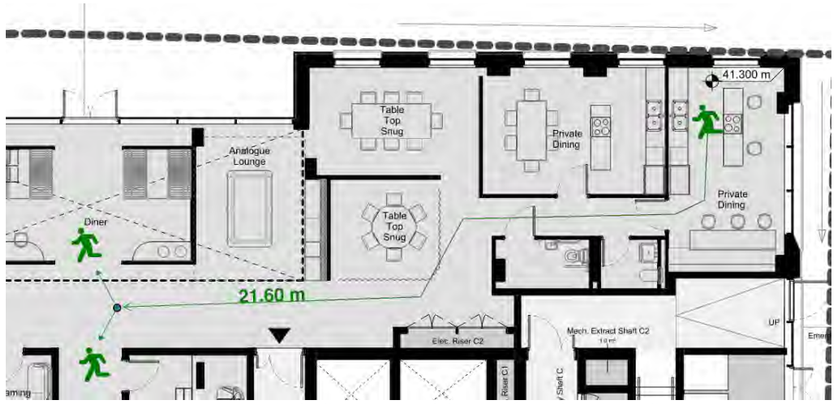


Figure 11: Maximum single direction travel distance from the private dining room

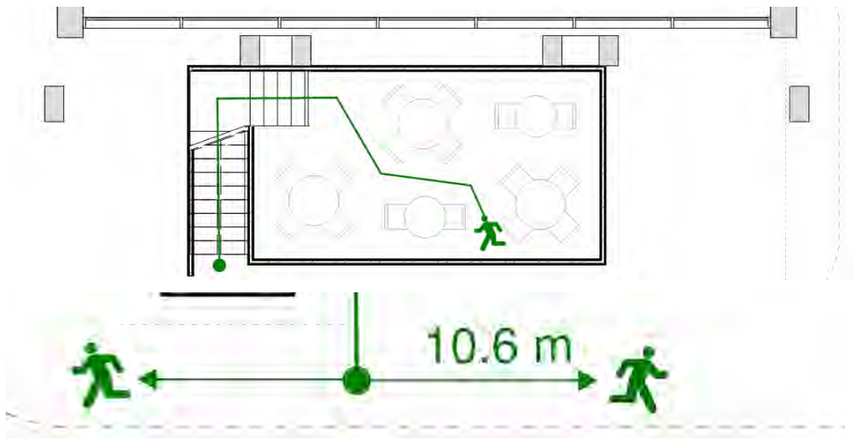


Figure 12: Diner Mezzanine

4.1.5.3 Exit Widths

The minimum exit width per person as recommended in BS 9999 is dependent upon the risk profile of the area as shown below in Table 12.

A decrease of 15% has been provided to the minimum width limitations due to the provision of a Category L2 fire detection system throughout the ancillary areas.

Table 12: Minimum exit widths per person – Ground Floor

Risk Profile	Minimum exit width per person (mm) [i)]
B1	3.06
i) Minimum exit widths have been decreased due to the provision of automatic fire detection for a B1 risk profile.	

4.1.5.4 Maximum Occupancy

The design intent is to ensure that escape from the ground floor amenity space is independent from the residential levels and to ensure that the escape routes do not pass through the protected stairs/firefighting lobbies.

The exits from the ground floor to be considered are shown in Figure 13. As shown in Table 13 below, discounting the largest exit from this level, the maximum horizontal exit capacity is 680 persons. This is considered to be conservative as it does not consider exits from the staff areas or the cores serving the residential levels. As such, the number and width of the proposed exits from ground floor is considered to be acceptable.

Table 13: Ground floor – Exit Capacity

Door reference (Figure 13)	Door clear width (mm) [i)]	Capacity (persons) [ii)]	Total Horizontal Capacity (Persons)
1	1400	457	680
2	950 [iii)]	163	
~~3~~	~~1550~~	~~506~~	
4	1450	60 [iv)]	

i) As measured from the Sheppard Robson architectural plans.

ii) Adopting a horizontal exit width per person of 3.06/person (Table 12).

iii) Capacity of a door less than 1050mm clear width = 500/m as per BS 9999 recommendations, where m has been taken as 3.06mm/person for a B1 risk profile area (Table 12).

iv) Door does not open in the direction of escape.

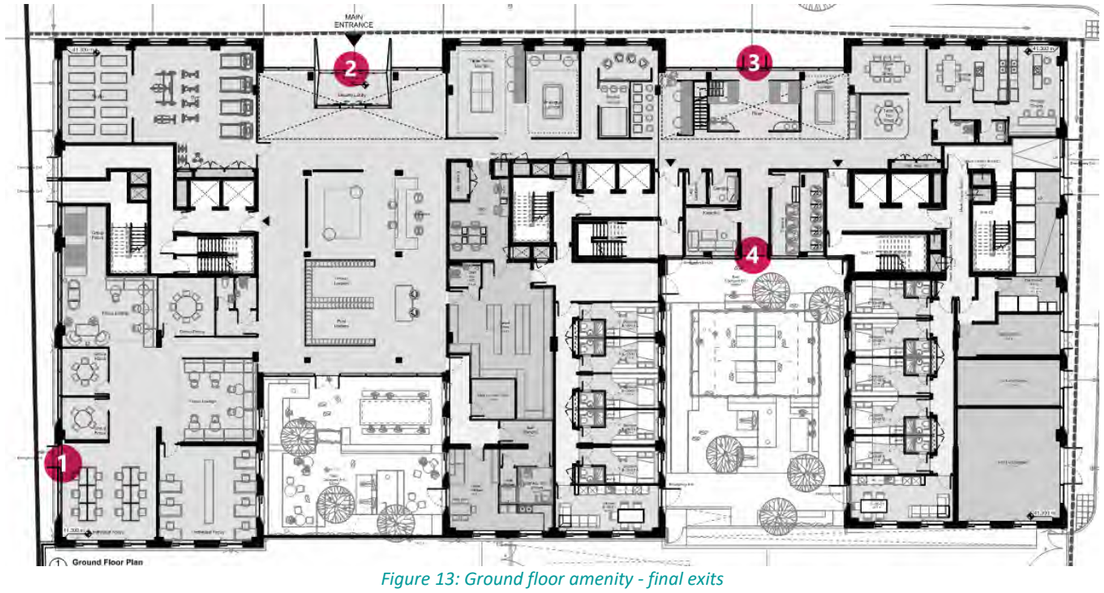


Figure 13: Ground floor amenity - final exits

4.1.6 Residential Areas

4.1.6.1 Studios

The design and configuration of studio flats as recommended in BS 9991 is as per Figure 14. BS 9991 recommends the following:

- The total travel distance from any point within the studios to the entrance doors limited to 9m
- Cooking facilities should be sited away from the flat entrance doors and the internal escape route.

The studios are currently c.2775mm wide, with a 600mm wide hob appliance. It is proposed to locate the hob appliance centrally within the studio as shown indicatively in Figure 15 as opposed to the extremity of the studio flat as per BS 9991 recommendations.

Therefore, to compensate for this it is proposed to introduce both hob cut-off devices and a hob suppression system to all cooking appliances within the scheme to reduce the risk and potential radiation exposure to occupants escaping from the studios as a mitigatory measure.

The studio layouts would be subject to review and approval by the Health and Safety Executive (HSE) and the Building Control Body.

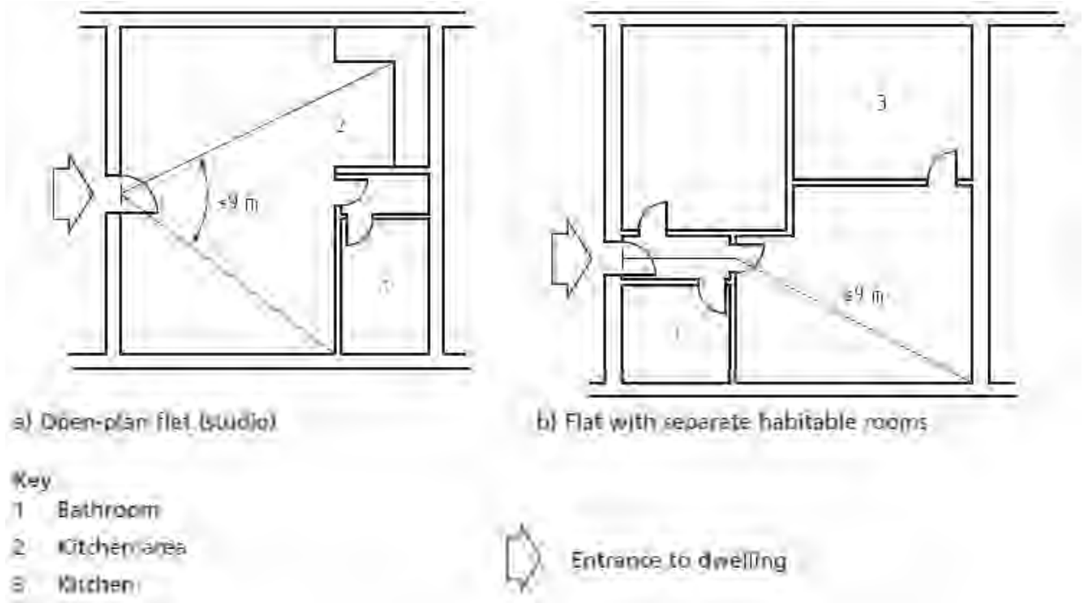


Figure 14: Flats with restricted travel distances – Figure 10 in BS 9991

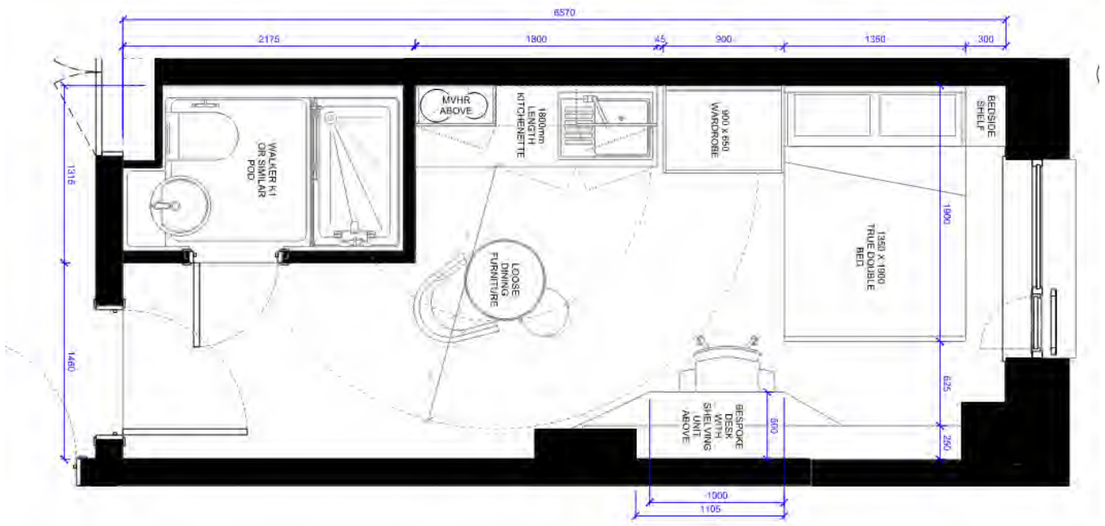


Figure 15: Indicative studio layout including cooking appliances

4.1.6.2 Cluster Flats

Cluster flats within the scheme are designed in accordance with BS 9991 recommendations (Figure 16). The flats are to meet the following design principles:

- Cluster separated from the remainder of the building by construction having at least 60 minutes fire resisting construction and an FD 30S fire door.
- The internal corridor serving the cluster bedrooms should have at least 30-minute fire resistance to each room off the corridor.
- The doors to the bedrooms and living spaces accessed from the residential common corridor should be FD 30S and self-closing. Cupboard and service duct access from the corridor to be separated by FD 30S fire doors.
- There is no limit to the number of bedrooms within a cluster as the travel distance to the flat entrance door Is less than 15m in a single direction. This is due to the provision of sprinklers throughout the building.
- The cluster flats will be lobbied from all staircases serving the building.
- All cluster flats will be provided with a Category L2 automatic fire detection system in accordance with BS 5839-1, to facilitate simultaneous evacuation of the cluster of fire origin.
- The kitchens will be fire separated from the bedrooms with 30 minutes fire resisting construction. The kitchen doors will be provided with self-closing devices. In addition, the kitchens are located such that they are at the remote end of the corridor away from the final exit from the cluster flat.

As recommended in the IQ Student Accommodation Blueprint document, the kitchen doors should be fitted with vision panels and be specified as FD 30S.

An indicative representation of a cluster flat is shown in Figure 17.

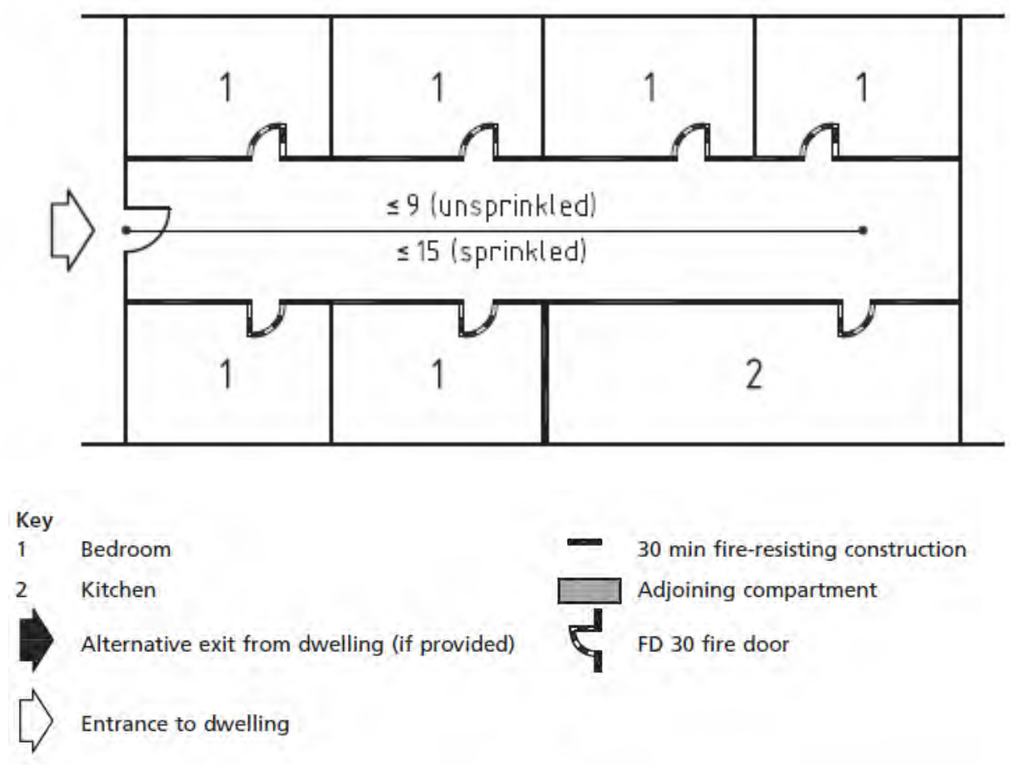


Figure 16: BS 9999 - Figure 16

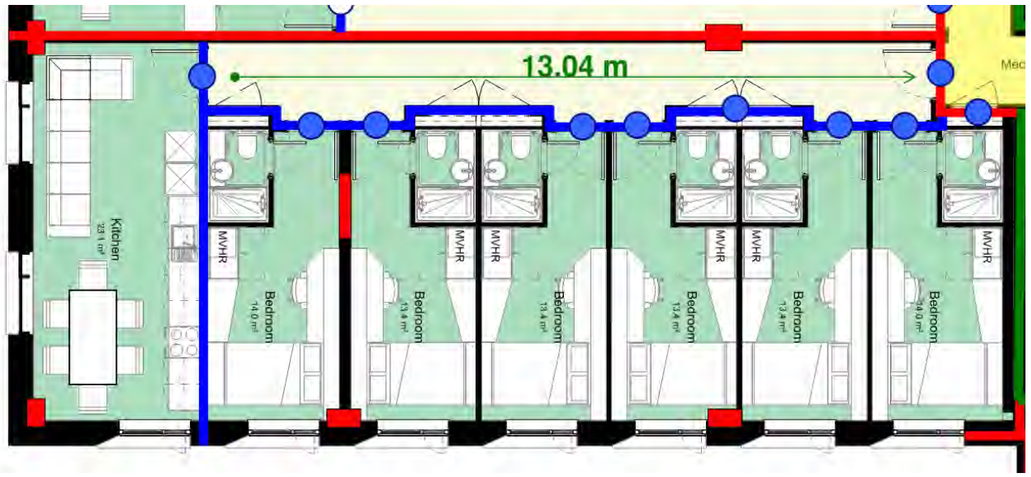


Figure 17: Indicative studio cluster layout

4.1.7 Common Corridor Escape Routes

4.1.7.1 Overview

The studio flats and cluster flats in the scheme are all accessed via common residential corridors. To prevent exposure of escaping occupants to smoke and/or heat in the internal corridors, BS 9991 recommends that the travel distances between the exit doors from the dwellings and a smoke free area are limited, and that the amount of smoke and other combustion products in the internal corridor or lobby are kept to a minimum by providing cross-corridor fire doors and ventilation.

It should be noted that this building is a complex building >50m in height. Therefore, as part of the OFR QDR process (Appendix B), additional recommendations above those in guidance have been proposed for this scheme as further described in Sections 4.1.8.1 to 4.1.8.4 .

4.1.7.2 Dwellings with a single escape route

For dwellings with only a single escape route to the protected stair enclosures, BS 9991 would recommend that the corridors be ventilated as per Figure 18. The ventilation strategy is premised on these principles, however additional measures have been implemented to accommodate persons with reduced mobility (PRM).

4.1.7.3 Dwellings with multiple escape route

For dwellings with multiple escape routes to the protected stair enclosure, BS 9991 would recommend that the corridors will be ventilated as per Figure 19. The ventilation strategy is premised on these principles, however additional measures have been implemented to accommodate persons with reduced mobility (PRM).

4.1.8 Mechanical Smoke Ventilation Systems

It is proposed to adopt a mechanical ventilation system for the lobbies/corridors within the building. The design of the system should limit pressure differentials so that the door opening forces do not exceed 100 N at the door handle when the system is in operation. The mechanical shafts should also meet the following recommendations:

a) The smoke shaft should be fully open to the external air at the top and closed at the base;

b) The top of the lobby/corridor vent should be located as close to the ceiling of the lobby/corridor as is practicable, and should be at least as high as the top of the door connecting the lobby/corridor to the stairwell;

c) The lobby or corridor vents, in the closed position, should have a minimum fire and smoke resistance performance of 30 minutes and integrity (leakage) no greater than 360 $m^3/h/m^2$ when tested in accordance with BS EN 1336-2 [29];

d) Smoke shaft should be constructed of materials classified as A1 in accordance with BS EN 13501-1 [30], or of materials determined to be non-combustible when tested in accordance with BS 476-4 [31], or of any material which when tested in accordance with BS 476-11 [32] does not flame or cause any rise in the temperature on either the centre of the specimen or the furnace thermocouples;

e) No services other than those relating to the smoke shaft should be contained within the shaft;

f) The shaft should be located at the remote end of the corridor away from the staircase.

During these preliminary stages, OFR have undertaken a proof-of-concept modelling exercise for the proposed corridor arrangements as shown in Appendix B.

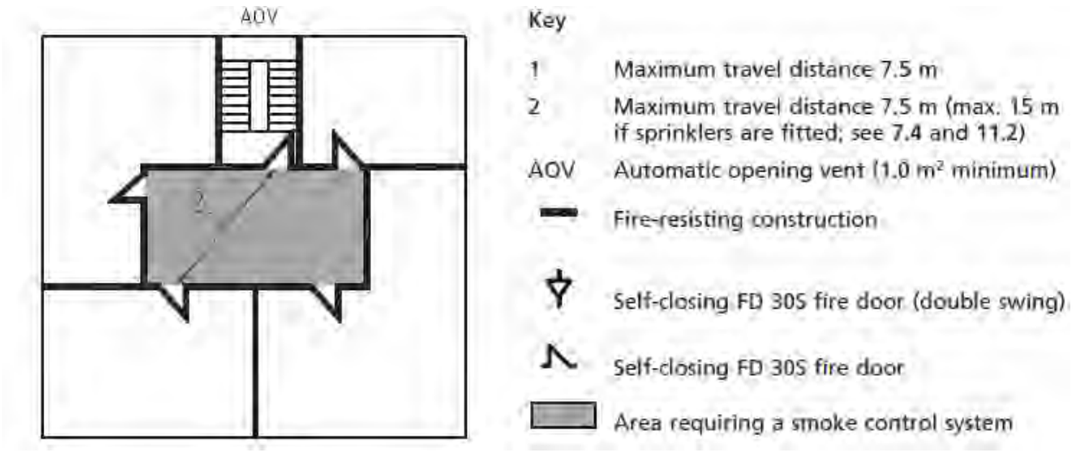
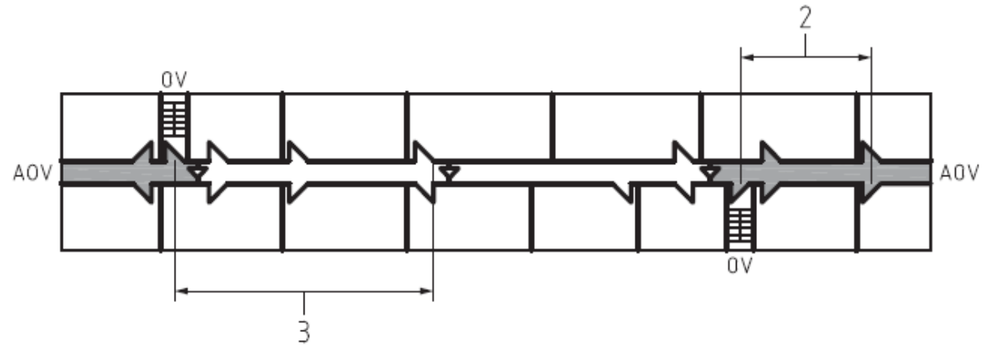


Figure 18: Common Escape Routes – Single direction of escape (BS 9991 - Figure 6)



Key

1 Maximum travel distance 30 m (max. 60 m if sprinklers are fitted; see 7.4 and 11.2)
2 Maximum travel distance 7.5 m (max. 15 m if sprinklers are fitted; see 7.4 and 11.2)
3 Maximum travel distance 30 m
4 Maximum travel distance 7.5 m
AOV Automatic opening vent (1.5 m^2 minimum)
OV Openable vent for fire and rescue service use (1.0 m^2 minimum)
Self-closing FD 30S fire door (double swing)
Self-closing FD 30S fire door
Area requiring a smoke control system

Figure 19: Dwellings with corridor access and with dead ends (BS 9991 - Figure 7)

4.1.8.1 Common Corridor - Configuration 1

Common corridor configuration 1 relates to the corridor serving the studio and cluster flats in Block A. Within the common corridor, there is currently a single direction travel distance of c.19m (Figure 20). This travel distance has been measured from the furthest flat entrance door to the protected stair lobby entrance. This value exceeds the maximum recommended in BS 9991.

It is proposed to provide a means of ventilation to this common corridor via 2no. mechanical shafts. 1no. mechanical shaft is proposed to be used to provide supply air to the corridor, whereas 1no. mechanical shaft is proposed to extract. This is proposed such that smoke is extracted away from the stair lobby which will also be used for mobility impaired persons to wait in a place of relative safety.

At this stage it is proposed to allow for a minimum shaft and vent geometric area of 1.0m^2, however these sizes (and required extract rates) are subject to the CFD assessment.

4.1.8.2 Common Corridor – Configuration 2

Common corridor configuration 2 relates to the dead-end corridors serving studio flats in Blocks A, B and C as shown in Figure 21. Single direction travel distance within these dead-end corridor areas is measured at c.5m and aligns with BS 9991 recommendations.

It is proposed to provide a single mechanical extract shaft within these sections of the corridor, supplemented by the AOV at the head of the stair. The design intent of the smoke ventilation system for these corridors is to protect the stair only in the firefighting scenario.

Within these corridors, the smoke shafts are located adjacent to the stairs as opposed to the extremity of the common corridors as recommended in BS 9991.

4.1.8.3 Common Corridor – Configuration 3

Common corridor configuration 3 relates to the common corridors serving the protected lobbies for Blocks B and C (Figure 22). As these areas will also be used as the primary refuge for persons with reduced mobility (PRM), it is proposed to provide 2no. mechanical shafts to this lobby in a push-pull configuration. 1no. mechanical shaft is proposed to provide supply air to the corridor, whereas 1no. mechanical shaft is proposed to extract. This is proposed such that smoke is extracted away from the stair lobby.

4.1.8.4 Common Corridor – Configuration 4

Common corridor configuration 4 relates to the central corridors adjacent to Block B whereby there are 2no. means of escape from the corridor (Figure 23).

It is proposed to provide a single mechanical extract shaft with the intent to protect the stair from the ingress of smoke during firefighting operations.

4.1.8.5 Summary

A detailed computational fluid dynamics (CFD) analysis will be undertaken by OFR at the next design stage to demonstrate that the conditions within the common corridor remain tenable during occupant escape. During these preliminary stages, OFR have undertaken proof-of-concept modelling as shown in Appendix B.

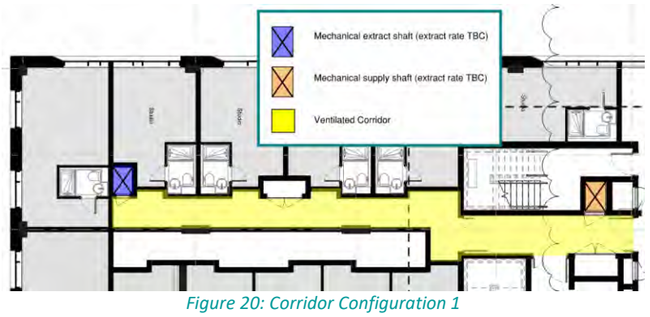


Figure 20: Corridor Configuration 1

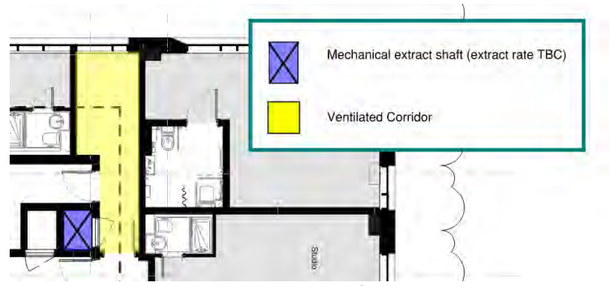


Figure 21: Corridor Configuration 2

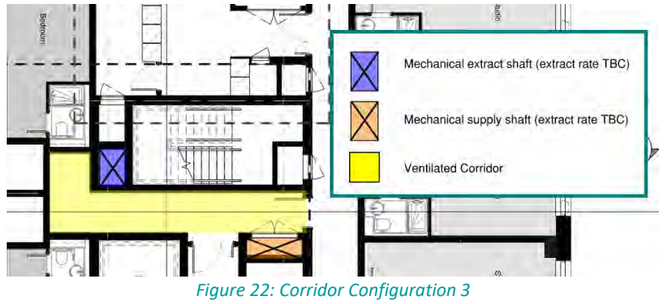


Figure 22: Corridor Configuration 3

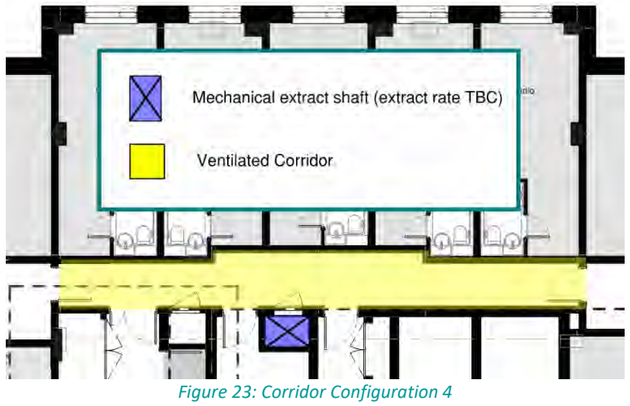


Figure 23: Corridor Configuration 4

4.2 Vertical Means of Escape

4.2.1 Stair Description

There are 6no. stairs within the building. Each block has 2no. stairs serving it as shown Figure 24. 2no. stairs serve the basement level as shown in Figure 25. Further information is shown below in Table 14.

Table 14: Stair description – Levels served

Level Served	A1	A2	B1	B2	C1	C2
Basement	Yes	No	Yes	No	No	No
Ground	Yes	Yes	Yes	Yes	Yes	Yes
01-16	Yes	Yes	Yes	Yes	Yes	Yes
17-22	No	No	Yes	Yes	Yes	Yes
23-28	No	No	No	No	Yes	Yes

4.2.2 Stair Width

All stairs are currently proposed to have a clear width of 1200mm which aligns with BS 9991 minimum recommendations.

As the building will be fitted with a BS 8629 evacuation alert system (Section 7.8), there could be a scenario where either a single floor, or multiple floors are alerted to evacuate. In a worst-case fire scenario, all persons on the upper residential levels could evacuate simultaneously via the stairs.

As there are no explicit recommendations in either BS 9991 or Approved Document B: Volume 1 to calculate the stair capacity for a residential building (due to the stay-put strategy typically implemented), it is considered best practice to calculate the stair capacities utilising the principles in AD B v2. This assessment has not considered stair exit capacity from the basement, as this is anticipated to be a transiently accessed space.

The maximum capacity of each stair is shown below in Table 15.

As shown in Table 9, the maximum number of occupants anticipated to use each stair is less than the stair capacity below and as such the stair widths are considered to be acceptable.

Table 15: Stair capacity (BS 8629 system activation event)

Stair (Figure 24)	Clear width (mm) [i]	No. of storeys served [ii]	Stair capacity (persons) [iii]
A1, A2	1200	14	825
B1, B2	1200	20	1095
C1, C2	1200	26	1365

i) As per Sheppard Robson drawings.
ii) Residential levels considered only.
iii) As per Table 3.2 in AD B v2.

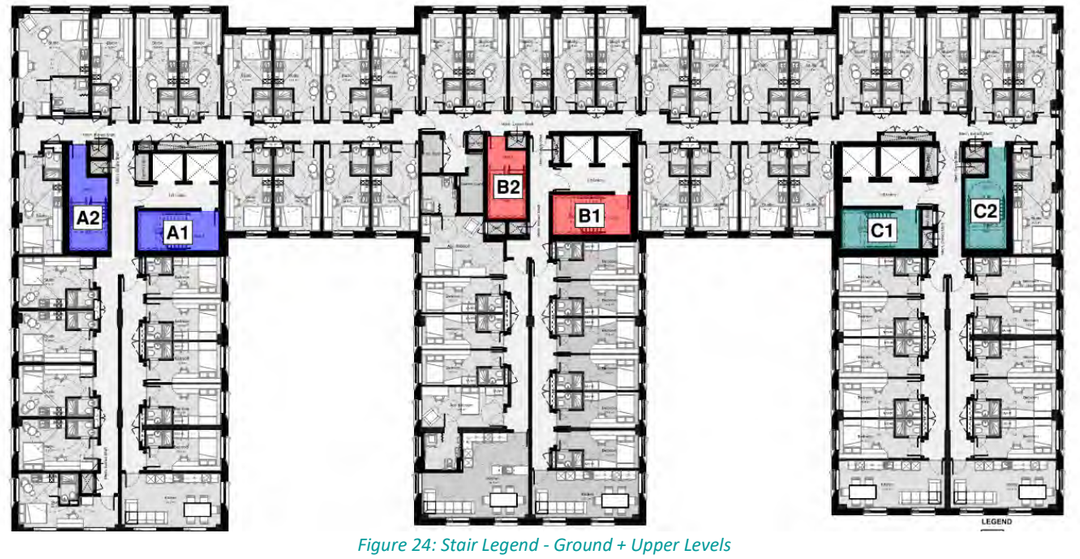


Figure 24: Stair Legend - Ground + Upper Levels



Figure 25: Stair Legend - Basement Level

4.2.3 Basement Stairs

BS 9991 recommends that where there is more than one common stair from an upper storey or part thereof, at least one such stair serving the upper storeys should terminate at the ground level. Any other stair may connect with the basement storey if it is separated from each basement level by a protected lobby.

Stairs A1 and B1 serve the upper levels of Blocks A and B respectively as well as the basement level. However, this is considered acceptable as each block has 2no. stairs serving all levels. As per BS 9991 recommendations, the A1 and B1 stairs will be accessed via a ventilated protected lobby. The lobbies will be ventilated via the mechanical extract shafts serving the upper levels (Figure 26).

4.2.4 Discharge from Common Stairs and Final Exits

BS 9991 recommends that discharge from common stairs and final exits should meeting the following recommendations:

a) Protected stairways should discharge either:

   1. Directly to a final exit; or

   2. Into a protected corridor leading to a final exit which is itself lobbied from any accommodation. (The protected corridor leading to a final exit should have the same standard of fire-resisting enclosure and lobby protection as the stairway it serves and that it is not the common access corridor serving the dwellings at the exit level).

b) Two stairs should not terminate in the same enclosure at final exit level. Because an outbreak of fire leading to penetration of the enclosure at that level would render both stairs simultaneously unusable.

c) Where the exit passageways from two common stairs adjoin, they should be separated by imperforate construction.

d) Final exits should discharge directly to a street, passageway, walkway or open space.

Stairs A1, A2, B1, C1 and C2 align with the above recommendations as the stairs discharge either directly to outside or via a protected corridor lobby separate from the accommodation (Figure 27). However, Stair B2 does not currently discharge directly to outside. The proposed final exit discharge strategy for Stair B2 is described in Section 4.2.4.2

4.2.4.1 Access Ramp

Due to the sloping site, egress from the building to the south via Courtyard B-C is via an access ramp as shown in Figure 28. As the egress route is located within 1.8m of the external wall construction, it is proposed to provide 30 minutes fire resisting construction (30 RE) to the external wall tested from the inside within 1800mm of the escape route, up to 1100mm above the access ramp level.



Figure 26: Basement stair protection

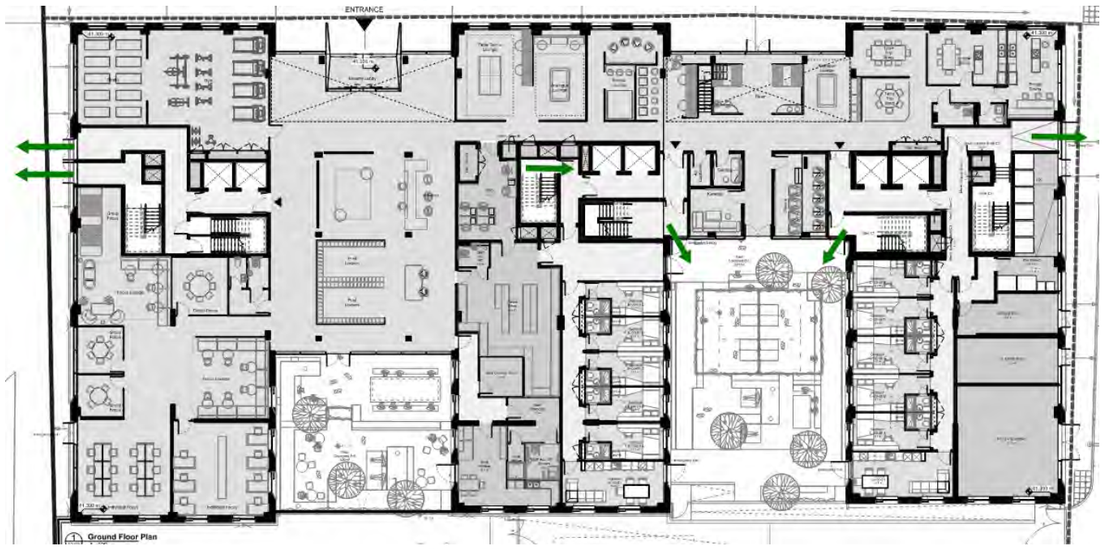


Figure 27: Stair discharge routes

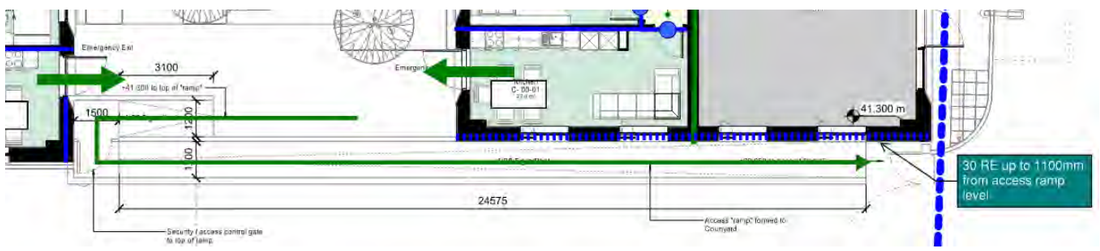


Figure 28: Access ramp provisions

4.2.4.2 Stair B2 Discharge

Due to the location of Stair B2, it must discharge internally to a central lobby. To ensure that the stair does not have to share the same escape route at the ground floor as Stair B1, it is proposed to introduce 2no. exit routes from this stair, separated via fire resisting construction and supplemented by dynamic signage (Figure 29). This layout is arranged such that a single seat of fire would not compromise both Stairs B1 and B2, and that in all instances, persons would have protection by 2no. layers of fire doorsets and a ventilated lobby.

The following cause and effect shown in Table 16 is proposed for this dynamic signage.

Table 16: Dynamic signage - Cause and effect

Scenario	Cause	Sign Indicator 1	Symbol 1	Sign Indicator 2	Symbol 2
1 (Figure 30)	Manual call point activation – Cluster Lobby	Exit Available	↑	Exit Unavailable	✖
	Smoke/Heat detector activation – Cluster Lobby	Exit Available	↑	Exit Unavailable	✖
2 (Figure 31)	Manual call point activation – Ground Floor Amenity	Exit Unavailable	✖	Exit Available	↑
	Smoke/Heat detector activation – Ground Floor Amenity	Exit Unavailable	✖	Exit Available	↑
3	Manual call point activation – Elsewhere	Exit Available	↑	Exit Available	↑
	Smoke/Heat detector activation - Elsewhere	Exit Available	↑	Exit Available	↑



Figure 29: Stair B2 - Dynamic Signage Location

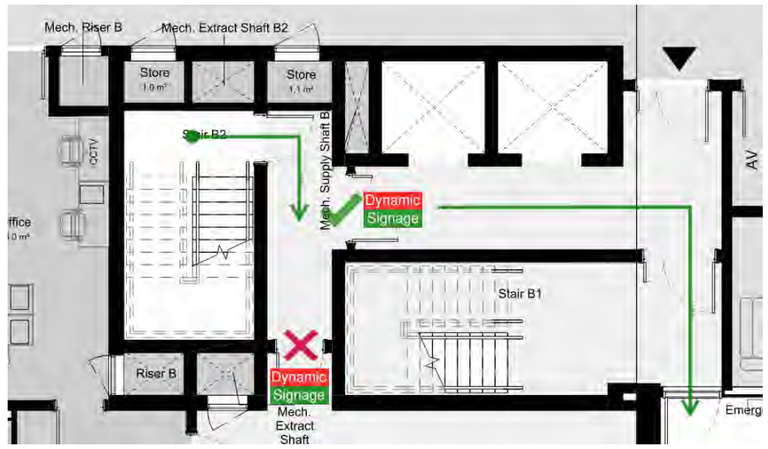


Figure 30: Fire Scenario 1 - Escape Route

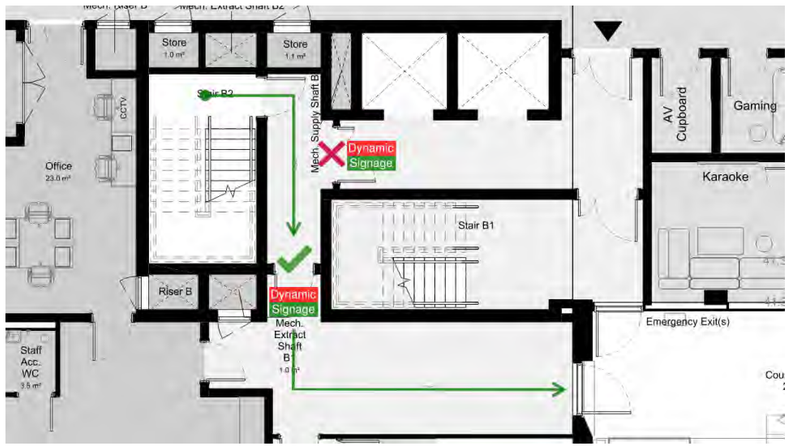


Figure 31: Fire Scenario 2 - Escape Route

4.3 Persons with Reduced Mobility (PRM)

4.3.1 Overview

Under the Regulatory Reform (Fire Safety) Order, it is the duty of the responsible person to ensure that there are measures and procedures in place to allow everyone to be assisted to a place of ultimate safety outside the building in the event of an emergency.

Current guidance does not provide specific recommendations with regards to the provision of egress of persons with mobility impairments such as disabled refuges or disabled communication provisions. However, in an emergency, accessible means of escape and the associated fire safety strategy should be treated as an integral part of the design process and consideration should be given to PRM occupants using the fire-fighting lifts to self-evacuate, prior to Fire and Rescue Service arrival.

4.3.2 Temporary Refuge Spaces

Where a refuge is required as per the following sections, each refuge will be provided with space for a wheelchair not less than 900mm x 1400mm and located such that they would not obstruct the flow of persons escaping from each level.

All refuges will be provided with an emergency voice communication (EVC) system in accordance with BS 5839-9:2021 [12]. The signal location of the EVC system will be provided next to the main fire alarm panel or a location which will be staffed when the building is occupied. The EVC's will be a Type B outstation.

4.3.3 Basement

At the basement level, there is access directly to outside via the ramp to the south. However, to the north of the basement, egress is via steps leading to the ground floor level. As such, it is proposed to provide disabled refuges within the protected stair enclosure for both Stairs A1 and B1 as shown in Figure 32.

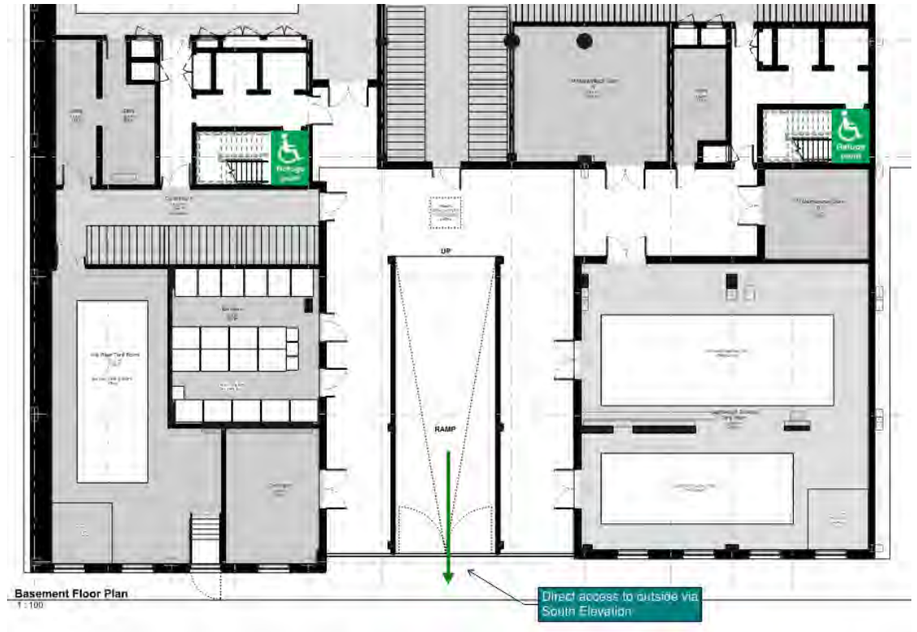


Figure 32: Basement egress routes and refuges

4.3.4 Ground Level

The ground floor level has exits directly to outside that are accessible for MIPs, therefore no disabled refuges are proposed at this level.

4.3.5 Residential Levels

For all residential levels in Blocks A, B and C, it is proposed to provide a protected refuge to the primary firefighting lobby at each level, supplemented with an associated EVC (Figure 33).

In addition to this, it is proposed to provide an evacuation lift to serve each level. As described in Section 4.1.8, the smoke ventilation strategy is such that the refuge will be kept clear from fire and/or smoke to facilitate mobility impaired egress from each level.

The introduction of the EVC at each level would allow PRM to alert building management that they need assistance, and for them to be reassured that this assistance will be forthcoming.

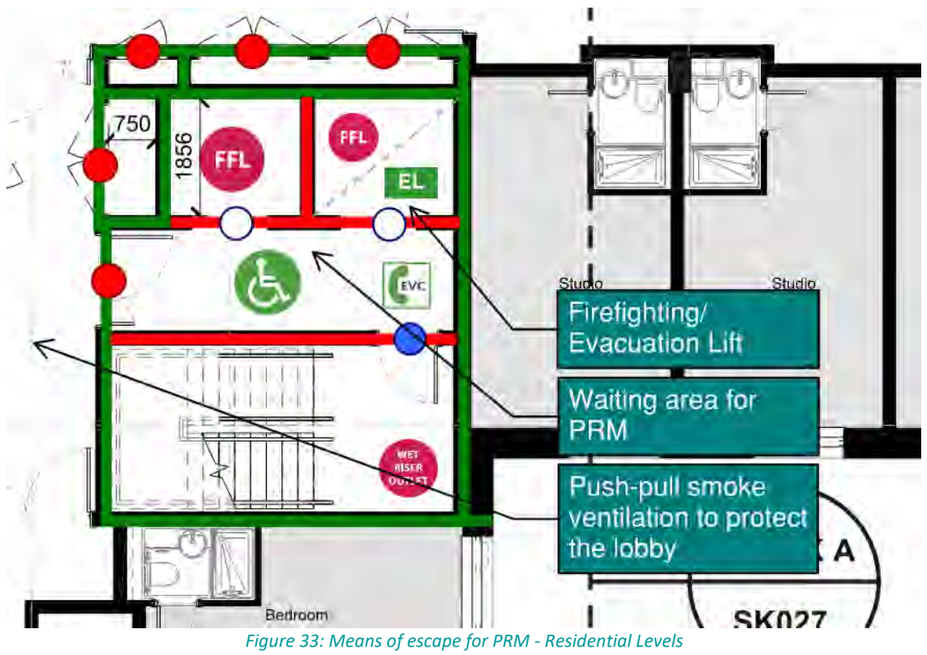


Figure 33: Means of escape for PRM - Residential Levels

4.3.6 Management Procedures

The existing IQ management procedures have not yet been identified. IQ should confirm if it proposed to have the building managed 24/7.

4.4 Assembly/Muster Points

In co-ordination with IQ Student Accommodation, the proposed assembly point location is via the land adjacent to Granby Row and Cobourg Street as shown in Figure 34.

This location is considered acceptable as it would not interfere with the fire service operations upon their arrival. It also has the added benefit of building management having the option to migrate persons further away from the building if necessary.



Figure 34: Proposed assembly point location

5 Internal Fire Spread

5.1 Linings

The surface linings of walls and ceilings should meet the classifications in Table 17 for the appropriate location when tested in accordance with BS EN 13501-1 [30].

However, parts of walls in rooms may be of a lower class (but not lower than European Class D-s3,d2) provided that the total area of those parts in any one room does not exceed half of the floor area of the room, subject to a maximum of 20m^2 in residential accommodation, and 60m^2 in non-residential accommodation.

Table 17: Classification of linings

Location	European Class
Small rooms of area not more than: • 4m^2 in residential accommodation • 30m^2 in non-residential accommodation	D-s3, d2
Other rooms	C-s3, d2
Circulation spaces within dwellings	C-s3, d2
Other circulation spaces including common areas of blocks of flats	B-s3, d2

5.2 Structural Fire Resistance

As the height to the top occupied storey of Blocks A, B and C exceeds 30m, BS 9991 recommends that all loadbearing elements of the structure should be designed to achieve at the minimum 120 minutes fire resistance.

However, as the height of all blocks are more than 15 storeys, they are designated as a Consequence Class 3 (CC3) building as per Approved Document A. For CC3 buildings, the adequate performance of the structure should be demonstrated by a systematic risk assessment which is to be developed at the next design stage, considering the impact of fire on the structure of the building. The structural fire engineering assessment should also consider the different residential and non-residential areas and the associated likelihood of fires occurring and their potential to impact the structure.

5.3 Compartmentation

5.3.1 Overview

The recommended fire resisting construction for areas of the scheme are shown in Table 18 and Appendix A.

5.3.2 Compartment Floors

All floors should be compartment floors achieving at the minimum 120 minutes fire resisting construction (REI).

5.3.3 Storage Lockers

It is proposed to provide fire resisting storage lockers (30 minutes fire resisting construction) at the ground floor where the lockers are not located within their own fire resisting enclosure, and it is further recommended the storage lockers are constructed from materials achieving at the minimum Class A2-ds3,d0.

5.3.4 Dead-end Corridors

In non-residential areas, all dead-end corridors will be provided with 30 minutes fire resisting construction (30 REI) and FD 30S fire doorsets. Residential common corridors will achieve 60 (REI).

5.4 Fire Doors

Fire doors should meet the recommendations outlined in Table 18. Any doors penetrating a fire rated partition should be provided in accordance with BS 476-22:1987 [33] and provided with smoke seals (where specified) in accordance with BS 476-31.1:1983 [34].

All fire doors should be fitted with a self-closing device except for fire doors to cupboards, to service ducts which will be kept locked shut at all times other than for maintenance. Flat entrance doors should be fitted with a self-closing device. This does not apply to the doors within the flat. The below values are as per the recommendations in BS 9999 for the basement and ground floor, and BS 9991 for all upper residential levels.

5.5 Fire and Smoke Curtains

Where fire and smoke curtains are used on the scheme, they should be designed and installed in accordance with BS 8524-1 [18] and BS 8524-2 [19]. The curtains should be fitted with smoke seals installed in accordance with BS EN 1634-3:2004 [20].

The recommended performance of the fire and smoke curtain provided at the lower ground floor is a ‘120 ES’ specification. The following definitions apply:

- E - Integrity performance
- EW - Radiation (heat flux)
- S - Smoke containment

Obstruction alarms should be provided for the curtains, to prevent the misuse of the spaces in proximity to the deployment areas. BS 8524-1 recommends that the alarms commence between 5 and 10 minutes after the obstruction occurs.

The cause-and-effect with regards to the detection system and the barriers should be developed by the M&E engineer.

Table 18: Fire resistance of elements within the building

Area	Minimum Fire Resistance rating (minutes)	Minimum Fire Resistance Fire Doorset
Basement Level		
Generator [i)]	120 REI	FD 60
Bin Store	120 REI	FD 60
Wet Riser Tank	120 REI	FD 60
Sprinkler Tank	120 REI	FD 60
Domestic Water Tank	120 REI	FD 60
Cycle Store/Hub	30 REI	FD 30
General Stores	30 REI	FD 30
Firefighting Shaft Cupboard	120 REI	FD 120S
Firefighting Shaft Enclosure	120 REI	FD 60S
Firefighting Lift	60 REI	FD 30
Firefighting Stair	60 REI	FD 30S
Protected Shafts	120 REI	FD 60 / FD 60S [ii)]
Ground Floor		
Staff Welfare	30 REI	FD 30S
Staff Changing	30 REI	FD 30S
Main Comms Room	30 REI	FD 30S
Parcel Store	30 REI	FD 30
Studio/Gym	30 REI	FD 30
General Stores	30 REI	FD 30
Karaoke	30 REI	FD 30
Cinema	30 REI	FD 30
Private Dining	30 REI	FD 30S
Access Ramp Escape Route (within 1800mm of the external wall)	30 RE	N/a
Fire and Smoke Curtains	Section 5.5	
Residential Levels		
Protected Stairs	120 REI	FD 60S
Studios	60 REI	FD 30S
Cluster Enclosure	60 REI	FD 30S
Cluster Internal Corridor	30 REI	FD 30S
Walls Separating Ground Floor	120 REI	N/a
Cross-Corridor Sub-Division	30 REI	FD 30S
General		
Cavity Barriers	30 E & 15 I	FD 30
Loadbearing Elements	120 R	N/a
Compartment Floors	120 REI	N/a

i) To be confirmed by the energy supplier.

ii) As per specific location (Refer to Appendix A).

5.6 Concealed Spaces (Cavity Protection)

In order to restrict smoke and/or fire spread through concealed spaces or cavities, cavity barriers should be provided as described in Section 19 and 21 of BS 9991:

- At the edges of cavities, including around openings (such as windows, doors and exit/entry points for services);
- At the junction between an external cavity wall and every compartment floor and compartment wall;
- At the junction between an internal cavity wall and every compartment floor, compartment wall or other wall or door assembly forming a fire resisting barrier; and
- Subdivide extensive cavities to meet the provisions in Figure 35 and Table 19.

Table 19: Cavity Barrier Provisions

Location of cavity	Class of surface /product exposed in cavity	Maximum dimensions in any direction (m)
Between roof and ceiling	Any	20
Any other cavity	Class C-s3,d2 or better	20
	Worse than Class C-s3,d2	10

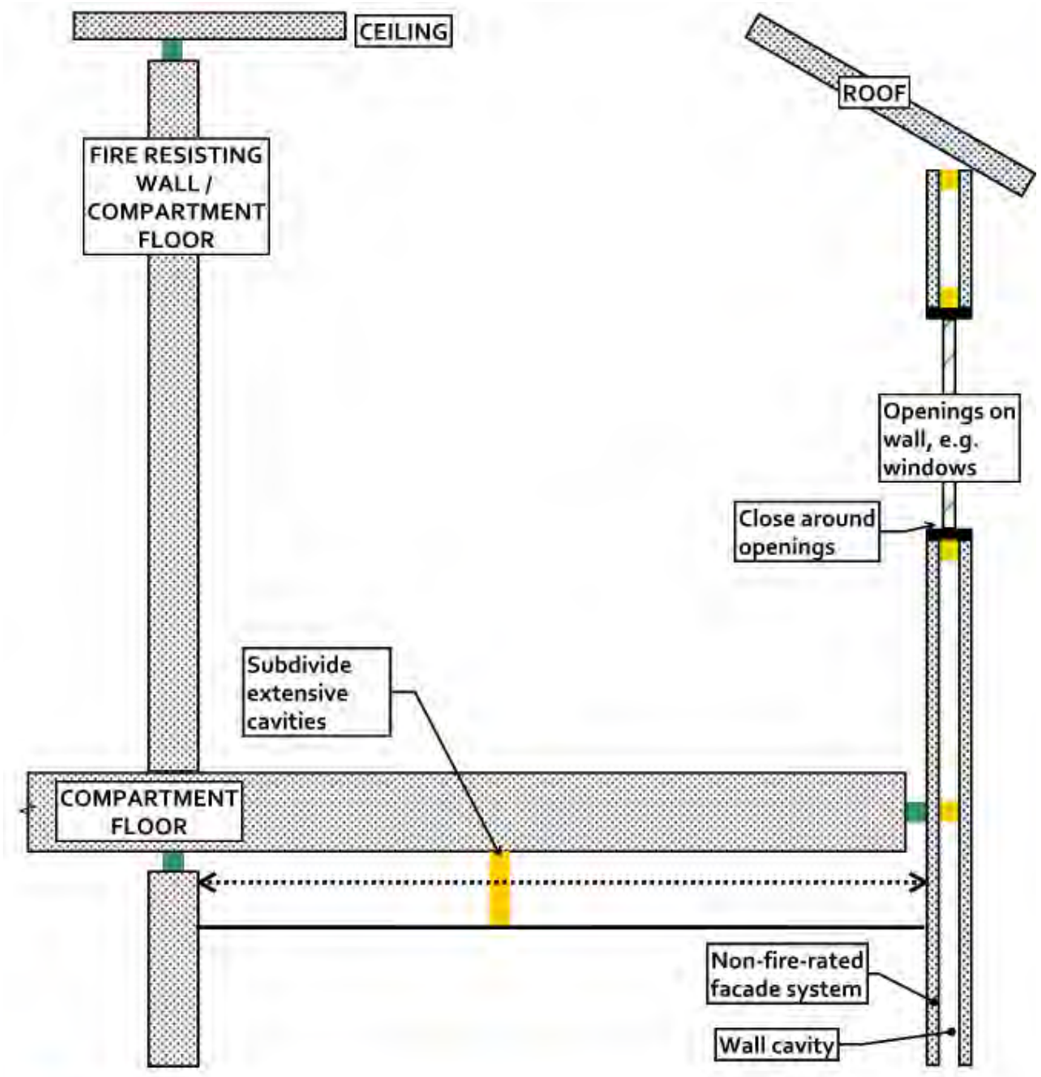


Figure 35: Cavity barriers and fire-stopping

5.7 Fire-stopping

5.7.1 Overview

As described below, any openings in compartment walls and floors should be fire-stopped achieving the same fire rating as the wall or floor through which they pass, including all relevant openings for pipes, ducts and conduits for cables. The number of openings should be kept to as few in number as possible and the size as small as is practicable. Fire-stopping is also to be installed where joints between fire resisting elements are provided (Figure 36).

Where fire stopping, dampers or similar are used to maintain protection when services pass through fire resisting elements, the design of the penetration should ensure the configuration of the chosen sealing product is compatible with the relevant substrate and application. Where practicable, penetration details should align with standard details provided by product manufacturers supported by relevant test data.

Where achieving a standard detail is not practicable, the non-standard detail must be supported by assessments or engineering judgements by a suitably qualified party and be based on appropriate primary and secondary test data.

All fire stopping, dampers or similar must be installed by suitably qualified persons and certified by the installer (if a member of a self-certification scheme) or by a suitable third party.

5.7.2 Pipes

Pipes that pass through a fire separating element, as shown in Figure 36, should meet one of the following provisions:

- Proprietary seals - Provide a proprietary fire-stopping sealing system (e.g. a pipe collar) which has been shown by test to maintain the fire resistance of the wall, floor or cavity barrier; or
- Restricted pipe diameter - Where a proprietary sealing system is not used, and the nominal internal diameter of the pipe is not more than the relevant dimension given in Figure 36 providing a suitable fire stopping sealant applied around the pipe is sufficient. The opening should be kept as small as possible; or
- Sleeving - A pipe of lead, aluminium, aluminium alloy, fibre-cement or uPVC (BS 4514:2001 [35] and uPVC pipes complying with BS 5255:1989 [36]), with a maximum nominal internal diameter of 160mm, may be used with a sleeve made out of a high melting point metal. The opening in the structure should be as small as possible and suitable fire stopping sealant should be provided around the sleeve. The sleeve should extend no less than 1000mm on either side of the structure.

In addition to the minimum recommendations from guidance, best practice guidance recommends that appropriate protection be provided to pipes such that the insulation and integrity of the separating element they pass through be maintained.

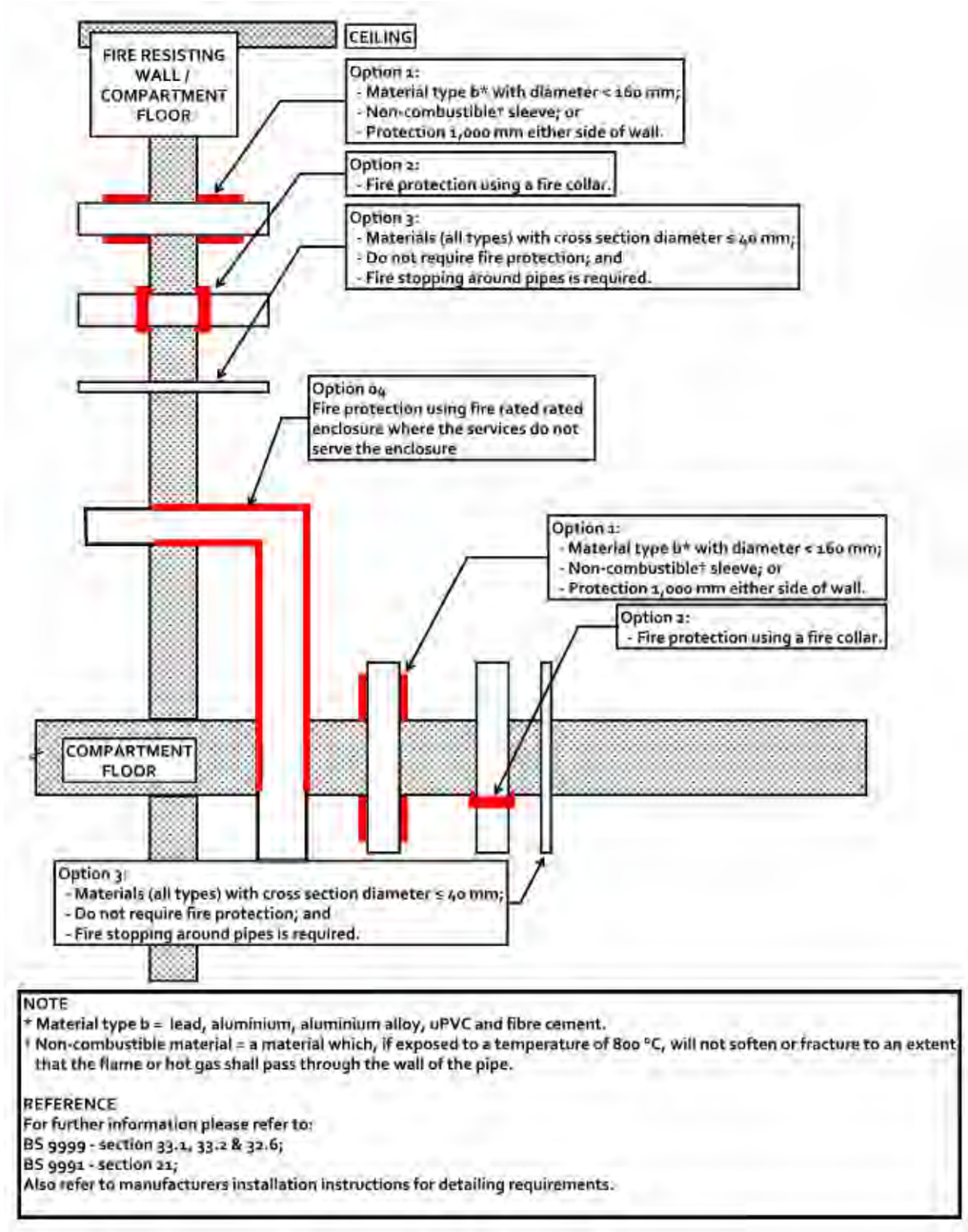


Figure 36: Fire-stopping details: pipes

5.8 Ventilation Ducts, Flues, etc.

One of the following methodologies, as illustrated in Figure 37, is to be implemented where a ventilation duct passes through a fire resisting element to maintain the integrity of this element:

- Protection using fire and smoke dampers, conforming to BS EN 15650 [37]. It should be noted that thermally activated fire dampers only are not adequate to protect escape routes and in residential parts of the building. Penetrations into protected corridors or across compartment walls subdividing evacuation zones shall be protected with motorised fire and smoke dampers, which are activated on the detection of smoke or fire within the associated compartments;
- Protection using fire-resisting enclosures; and
- Protection using fire-resisting ductwork.

Any extract ductwork serving kitchens penetrating fire resisting elements should not be provided with fire dampers. They should be protected throughout using a fire resisting enclosure or fire-resisting ductwork. It should be confirmed if the flats include kitchen ductwork.

Shared ductwork between flats should be avoided, otherwise fire and smoke dampers will be required at penetrations where a duct enters or leaves a flat, which would likely lead to difficulties in terms of access, testing and maintenance.

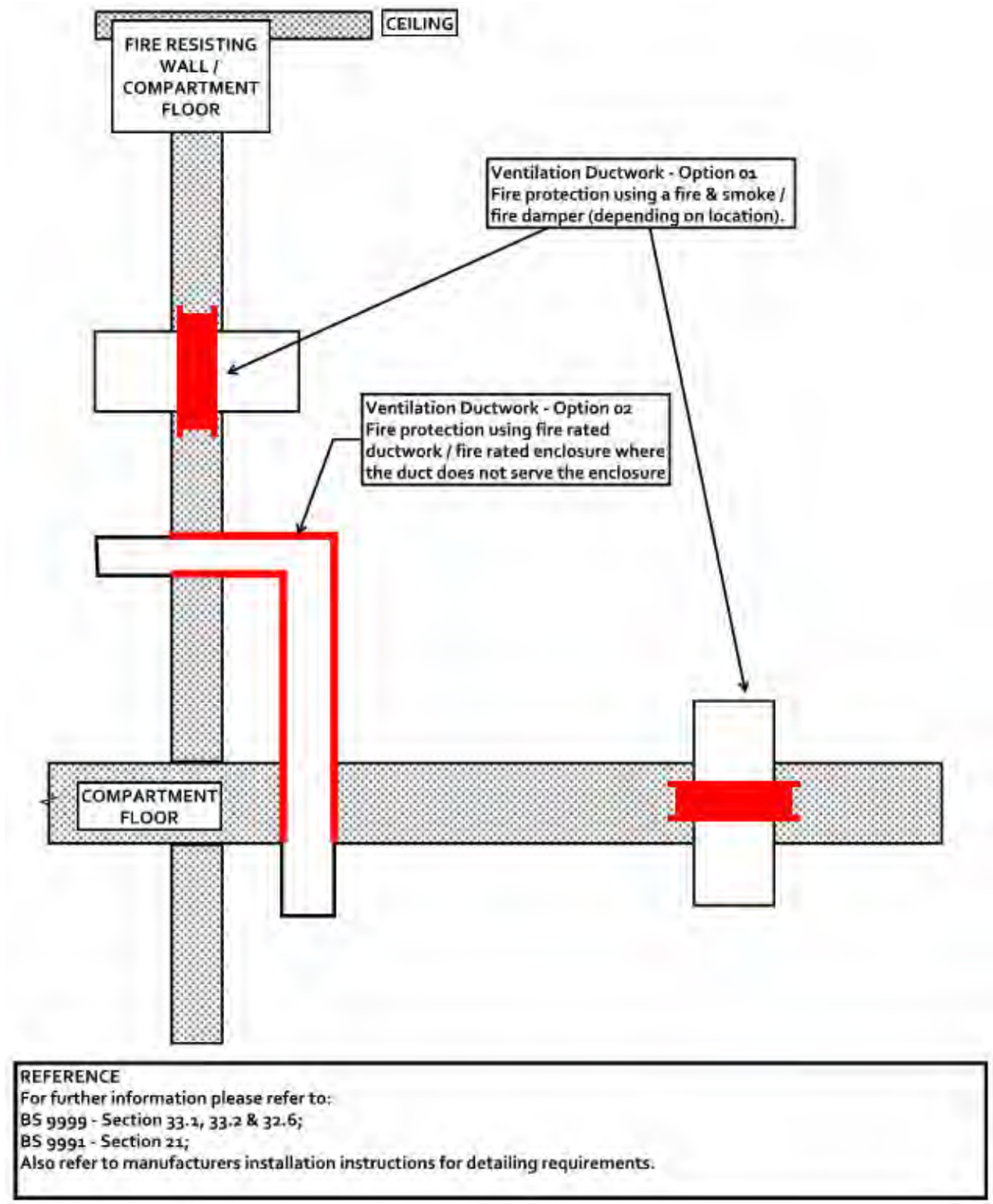


Figure 37: Fire-stopping details: ventilation ducts

6 External Fire Spread

6.1 External Wall Build-Up

The building is a *'relevant building'* as defined in the Building Regulations. A relevant building is *'any building with a storey at least 18m above ground level which contains one or more dwellings; and institution; or a room for residential purposes'.* Therefore, all materials which are part of the external wall or specified attachment must be of European Classification A2-s1,d0 or Class A1, classified in accordance with BS EN 13501-1 [30] as per the requirements in Regulation 7(2).

Regulation 7(3) sets out some exceptions from the requirements in Requirement 7(2), which includes the following:

- Cavity trays when used between two leaves of masonry;
- Any part of a roof (other than any part of a roof which falls within paragraph (iv) of regulation 2(6)) if that part is connected to an external wall;
- Door frames and doors;
- Electrical installations;
- Insulation and water proofing materials used below ground level;
- Intumescent and fire stopping materials where the inclusion of the materials is necessary to meet the requirements of Part B of Schedule 1;
- Membranes;
- Seals, gaskets, fixings, sealants and backer rods;
- Thermal break materials where the inclusion of the materials is necessary to meet the thermal bridging requirements of Part L of Schedule 1; or
- Window frames and glass.

Whilst regulation 7(3) states that the requirements do not apply to membranes, the revised statutory guidance (AD B) recommends that membranes used as part of the external wall construction should achieve a minimum classification of European Class B-s3, d0. Roofing membranes do not need to achieve a minimum of Class A2-s1,d0 when used as part of a roof connecting to an external wall. However, refer to Section 6.3 for additional commentary.

Thermal breaks should not span two compartments and should be limited in size to the minimum required to restrict the thermal bridging (the principal insulation layer is not regarded as a thermal break).

As best practice, it is recommended that all practical endeavours should be applied to seek the best performing materials (subject to other performances being satisfactory).

6.2 Roof Coverings

Performance of the resistance of roofs to external fire exposure is measured in terms of penetration through the roof construction and the spread of flame over its surface.

It is recommended that roof coverings be designated with $B_{ROOF}(t4)$ in accordance with BS EN 13501-5 [38] due to the proximity of the site boundary.

6.3 Roof Insulation

There are 5no. main roof areas for the building as shown in Figure 38. This includes Block A, B and C roofs at levels 16,22 and 28 respectively, and link A-B and link B-C roofs at levels 12 and 16 respectively.

There are proposals to utilise combustible insulation within the Block A, B and C build-ups at the roof level. However, for the link A-B and B-C roof levels that are situated adjacent to the external wall construction of Blocks A,B and C, the design intent is to provide non-combustible insulation to achieve at the minimum Class A2-s1,d0. The reasoning is explained below.

To assess the suitability of adopting combustible insulation within the roof for this scheme, it is considered appropriate to evaluate against the requirements of the Building Regulations 2010 (as amended).

As per Section 6.1, Regulation 7(2) applies to this scheme which provides restrictions on the materials used in the external wall build-up for relevant building.

As stated in Regulation 7(3), Regulation 7(2) '*does not apply to any part of a roof (other than any part of a roof which falls within Paragraph (iv) of Regulation 2 (6)) if that part is connected to an external wall'. Paragraph (iv) of Regulation 2 (6) relates to 'any part of a roof pitched at any angle of more than 70 degrees to the horizontal if that part of the roof adjoins a space within the building to which persons have access, but not access only for the purpose of carrying out repairs or maintenance'.*

As all roof areas are approximately 0 degrees to the horizontal, this clause does not apply. Therefore, the build-ups would not have to meet Regulation 7 of the Building Regulations. However, OFR consider it appropriate to evaluate in respect to Requirement B3 (internal fire spread) and B4 (external fire spread) of the Building Regulations 2010 (as amended).

B3 (Internal Fire Spread - Structure)

- Section 5.11 in AD B v1 recommends that to reduce the risk of fire spreading over the roof from one compartment to another, a 1500mm wide zone of the roof, either side of the wall, should have a covering classified B_{ROOF}(t4), on a substrate or deck of a material rated Class A2-s3,d2 or better.
- As per the *'ECHO-SRA-ZZ-XX-DR-A-SK036'* drawing provided, the roof structure will be supported and separated from the accommodation below via a 250mm RC concrete slab. As such, it is considered that the recommendations in Section 5.11 in AD B v1 are inherently met. There will be a physical concrete barrier between the internal compartment walls and the roof elements.

From the above, it can be ascertained that due to the provision of the 250mm RC concrete roof slab, Requirement B3 can be considered to be met.

B4 (External Fire Spread)

- Requirement B4 (1) - *'The external walls of the building shall adequately resist the spread of fire over the walls and from one building to another, having regard to the height, use and position of the building'*. This is further supplemented with the intent outlined within AD B v1 which states *'The external envelope of a building should not contribute to undue fire spread from one part of a building to another part'.* This intent can be met by constructing external walls so that both of the following are satisfied:
    - *'The risk of ignition by an external source to the outside surface of the building and spread of fire over the outside surface is restricted; and*
    - *The materials used to construct the external walls, and attachments to them, and how they are assembled do not contribute to the rate of fire spread up the outside of the building'.*

All roof level roof elements are exempt from Regulation 7, however, to reduce the risk of ignition to the outside surface of the external walls to Blocks A, B and C, it is recommended that the build-up of the roof for the A-B and B-C link areas aligns with Regulation 7 as it is directly adjoined to the external wall.

- Requirement B4 (2) – '*The roof of the building shall adequately resist the spread of fire over the roof and from one building to another, having regard to the use and position of the building'.*

The above is typically achieved via the specification of roof coverings. Due to the proximity to the relevant boundary for this scheme, it is recommended that the roof coverings achieve B_{ROOF}(t4) in accordance with BS EN 13501-5.

Conclusion

- Link A-B and B-C roofs - Align with Regulation 7(2) i.e. all elements to achieve at the minimum Class A2-s1,d0 unless exempt as per Regulation 7(3). Ensure roof covering achieves B_{ROOF}(t4) in accordance with BS EN 13501-5.
- Block A,B and C roofs - No provisions with regards to the insulation product. Ensure roof covering achieves B_{ROOF}(t4) in accordance with BS EN 13501-5. Combustible insulation considered acceptable subject to review and agreement with the Building Control and the insurance body.



Figure 38: Roof zones

6.4 Space Separation Assessment

6.4.1 Overview

A space separation assessment carried out in accordance with BR 187 [39] has been conducted, in order to determine the requisite quantity of fire rated external wall construction to mitigate the risk of fire spread across relevant boundaries. The following assumptions have been made for these calculations.

- Each area has been measured as an equivalent rectangle;
- The fire has been assumed to compromise the entirety of a compartment;
- The most onerous enclosing rectangle has been taken for each respective elevation;
- A heat flux of 84 kW/m^2 has been assumed for all residential areas (including the ground floor amenity area);
- A heat flux of 168 kW/m^2 has been assumed for all plant and refuse areas;
- As the building is fitted with sprinklers, the allowable unprotected area % is doubled;
- The relevant boundaries to the North and South have been taken as the centreline of the road and Viaduct respectively;
- The relevant boundary to the East has been taken to the notional boundary between Echo Street and Bainbridge Hall;
- The relevant boundary to the West has been taken to the centreline of Vimto Park.

The most onerous compartments only have been assessed within Table 20 considering the basement and ground floor only, as these are considered to be more conservative measurements than the upper-level residential areas.

The conclusion is that none of the external walls would require fire resisting construction from a space separation perspective. However, some walls would require fire resisting construction to limit fire spread between flats located at right angles (Section 6.4.3).

These calculations will have to be revised following any internal layouts post planning.

6.4.2 External walls 1000mm or more from the relevant boundary

Where an external wall is more than 1000mm from the relevant boundary, the extent of unprotected areas should not exceed the recommendations in Table 20. The rest of the wall (if any) should achieve 120 minutes fire resisting construction (integrity and insulation) tested from the inside of the building only.

6.4.3 Apartment Internal Angle

On various upper residential levels, there are multiple instances where apartments are located at an internal angle to each other. It is proposed to provide 60 minutes fire resisting construction (integrity and insulation) to a 1m strip at the internal angle of the flats, to prevent flat to flat fire spread. This construction should be tested from the inside only. Further information is contained within Appendix A.

Table 20: External fire spread analysis

Compartment (Figure 41)	Level	Elevation	Heat flux (kW/m^2)	Relevant Boundary	Boundary Distance (m)	Enclosing Rectangle (W x H) (m)	Allowable Unprotected Area (%)
A	Basement	South	84	Viaduct	9.5	15 x 3	100
B	Ground	South		Viaduct	9.5	15 x 3.9	100
		West		Vimto Park	30	24 x 3.9	100
C	Ground	South	168	Echo Street	9.5	7.8 x 3.9	100
		East		Echo Street	5	8.5 x 3.9	100
D	Ground	North	84	Granby Row	4.3	71 x 3.9	100
	Ground + Mezzanine	North		Granby Row	4.3	13 x 6.9	100
	Ground	East		Vimto Park	33	7.3 x 3.9	100
		West		Echo Street	5	7.3 x 3.9	100
i) There is currently a mezzanine located in between the ground floor and the first floor level, fire separated from the remainder of the building. As such, this double height space has been considered in these calculations.							



Figure 39: Site Boundary



Figure 40: Basement Level Compartment

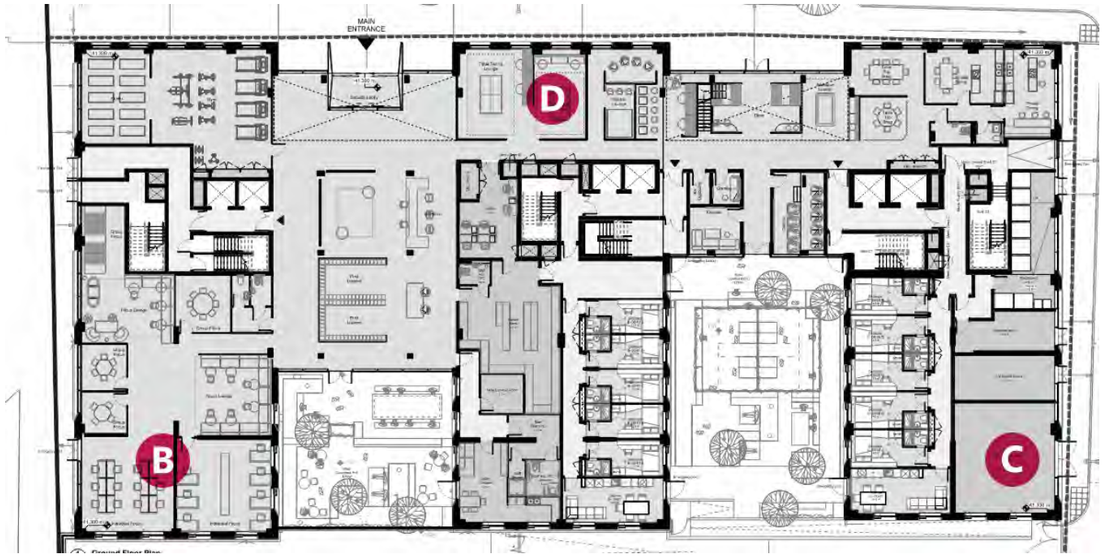


Figure 41: Ground Level Compartment

7 Access and Facilities for the Fire and Rescue Service

7.1 Fire Service Vehicle Access

Vehicular access to the site is via Granby Row and Echo Street as shown in Figure 42. The parking position is within 18m of an entrance point to both Core A and Core C firefighting shafts.

Access to the south of the site is not currently possible for a fire service vehicle due to the sloping site and constraints due to the existing bridge. Therefore, it is proposed that fire service access to the central core B is via the reception.

The access routes from both Granby Row and Echo Street are such that the fire service vehicle would not have to reverse more than 20m.

Fire appliances in the UK are not standardised and therefore it is recommended that the provisions outlined in Table 21 below are met, subject to agreement with the Greater Manchester Fire and Rescue Service (GMFRS). It is recommended that preliminary vehicle tracking is undertaken to confirm if the below values are achievable.

Table 21: Fire and rescue service vehicle route specification

Appliance type	Minimum width of road between kerbs	Minimum width of gateways	Minimum turning circle between kerbs	Minimum turning circle between walls	Minimum clearance height	Minimum carrying capacity
Pump	3.7m	3.1m	16.8m	19.2m	3.7m	12.5 tonnes

7.2 Internal Firefighting Provisions

As the blocks are all over 18m in height to the top occupied storey, each will be provided with a firefighting shaft as per the recommendations in BS 9991 and BS 9999, serving all levels in the premises besides the basement (Figure 43). It is however proposed to continue the firefighting stair, firefighting lobby and wet riser outlets down to serve the basement and roof levels. The firefighting lifts will not serve either the basement or roof levels.

The firefighting shaft will contain the following:

- 1no. firefighting lift installed in accordance with BS EN 81-72 [21];
- Firefighting lobby provided with a means for ventilation;
- Firefighting stair with a minimum of 1100mm clear width; and
- A wet rising main designed in accordance with BS 9990 [15]

In addition to this, primarily to facilitate egress for persons with reduced mobility (PRM) (Section 4.3), one of the passenger lifts will be a combined firefighting/evacuation lift. This approach will be further developed following confirmation of the proposed building management strategy.

7.3 Wet Fire Mains

As each block has a height to the top occupied storey above 50m from firefighting access level, wet fire mains will be installed and located within each stair enclosure.

The wet riser infill location will be located within 18m of the fire service vehicle parking position as shown in Figure 42.

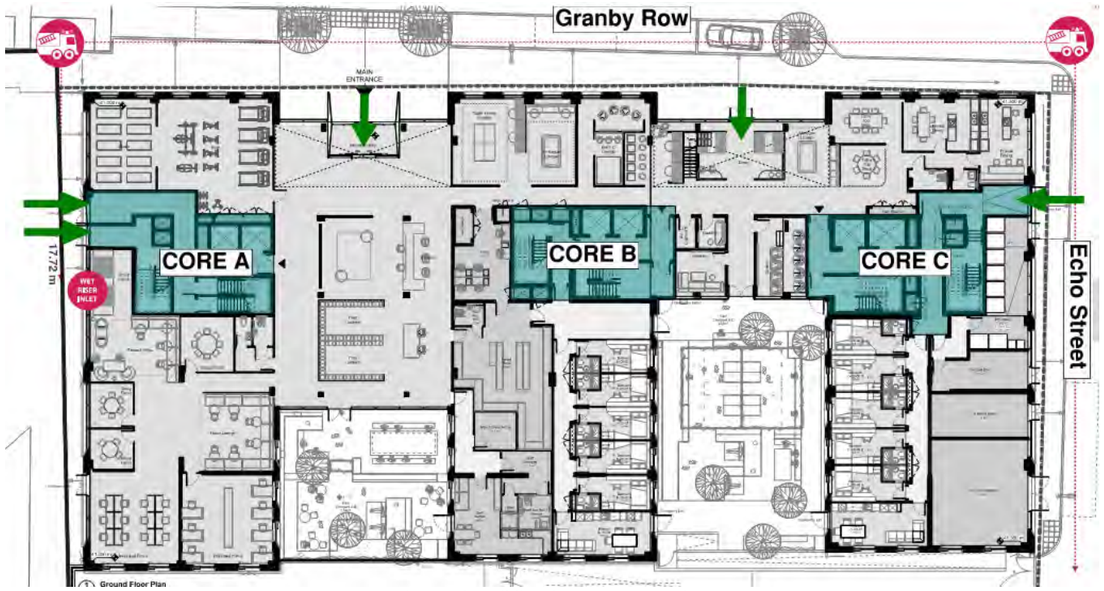


Figure 42: Building Core Entrance Points

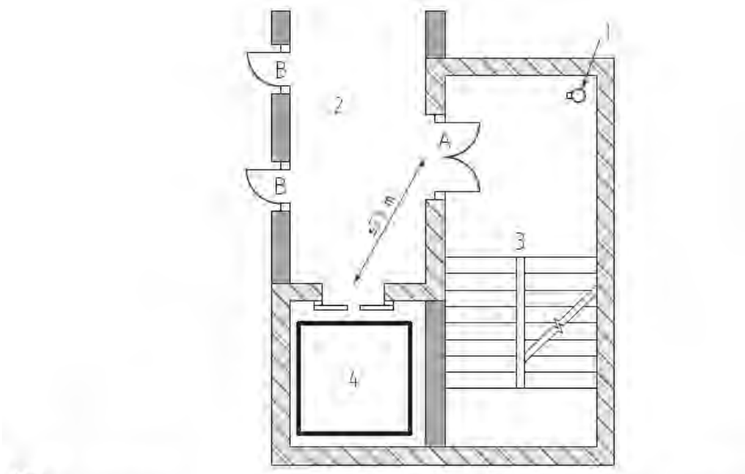


Figure 43: Residential firefighting shaft (as extracted from Figure 35 in BS 9991)

7.4 Hose Coverage

7.4.1 Overview

As recommended in BS 9991, as the building is fitted throughout with a sprinkler system in accordance with both BS 9251 and BS EN 12845, the hose laying distance to every part of every storey should be no more than 60m from a fire main outlet in the firefighting shaft, as measured on a route suitable for laying hose.

7.4.2 Basement

Both stairs serving the basement level will be provided with wet rising main outlets. As shown in Figure 44, the maximum hose distance for this level is c.44m. It is proposed to continue the wet risers to both of the basement stairs for additional redundancy.

7.4.3 Ground Floor

All stairs at the ground floor level will be provided with wet riser outlets. Therefore, hose coverage is within 60m to all areas of the floor plate (Figure 45). This is further supplemented by the fact that the fire service can directly access the ground floor level via either the reception, or from Cores A and C.

7.4.4 Upper Levels

All stairs at the upper levels provided with wet riser outlets. Therefore, hose coverage is within 60m to all areas of the floor plate (Figure 46).



Figure 44: Maximum hose coverage - Basement Level



Figure 45: Maximum hose coverage – Ground Floor

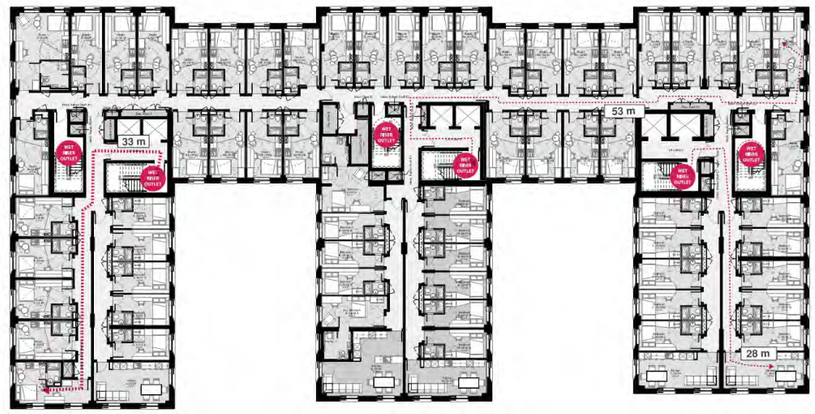


Figure 46: Maximum hose coverage – Upper Levels

7.5 Basement Smoke Ventilation

7.5.1 Overview

BS 9991 recommends that a system of smoke and heat ventilation should be provided from every basement, except for any basement storey that has:

a) A floor area of not more than 200m^2; or

b) A floor level not more than 3m below the adjacent ground level.

BS 9991 further recommends that basement compartments having external doors or windows do not need smoke outlets, as long as the floor area recommendations are met. The following rooms meet these recommendations as they are enclosed with compartment walls and have windows directly to outside and thus do not require additional smoke outlets:

1. Wet Riser Tank Room (101m^2);
2. Generator Room (31m^2);
3. Commercial Sprinkler Tank Room (201m^2)

Systems may be either natural, using one or more smoke outlets, or mechanical.

7.5.2 Natural Smoke and Heat Ventilation

The proposed means to ventilate the basement level is via means of natural smoke ventilation. As shown in Figure 47, all rooms (besides the storerooms adjacent to Stair 1) open directly into the central basement area which is open to the external to the southern elevation. As such, the following recommendations in BS 9991 should be met.

a) Smoke outlets not less than 2.5% of the floor area of the storey;

b) Sited at the highest level practicable, either in the ceiling or in the wall of the space they serve;

c) Evenly distributed around the perimeter of the building, to discharge into the open air outside the building; and

d) Located such that they would not prevent the use of escape routes from the building.

Discounting the wet riser tank room, generator room, commercial sprinkler tank room and the firefighting shafts (sterile spaces), the total area of the basement which would require a means for ventilation is 800m^2. Therefore, the basement should be provided with smoke vents with a minimum free area of 20m^2 (2.5%).

To provide sufficient cross-ventilation to the central basement space, it is proposed to provide 10m^2 free area via openings in the ground floor slab above which discharge to the external (Figure 48). The openings in the slab will be integrated into the fixed furniture at the ground floor level In addition to this, a minimum of 10m^2 free area will be provided via the entrance ramp opening to the external basement area.

The location of these proposed vents is not anticipated to prevent the use of escape routes from the building, as within both the basement and the ground floor level, persons have alternative exits and are able to turn their back a seat of fire and/or smoke.

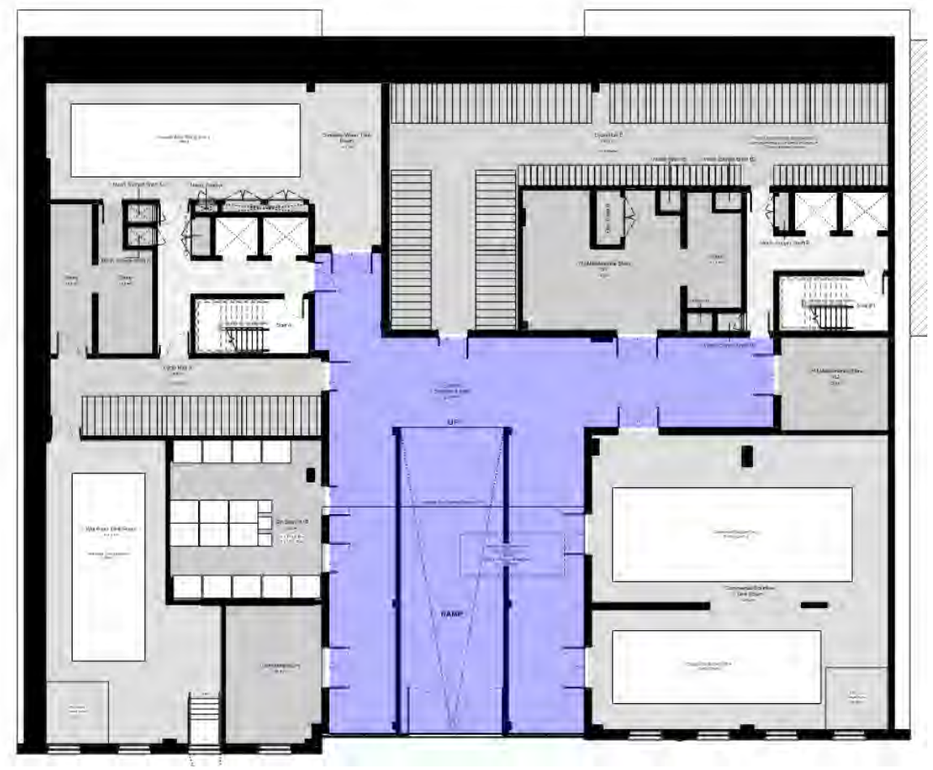


Figure 47: Ventilated External Basement Area

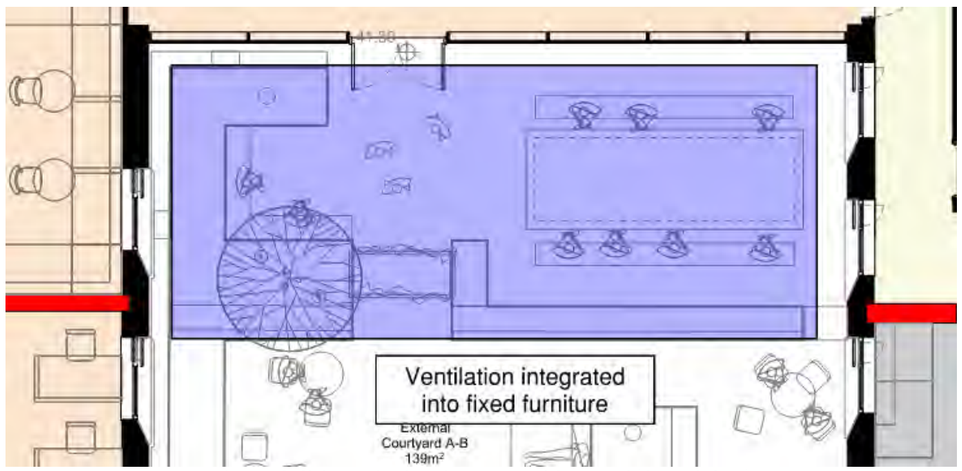


Figure 48: Slab opening location - External Courtyard (Ground Floor)

7.6 Wayfinding Signage for the Fire Service

To assist the Fire and Rescue Service to identify each floor of the building, and individual flats, floor identification signs will be provided as per best practice and as per AD B Volume 1 (2022) to meet all of the following conditions:

a. The signs should be located on every landing of a protected stairway and every protected corridor / lobby into which a fire-fighting lift opens;

b. The text should be in sans serif typeface with a letter height of at least 50 mm. The height of the numeral that designates the floor number should be at least 75mm;

c. The signs should be visible from the top step of a fire-fighting stair and, where possible, from inside a fire-fighting lift when the lift car doors open;

d. The signs should be mounted between 1.7m and 2.0m above floor level and, as far as practicable, all the signs should be mounted at the same height; and

e. The text should be on a contrasting background, easily legible and readable in low-level lighting conditions or when illuminated with a torch.

Refer to Section 15 in AD B v1 for more information related to fire service wayfinding.

7.7 Secure Information Boxes

A secure information box provides a secure facility to store information about a building for use by the fire and rescue service during an incident. As the building has a top storey height more than 11m above ground level, the building should be provided with a secure information box. The box should meet all of the following conditions:

a. Sized to accommodate all necessary information;

b. Easily located and identified by firefighters;

c. Secured to resist unauthorised access but readily accessible by firefighters;

d. Protected from the weather.

Best practice guidance for the adoption of these secure information boxes is contained within Sections 2 to 4 of the *'Code of Practice for the Provision of Premises Information Boxes in Residential Buildings'* published by the Fire Industry Association (FIA).

7.8 Evacuation Alert Systems

As the building has a top storey over 18m above ground level, an evacuation alert system should be provided in accordance with BS 8629 [11].

7.9 Hydrant Provisions

BS 9991 recommends that hydrants be located in positions that are near to building entry points (including entry points to fire-fighting shafts containing fire mains) and fire appliance parking positions. For buildings that are provided with wet rising mains such as the Echo Street building, hydrants should be provided within 90m of an entry point to the building and not more than 90m apart.

An existing utilities survey dated 04.05.2017 shows that multiple fire hydrants are located in proximity to the Echo Street building as shown in Figure 49.

It should be confirmed that the relevant hydrant(s) have recently been tested and are capable of supplying the appropriate pressures.

It should be demonstrated that the water mains and hydrants are capable of delivering a sufficient flow of water to enable effective fire-fighting to be undertaken.

All hydrants should have signage in accordance with BS 3251 [40].

OFR and IQ Student Accommodation held a meeting with Greater Manchester Fire and Rescue Service (GMFRS) (Simon Whittaker and Neil Helmrich) via Microsoft Teams on 8th February 2023 to discuss the existing hydrant locations, and GMFRS agreed in principle to their location.



Figure 49: Existing Hydrant Locations

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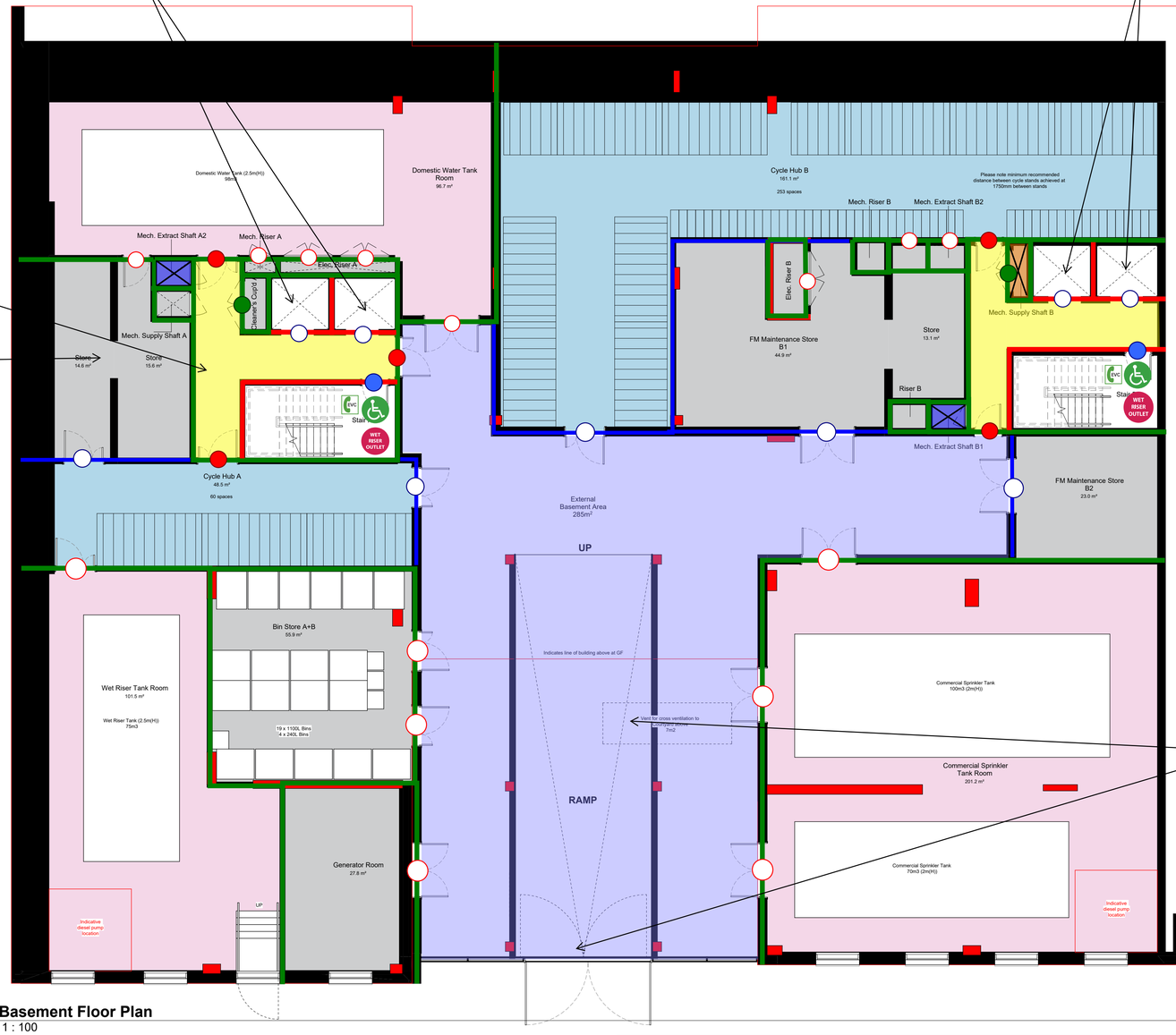
APPENDIX A – FIRE STRATEGY MARK-UPS

Firefighting lifts do not have to serve the basement level and so have not been labelled.

Firefighting lifts do not have to serve the basement level and so have not been labelled.

Firefighting lobby smoke control proposals to be developed at RIBA Stage 3.

As these stores do not open directly into the central ventilated space, the rooms would require a means for smoke ventilation.



Allow for a combined minimum free area of 20m² to ventilate the shaded portion to the basement. To provide sufficient cross-ventilation, a minimum of 10m² free area should be provided in the basement soffit slab, and a minimum of 10m² via the basement entrance ramp opening.

1 02099 **Basement Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- Refuge
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- EVC — Emergency voice communication system (EVC)
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Lobby/Corridor
- Ventilated Basement Section - 2.5% of the basement area (10m²).

OFR FIRE + RISK CONSULTANTS

Project:	Echo Street, Manchester		
Title:	Fire Resistance & Fire Safety Mark-ups		
Revision:	R00	**Scale:**	As shown
Prepared by:	AT	**Date:**	24/01/23
Checked by:	DM	**Date:**	01/02/23

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Student Accommodation

STATUS	PURPOSE FOR ISSUE
S2	**Planning**

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27th Floor City Tower Piccadilly Plaza Manchester M1 4BT
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SCALE@A1	DATE	ORIGINATOR	CHECKED	AUTHORISED
1 : 100	**24/03/23**	**LK**	**VC**	**RG**

PROJECT
Echo Street
General Arrangement
Basement Plan

Stage 2

SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- B1- DR - A - 02099**

REV. **P04**

MAIN ENTRANCE

120 EW Fire and Smoke Curtain

120 EW Fire and Smoke Curtain

120 EW Fire and Smoke Curtain

30 minute fire rated lockers to be provided. It is recommended they are also constructed from A2-s3,d2 materials.

30 RE up to 1100mm from access ramp level

1 02100 **Ground Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby

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6. Ground Floor amenity space layout completed by Manalo + White Architects design intent only and follow Client's brief. Subject to further review and co-oridnation with SRA and specialist consultants (incl. MEP, structure and fire engineer)

OFR FIRE + RISK CONSULTANTS

Project:	Echo Street, Manchester		
Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

Note:

These mark-ups are in accordance with BS 9999 for the ground floor amenity areas.

BS 9991 has been adopted for the cluster bedrooms and the central cores.

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1 : 100	14/04/23	LK	VC	RG

PROJECT
Echo Street
General Arrangement
Ground Floor Plan

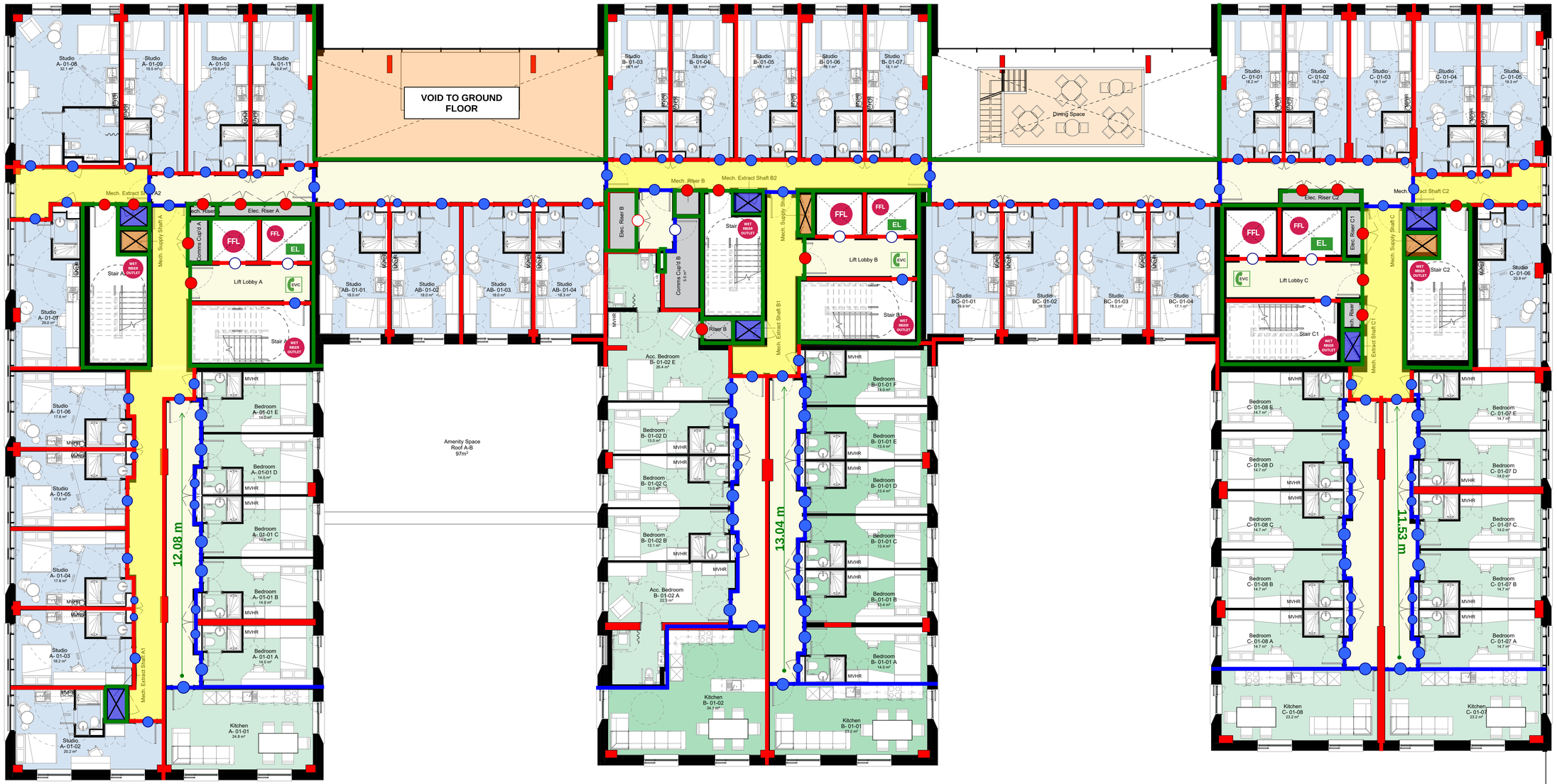
Stage 2

SR NO. **7054**

DRAWING NO. **ECHO-SRA-ZZ-00-DR-A-02100**

REV. **P08**

STATUS	PURPOSE FOR ISSUE
S2	**Planning**



1 02101 **Level 01 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
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OFR FIRE • RISK CONSULTANTS

Project:	Echo Street, Manchester		
Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

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1 : 100	24/03/23	LK	VC	RG

PROJECT
Echo Street
General Arrangement
Level 01 Floor Plan

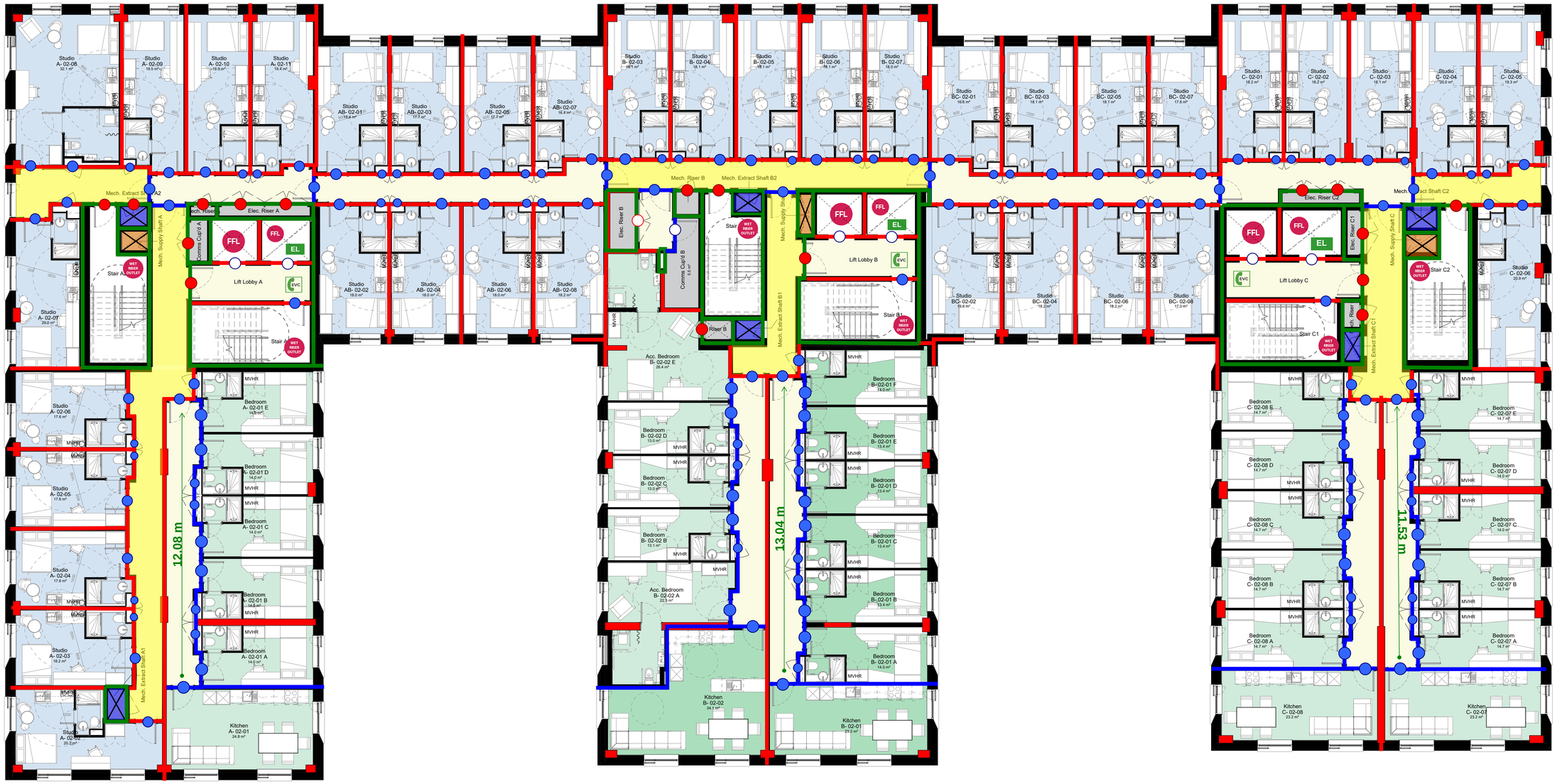
Stage 2

SR NO.
7054

STATUS **S2** PURPOSE FOR ISSUE **Planning**

DRAWING NO. **ECHO- SRA- ZZ- 01- DR - A - 02101**

REV. **P06**



1 02102 **Level 02 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
- Mechanical extract shaft (extract rate TBC)
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Project:	Echo Street, Manchester		
Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

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1 : 100	24/03/23	LK	VC	RG

PROJECT
Echo Street
General Arrangement
Level 02 Floor Plan

Stage 2

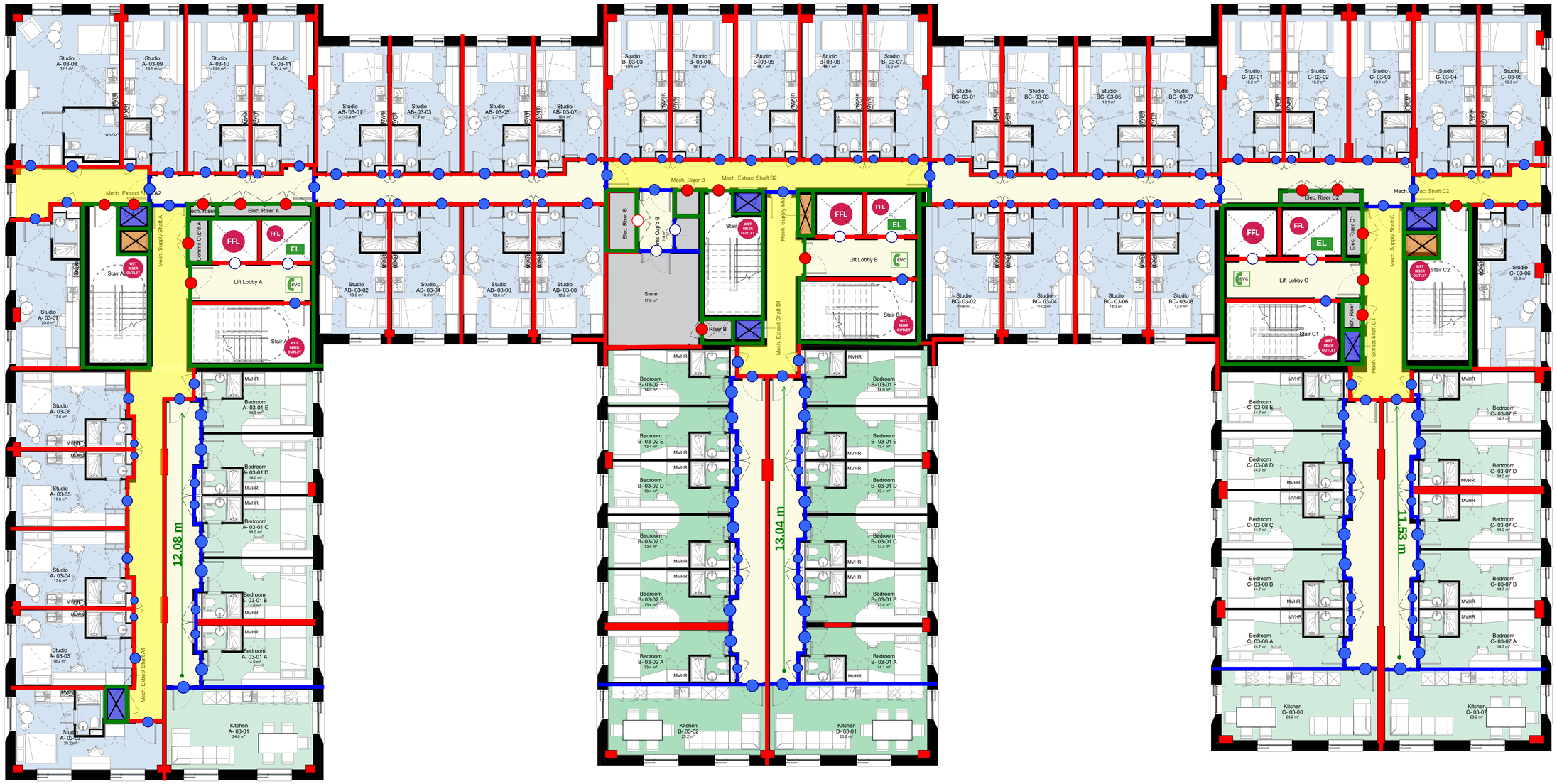
SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 02- DR - A - 02102**

REV. **P05**

STATUS **S2**

PURPOSE FOR ISSUE **Planning**



1 Level 03 Floor Plan
02103

1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- Mechanical extract shaft (extract rate TBC)
- Ventilated Refuse Lobby
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
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OFR FIRE + RISK CONSULTANTS

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Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

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PROJECT
Echo Street
General Arrangement
Level 03 Floor Plan

Stage 2

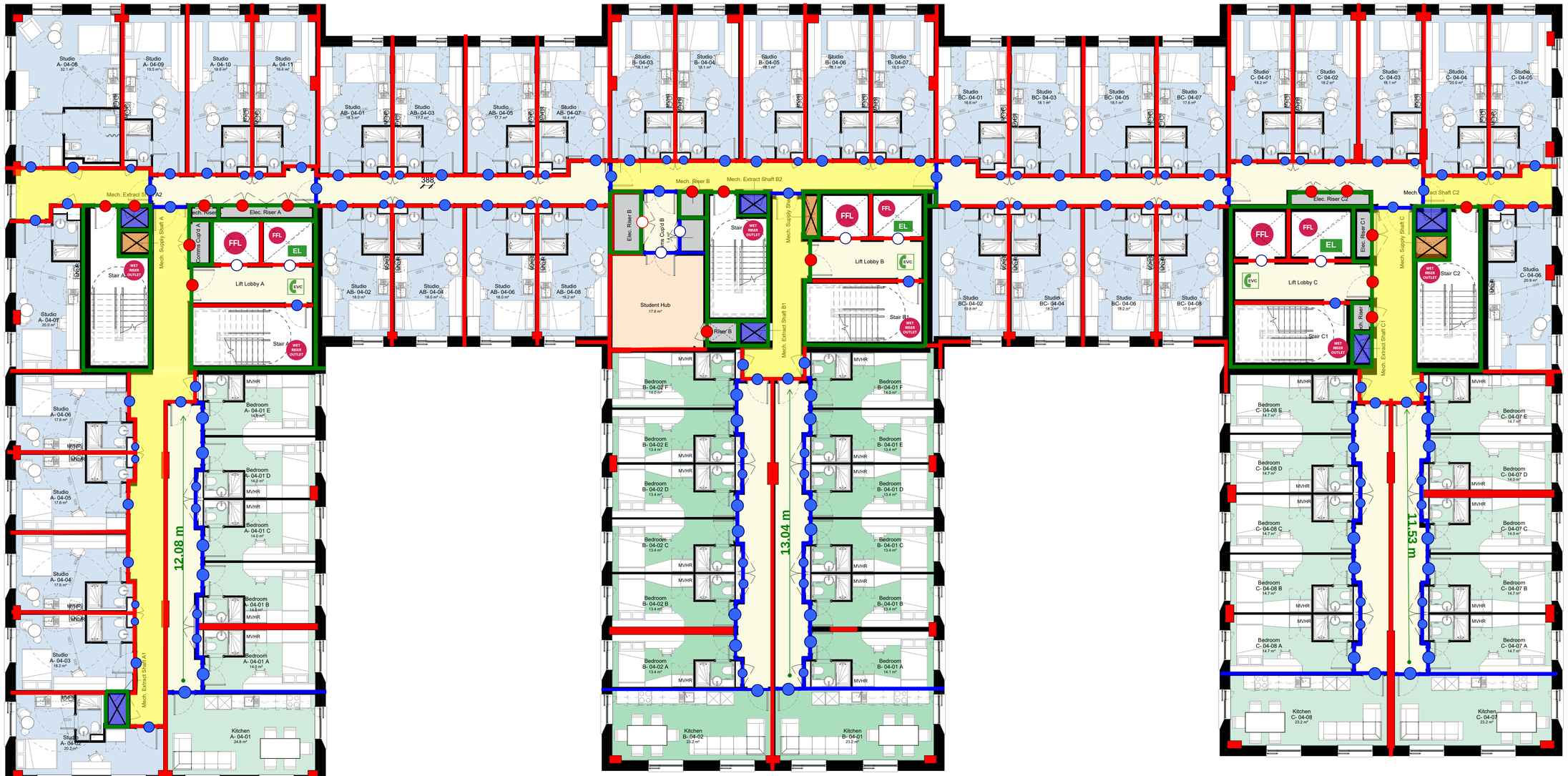
SR NO.
7054

DRAWING NO.
ECHO- SRA- ZZ- 03- DR - A - 02103

REV.
P05

STATUS
S2

PURPOSE FOR ISSUE
Planning



1 Level 04 Floor Plan
02104 1 : 100

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OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
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OFR FIRE • RISK CONSULTANTS

Project:	Echo Street, Manchester		
Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
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Checked by:	DM	**Date:**	03/03/23

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1 : 100	24/03/23	LK	VC	RG

PROJECT
Echo Street
General Arrangement
Level 04 Floor Plan

Stage 2

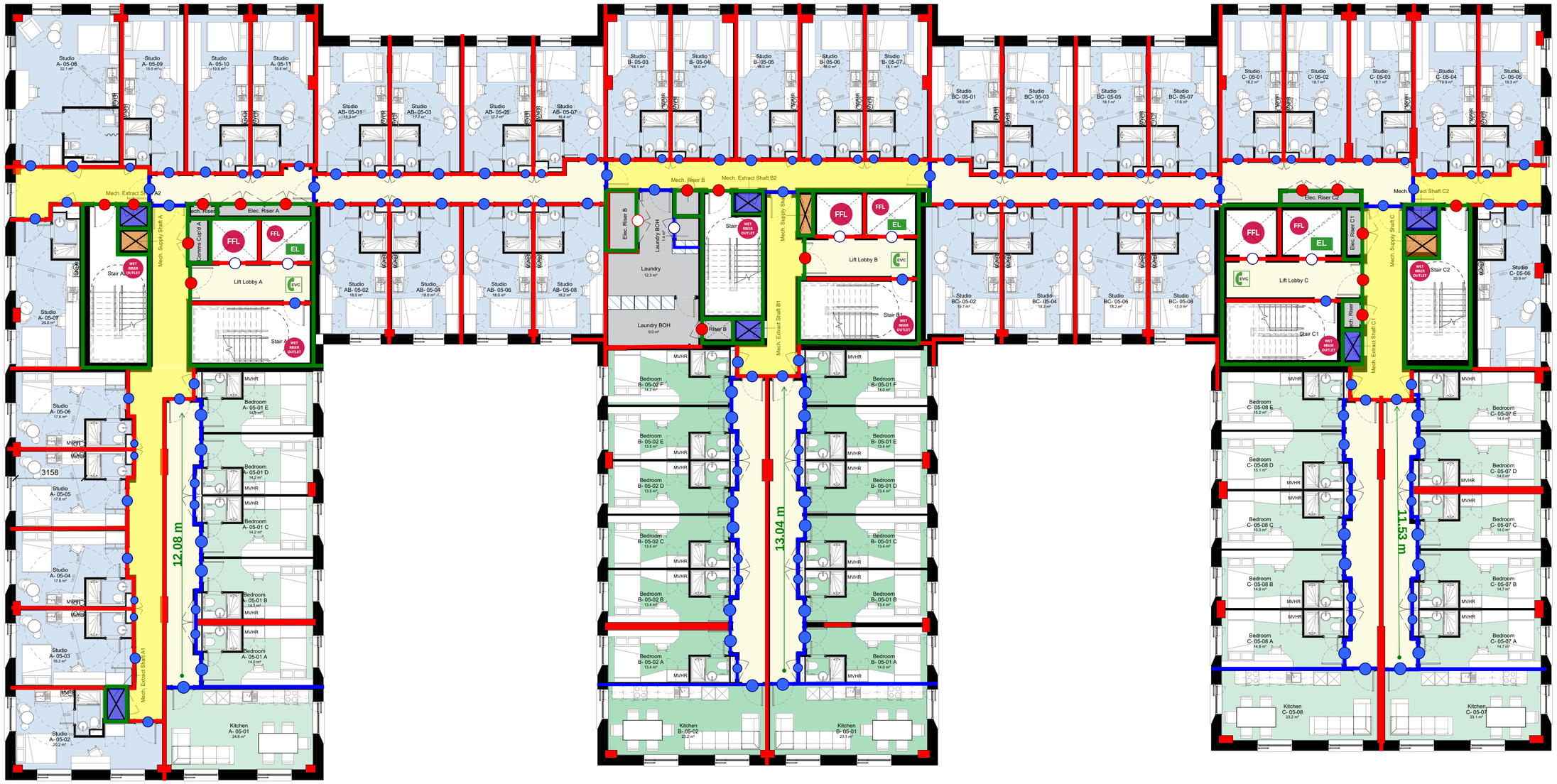
SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 04- DR - A - 02104**

REV. **P05**

STATUS **S2**

PURPOSE FOR ISSUE **Planning**



1 02105 **Level 05 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
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OFR FIRE + RISK CONSULTANTS

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Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
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1 : 100	24/03/23	LK	VC	RG

PROJECT
Echo Street
General Arrangement
Level 05 Floor Plan

Stage 2

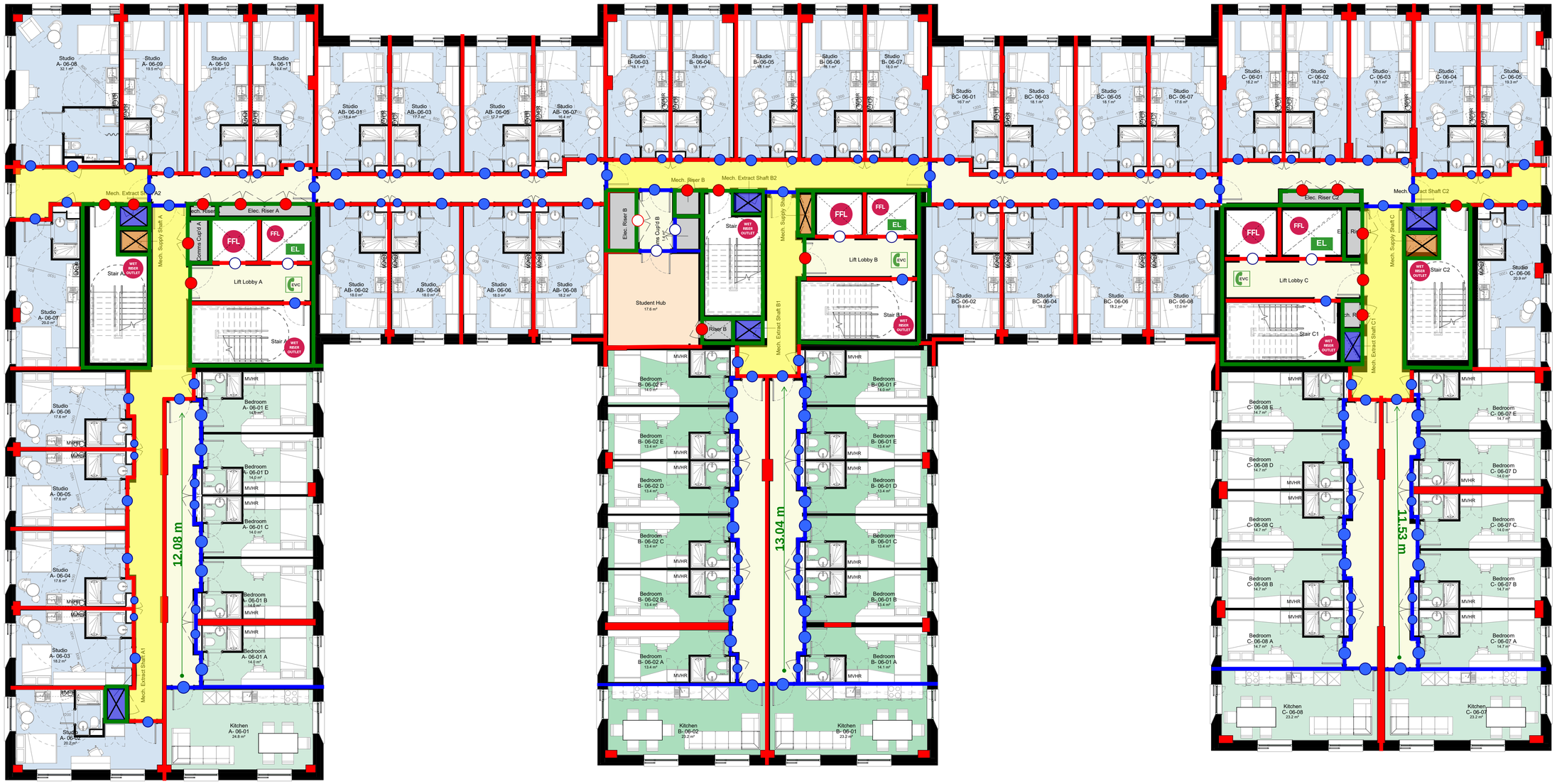
SR NO.
7054

DRAWING NO.
ECHO- SRA- ZZ- 05- DR - A - 02105

REV.
P05

STATUS
S2

PURPOSE FOR ISSUE
Planning



1 02106 **Level 06 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
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- FD 60
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- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby

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OFR FIRE + RISK CONSULTANTS

Project:	Echo Street, Manchester		
Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

N

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1 : 100	24/03/23	LK	VC	RG

PROJECT
Echo Street
General Arrangement
Level 06 Floor Plan

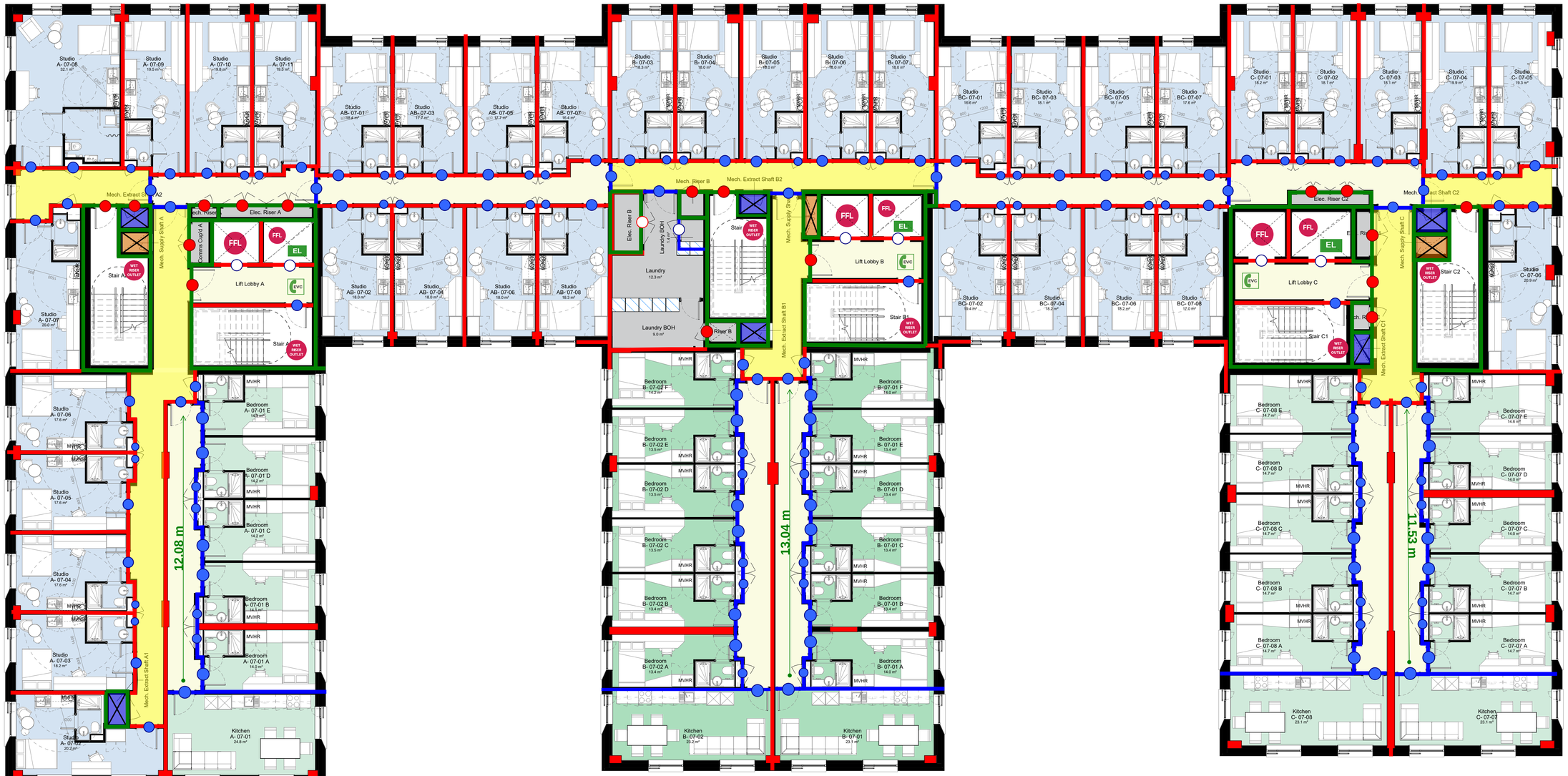
Stage 2

SR NO. **7054**

STATUS **S2** PURPOSE FOR ISSUE **Planning**

DRAWING NO. **ECHO- SRA- ZZ- 06- DR - A - 02106**

REV. **P05**



1 02107 **Level 07 Floor Plan**
1 : 100

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OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby

OFR FIRE + RISK CONSULTANTS

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Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
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STATUS **S2** PURPOSE FOR ISSUE **Planning**

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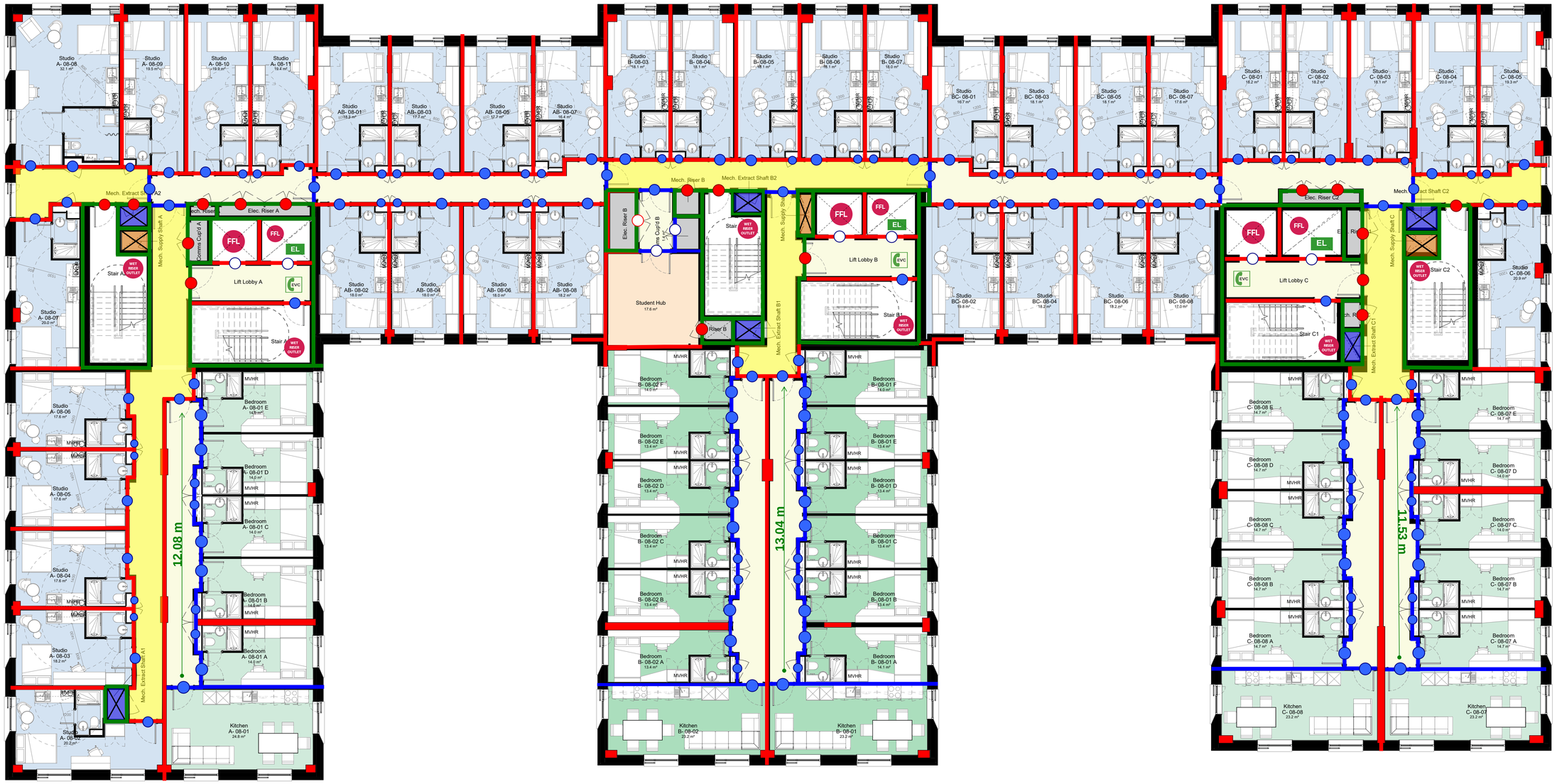
PROJECT
Echo Street
General Arrangement
Level 07 Floor Plan

Stage 2

SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 07- DR - A - 02107**

REV. **P05**



1 02108 **Level 08 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
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PROJECT
Echo Street
General Arrangement
Level 08 Floor Plan

Stage 2

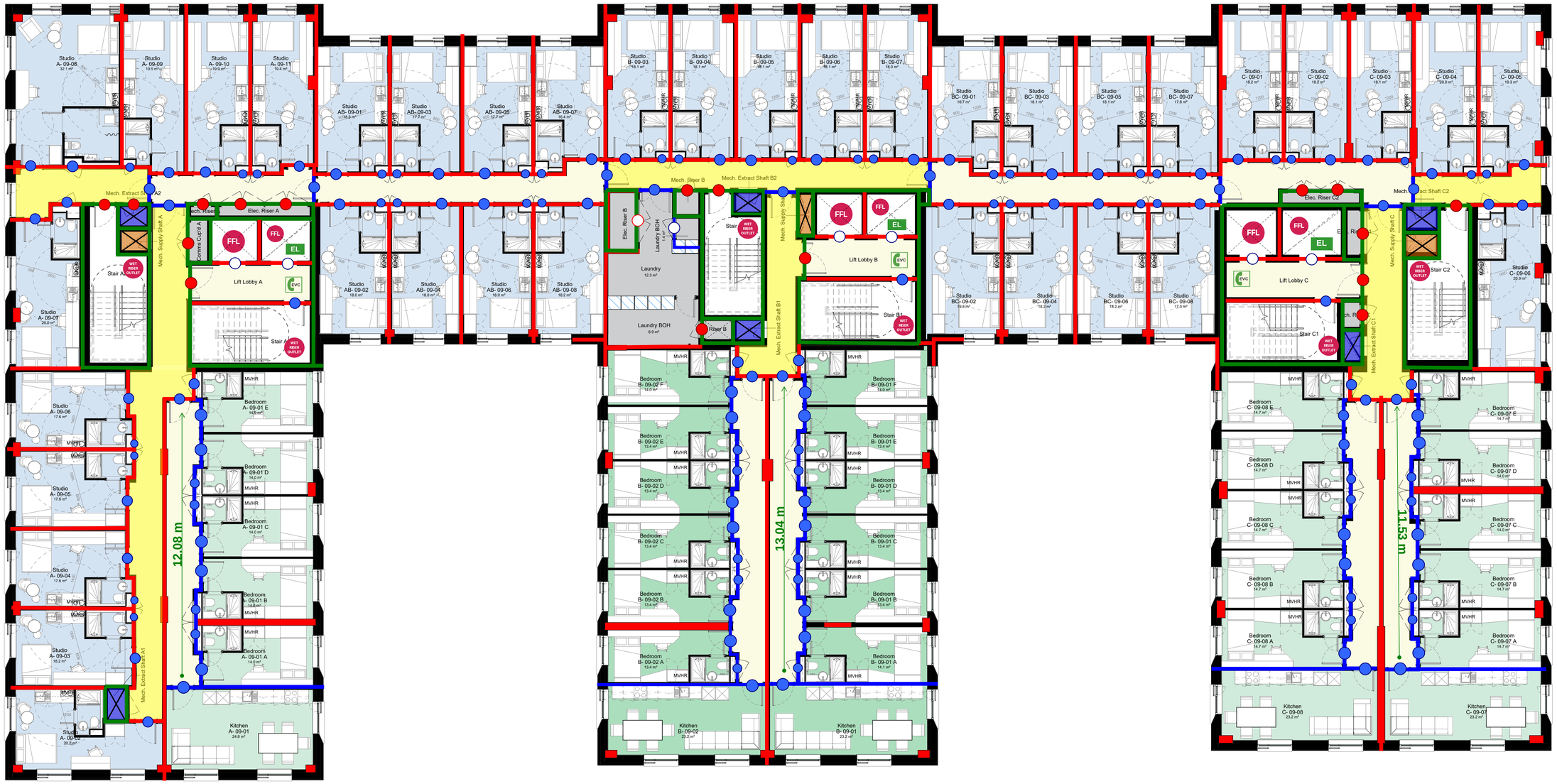
SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 08- DR - A - 02108**

REV. **P05**

STATUS **S2**

PURPOSE FOR ISSUE **Planning**



1 Level 09 Floor Plan
02109 1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
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PROJECT
Echo Street
General Arrangement
Level 09 Floor Plan

Stage 2

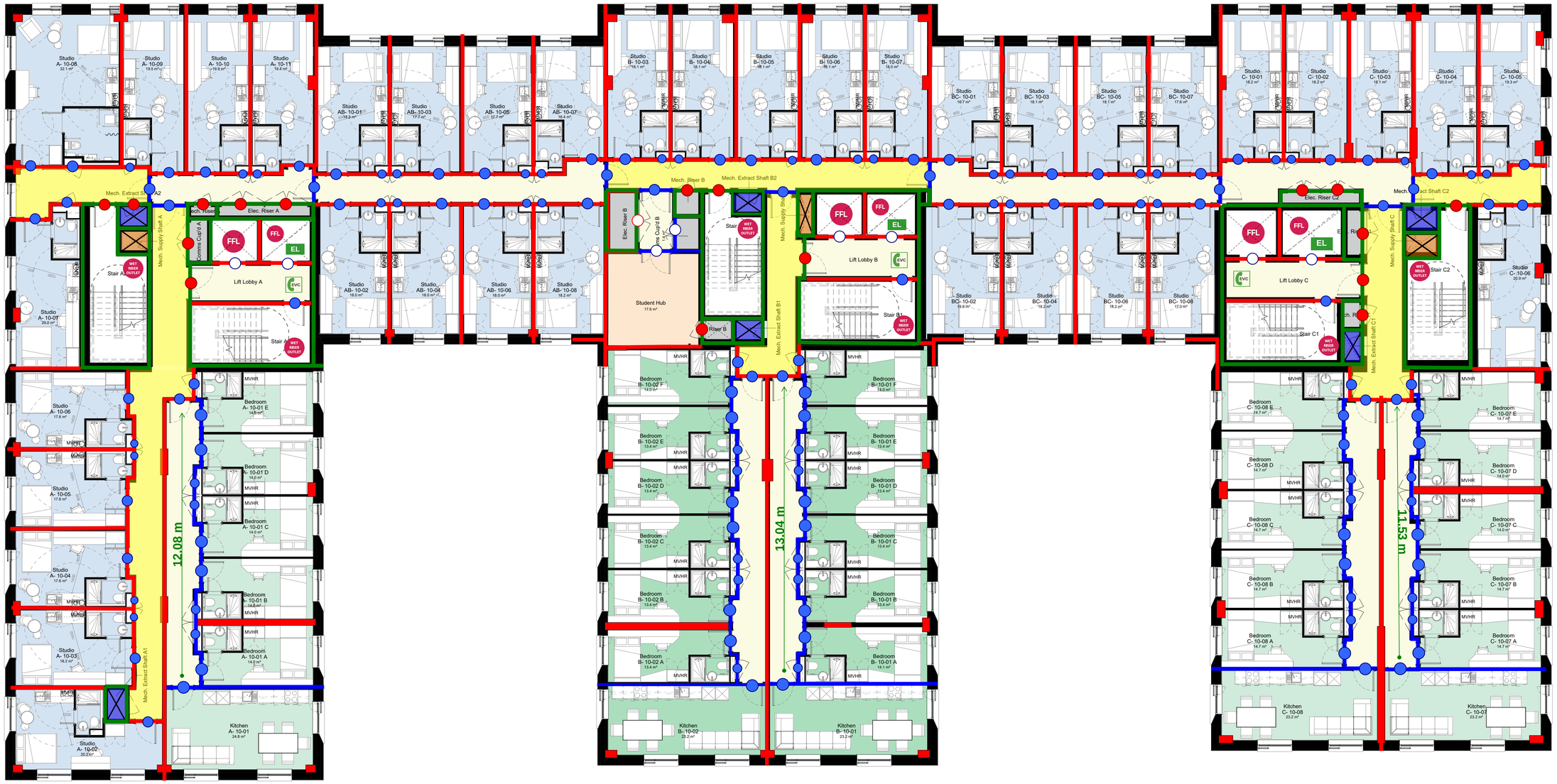
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DRAWING NO. **ECHO- SRA- ZZ- 09- DR - A - 02109**

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STATUS **S2**

PURPOSE FOR ISSUE **Planning**



1 Level 10 Floor Plan
02110
1 : 100

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- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
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- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
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OFR FIRE + RISK CONSULTANTS

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Revision:	R01	**Scale:**	As shown
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PROJECT
Echo Street
General Arrangement
Level 10 Floor Plan

Stage 2

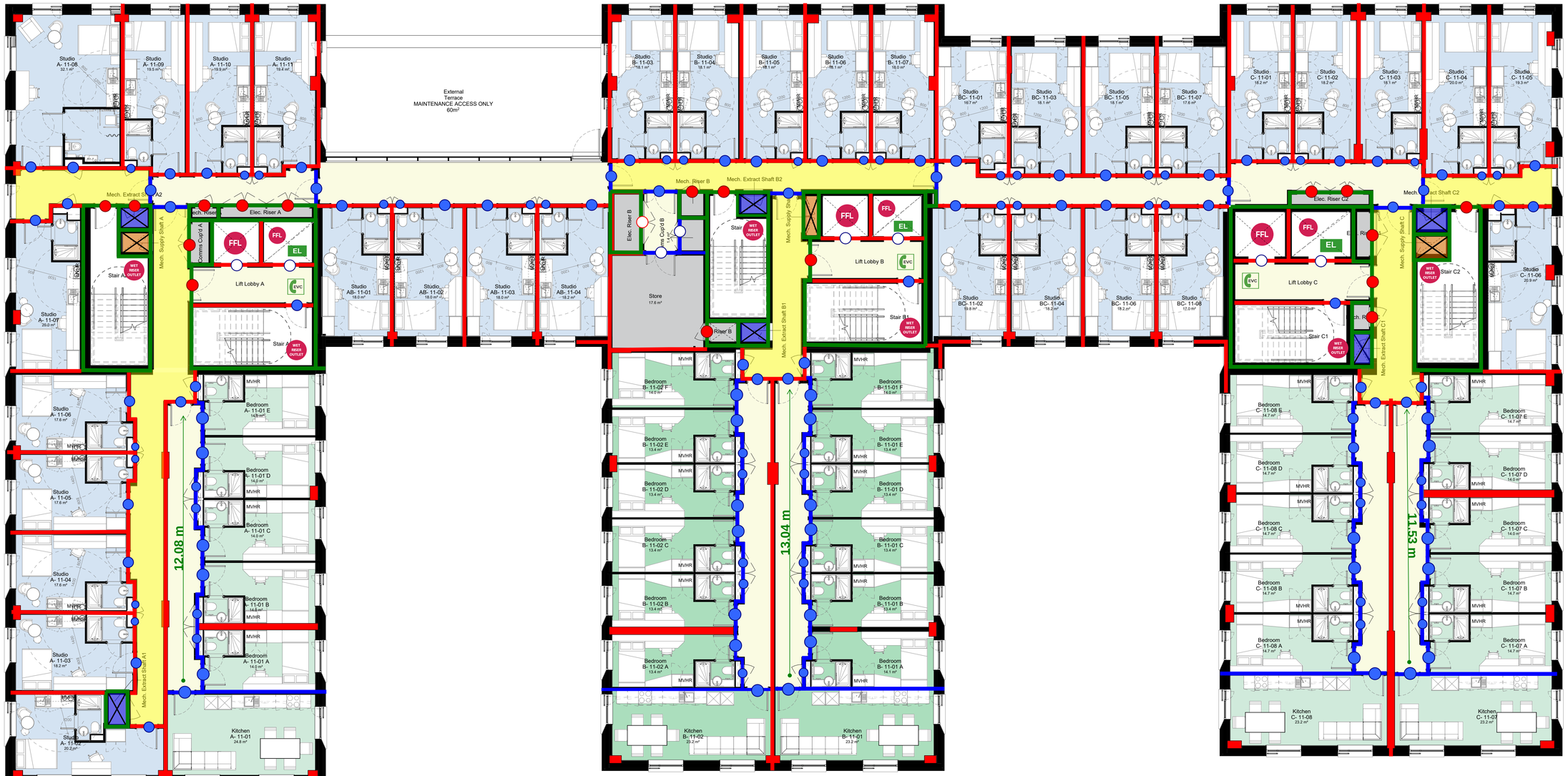
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7054

DRAWING NO.
ECHO- SRA- ZZ- 10- DR - A - 02110

REV.
P05

STATUS
S2

PURPOSE FOR ISSUE
Planning



1 Level 11 Floor Plan
02111 1 : 100

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PROJECT
Echo Street
General Arrangement
Level 11 Floor Plan

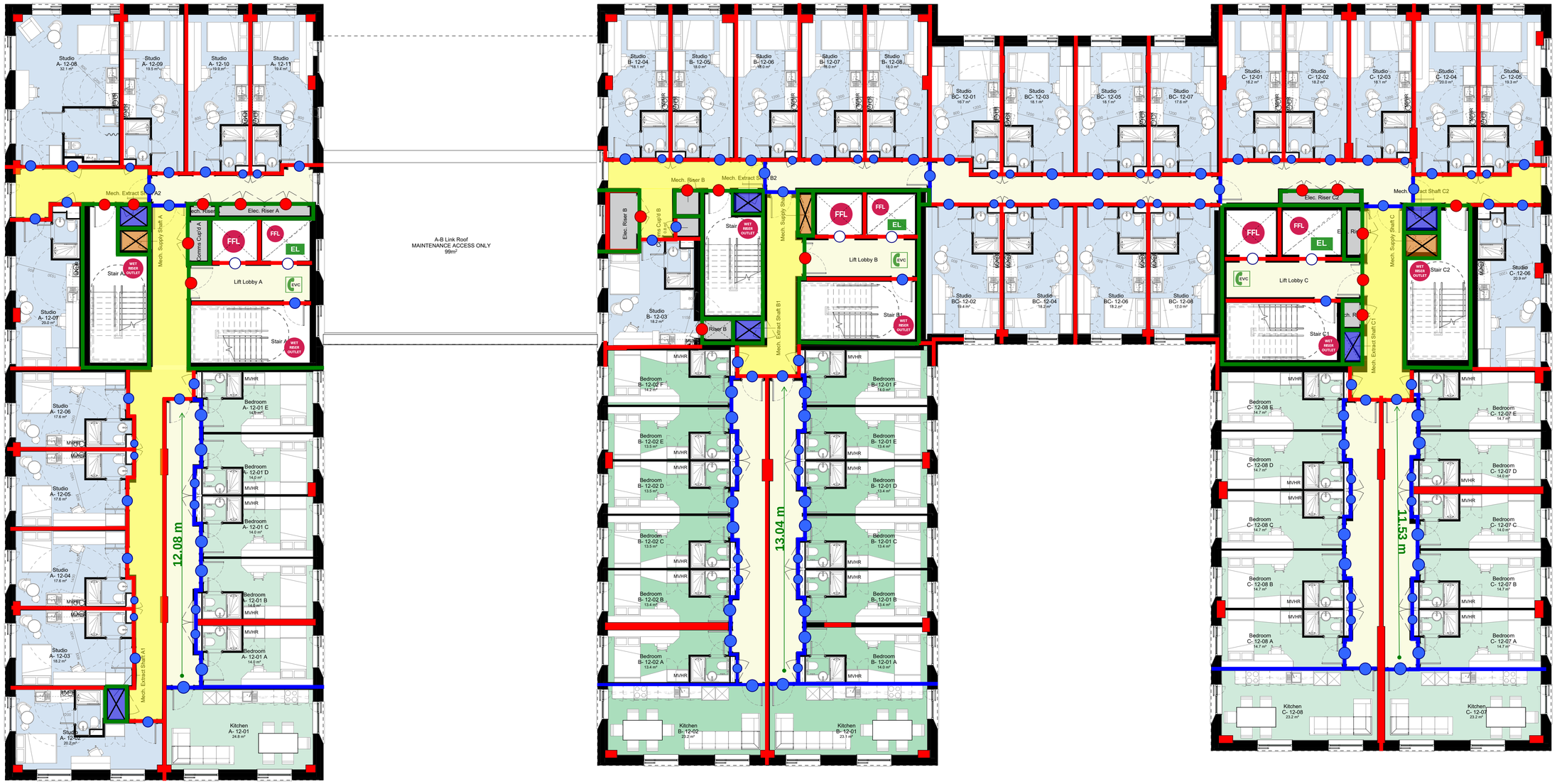
Stage 2

SR NO. **7054**

STATUS **S2** PURPOSE FOR ISSUE **Planning**

DRAWING NO. **ECHO- SRA- ZZ- 11- DR - A - 02111**

REV. **P05**



1 Level 12 Floor Plan
02112
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
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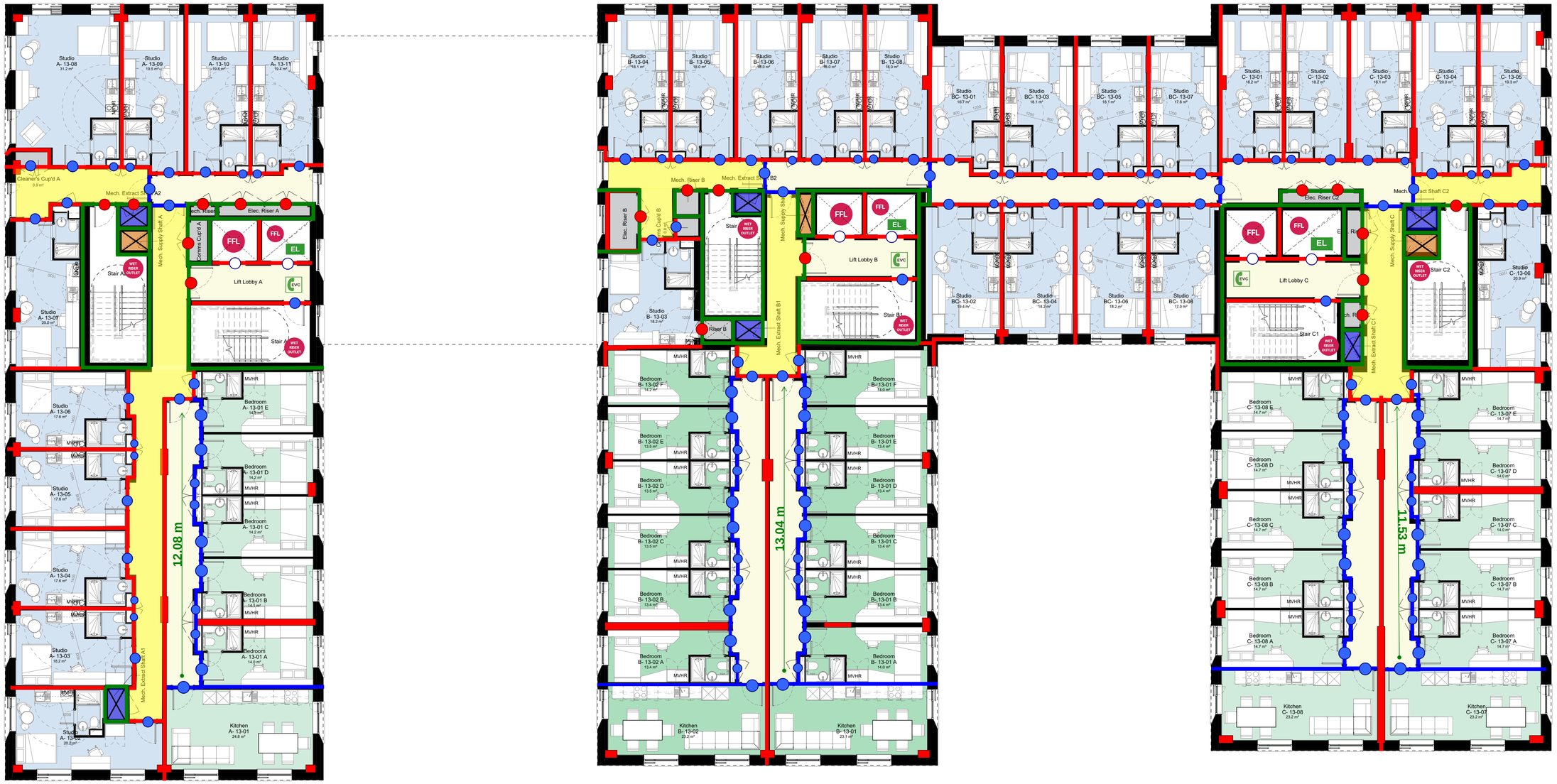
PROJECT
Echo Street
General Arrangement
Level 12 Floor Plan

Stage 2

SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 12- DR - A - 02112**

REV. **P05**



1 Level 13 Floor Plan

02113

1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
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- FD 60S
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby

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OFR FIRE • RISK CONSULTANTS

Project:	Echo Street, Manchester		
Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

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Accommodation

SHEPPARD ROBSON

27th Floor City Tower Piccadilly Plaza Manchester M1 4BT
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1 : 100	24/03/23	LK	VC	RG

PROJECT
Echo Street
General Arrangement
Level 13 Floor Plan

Stage 2

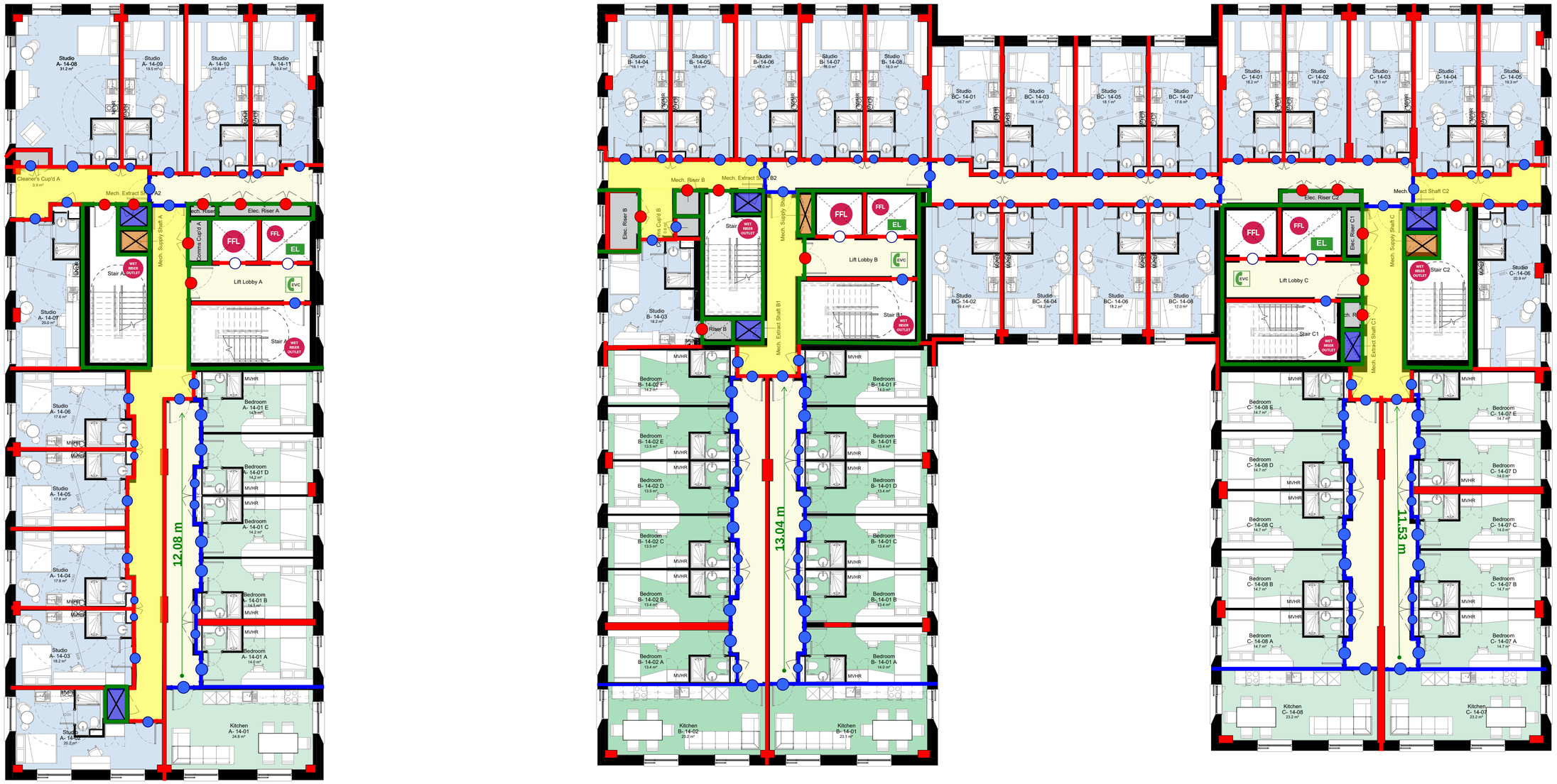
SR NO.
7054

STATUS
S2

PURPOSE FOR ISSUE
Planning

DRAWING NO.
ECHO- SRA- ZZ- 13- DR - A - 02113

REV.
P05



1 02114 **Level 14 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
- Mechanical extract shaft (extract rate TBC)
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FIRE + RISK CONSULTANTS

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PROJECT
Echo Street
General Arrangement
Level 14 Floor Plan

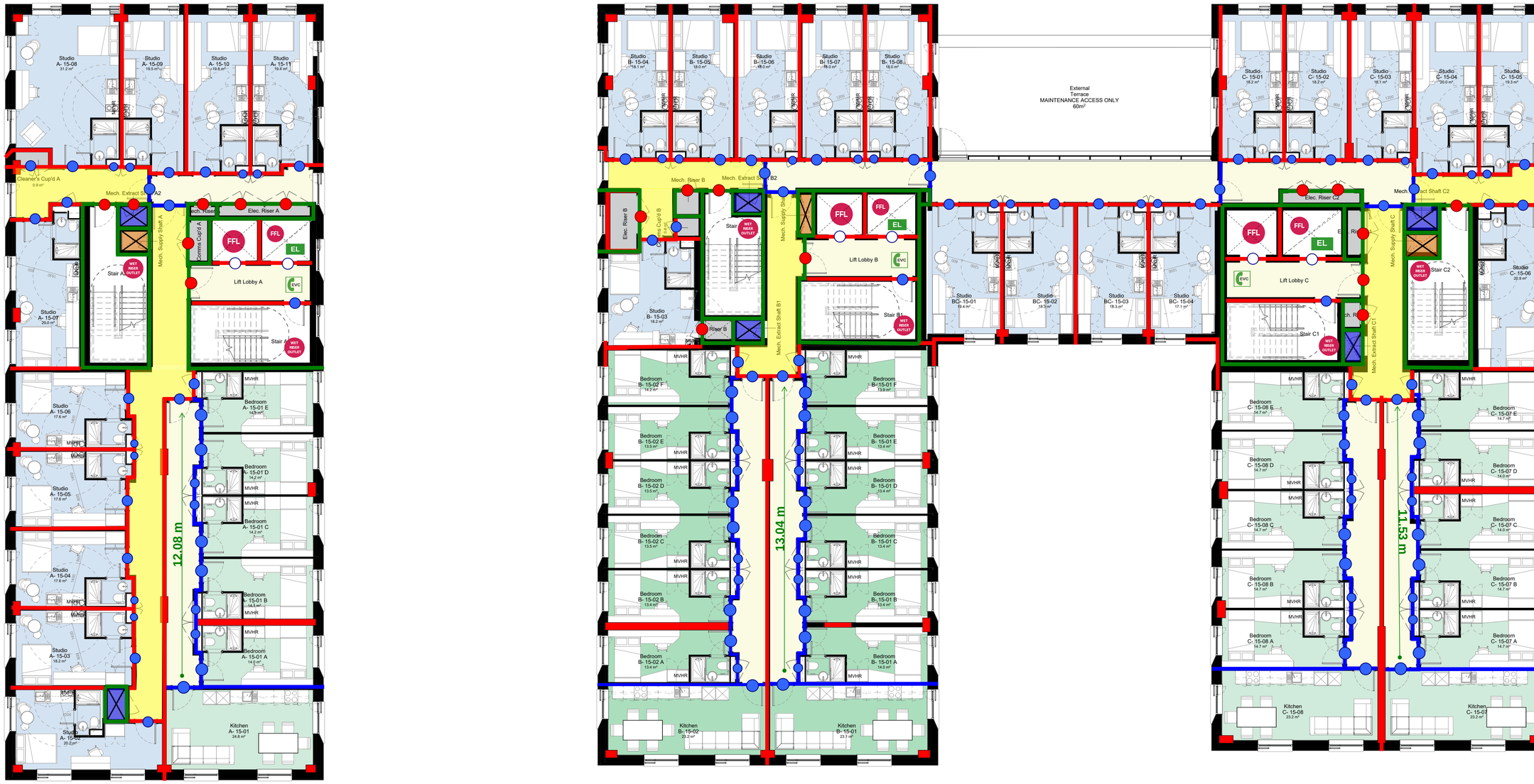
Stage 2

SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 14- DR - A- 02114**

REV. **P05**

STATUS **S2** PURPOSE FOR ISSUE **Planning**



1 02115 **Level 15 Floor Plan**
1 : 100

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OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- Refuge
- EVC — Emergency voice communication system (EVC)
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby

OFR FIRE + RISK CONSULTANTS

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PROJECT
Echo Street
General Arrangement
Level 15 Floor Plan

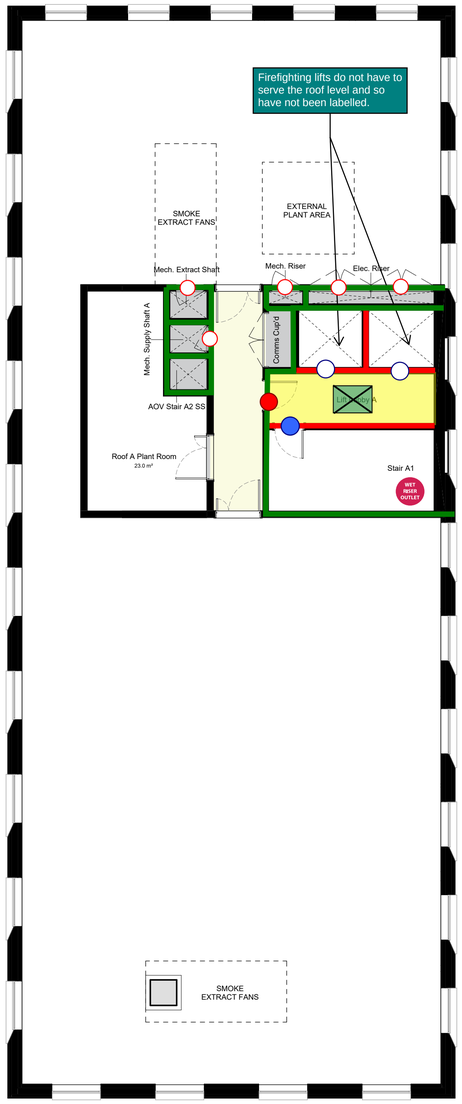
Stage 2

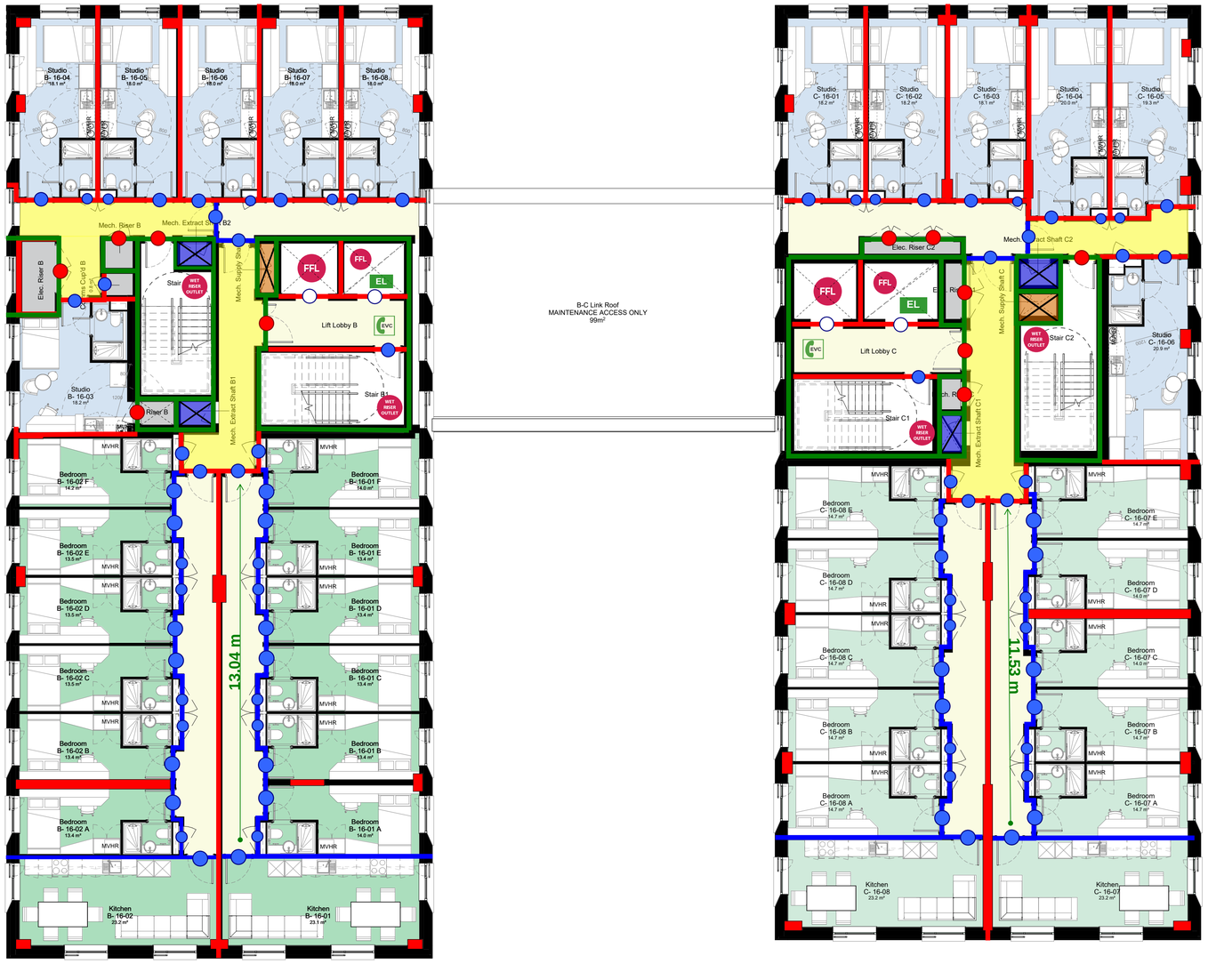
SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 15- DR - A- 02115**

REV. **P05**

STATUS **S2** PURPOSE FOR ISSUE **Planning**





1 02116 **Level 16 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby
- AOV (Size TBC)

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Project:	Echo Street, Manchester		
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PROJECT
Echo Street
General Arrangement
Level 16 Floor Plan

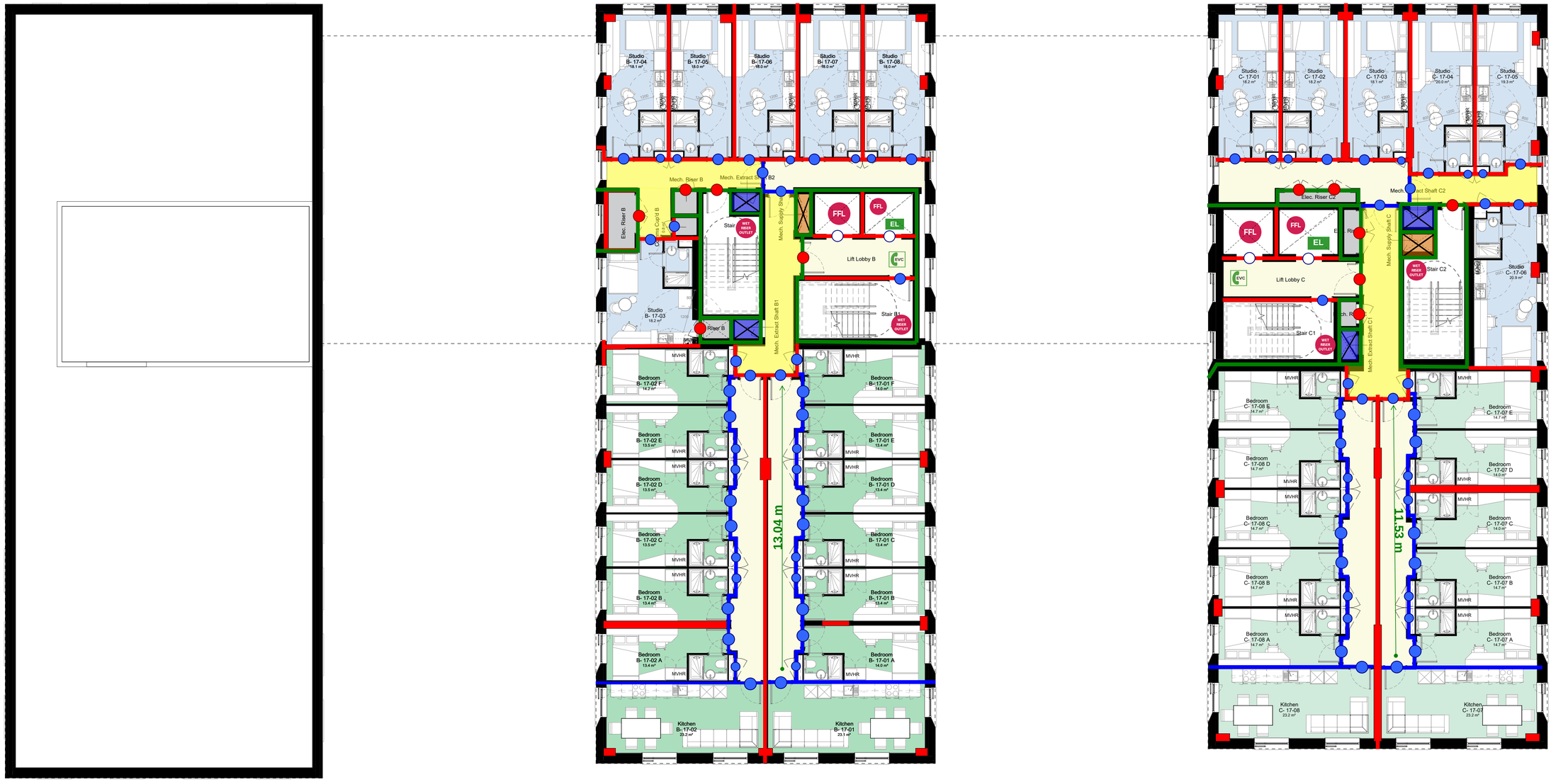
Stage 2

SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 16- DR - A- 02116**

REV. **P05**

STATUS	PURPOSE FOR ISSUE
S2	**Planning**



1 02117 **Level 17 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- Refuge
- EVC — Emergency voice communication system (EVC)
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PROJECT
Echo Street
General Arrangement
Level 17 Floor Plan

Stage 2

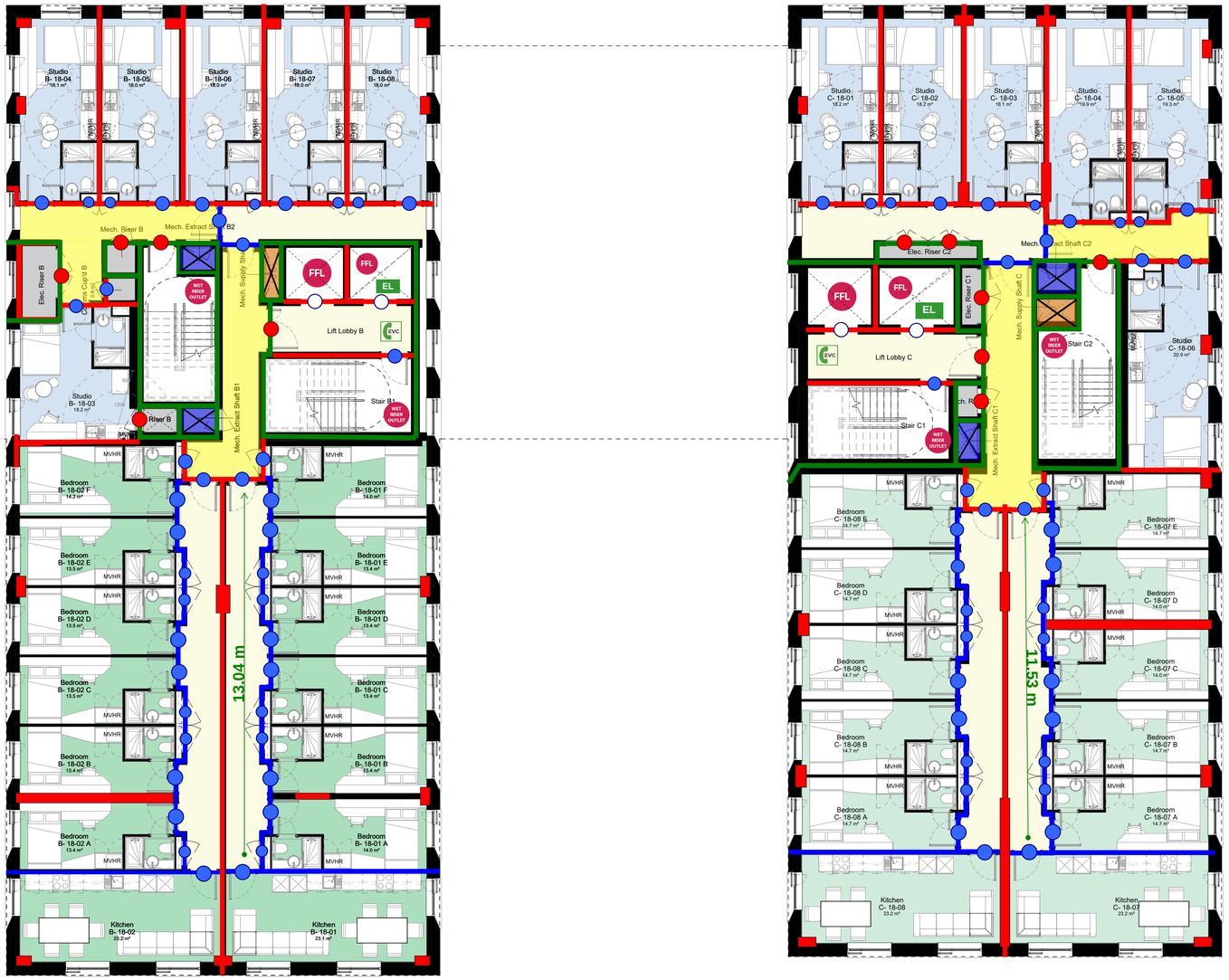
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DRAWING NO. **ECHO- SRA- ZZ- 17- DR - A- 02117**

REV. **P05**

STATUS **S2**

PURPOSE FOR ISSUE **Planning**



1 Level 18 Floor Plan
02118 1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
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PROJECT
Echo Street
General Arrangement
Level 18 Floor Plan

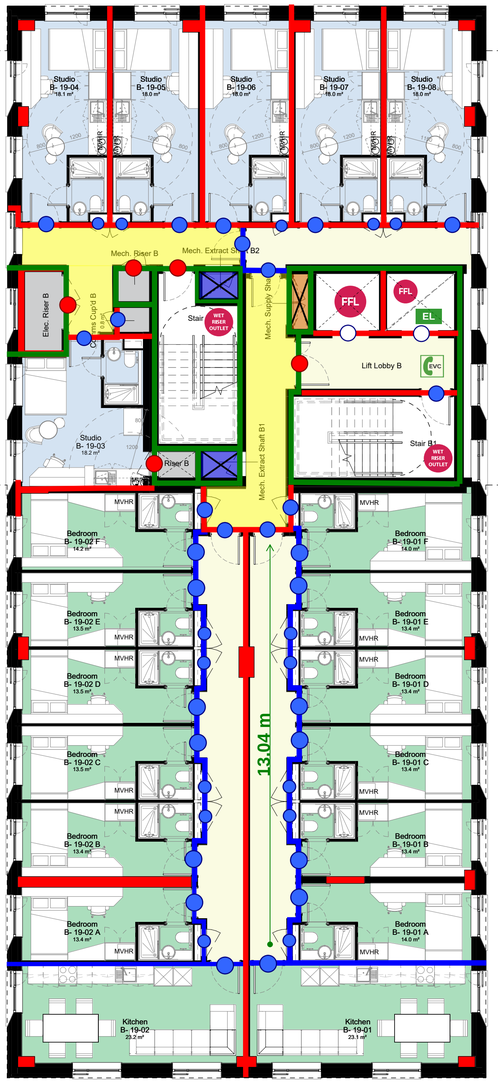
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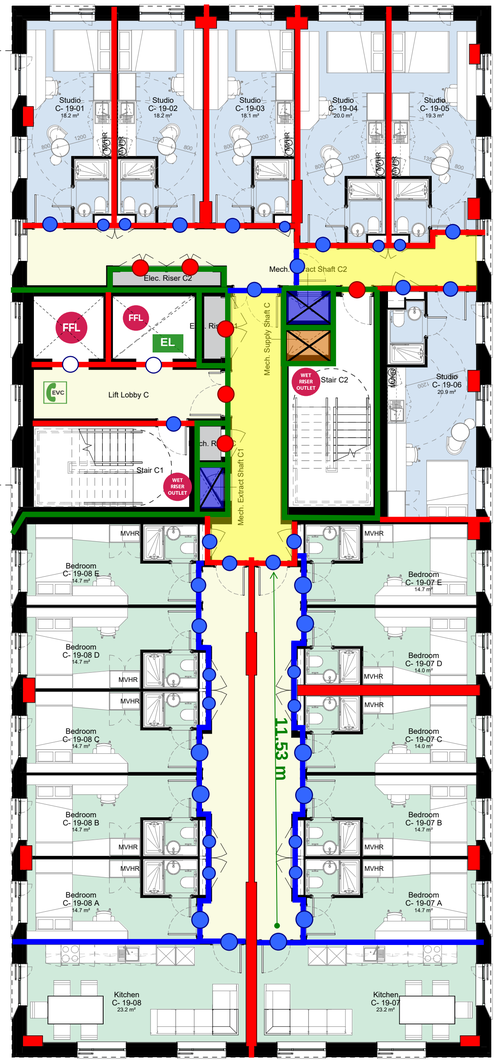
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DRAWING NO. **ECHO- SRA- ZZ- 18- DR - A- 02118**

REV. **P05**

STATUS	PURPOSE FOR ISSUE
S2	**Planning**





1 02119 **Level 19 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
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- Refuge
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OFR FIRE • RISK CONSULTANTS

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PROJECT
Echo Street
General Arrangement
Level 19 Floor Plan

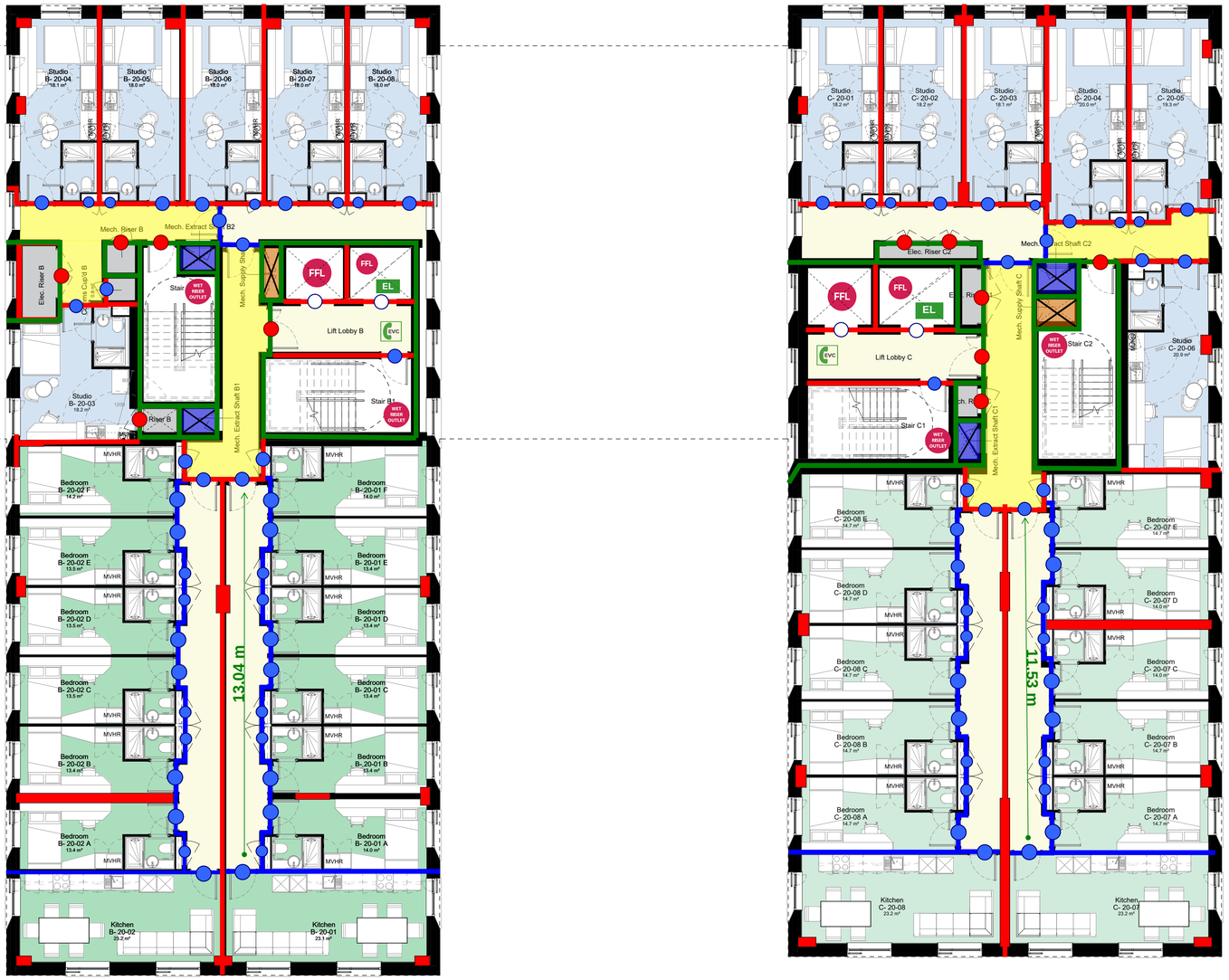
Stage 2

SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 19- DR - A- 02119**

REV. **P05**

STATUS	PURPOSE FOR ISSUE
S2	**Planning**



1 02120 **Level 20 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby

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OFR FIRE • RISK CONSULTANTS

Project:	Echo Street, Manchester		
Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

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Student Accommodation

SHEPPARD ROBSON

27th Floor City Tower Piccadilly Plaza Manchester M1 4BT
T: +44 (0)161 233 8900 E: enquiries@sheppardrobson.com

SCALE@A1	DATE	ORIGINATOR	CHECKED	AUTHORISED
1 : 100	24/03/23	LK	VC	RG

PROJECT
Echo Street
General Arrangement
Level 20 Floor Plan

Stage 2

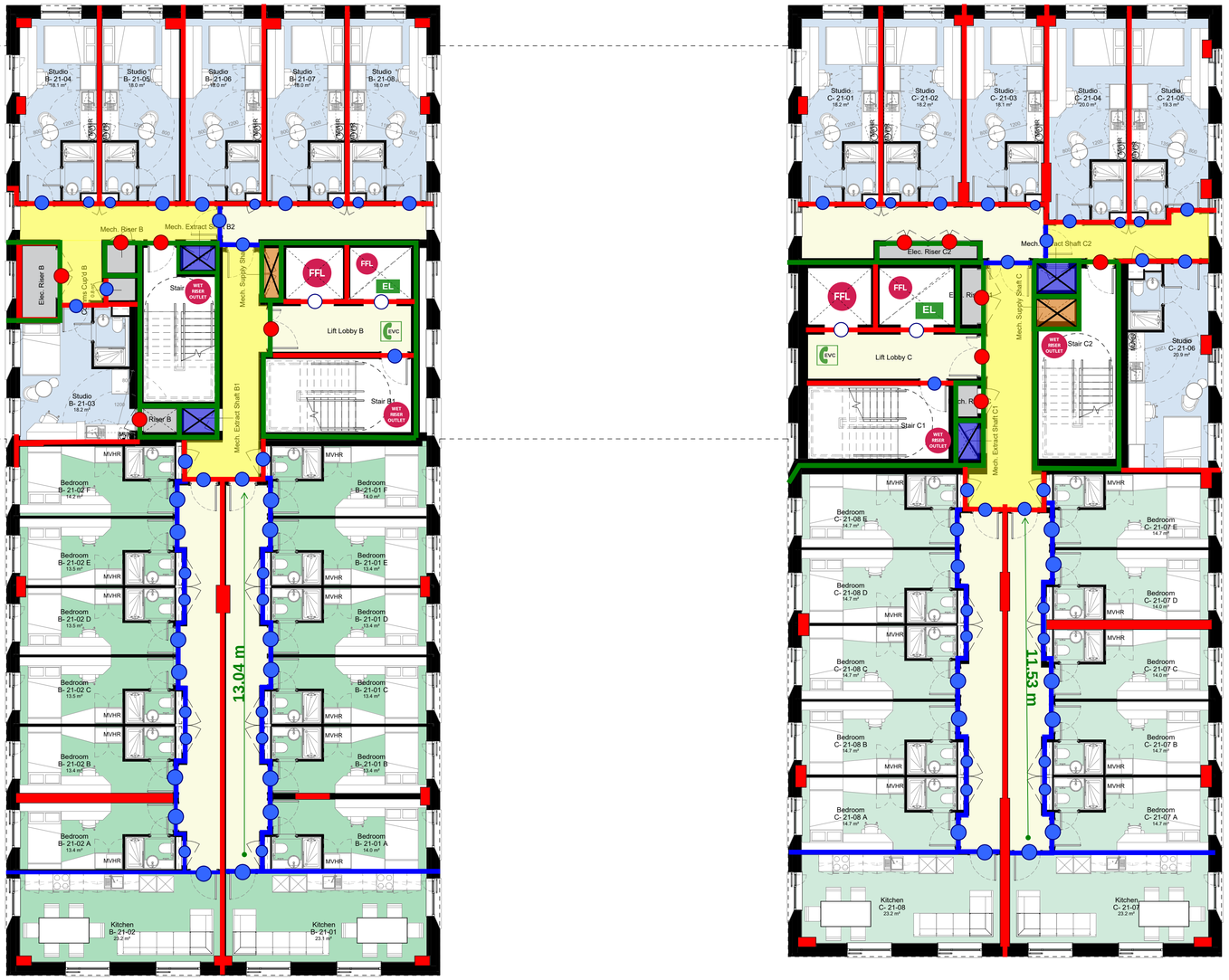
SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 20- DR - A- 02120**

REV. **P05**

STATUS **S2**

PURPOSE FOR ISSUE **Planning**



1 02121 **Level 21 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby

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OFR FIRE • RISK CONSULTANTS

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Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

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PROJECT
Echo Street
General Arrangement
Level 21 Floor Plan

Stage 2

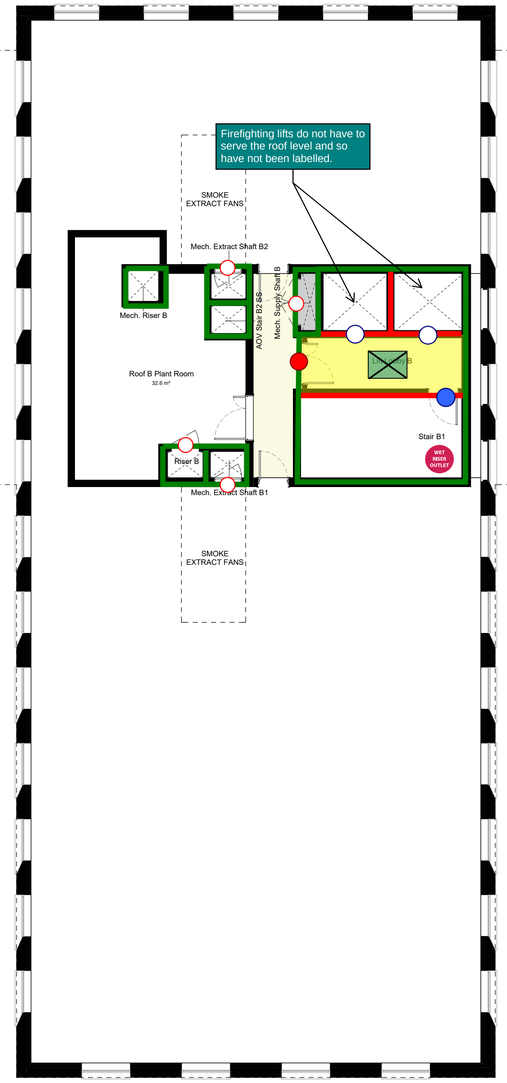
SR NO.
7054

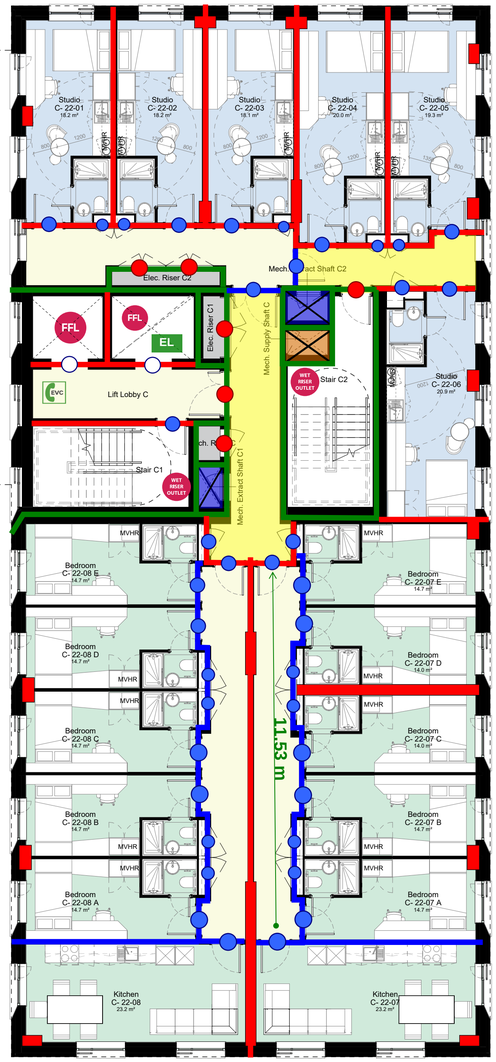
DRAWING NO.
ECHO- SRA- ZZ- 21- DR - A- 02121

REV.
P05

STATUS
S2

PURPOSE FOR ISSUE
Planning





1 02122 **Level 22 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- Refuge
- EVC — Emergency voice communication system (EVC)
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby
- AOV (Size TBC)

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OFR FIRE + RISK CONSULTANTS

Project:	Echo Street, Manchester		
Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

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1 : 100	**24/03/23**	**LK**	**VC**	**RG**

PROJECT
Echo Street
General Arrangement
Level 22 Floor Plan

Stage 2

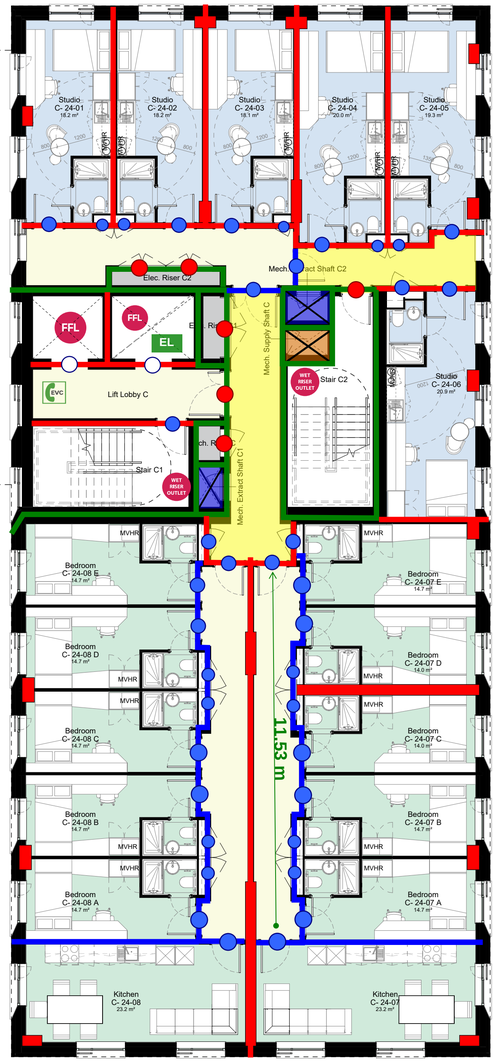
SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 22- DR - A - 02122**

REV. **P05**

STATUS **S2**

PURPOSE FOR ISSUE **Planning**



1 02123 **Level 23 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby

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OFR FIRE • RISK CONSULTANTS

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Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

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1 : 100	**24/03/23**	**LK**	**VC**	**RG**

PROJECT
Echo Street
General Arrangement
Level 23 Floor Plan

Stage 2

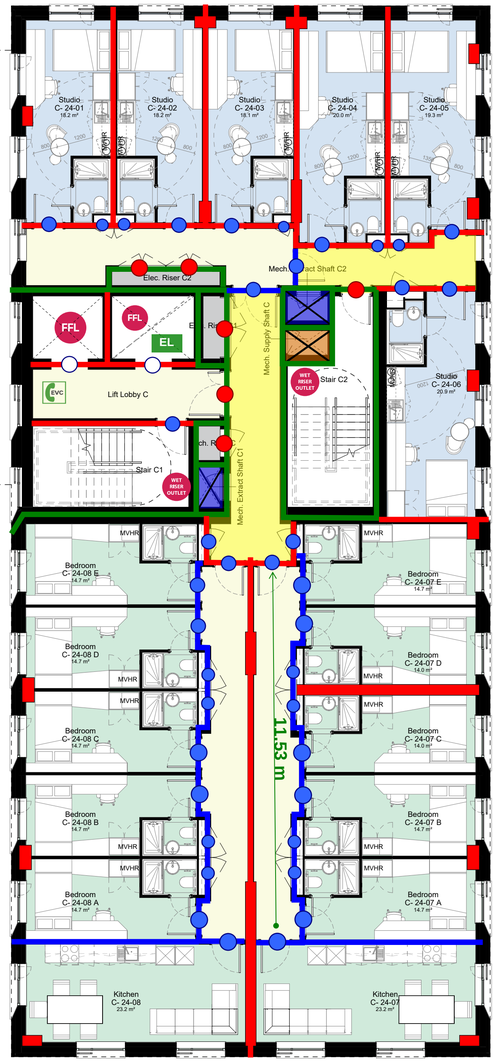
SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 23- DR - A - 02123**

REV. **P04**

STATUS **S2**

PURPOSE FOR ISSUE **Planning**



1 02124 **Level 24 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- Refuge
- EVC — Emergency voice communication system (EVC)
- Mechanical extract shaft (extract rate TBC)
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OFR FIRE • RISK CONSULTANTS

Project:	Echo Street, Manchester		
Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
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1 : 100	**24/03/23**	**LK**	**VC**	**RG**

PROJECT
Echo Street
General Arrangement
Level 24 Floor Plan

Stage 2

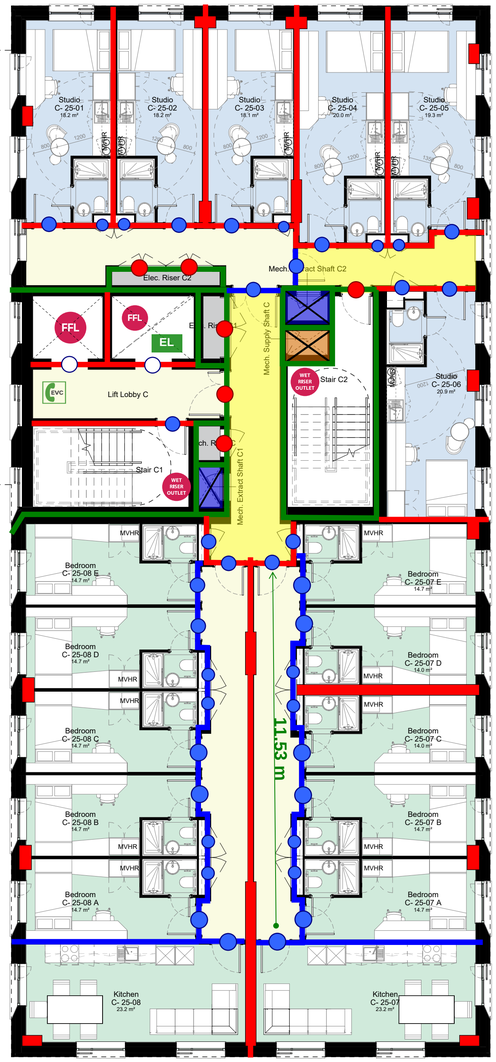
SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 24- DR - A - 02124**

REV. **P05**

STATUS **S2**

PURPOSE FOR ISSUE **Planning**



1 02125 **Level 25 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- EVC — Emergency voice communication system (EVC)
- Refuge
- Mechanical extract shaft (extract rate TBC)
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- Ventilated Refuse Lobby

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OFR FIRE • RISK CONSULTANTS

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Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
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1 : 100	**24/03/23**	**LK**	**VC**	**RG**

PROJECT
Echo Street
General Arrangement
Level 25 Floor Plan

Stage 2

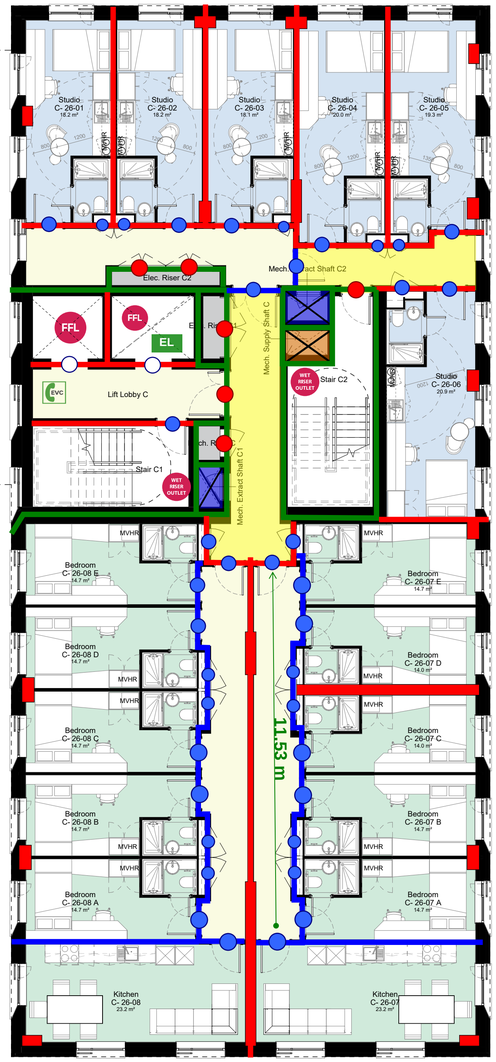
SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 25- DR - A - 02125**

REV. **P05**

STATUS **S2**

PURPOSE FOR ISSUE **Planning**



1 Level 26 Floor Plan
02126
1 : 100

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OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- Refuge
- EVC — Emergency voice communication system (EVC)
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- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby

OFR FIRE + RISK CONSULTANTS

Project:	Echo Street, Manchester		
Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

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1 : 100	**24/03/23**	**LK**	**VC**	**RG**

PROJECT
Echo Street
General Arrangement
Level 26 Floor Plan

Stage 2

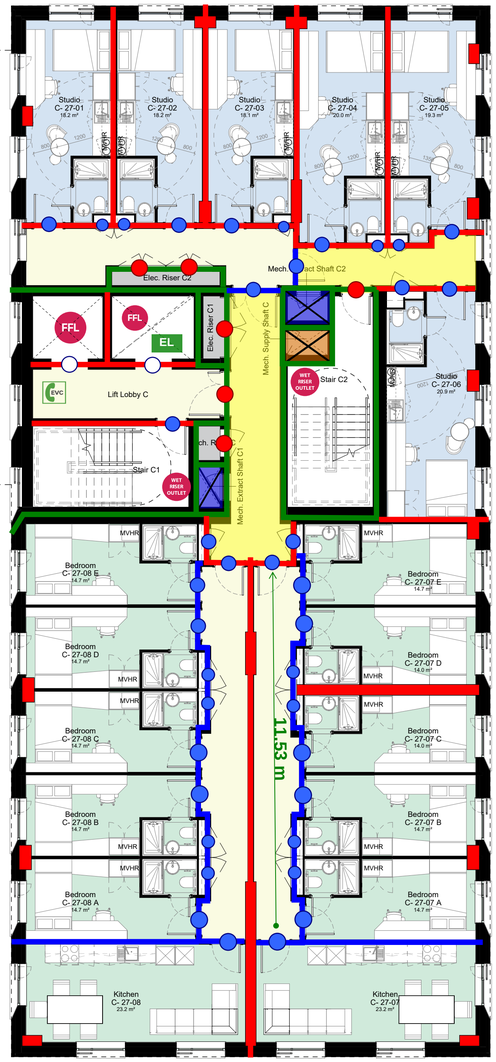
SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 26- DR - A - 02126**

REV. **P05**

STATUS **S2**

PURPOSE FOR ISSUE **Planning**



1 02127 **Level 27 Floor Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- Refuge
- EVC — Emergency voice communication system (EVC)
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby

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Figures relate to the likely areas of the building at the current stage of the design and are calculated using one of the following (as stated in the accompanying areas schedule) IPMS1, IPMS2, IPMS 3, Gross External Area (GEA), Gross Internal Area (GIA) or Nett Internal Area (NIA) methods of measurement from the RICS Property Measurement 1st edition.

PLEASE NOTE:

1. The measured areas shown for all en-suite clusters, studios and kitchens do not yet account for any protruding columns and will therefore reduce accordingly to account for these once locations and sizes are fully known.

2. Wall lining has been allowed for to solid core walls, shears walls and other strucutral items however depth of wall lining subject to change dependent on acoustic requirements. This may result in room sizes reducing.

3. Areas of ensuite bedrooms and studios include the area of the bathroom and the separating wall between bedroom and pod, but exclude the riser.

4. Cluster kitchens will require a riser to provide drainage etc and will reduce the area stated accordingly. The location of this is as yet unknown until full fit outs have been progressed.

5. Studio layouts shown are design intent only and follow Clients brief. Escape routes' distance from hobs to be tested and validated by Fire Strategy with fire suppression measures as necessary. Studio layouts in abeyance until signed-off by Building Safety Regulator (HSE), Building Control Officer, and Building Insurer.

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Project:	Echo Street, Manchester		
Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

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PROJECT
Echo Street
General Arrangement
Level 27 Floor Plan

Stage 2

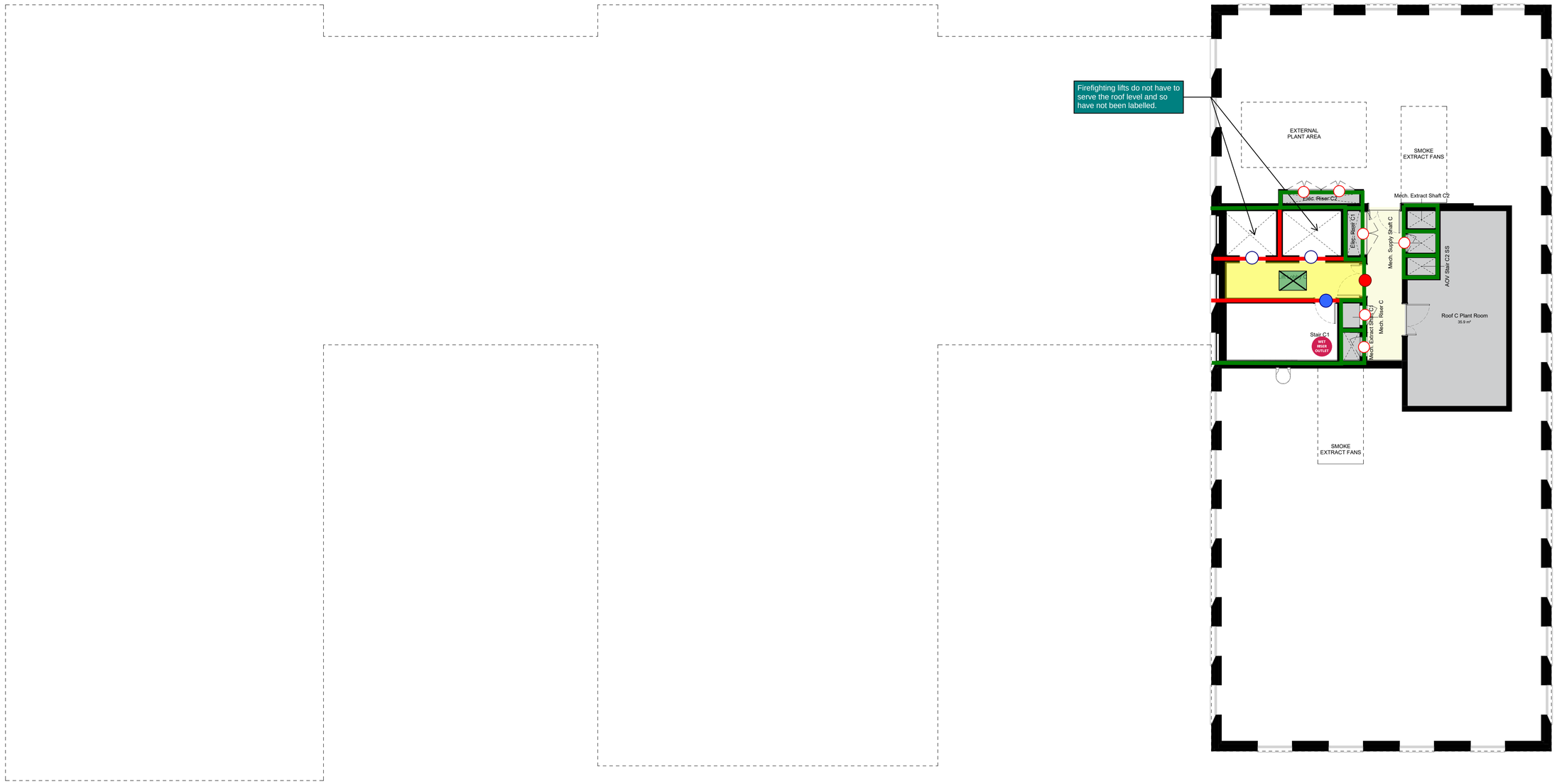
SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ- 27- DR - A - 02127**

REV. **P05**

STATUS **S2**

PURPOSE FOR ISSUE **Planning**



1 / 02128 **Block C Roof Plan**
1 : 100

OFR Legend

- 30 minutes fire resistance
- 60 minutes fire resistance
- 90 minutes fire resistance
- 120 minutes fire resistance
- FFL — Firefighting Lift
- WET RISER OUTLET — Wet Riser Outlet
- Ventilated Lobby/Corridor
- FD 30
- FD 30S
- FD 60
- FD 60S
- FD 120
- FD 120S
- Refuge
- EVC — Emergency voice communication system (EVC)
- Mechanical extract shaft (extract rate TBC)
- Mechanical supply shaft (extract rate TBC)
- Ventilated Refuse Lobby
- AOV (Size TBC)

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Figures relate to the likely areas of the building at the current stage of the design and are calculated using one of the following (as stated in the accompanying areas schedule) IPMS1, IPMS2, IPMS 3, Gross External Area (GEA), Gross Internal Area (GIA) or Nett Internal Area (NIA) methods of measurement from the RICS Property Measurement 1st edition.

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OFR FIRE + RISK CONSULTANTS

Project:	Echo Street, Manchester		
Title:	Amenity Fire Resistance Mark-ups		
Revision:	R01	**Scale:**	As shown
Prepared by:	AT	**Date:**	03/03/23
Checked by:	DM	**Date:**	03/03/23

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STATUS **S2** PURPOSE FOR ISSUE **Planning**

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PROJECT
Echo Street
General Arrangement
Block C Roof Plan

Stage 2

SR NO. **7054**

DRAWING NO. **ECHO- SRA- ZZ - RF- DR - A - 02128**

REV. **P04**

APPENDIX B – QUALITATIVE DESIGN REVIEW (QDR)

Echo Street, Manchester

Qualitative Design Review (QDR)

Revision: R00
Date: 21/04/2023
Project Number: MA22153

Prepared for:	IQ Student Accommodation
Project Location:	Manchester
Prepared by:	OFR Consultants Limited
Office address:	Sevendale House, Dale Street Manchester M1 1JA
Project No:	MA22153
Revision:	R00
Date:	21/04/2023

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Quality Management

Revision	Date	Comment	Author	QA & Technical Review	Approver
R00	21/04/2023	First issue for stakeholder comment	AT	AR	CB

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1 INTRODUCTION

1.1 General

OFR Consultants have been appointed by IQ Student Accommodation to develop the outline fire strategy report for the Echo Street development in Manchester.

The purpose of this report is to provide a Qualitative Design Review (QDR) for the development. This is considered necessary as OFR would consider the scheme to be a *'complex'* residential building. *'Complex'* residential buildings, in the opinion of OFR are those which are not common building situations that fall within standard guidance documents such as Approved Document B (v1 and v2) [1] [2], BS 9999 [3] and BS 9991 [4]. Examples of *'complex'* buildings include the following:

1. Buildings >50m in height – BS 9991 Section 0.7 states that *'the increased design demands on structural integrity, services, fire safety systems, means of fire-fighting and evacuation generated by buildings in excess of 50m high warrants the specific evaluation of the adopted fire safety provisions'*.
2. Buildings which incorporate evacuation lifts regardless of height;
3. Buildings constructed from non-standard methods of construction, e.g., modular, mass timber etc.

Items 1 and 2 outlined above are considered within the scope of this report, which lays out the approach proposed for this QDR.

This report will be reviewed and updated as the design develops and will form an appendix to the outline fire strategy report. The key objectives of this document are the following:

- Record key design decisions, particularly where a fire engineered approach is needed to an aspect of the design; and
- Track any changes to the design that may occur during the design stages and evaluate the impact that these changes may have to determine if any further assessment and approval is required.

The QDR process is outlined in Section 1.3.

1.2 Applicable Guidance

The guidance documents BS 9991, Approved Document B: Volume 1 (2022 edition) (herein refer to as AD B v1) and BS 9999 were used as the primary guidance documents in the fire strategy and as such will form the basis of the OFR QDR report, alongside PD 7974-0 [5].

In addition to the standard guidance documentation, the IQ Student Accommodation employers' requirements documentation will also be followed. This document outlines recommendations above and beyond those typically recommended to align with the Building Regulations 2010 (as amended).

1.3 Qualitative Design Review (QDR) Process

BS 7974 [6] and the associated PD 7974 suite of documents provide a performance-based framework for an engineered approach to fire safety which may be applied to the design of new buildings to show that regulatory requirements can be satisfied. This performance-based framework may be used to justify alternative approaches to those outlined in BS 9991/AD B, or where a performance-based approach is required due to the complexity of the scheme. One of the primary stages that comprises the basic design principles of the performance-based framework within BS 7974 is a qualitative design review (QDR). The QDR process can be described as:

'The interaction of fire, buildings and people give rise to an almost infinite number of possible scenarios; therefore, before attempting to carry out detailed quantified analysis, the significant fire hazards should be identified, the problem simplified, and the required extent of quantification established'.

The main stages in the QDR are the following:

1. Review architectural design and selection of materials, including their suitability and fire properties, occupant characteristics and client requirements;
2. Establish functional objectives for the fire;
3. Identify fire hazards and possible consequences;
4. Establish trial fire safety engineering (FSE) designs;
5. Set acceptance criteria;
6. Identify method of analysis;
7. Establish fire scenarios for analysis; and
8. Document the outputs of the QDR.

The above list identifies the general order in which each aspect of the QDR may be carried out. However, in practice the order of events may differ in order to suit each individual circumstance. Further information is contained in the following sections of this report.

As multiple blocks within the development (Refer to Section 2) exceed 50m in height, and the building is interconnected at the 'link' levels, the QDR process is likely to impact the majority of the design team. Therefore, this QDR will be discussed with the following stakeholders:

- Architects (Sheppard Robson)
- Structural engineers (Apex Consulting);
- MEP engineers (Waterman Group);
- Statutory authorities (Building Control (to be confirmed) and Greater Manchester Fire & Rescue Service);
- Insurers (To be confirmed);
- Building manager (To be confirmed);
- Contractor and sub-contractors (To be confirmed);
- Client (IQ Student Accommodation)

An initial meeting has taken place to discuss general site access for fire tender vehicles with Greater Manchester Fire & Rescue Service (GMFRS) via Microsoft Teams dated 08.02.2023. GMFRS had no adverse comments to the proposals developed during RIBA Stage 2.

1.4 Golden Thread

Due to the early stages of the project, reviews of the QDR should be undertaken at various stages of the development and follow the Golden Thread. These will be provided in future updates of this report identifying any design changes/design development, etc. The objective of the design review is to check that the fire strategy still meets the functional requirements of the Building Regulations 2010 (as amended).

2 Building Description

The project involves the construction of 3no. blocks of student accommodation. The number of storeys in each block varies and all three blocks are linked by connecting link blocks (Figure 1).

All upper floors comprise residential accommodation and will contain a mixture of studios and cluster accommodation. Student amenity and back-of-house areas are provided at the ground and lower ground floors. The lower ground floor meets the definition of a *'basement'* as specified in BS 9991 as the floor level is more than 1.2m below the highest level of ground adjacent to the outside walls.

The site is located in between Granby Row, Echo Street and Vimto Gardens as shown in Figure 2, with fire service vehicle access to both Granby Row and Echo Street.

Additional information for each building is contained in the below tables.

Table 1: Block A building characteristics

Key Characteristics		Description
Block Height		51.9m (Measured to the top occupied storey)
Building Areas	Basement	Tank rooms, Store Rooms, Generator, Refuse Stores, Cycle Hub
	Ground Floor	Residential Amenity
	Levels 01-15	Residential Studios, Residential Cluster Flats
	Roof Level	Plant

Table 2: Block B building characteristics

Key Characteristics		Description
Block Height		69.9m (Measured to the top occupied storey)
Building Areas	Basement	Tank rooms, Store Rooms, Generator, Refuse Stores, Cycle Hub
	Ground Floor	Residential Amenity
	Levels 01-21	Residential Studios, Residential Cluster Flats
	Roof Level	Plant

Table 3: Block C building characteristics

Key Characteristics		Description
Block Height		83.3m (Measured to the top occupied storey)
Building Areas	Ground Floor	Residential Amenity
	Levels 01-27	Residential Studios, Residential Cluster Flats
	Roof Level	Plant

Table 4: A-B and B-C Link building characteristics

Key Characteristics		Description
Block Height		36.8m
A-B Link	Ground Floor	Residential Amenity
	Levels 01-11	Residential Studios
B-C Link	Ground Floor	Residential Amenity
	Levels 01-15	Residential Studios

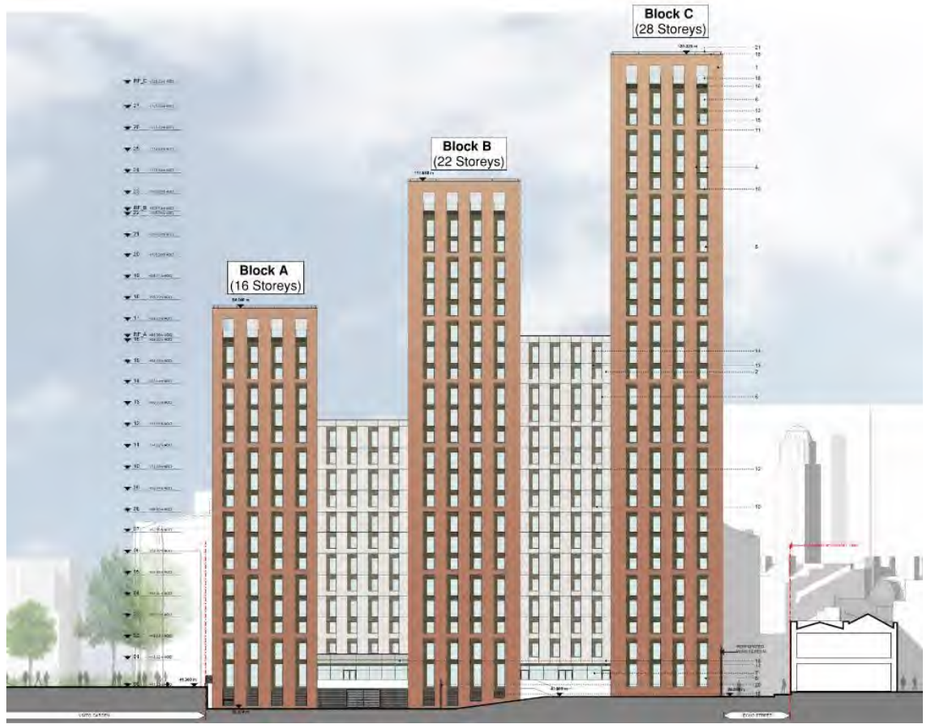


Figure 1: Block Diagram Legend



Figure 2: Site Plan (Echo Street Building highlighted)

3 FUNCTIONAL OBJECTIVES

3.1 Overview

The primary objective of the fire strategy is to demonstrate how the design of the building can meet the functional requirements of the Building Regulations 2010 (as amended), as set out in Part B of Schedule 1 to the Regulations. OFR are not currently aware of any property protection, business continuity requirements or environmental requirements. The IQ Student Accommodation employers' requirements documentation will also be followed.

All objectives are outlined in Table 5 along with the principal documents stating the requirements, and the principal design guidance that will be used to demonstrate compliance.

Table 5: Functional Objectives

Functional Objectives	Principal regulation / documents to comply with	Principal design guidance to follow [a)]
Statutory Requirements	Building Regulations 2010 (as amended)	Approved Document B Fire Safety Volume 1: 2019 edition incorporating 2020 and 2022 amendments [1]
		BS 9991:2015 [4]
		BS 9999: 2017 [3]
		BS 7974:2019 [6]
	Regulatory Reform (Fire Safety) Order 2005 [7]	PAS 79-1: 2020 [8]
		PAS 79-2: 2020 [9]
	Construction (Design and Management) Regulations 2015 [10]	To be co-ordinated with the Principal Designer. The fire strategy will set out performance requirements for systems and products, rather than a detailed design.
Property protection and business continuity requirements	Any additional property protection/business continuity requirements not covered in the Employer's Requirements will need to be advised to OFR. Discussions and consultation with Insurer and Warranty Providers to be undertaken at the appropriate stage. The IQ Student Accommodation employers' requirements documentation will also be followed. This document outlines recommendations above and beyond those typically recommended to align with the Building Regulations 2010 (as amended).	
Environmental Requirements	Any environmental requirements relating to fire safety will need to be advised to OFR by the Client and other members of the design team, but the measures provided in the fire strategy are expected to reduce the frequency and consequences of a large fire occurring. The selection of materials and systems used to address environmental and sustainable design will be reviewed in relation to the agreed fire strategy.	

a) It is generally advised that the use of multiple guidance documents is avoided. However, in some instances it may be necessary to supplement one publication with another. Where this approach has been used it will be addressed in the OFR fire strategy report.

3.2 Route to Building Regulations Compliance

The below table provides a preliminary route to compliance to meeting the Requirements of the Building Regulations 2010 (as amended) as set out in Part B of Schedule 1 to the Regulations. The proposed route to compliance pathway recommended can either be as per standard guidance documentation (i.e., BS 9991, BS 9999 etc.) or a performance-based solution.

Table 6: Building Regulations Requirements

Functional Requirement	Intention	Provision	Route to Compliance
B1 – Means of escape	B1 is met by achieving all of the following: (a) Sufficient means for giving early warning of fire to people in the building; (b) All people can escape to a place of relative safety without external assistance; (c) Escape routes are suitably located, sufficient in number and of adequate capacity; (d) Where necessary, escape routes are sufficiently protected from the effects of fire and smoke; (e) Escape routes are adequately lit and exits are suitably signed; (f) There are appropriate provisions to limit ingress of smoke to the escape routes, or to restrict the spread of fire and ventilate smoke.	Fire detection & alarm systems	Guidance per BS 9991: 2015
		Horizontal escape	Performance-based
		Vertical escape	Performance-based
		Protection to escape routes	Performance-based
		Escape away from the building	Guidance per BS 9991: 2015
		Lighting & signage	Guidance per BS 9991: 2015
B2 – Internal fire spread (linings)	B2 is met by achieving a restricted spread of flame over internal linings. The building fabric should make a limited contribution to fire growth, including a low rate of heat release.	Wall and ceiling linings	Guidance per BS 9991: 2015

B3 – Internal fire spread (structure)	B3 is met by achieving all of the following: (a) For defined periods, loadbearing elements of structure withstand the effects of fire without the loss of stability; (b) Compartmentation of buildings by fire resisting construction elements; (c) Automatic fire suppression is provided where it is necessary; (d) Protection of openings in fire-separating elements to maintain continuity of the fire separation; (e) Inhibition of the unseen spread of fire and smoke in cavities, to reduce the risk of structural failure and spread of fire and smoke, where they pose a threat to the safety of people in and around the building.	Structural fire safety	Performance-based
		Internal separation	Guidance per BS 9991: 2015
		Automatic water fire suppression systems (AWFSS)	Guidance per BS 9251 and BS EN 12845
		Concealed fire spread	Guidance per BS 9991: 2015
B4 – External fire spread	B4 is deemed to be satisfied when: **Resisting fire spread over external walls:** (a) The risk of ignition by an external source to the outside surface of the building and spread of fire over the outside surface is restricted; (b) The materials used to construct external walls, and attachment to them, and how they are assembled do not contribute to the rate of fire spread up the outside of the building. **Resisting fire spread from one building to another:** (a) The risk of ignition by an external source to the outside surface of the building is restricted; (b) The amount of thermal radiation that falls on a neighbouring building from window openings and other unprotected areas in the building	Vertical fire spread	Guidance per BS 9991: 2015 Regulation 7(2)
		Space separation	Guidance per BS 9991: 2015
		Roof coverings	Guidance per BS 9991: 2015
	on fire is not enough to start a fire in the other building; Flame spread over the roof and/or fire penetration from external; sources through the roof is restricted.		
B5 – Access and facilities for the fire service	B5 is met by achieving all of the following: (a) External access enabling fire appliances to be used near the building; (b) Access into and within the building for firefighting personnel to both I. Search for and rescue people; II. Fight fire. (c) Provision for internal and external fire facilities for firefighters to complete their tasks; (d) Ventilation of heat and smoke from a fire in a basement.	Vehicle access	Guidance per BS 9991: 2015
		Fire mains and hydrants	Guidance per BS 9991: 2015
		Access to the building	Guidance per BS 9991: 2015
		Provisions within the building	Guidance per BS 9991: 2015

4 Fire Hazards And Consequence

4.1 Definitions

- Fire hazard – a source of possible injury or damage from fire.
- Risk – probability (likelihood x consequence) of occurrence of a hazard causing harm and the degree of the severity of the harm

4.2 Hazards

As part of the QDR process, fire-related hazards within the building will be established and their potential consequence evaluated. The review will consider the following factors:

- Ignition sources
- Combustible contents
- Materials of construction
- Nature of the activities in the building
- Any other unusual factors

Table 7 below summarises a list of main items that have been considered in carrying out this hazard assessment. The contents of this QDR report does not include a full hazard assessment for all items listed below, however should be documented by the QDR team.

Table 7: Hazards to consider for Echo Street

Reference	Description	Proposed Safeguard	Description
1. **Within the residential accommodation (Studios and Cluster Flats)**			
1.01	Furniture	• Design standards • Fire detection • Suppression Systems	• BS 9991/BS 9999/AD B v1 • Category L2 fire detection system in accordance with BS 5839-1 [11] • Category 4 sprinkler system in accordance with BS 9251 [12]
1.02	Electrical appliances (not heaters)	• As 1.01	• As 1.01
1.03	Portable electrical heaters	• As 1.01	• As 1.01
1.04	Fixed electrical heaters	• As 1.01	• As 1.01
1.05	Candles, burners etc.	• As 1.01	• As 1.01
1.06	Linings and coverings (wall, floor & ceiling)	• As 1.01 • Wall and ceiling lining provisions	• As 1.01 • Linings in accordance with BS EN 13501-1 [13].
1.07	Fixed electrical systems (lighting, wiring etc)	• As 1.01	• As 1.01
1.08	Fixed cooking equipment	• As 1.01, plus • Additional measures	• As 1.01 • Hob cut-off/hob-suppression device proposed
1.09	Non-fixed cooking equipment	• As 1.01	• As 1.01
1.10	Non-electrical heaters (e.g. LPG, paraffin)	• As 1.01	• As 1.01
1.11	Fixed gas system	• As 1.01	• As 1.01
1.12	Festive decorations	• As 1.01	• As 1.01
1.13	Fire/smoke from fire in neighbouring apartment	• As 1.01 • Compartmentation	• As 1.01 • 60 minutes Fire separation as per BS 9991
2. Residential Common Corridor			
2.01	Furniture	• Design standards • Fire detection	• As 1.01 • Category L5 system in accordance with BS 5839-1.
2.02	Linings and coverings (wall, floor & ceiling)	• As 2.01 • Wall and ceiling lining provisions	• As 2.01 • Linings in accordance with BS EN 13501-1 [13].
2.03	Fixed Electrical System (Lighting, wiring etc)	• As 2.01	• As 2.01
2.04	Waste material (e.g. refuse or unwanted furniture etc)	• Management protocols • Fire detection	• Building management routine inspections • As 2.01
2.05	Smoke/Fire Spread	• Fire doors • Fire detection • Smoke ventilation system	• As 1.01 • As 2.01 • Mechanical ventilation system
3. Materials of Construction			
3.01	Insulation	• Proof of suitable fire resistance	• Varying British Standards
3.02	Aluminium	• As 3.01	• As 3.01
3.03	External Wall	• Regulatory provisions	• Regulation 7
4. Plant Rooms			
4.01	Electric Installations	• Design standards • Fire detection • Suppression systems • Compartmentation	• As 1.01 • Category L2 automatic fire detection system in accordance with BS 5839-1 • BS EN 12845 commercial sprinkler system • Fire resisting construction
4.02	Liquid fuels (e.g, diesel, kerosene)	• As 4.01	• As 4.01
4.03	Mains gas supply	• As 4.01 • Additional measures	• As 4.01 • Gas detection • Supply isolation valves
4.04	Gas bottles (e.g. LPG)	• As 4.01	• As 4.01
4.05	Solvents	• As 4.01 • Additional measures	• As 4.01 • Secure storage cupboards

4.06	Lithium Batteries	• As 4.01	• As 4.01
5. Residential Amenity Spaces			
5.01	Furniture	• Design standards • Fire detection • Suppression Systems	• BS 9991/BS 9999/AD B v1 • Category L2 fire detection system in accordance with BS 5839-1 • BS EN 12845 commercial sprinkler system
5.02	Linings and coverings (wall, floor & ceiling)	• As 5.01 • Wall and ceiling linings	• As 5.01 • Linings in accordance with BS EN 13501-1 [13].
5.03	Fixed electrical system (lighting, wiring etc)	• As 5.01	• As 5.01
5.04	Electrical appliances	• As 5.01	• As 5.01
5.05	Fixed cooking equipment	• As 5.01	• As 5.01
5.06	Festive Decorations	• As 5.01	• As 5.01
6. Non-residential Spaces			
6.01	Refuse	• Design standards • Fire detection • Suppression Systems • Fire doors to isolate refuse stores from residential areas and stairs • Ventilated protected lobby	• As 1.01 • As 4.01 • As 4.01 • 0.2m^2 permanent ventilation (or suitable mechanical alternative)
6.02	Postal Deliveries & Parcel Storage	• Fire detection • Suppression systems • Management protocols • Fire resisting construction • Locker provisions	• As 1.01 • As 1.01 • As 2.04 • As 1.01 • Fire resisting lockers with materials achieving at the minimum Class A2-s3,d0
7. External Hazards			
7.01	Fire in the adjacent building	• Sufficient space separation between buildings.	• Calculation procedure outlined in BR 187 [14] • Fire resisting external wall construction (if dictated by BR 187)
7.02	Build-up of waste in proximity	• Building management protocols	• Route inspections by building management
7.03	Lightning Strike	• Lightning protection system	• Lightning protection system
8. Non-routine activites			
8.01	Hot works inside the building	• Building management protocols	• Permit to work system implemented
8.02	Hot work outside the building	• Building management permit to work	• Permit to work system implemented

5 Architectural Review

5.1 Design Reviews

PD 7974-0 recommends that all relevant information about the building, its occupant and uses, should be provided to the QDR team including the following information:

1. Building structure and layout;
2. Use (s) and contents of the building;
3. Fire service access to the building;
4. Occupants (including any special requirement for people with disabilities);
5. Ventilation systems;
6. Unusual fire hazards;
7. Planning constraints (e.g. listed buildings of historical merit);
8. Client requirements including possible future options;
9. Personnel who can supply further information as required.

Table 4 in PD 7974-0 outlines typical items to be considered during the review of the architectural design as shown overleaf in Table 8 . An additional column has been added which highlights which section (if applicable) of the OFR outline fire strategy addresses said aspect of the architectural design from a fire safety perspective. This table would require further revision following future fire strategy updates.

Table 8: Items typically considered in PD 7974-0 with reference to the OFR RIBA Stage 2 fire strategy report

Area of review	Item to be considered	OFR Outline Fire Strategy
Building Design	Number of storeys (above and below ground)	Section 2
	General dimensions	
	Nature of construction	
	Geometry of interconnection of spaces	
	Internal sub-division of the building	Section 5
	Normal circulation routes	Section 4
	Escape routes	
	Provision for dispersal of people from vicinity of the building	
	Fire brigade response time	N/a
	Access for fire appliances	Section 7
	Fire-fighting access within the building	
	Location relative to other buildings or site boundary	Section 6
Occupants	Number and distribution	Section 2
	Single or multiple tenancy or use	
	Mobility	
	State of wakefulness	
	Familiarity with the building	
	Social groupings	
	Roles and responsibilities of key individuals	N/a
Room or compartment	Unusual fire hazards (e.g. flammable liquids stored in offices)	QDR
	Potential ignition sources	
	Combustible contents	
	Fire load density	Section 2
	Wall linings	Section 5
	Ceiling linings	
	Ambient noise levels	N/a
	Ventilation systems	Section 3 & 5
	Fire and smoke spread routes	Section 3
	Escape Routes	

5.2 Inclusive Design

5.2.1 Overview

The accessible means of escape needs to form an integral part of the fire safety strategy and is a requirement of the Building Regulations, with Requirement B1 stating that:

'The building shall be designed and constructed so that there are appropriate provisions for the early warning of fire, and appropriate means of escape in case of fire from the building to a place of safety outside the building capable of being safely and effectively used at all material times.'

Approved Document B clarifies further that one of the intentions of this Requirement (in the Secretary of State's view) is that all people can escape to a place of safety without external assistance. Within the Echo Street development, there could be occupants with a wide range of needs and requirements (both permanent and temporary), and these will need to be considered and appropriate measures developed to ensure that occupants can escape safely in the event of a fire. As stated, no reliance should be made on the fire service to assist in the evacuation of mobility impaired occupants.

5.2.2 Basement Level

At the basement level, there is access directly to outside via the ramp to the south. However, to the north of the basement, egress is via steps leading to the ground floor level. As such, it is proposed to provide disabled refuges within the protected stair enclosures (Figure 3).

5.2.3 Ground Level

The ground floor level has exits directly to outside that are accessible for MIPs, therefore no disabled refuges are proposed at this level.

5.2.4 Residential Levels

To accommodate inclusive design within the development for the residential levels, it is proposed to provide 2no. firefighting lifts within each core. 1no. of the firefighting lifts may be configured as an evacuation lift as per BS 9999 recommendations, if necessary, as IQ Student Accommodation have confirmed that the building is managed 24/7 by on-site staff.

To ensure there is a suitable place for persons to wait prior to evacuation via the lifts, a protected lobby is introduced in front of the lift landing doors at all residential levels (Figure 4). The smoke control basis of design for the residential common corridors is such that this lobby remains free from smoke during the means of escape phase.

The OFR fire strategy report aims to ensure the following:

- Both firefighting lifts can continue to run during a fire scenario
- Occupants who can't use the stairs to evacuate can use the lifts without assistance from others
- Occupants can wait safely for a lift to arrive
- Occupants can safely exit the building from the lift at the ground floor level

Table 9 overleaf summarises the above design objectives, consequences and proposed solutions of how the firefighting/evacuation lifts are integrated into the overall fire safety strategy.

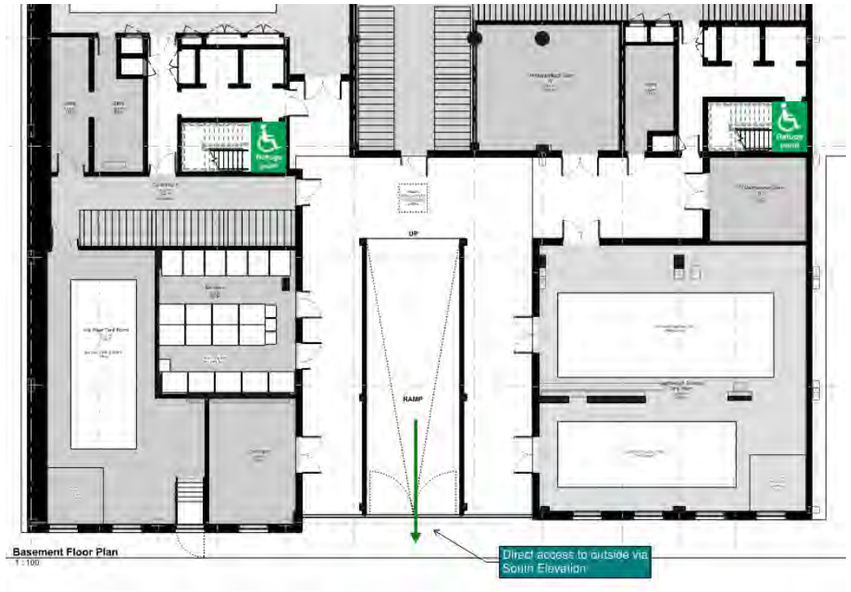


Figure 3: Basement egress routes and refuges

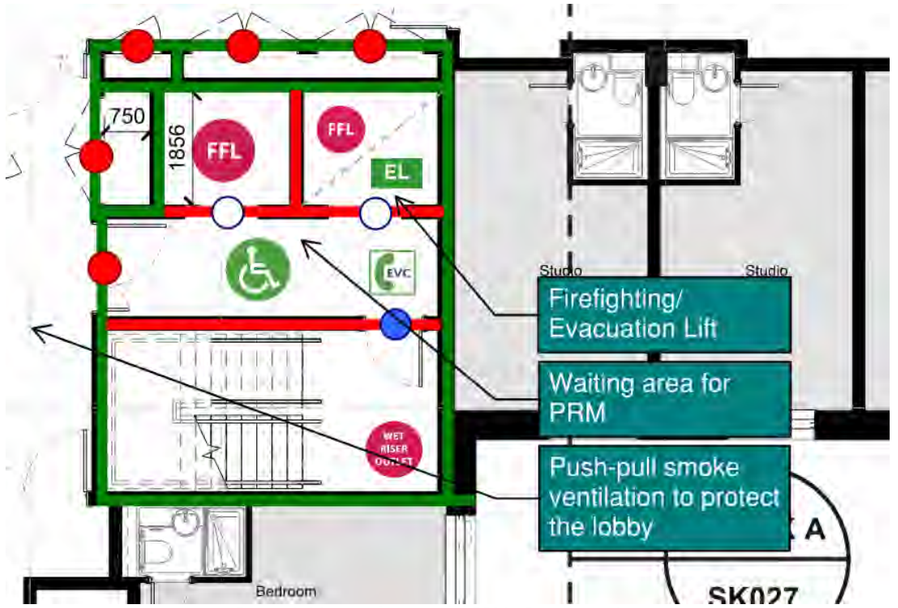


Figure 4: Means of escape for PRM - Residential Levels

Table 9: Evacuation lift design objectives/solutions

Objective	Hazards/Consequences	Solution [a) b)]
The lifts can continue to run during a fire scenario	A fire in the building affects the lift equipment and power supplies to the lift.	The evacuation lifts will be designed based on the standard for fire-fighting lifts (BS EN 81-20 and BS EN 81-72), enclosed in a protected shaft, and provided with secondary power supplies.
Occupants who can't use the stairs to evacuate can use the lifts without assistance from others	The lifts will need to be able to run during a fire scenario. This could result in occupants using a lift discharging from non-fire floors stopping at the fire floor and being exposed to fire and smoke.	The proposed smoke ventilation system will be provided to the common corridors serving the flats such that conditions in the corridor and protected lobby adjacent to the lifts remain tenable for occupants using the evacuation lifts. Heat detectors will be provided adjacent to the lifts within the protected lobby at each residential storey. In the event of failure of the fire safety systems to maintain tenable conditions within the lift lobby space, the operation of the heat detector will disable the lift landing controls and return the lift to Ground, with the doors open. Suitable override controls will also be provided for fire-fighters to allow to be under the control of fire-fighters during operations.
Occupants can wait safely for a lift to arrive	Standard smoke ventilation systems within common corridors recommended in BS 9991 are provided primarily to protect the stair and do not necessarily provide tenable conditions within the corridors.	It is proposed to locate the firefighting/evacuation lifts within a protected lobby enclosure. In addition to this, the proposed smoke ventilation system in the corridors will be designed to maintain tenable conditions in the lobby to allow occupants who need to use the lifts to wait safely during a fire within a flat (Figure 5). Refer to Section 7 for preliminary proof-of-concept CFD modelling.
Occupants can safely exit the building from the lift	Once occupants using the lift reach the exit level from the building, they should be able to safely escape from the building to outside the building.	The evacuation lifts will discharge into the same escape route used by the protected stair and fire-fighting lift. This will afford the same level of protection for all occupants escape from the building. At the ground floor level, it is further proposed to introduce fire and smoke curtains in front of the fire doors accessing the firefighting core (Figure 6). This is to ensure that the entire escape route from the evacuation lifts is protected via 2no. layers of passive fire protection.
a) Currently there is only a draft version of BS EN 81 76 (19/30385553 DC) that provides guidance for evacuation lifts, but this has not been formally published. Therefore, the exact specification and operation of this lift will need to be developed by a specialist contractor. b) The smoke ventilation proposals are described within the main body of the Fire Strategy Report and will be subject to detailed CFD analysis to demonstrate that the design objectives have been satisfied. Preliminary CFD analysis during these early design stages is shown below in Section 7.		

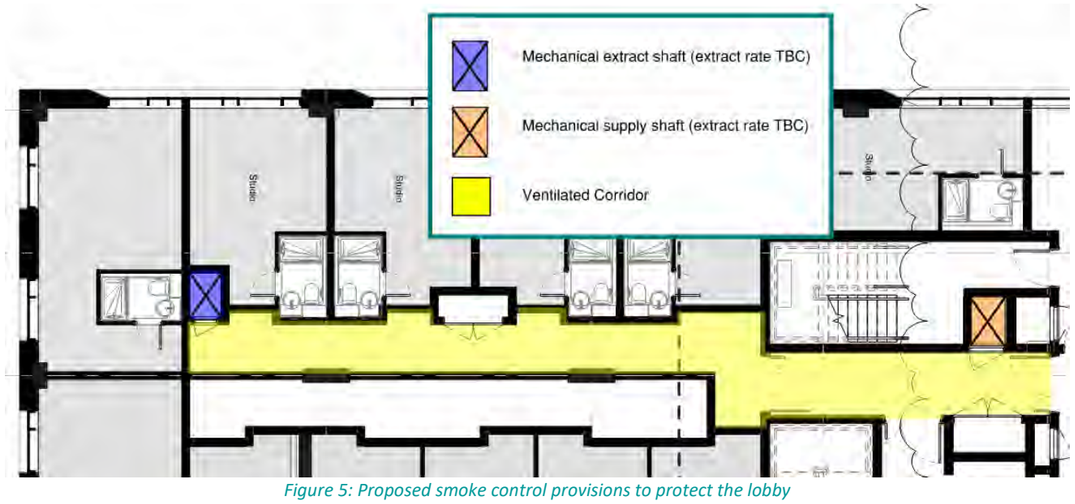


Figure 5: Proposed smoke control provisions to protect the lobby

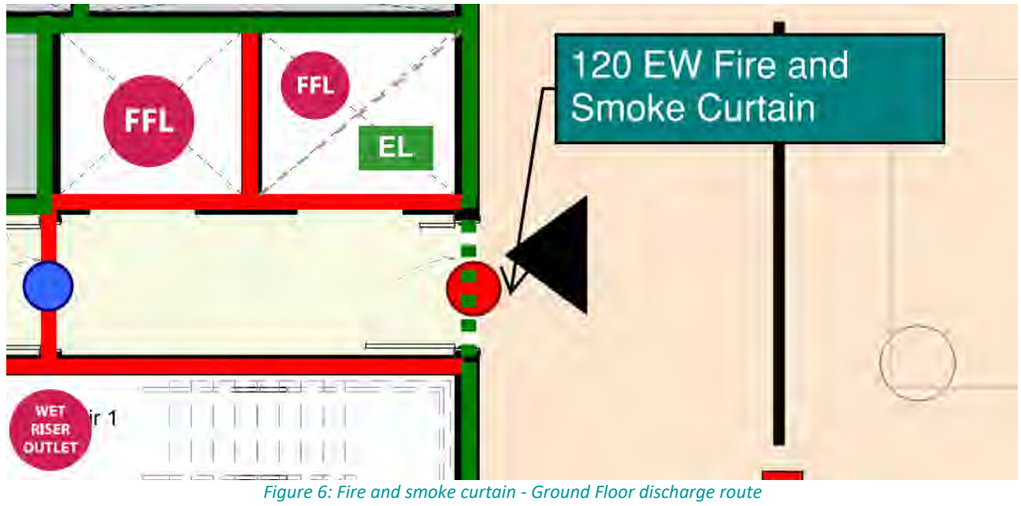


Figure 6: Fire and smoke curtain - Ground Floor discharge route

5.3 Building Height Impact

Table 10 overleaf provides an initial summary of the key design challenges specific to buildings >50m in height and OFR's proposed roadmap for demonstrating compliance with the requirements B1-B5 of the Building Regulations 2010 (as amended).

The below should be reviewed and agreed by all relevant stakeholders.

Table 10: Assessment of the impact of building height on aspects of the fire strategy

Building Regulations – Requirement	Design Consideration	Building Hazards and Consequences	Route to Compliance	OFR Proposed Solution
(B1) Means of Warning and Escape	Flat Fire	A fire within a flat may cause smoke to spread to the common corridor and / or stair, impeding escape of occupants and resulting in places of relative safety no longer remaining tenable. This has been highlighted as a key consideration with respect to mobility impaired egress.	Performance Based	The building height does not directly impact the likelihood of a fire within a studio flat or cluster flat.
	Management Procedures	A reliance on management for egress requires specialist training and could result in sending management staff into a fire affected and unsafe environment. Management staff may conflict or interfere with firefighter operations, compromising procedures and causing delays.	Guidance as per BS 9991/AD B Performance Based	**Residential Levels** OFR are proposing an evacuation solution for accessible emergency egress without reliance on management intervention for Blocks A, B and C, due to their height far exceeding 50m. This will be achieved via the provision of a firefighting/evacuation lift serving every level of each block. Each evacuation lift will be provided with a protected lobby and an associated emergency voice communication (EVC) device. The smoke control system will be designed such that smoke ingress into the protected lobby will be inhibited. **Ground Floor** The ground floor level will adopt a simultaneous evacuation strategy, with exits directly to outside. Therefore, no refuges are proposed to persons with reduced mobility (PRM). **Basement** Egress from the basement for mobility impaired will be supplemented via management procedures, as disabled refuges are provided to the basement stairs with an associated EVC system.
	Non-residential areas	A potential hazard, if not suitably mitigated, is that a fire in non-residential spaces could be more severe than typically designed for with respect to residential areas. A consequence of this is that other areas could become compromised, such as the residential stair, affecting both escape and firefighting operations.	Guidance as per BS 9991/AD B	Provision of compartmentation, appropriate smoke control, sprinklers and adequate separation between the residential stair core and ancillary areas are combined measures considered to suitably mitigate the hazards. The proposed measures are expected to result in a situation in which a fire within the non-residential areas would be no more severe than in residential areas. It is also anticipated that ignition likelihood in these areas will be lower. The evacuation strategy for the ground floor is such that egress is independent from the residential levels. All exits from the ground floor and basement levels via the stairs/lifts are directly to outside.
	Fire detection and alarm systems	The increase in building height can lead to protracted evacuation times within the building due to the increased number of storeys required to traverse in order to reach a final exit.	Guidance as per BS 9991/BS 9999	**Studio and Cluster Flats** It is proposed to provide a Category L2 automatic fire detection system in accordance with the recommendations in BS 5839-1 [11].

Building Regulations – Requirement	Design Consideration	Building Hazards and Consequences	Route to Compliance	OFR Proposed Solution
		However, the increase in building height is not anticipated to lead to protracted evacuation times to a place of safety i.e., protected lobby or stair at each level.		**Residential Common Corridors** It is considered appropriate provide a Category L5 detection system within the residential common corridors in accordance with the recommendations in BS 5839-1 [11]. Said system will be linked to the smoke control system and the AOVs at the head of the stairs with coverage to that of a Category L4 detection system to BS 5839-1. If so required, the detection system within the studios/cluster flats could link to the smoke control system such that it is activated earlier. This has been explored in the CFD modelling in Section 7. **Non-residential/Ancillary Residential** It is proposed to provide an automatic fire detection system designed and installed in accordance with BS 5839-1 to these areas to a Category L2 standard. This provision exceeds the minimum recommendations in BS 9991 and BS 5839-1 (Category M system minimum recommendation).
	Horizontal escape	The increase in building height would not affect the horizontal escape route from each floor plate. This is further reinforced on the residential levels within the building on the basis that in the event of a fire within any flat, a phased evacuation strategy is to be implemented for unaffected flats.	Guidance as per BS 9991/AD B Performance Based	It is not considered that the building height adversely affects the horizontal escape from the studios and cluster flats located on the residential levels. A primary consideration with regards to building height is the provision of smoke ventilation to the residential common corridors. The proposed smoke ventilation system will adopt supply and extract shafts located at the extremities of the corridors in a 'push-pull' configuration. This is to ensure that there is no reliance on AOV's on the external wall, which BS 9991 recommends should be avoided for buildings with a height to the top occupied storey above 30m.
	Vertical escape	The vertical escape from the residential levels in the building is uncommon by virtue of the height of Blocks A, B and C above ground. The guidance contained within BS 9991 does not explicitly assess the vertical escape from buildings of this height. Primary risks relating to vertical escape for buildings of this height include the distance occupants must travel down the stairs to reach a final exit. Therefore, this can place additional reliance on evacuation lifts as mobility impairments may prevent occupants from travelling down multiple storeys compared to that of a low-rise building. In addition to this, with building height increase, the number of occupants within the building is also likely to increase and therefore, additional lifts may be required for capacity/redundancy. An additional factor for increased building height is a greater number of persons reliant on the protected stair enclosures to escape and thus additional protection measures to the stairs should be considered. Firefighting operations will also be protected due to the increased height of the building.	Guidance as per BS 9991/AD B Performance Based	All blocks within the building will be served via 2no. stair enclosures, protected by their own ventilated lobby. The smoke ventilation strategy has been developed such that the stair remains free from smoke in a fire scenario. It is recommended that heat detectors are provided adjacent to the lifts to initiate emergency recall rather than smoke detectors. This is so that the lifts remain in use for evacuation for as long as it is practicable and safe to do so. As all blocks are taller than the most onerous building height of 50m in BS 9991, a performance-based assessment (CFD) will be undertaken to demonstrate that the proposed smoke ventilation systems are adequate to protect the vertical means of escape provisions from the building. OFR have undertaken a preliminary proof of concept modelling as shown later in this report (Section 7). The preliminary CFD simulation demonstrates that providing a push-pull system is capable of maintaining the tenability of the stair and lift lobby for vertical means of escape and the fire-fighting phases. It is recommended to provide 2no. firefighting lifts in these blocks, with 1no. of the lifts to be used for the evacuation of occupants (evacuation lift), prior to the fire and rescue services arrival. This is an enhancement from guidance recommendations as evacuation lifts are not specifically recommended in BS 9991. The dual fire-fighting lift arrangement would allow for further evacuation of occupants with mobility

Building Regulations – Requirement	Design Consideration	Building Hazards and Consequences	Route to Compliance	OFR Proposed Solution
				impairment whilst the fire and rescue service carry out fire-fighting occupations using one of the firefighting lifts.
	Vertical Escape - Evacuation of persons with reduced mobility (PRM)	Requirement B1 of Schedule 1 to the Building Regulations states that there should be an *'appropriate means of escape in case of fire to a place of safety outside the building capable of being safely and effectively used at all material times'.* Approved Document B also states that in the Secretary of State's view, requirement B1 is only met when all people can escape safely to a place of safety without external assistance. In residential buildings, there is generally minimal on-site fire safety management, and the general arrangement of fire alarms is that only the occupants of the apartment of fire origin are expected to escape, with the majority of occupants remaining within their apartment as they should be suitably protected from the effects of fire in the building. However, any occupants who wish to escape should be able to do so, safely, to outside the building at any stage. For mobility impaired occupants, it may not be practicable for them to escape downstairs. Traditionally, the use of lifts during a fire event is discouraged and the operation of the fire alarm in the common areas would normally disable the use of the lifts. The consequences of this either results in occupants being unable to escape to outside the building and therefore results in failure to comply with Requirement B1 or it places a significant onus on the building management to manually intervene and evacuate occupants requiring assistance. For taller buildings the use of evacuation chairs to assist occupants down the stairs may also become impracticable. The use of evacuation lifts as described in Annex G of BS 9999 could be a solution, but these generally require trained staff to operate the lift. Again, this could place an unrealistic onus on the fire safety management of the building.	Guidance as per BS 9991/ BS 9999	It is proposed to provide 2no. firefighting lifts to each block in the scheme. 1no. of the lifts is to also function as an evacuation lift to mobility impaired egress. To supplement this approach, a protected lobby will be provided at all levels, protected with a mechanical smoke ventilation system to ensure that the lobby remains tenable. It is proposed to supplement this by providing a Type B EVC outstation within the protected lobbies, installed in accordance with BS 5839-9 [15]. The L5 detection system provided within the residential common corridors will be configured such that activation of a smoke detector within the corridor itself will not cause the lifts to ground. It is instead proposed to provide a detector within the protected lobby to the evacuation lifts to initiate recall.
	Escape away from the building	Although the building is considered to be very tall, the distance needed to escape from the building to a space of relative safety may need to be increased due to variables such as falling debris.	Guidance as per BS 9991/AD B	All stairs discharge directly to outside via a 120-minute fire resisting construction. No accommodation opens directly into the said protected corridors. The agreed assembly points by building management should consider building height.
	Provisions for escape lighting	Although the buildings are considered to be very tall, the provisions for emergency lighting are not affected.	Guidance as per BS 9991/AD B	Emergency lighting will be installed in accordance with BS 5266-1 [16].
	Fire Safety Signage	Due to the height of the buildings, it is imperative that the fire and rescue service are aware of their position within the building via the form of floor/flat identification.	Guidance as per AD B	The recommendations in AD B v1 are to be followed as best practice. This will include the installation of fire safety signs to provide clear identification of fire precautions, fire equipment and means of escape in the event of a fire. Floor

Building Regulations – Requirement	Design Consideration	Building Hazards and Consequences	Route to Compliance	OFR Proposed Solution
				identification signs will be provided, located on every landing of a protected stair and every protected corridor/lobby into which a fire-fighting lift opens.
(B2) Internal fire spread (linings)	Wall and ceiling linings	As a building increases in size the possibility of more people being affected increases if a seat of fire was to spread across linings, for this reason attention should be paid to the proper selection of lining materials.	Guidance as per BS 9991/BS 9999	The wall and ceiling linings within all buildings of the scheme will following the recommendations in BS 9991/ BS 9999.
(B3) Internal fire spread (structure)	Loadbearing elements of structure	Where a building exceeds 30m in height (measured to the topmost storey), BS 9991 and Approved Document B do not explicitly define an upper limit when recommending levels of fire resistance, with any building greater than 30m recommending 120 minutes fire resistance period, regardless of use, size and complexity. As building height increases, the consequence of a fire increases as the building height affects the number of persons at risk, the ease at which persons can escape, fire-fighting operations, and the potential increase of damage to neighbouring buildings and structural due to a potential collapse. The building would be considered a Consequence Class 3 (CC3) building in accordance with Approved Document A [17] and therefore a systematic risk assessment of the building (which should also include the impact of fire on the structure) is recommended to satisfy Requirement A3 relating to disproportionate collapse. This assessment should be conducted by the structural engineers or fire engineers.	Performance Based	To address the impact of fire on the structure and the adequacy of the 120 minutes fire resistance period recommended in BS 9991 for Blocks A, B and C, OFR will consider the following by undertaking a probabilistic risk assessment (PRA): • Estimate the minimum acceptable safety target for the building; • Measurement of the input data for the relevant fire compartments, including geometry and ventilation openings; • Development of a range of credible and structurally significant fire scenarios based on statistical variation in parameters informing fire development; • Assessment of these fires to establish their impact on the temperatures achieved by the structural elements; • Benchmarking the fire severity using the time equivalence principle to define the fire resistance specification to meet the acceptable failure probability;
	Compartmentation	As a building increases in size, the possibility of more people being affected increases if the fire were to spread across different compartments, for this reason compartmentation should take into consideration the height of the building as to ensure each protected compartment has enough resistance to not compromise the buildings integrity in case of a fire.	Guidance as per BS 9991/BS 9999 Performance Based	Prior to the conduction of the building specific PRA, compartmentation and fire-resisting recommendations for the building are to be as per guidance recommendations in BS 9991/BS9999. It is also to be noted that all floors are to be compartment floors throughout the building. These recommendations will be co-ordinated with the design team as the design progresses. The probability risk assessment (PRA) conducted by OFR will estimate the minimum acceptable safety target for the building and will define the fire resistance specification required to meet the acceptable failure probability. If the PRA analysis finds that a higher level of fire resistance is required to the structure, then some aspects of the compartmentation will have to be increased above that of the minimum recommendations in BS 9991/BS9999.
	Suppression	BS 9251 recommends that sprinkler systems should be provided with enhanced performance, reliability and resilience arrangements to address any aspects of additional risk identified. For buildings greater than 18m in height, BS 9251 (2021 edition) recommends that a Category 4 sprinkler system should be provided to residential areas. A BS EN 12845 commercial sprinkler system will be provided to the non-residential areas >100m^2.	Guidance as per BS 9251 and BS EN 12845	**Residential Areas** For buildings greater than 18m in height, BS 9251 (2021 edition) recommends that Category 4 sprinkler system should be provided. To address the additional risks associated with the height of the buildings, the Category 4 sprinkler system for the residential levels will include the following to improve its resilience and reliability: • 60 minutes water supply;

Building Regulations – Requirement	Design Consideration	Building Hazards and Consequences	Route to Compliance	OFR Proposed Solution
				• Duty and stand-by pumps; • Back-up power supply for the duty and stand-by pumps; • Non-combustible pipes in non-residential areas of the building; • Infill connection for the Fire Service; • Arrangements to maintain system integrity during maintenance or repair; and • Remote monitoring of critical system components. **Residential Ancillary/ Non-residential areas** Non-residential areas of the premises will be covered by a BS EN 12845 sprinkler system, with the hazard classifications defined as per BS EN 12845. The MEP contractor should confirm that the sprinkler system design is sufficient to satisfy the functional requirements of the Building Regulations.
	Concealed fire spread	Concealed spaces or cavities in the construction of a building provide a ready route for smoke and flame spread as the building will host a large amount of people this can represent a high risk, for this reason compartmentation should take into consideration the height of the building as to ensure proper fire stopping and cavity protection throughout the building.	Guidance as per BS 9991/AD B	The fire-stopping and cavity protection to the building will be achieved through the guidance contained within BS 9991 and BS 9999. Therefore, this is considered to be sufficient to satisfy the functional requirements of the Building Regulations.
	Building Construction and Materials	If not suitably specified, the failure of any structural or external wall elements could result in external and / or internal fire spread, directly impacting the building occupants. A greater building height is likely to result in a greater consequence of structural failure due to the presence of a greater number of occupants.	Guidance as per BS 9991/AD B	Suitable and sufficient evidence of performance for all materials will need to be sourced from suppliers and checked for validity. Any non-standard details adopted for fire stopping will need to be validated / tested.
(B4) External fire spread	Vertical Fire Spread	For tall buildings the vertical fire spread on the building will be required to be in accordance with Regulation 7. As per the amended Regulation 7 (specifically Regulation 7(2)) of the Building Regulations, all materials which become part of an external wall, or specified attachment, of a relevant building, must be of European Classification A2-s1, d0 or Class A1, as classified in accordance with BS EN 13501-1:2018. Regulation 7(3) sets out some exceptions from the requirements in 7(2), which includes the following: • Cavity trays when used between two leaves of masonry; • Any part of a roof (other than any part of a roof which falls within paragraph (iv) of regulation 2(6)) if that part is connected to an external wall; • Door frames and doors;	Statutory Requirements (Building Regulations 2010 as amended) and Guidance as per BS 9991/AD B.	The building is classed as a relevant building due to its use (residential) and height (>18m) and so the current design of the external wall build-up of the building will meet Regulation 7. Whilst regulation 7(3) states that the requirements do not apply to membranes, the revised statutory guidance (AD B) recommends that membranes used as part of the external wall construction should achieve a minimum classification of European Class B-s3,d0. As best practice, it is recommended that **ALL** elements of the external wall build-up including those mentioned prior achieve Class A2-s1,d0 or better, and that all practical endeavours should be applied to seek the least fire hazard materials (subject to other performances being satisfactory). As such, the design of the external walls would go above and beyond that of Regulation 7, to take cognisance of the increased risk in building height.

Building Regulations – Requirement	Design Consideration	Building Hazards and Consequences	Route to Compliance	OFR Proposed Solution
		• Electrical installations; • Insulation and waterproofing materials used below ground level; • Intumescent and fire-stopping materials where the inclusion of the materials is necessary to meet the requirements of Part B of Schedule 1; • Membranes; • Seals, gaskets, fixings, sealants and backer rods; • Thermal break materials where the inclusion of the materials is necessary to meet the thermal bridging requirements of Part L of Schedule 1; or • Window frames and glass. Whilst Regulation 7(3) states that the requirements do not apply to membranes, these have also been covered under the changes in the guidance and it is recommended that membranes used as part of the external wall construction should achieve a minimum classification of European Class B-s1 d0.		OFR will continue to liaise with Sheppard Robson to ensure that all elements located within the external wall are at the minimum Class A2-s1,d0 or better wherever practicable.
	Space Separation	Although the building is considered to be very tall, the current design involves 120-minute compartment floors, so the risk of a larger radiation area does not increase proportionally with the height of the building.	Guidance as per BS 9991/AD B	The risk of external fire spread has been assessed based on principles of BR 187, as detailed in OFR outline fire strategy. The analysis demonstrated that the risk of fire spread from this building to adjacent buildings is suitably mitigated. As such, no external wall fire resisting construction would be required from a space separation perspective and is considered to be sufficient to satisfy the functional requirements of the Building Regulations.
(B5) Access and facilities for the fire and rescue service	Access to the Building	Even though the building is considered to be very tall, the increase in height will not affect the provisions for vehicular access to the site.	Guidance as per BS 9991/AD B	As the building is over 50m in height, it is proposed to provide wet risers to all stair cores within the building, serving all levels including the basement. In addition, it is proposed to provide 2no. firefighting lifts in each stair core for Blocks A, B and C. All blocks are served by a firefighting shaft including the basement level. Fire service vehicle access to Blocks A and C is within 18m of a parking position and within sight of a suitable entrance into the firefighting shaft and inlet. Access to the central firefighting core (Core B) is not currently possible from the main fire service vehicle parking position on Granby Road. As such, access to Core B would have to be via the main reception area. This arrangement is considered reasonable due to the following: • If there is a fire within the ground floor level, there would be no requirement for the fire service to access Core B. • If there is a fire on an upper level, the ground floor level is considered a place of relative safety.

Building Regulations – Requirement	Design Consideration	Building Hazards and Consequences	Route to Compliance	OFR Proposed Solution
				• If in the unlikely scenario the fire service were on an upper level, and a secondary fire broke out at the ground floor level, Core B discharges directly to outside. OFR and IQ Student Accommodation held a meeting with Greater Manchester Fire and Rescue Service (GMFRS) (Simon Whittaker and Neil Helmrich) via Microsoft Teams on 8th February 2023 to discuss the above proposals, and GMFRS agreed in principle. The wet rising supplement inlet location is within 18m of a fire service vehicle parking position adjacent to Block A. Hose coverage is within 60m of all areas within the building.
	Fire mains	The height of the building affects the required pressures for dry rising mains. As such, buildings over 50m in height are instead recommended to be provided with wet rising mains.	Guidance as per BS 9991/AD B	All stairs are provided with wet rising mains. Landing valves are located at each level within the building including the ground floor levels. All hose distances are within the maximum recommendations outlined in BS 9991. The location of inlets further aligns with the recommendations within BS 9991/ AD B. It should be ensured that the inlet points are clearly signed, indicating the respective block they serve.
	Fire-fighting access (lifts)	Given the height of the Blocks A, B and C, the use and availability of the fire-fighting lift becomes more important for fire-fighting to transport personnel and equipment. The lack of a fire-fighting lift would require fire-fighters to access the fire floor through the stairs delaying the time to reach the fire and undertake fire-fighting operations. The energy expended by fire-fighters having to walk up the stairs and their ability to then undertake fire-fighting and rescue operations will be significantly reduced.	Guidance as per BS 9991 Performance Based	Two fire-fighting lifts are proposed in all blocks to increase resilience in terms of fire-fighter access due to the height of the building far exceeding the 50m criteria outlined within BS 9991. A secondary benefit is that the lifts can be used by occupants to self-evacuate prior to fire service arrival and for assisted evacuation post-fire service arrival. The introduction of an enhanced smoke ventilation system within the residential common corridors configured in a *'push-pull'* configuration and associated CFD will aim to ensure that the firefighting lifts and firefighting lobbies are protected from the ingress of smoke at all residential levels.
	Emergency Evacuation System (BS 8629 system)	High-rise schemes typically adopt a stay-put strategy, this however may not be ideal in buildings where evacuation of additional occupants might be needed. For this reason, the inclusion of evacuation alert systems (EAS) to aid the evacuation of certain areas of a building has been discussed.	Guidance as per BS 9991/AD B	Approved Document B recommends that evacuation alert systems designed in accordance with BS 8629 are provided within blocks with a storey more than 18 m above ground level. Such an evacuation alert system would allow for further evacuation of the building by the fire service, for a single floor at a time, as necessary. These systems are a recent introduction into guidance recommendations; and hence, the implementation of such system will require co-ordination between the management, the Building Control body and the Fire Brigade.

6 FIRE SCENARIOS AND METHODS OF ANALYSIS

6.1 Overview

Although efforts can be made to minimise the effects of fire, it is impossible to eliminate the risk of death or injury because a zero-risk scenario does not exist. As a result, it's crucial to define the standards that can be used to evaluate the adequacy of a design. The PD 7974 states that a QDR can achieve this by several methods, one of which is deterministic methods.

To conduct a deterministic study, the QDR should identify the most severe fire scenarios that are deemed plausible and require in-depth examination. These will incorporate safety margins to account for any uncertainties in calculation procedures or potential design failures. The below fire scenario modelling is proposed for this scheme.

6.2 Fire Scenario Modelling

In order to assess the impact of a fire that is in progress or likely to occur, it is generally recommended to establish one or more design fires to serve as the basis for analysis. A design fire can be described based on various factors, including:

- The rate at which heat, toxic species, and smoke are produced
- The size of the fire (including the length of its flames),
- and the length of time until key events, such as flashover, occur.

To determine whether the proposed systems in the building can be expected to achieve an adequate level of performance in the event of a fire and to determine the implemented design can be considered “safe” , a Computational Fluid Dynamics (CFD) based fire and smoke modelling assessment will be undertaken, these models will be based on specific design fire scenarios that are to include common modes of failure as well as different locations for the fire. The details of the assessment will be shown in a separate report.

6.3 Acceptance criteria

6.3.1 Means of Escape

The modelling acceptance criteria are premised upon the tenability thresholds recommended in PD 7974-6 [18] and other relevant guidance, where specified:

- The conditions in the lift lobby (refuge areas), and stair need to improve following initial occupant egress, so that they are navigable by other occupants during the evacuation. An indicative 120 s (2 minutes) smoke clearance time is applied in cases where extended travel distances are observed. This is broadly consistent with an approximated ‘quick’ pre-evacuation time in single-family dwellings [19].
- Whether a space is navigable is generally measured by attainment of a visibility of at least 10m at a height of 2.0m above the FFL and temperatures below 60 °C.
    - The temperature limit of 60 °C represents a conservative acceptance limit for means of escape, as it assumes an environment with high humidity and the modelling considers the possibility that the sprinklers fail to operate.
    - The 10m visibility parameter (as measured to a light reflective surface) is a distance limit representing an approximate value which persons unfamiliar with a building would be prepared to travel. Given the residential nature of the building, it can be assumed that most occupants are familiar with the building and, therefore, it should be noted that the 10m visibility parameter is conservative.
    - The above acceptance criteria are applied to portions of corridor which may be in use by occupants not located in the flat of fire origin during escape. In some instances, pockets of smoke may be observed within the corridor which are less than the specified visibility criterion. For the purposes of this assessment, it should be demonstrated that occupants will be able to see through these regions, e.g., where a 5m visibility would be sufficient for a 5m long pocket of smoke.
- PD 7974-6 discusses the impact of toxicity on evacuation, specifying that the concentrations of mixed smoke irritants will not impair or prevent escape if a visibility of at least 5m can be maintained. Given that this is less than the 10m visibility limit specified above, toxicity tenability thresholds are inherently addressed through the visibility limits employed.
- The environment that occupants moving to or waiting for a lift could be exposed to will be one of varying toxicity. To address this, the concept of fractional effective dose (FED) can be applied. As discussed in PD 7974-6, the FED aggregates exposure to the changing products of combustion over time. Exposure to an FED = 1.0 is statistically estimated to result in incapacitation of 50% of the exposed population. An FED of 0.1 would be the extreme case, as this is considered to be the value below which even the most vulnerable would not be incapacitated. For practical purposes, an FED < 0.3 is estimated to represent incapacitation of < 1% of the exposed population and can reasonably be used for the mobility impaired case.
- With respect to velocity, BR 368 [20] states that “airspeed through any inlets also serving as escape doors must be less than 5 m/s to avoid adverse effects on people escaping through those doors”. In its discussion on tenability and velocity, BR 368 also states that “measurements of the subjects’ actual walking speeds show that it was not seriously impeded below 10 m/s”. Given these observations, a 5 m/s velocity criterion is adopted for general corridor tenability. Fluctuations and small portions of the corridor with velocities of more than 5 m/s are considered acceptable should these velocities not exceed 10 m/s.
- BS EN 12101-6 [7] states that the smoke ventilation system should be designed so that the force on door handles which open onto the ventilated corridor does not exceed 100 N. This is so that occupants do not have to overcome excessive force to open a door when escaping. The door opening force will be influenced by several factors not specific to the smoke ventilation system performance, such as the closer mechanism, hinges and weight of the door, as well as the leakage rates within the common corridor. In considering door opening forces, BS EN 12101-6 recommends that a maximum pressure differential of 60 Pa across a door may be utilised for design purposes, conservatively assuming that the force is applied at the centre of the door. To accommodate for the uncertainty in door operation, other design factors, and possible adjustments during commissioning, a 10 Pa tolerance, i.e., up to ± 70 Pa, is applied.

6.3.2 Firefighting

The firefighting acceptance criteria are premised upon the recommendations of PD 7974-5 [21], PD 7974-6 [18], and the underlying principles contained within BS 9991 [4]. Conditions in the stair need to be maintained such that they remain tenable for the full duration of the simulated firefighting phase.

- Temperature in the corridor with extended travel distance: with the introduction of an ‘indefinite’ breach in compartmentation between the flat of fire origin and corridor during firefighting (from the flat door being opened), it is expected that the corridor will become compromised with smoke. The acceptance criteria for the corridor therefore focuses on the temperature conditions for firefighters. PD 7974-5 states that exposure to ‘extreme conditions’ (210 °C) for up to 1 min might be tolerable if the outcome is to save life. However, damage to personal protective equipment can occur under these conditions. 160 °C is referred to as ‘hazardous conditions’ and is specified as tolerable for a period of up to 10 min. In comparison, Donnelly et al. [22] note in their work on thermal environment for electronic equipment used by first responders that 260 °C could be tolerated for up to 5 min. Donnelly et al. also discuss experiments which considered skin temperatures measured inside the sleeves of turnout gear, where it was found that when subject to elevated temperatures reaching 260 °C the onset of third-degree burns did not occur until after 18 min.

- For firefighting scenarios which consider that sprinklers are not able to successfully control a fire (i.e., sprinkler failure), a less onerous expectation is applied in which temperatures along the common corridor retreat path should not exceed 210 °C for 'extreme conditions'. A 1.5 m reference height for firefighter tenability is consistent with the recommendations of the fire brigade intervention model (FBIM).
- For most simulated fire scenarios, high temperatures will be observed in proximity to the flat of fire origin door, with temperatures potentially reaching values greater than 210 °C or even as high as 260 °C. This observation is broadly independent of the common corridor smoke ventilation provisions and is instead a function of the defined fire scenario and estimated conditions within the flat. Therefore, no temperature criterion is applied for the portion of the common corridor adjacent to the flat of fire origin door.
- Visibility and temperature in stair: It is expected that, should the flat door remain open for a sustained period during firefighting operations, conditions within the common corridor will become untenable for occupant escape. However, provisions are necessary to ensure that the stair remains free from substantial smoke and heat. This is of importance where only one staircase serves as section of the building and occupants of the non-fire affected floor may be directed to evacuate by the fire and rescue service. For this, tenability criteria are adopted consistent with that of means of escape where visibility through the full height of the stair, above and below the fire affected floor, should be maintained above 10 m and temperatures maintained below 60 °C.

6.4 Common Modes of Failure

With respect to the QDR, BS 7974 states that "particular care should be taken by the QDR team to ensure that potential common mode failures are identified and accounted for in the analysis", where a common mode of failure refers to a situation in which the failure of one system has an adverse effect on the efficiency of another fire protection measure.

Table 11 shows the implication of various fire scenarios from the failure of safeguards implemented to reduce the potential fire risks identified within the design of the building (previously described in Table 5).

Table 11: Common modes of failure and fire scenario implications

Description	Implications on the fire scenario
Compartmentation:	In the absence of relevant incident data, it might be hypothesised that fire doors represent the most probable source of compartmentation failure, given: a) their relative fire rating when compared to compartment walls and floors; b) The possibility that they may fail to close or be propped open; and c) Their frequent use and the impact this may have on their overall fire safety performance. Therefore, the impact of compartmentation failure will be addressed in the design fire as part of the firefighting phase modelling, in which both the flat of fire origin door and the stair door are simulated as fully open for a substantial period. A partial failure to flat door will also be considered in means of escape phase.
Suppression:	Although suppression systems are highly reliable (as stated in PD 7974-7), due to the higher risk nature of the building on account of the height, a fire scenario will be modelled by assuming that sprinklers have not been able to adequately control fire growth.
Smoke ventilation:	The likelihood of smoke ventilation system failure is considered low considering the following: • As part of the client's responsibility under the RRO, smoke ventilation systems are to be tested routinely. • The smoke control system shall be provided with duty and standby fans, as well as a standby provision for power supplies, to limit the likelihood of failure. • The systems are also designed to operate automatically, minimising the reliance on any manual intervention. • Having multiple shafts in the design provides a high degree of redundancy and avoids the single point of failure concern. • A minimum of two smoke detectors are to be provided in the corridor to initiate the smoke control system. Regardless of this, the possibility that the smoke ventilation system might fail to activate or perform as intended will not be considered as part of the fire scenarios because the purpose of the assessment is to focus on the performance of smoke ventilation system in the context of other common modes of failure.

7 Preliminary Computational Fluid Dynamics (CFD) Modelling Results – Proof of Concept

7.1 Objectives

The purpose of this section is to simulate conditions in the corridors for a credible egress scenario considering the acceptance criteria and common modes of failure set up in the previous section of this report.

The details of the analysis will be provided in a separate CFD report which shows the specifics in methodology, analysis, and results; thus, this section will provide a brief summary of the scenarios modelled using computational fluid dynamics and the result from this analysis.

7.2 Modelling Tool and Mesh Configuration

The fire and smoke modelling presented herein has been undertaken using Fire Dynamics Simulator FDS version 6.7.9 (FDS) [23], [24]. FDS is an open-source computational fluid dynamics (CFD) modelling package developed by the National Institute of Standards and Technology (NIST) specifically for use in fire and smoke modelling applications. FDS solves an incompressible form of the Navier-Stokes equations, by default using the very large eddy simulation (VLES) turbulence model. This is solved on structured cartesian grids. The FDS documentation includes verification and validation guides [25], [26] to support applications of the tool.

All scenarios have been modelled with a uniform mesh with cell size (δx) of 0.1 m on the floor of fire origin and for all smoke shafts. A 0.2 m cell size is adopted within the stair, above and below the fire floor. Detailed justifications on mesh sensitivity will be included in next step detailed study.

7.3 Modelling scenarios

This analysis adopts a separate modelling scenario for the means of escape and firefighting phases, using the timelines discussed in Section 7.4. The modelling scenarios are illustrated and described in Table 13. A total of six modelling scenarios have been simulated for the purpose of this study, three scenarios during the means of escape phase and three scenarios during the firefighting phase for each block.

7.4 Timeline

Figure 7 and Figure 8 show the two separate timelines adopted for the means of escape and firefighting phase simulations, respectively. The timelines are not necessarily intended to represent real-time events and associated durations but have been developed to provide an onerous simulation-based ‘test’ of proposed smoke ventilation solutions.

7.5 Geometry

During both means of escape and firefighting, door openings are modelled with a ‘fully-open’ clear width, e.g., 0.8 m wide by 2.0 m high. This is likely a conservative representation of firefighting operations, as in practice the doors may regularly be opening and closing and in some instances may only be partially open to allow for the laying of the firefighting hose and equipment. For example, in comparison, Kent Fire & Rescue Service (KFRS) Guidance on Firefighter Tenability and CFD Analysis [27] outlines a recommended door opening for the stair door of 0.2 m during the firefighting phase. For the means of escape phase, the doors are assumed to be fully open for a 20 s period.

Corridors and flats have been modelled with a representative floor to ceiling height of 2.4 m. To support the requisite fire size, a natural inlet is provided to the flat of fire origin. For all fire scenarios, the flat incorporates a natural low-level vent (1.8 m by 0.8 m high) to allow for enough oxygen to sustain continuous combustion of a 0.2 MW and 1.0 MW HRR fire. This approach is consistent with the approach adopted in BD 2410 [28]. The low-level location of the vent allows for the provision of oxygen while minimising smoke and heat losses from the flat during the development of the fire.

All smoke shafts and vents modelled at this stage have a geometric free area of 1.0m^2. The preliminary extract rate modelled for Block A was 4.0m^3/s, with an extract rate of 5.0m^3/s for Blocks B and C. Block A was modelled with a natural inlet supply shaft during these preliminary stages, however a mechanical option will also be explored at the next stage. The supply rates for Blocks B and C were modelled as 5.0m^3/s utilising a mechanical supply shaft.

7.6 Fire properties

Table 12 provides a summary of the key design fire properties used as part of the modelling process. For each block, a 0.2 MW medium growth rate αt^2 fire is adopted for the means of escape (MOE) phase, and a 1.0 MW steady-state fires are simulated for the firefighting (FF) phase.

Table 12: A summary of key design fire properties.

Parameter	Value	Comment
Maximum HRR	MOE: 0.2 MW FF: 1.0 MW	A realistic fire size of 0.2 MW has been considered for means of escape phase. It is expected that the flat of fire origin will reach untenable conditions upon a medium growth fire reaching 0.2 MW. For the firefighting phase, an HRR of 1.0 MW fire for fires not impacted by sprinklers is considered for the assessment.
Heat release rate per unit area (HRRPUA)	497 kW/m^2	In a review of design values for HRRPUA, Hopkin et al. [29] (as adopted in PD 7974-1) propose that a HRRPUA range of 320 kW/m² to 570 kW/m² is reasonable for residential design from previous experimental studies.
Maximum area of fire	MOE: 0.4 m^2 FF: 2.0 m^2	The burner is represented as a circular vent with a radius of 0.35m, or 0.80m, depending upon the fire scenario. The area of this vent has been determined from the maximum HRR and HRRPUA.
Soot yield	0.1 kg/kg	0.1 kg/kg is a conservative soot yield for a rigid polyurethane foam fire [30]. The selected yield implies smouldering combustion but with a fire size commensurate with flaming combustion. By default, FDS does not account for soot deposition on surfaces, resulting in further conservatism in the modelling. If deposition were to be enabled, this would reduce the amount of soot particulates flowing from the room of fire origin into the corridor and subsequently result in a relative increase in the visibility
Effective heat of combustion	20 MJ/kg	This is the recommended pre-flashover design fire value from C/VM2. It is derived from BRANZ Study Report 185, representing a polyurethane fire.
Radiative fraction	0.35	This is the FDS value for ‘all other species’ and the recommended pre-flashover design fire value from C/VM2 for general building contents
Growth rate	MOE: Medium growth FF: Steady sate	For MOE, a medium growth rate is adopted from the recommendations of Hopkin et al. approximately equating to a 95th percentile design fire. For a radial fire growth, a fire spread rate needs to be specified. This spread rate is estimated as a function of the burner radius and area of the fire relative to the time taken for the fire to reach the maximum HRR. For FF, the fire effectively starts at steady state (i.e., with a nominal ramp-up time) with the maximum defined HRR.

Table 13. Selected means of escape fire scenarios

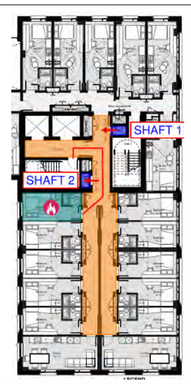
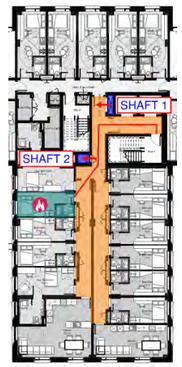
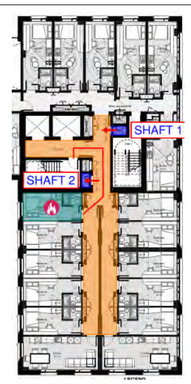
Illustration	Description
	**Scenario name: A-MOE02** Realistic means of escape scenario, medium growth fire, peak heat release rate 0.2MW. Occupants are expected to travel to the closest stair. The fire location is selected as the flat in proximity to the stair door. This is expected to provide an increased likelihood for smoke to spread into the stair shaft during means of escape, in event of fire.
	**Scenario name: B-MOE02** Realistic means of escape scenario, medium growth fire, peak heat release rate 0.2MW. Occupants are expected to travel to the closest stair. The fire location is selected as the flat is small and it is located in proximity to the stair door. This is expected to provide an increased likelihood for smoke to spread into the stair shaft during means of escape, in event of fire.
	**Scenario name: C-MOE02** Realistic means of escape scenario, medium growth fire, peak heat release rate 0.2MW. Occupants are expected to travel to the closest stair. The fire location is selected as the flat located in proximity to the stair door. This is expected to provide an increased likelihood for smoke to spread into the stair shaft during means of escape, in event of fire.
Key: For Block A, the smoke control system is to operate on a mechanical extract twin-shaft system. The extraction is to be the mechanical system, while the supply shaft will provide the replacement air, naturally. For Block B and Block C, the smoke control system is to operate on a mechanical push-pull system. Red arrows indicate the anticipated air flow direction driven by the smoke ventilation system. Red line indicates escape/firefighting route (e.g., dictates which doors will be accessed/opened). Areas highlighted in blue indicate shaft locations. Areas highlighted in orange indicate common corridor space. Areas highlighted in turquoise indicate the flat of fire origin.	

Table 14. Selected firefighting fire scenarios

Illustration	Description
	**Scenario name: A-FF10** A-FF10 represents a firefighting scenario, with a constant heat release rate of 1.0MW. Firefighters are expected to access the fire floor via the closest stair. Fire location is as per A-MOE02 which results in shortest distance between the fire origin flat door and the stair door, providing higher likelihood for smoke to spread into the stair shaft during firefighting, in event of fire.
	**Scenario name: B-FF10** A-FF10 represents a firefighting scenario, with a constant heat release rate of 1.0MW. Firefighters are expected to access the fire floor via the closest stair. Fire location is as per B-MOE02 which results in shortest distance between the fire origin flat door and the stair door, providing higher likelihood for smoke to spread into the stair shaft during firefighting, in event of fire.
	**Scenario name: C-FF10** A-FF10 represents a firefighting scenario, with a constant heat release rate of 1.0MW. Firefighters are expected to access the fire floor via the closest stair. Fire location is as per C-MOE02 which results in shortest distance between the fire origin flat door and the stair door, providing higher likelihood for smoke to spread into the stair shaft during firefighting, in event of fire.
Key: For Block A, the smoke control system is to operate on a mechanical extract twin-shaft system. The extraction is to be the mechanical system, while the supply shaft will provide the replacement air, naturally. For Block B and Block C, the smoke control system is to operate on a mechanical push-pull system. Red arrows indicate the anticipated air flow direction driven by the smoke ventilation system. Red line indicates escape/firefighting route (e.g., dictates which doors will be accessed/opened). Areas highlighted in blue indicate shaft locations. Areas highlighted in orange indicate common corridor space. Areas highlighted in turquoise indicate the flat of fire origin.	

0 s	30 s	131 s	131 + 16 + T s	151 s	131 + 16 + T + 20 s	271 s to 300 s
Fire starts, flat of fire origin door closed	**Ventilation system activates and ramps up**	**Flat of fire origin door opens**	**Door to stair opens**	**Flat of fire origin door closes (initial occupant egress)**	**Door to stair closes**	**Corridor clearance performance assessed**
Fire ignites and begins to grow, following a characteristic αt^2 medium growth rate.	This includes activation of AOVs, vents and mechanical ventilation. The mechanical smoke ventilation system is modelled to include a 30 s ramp-up time, from zero, to reach full capacity. The smoke ventilation system is active before the flat door initially opens due to the provision of a Category L2 detection system within the flats.	After 131 s, the HRR reaches 0.2 MW. At this time, it is expected the flat of fire origin to reach untenable conditions. Thus, it is considered a realistic scenario during means of escape.	16 s comprises the initial door open period and flow time for occupants to navigate the flat of fire origin door. The time taken for occupants subsequently to reach the stair door (T) is estimated based on the corridor travel distance and a horizontal movement speed of 1.2 m/s from PD 7974-6.	20 s following flat door opening, occupants finish evacuating from the flat of fire origin and the door closes behind them. This is a conservative representation of door opening time, where a lower time may be expected. This approach assumes that all occupants of the flat evacuate at the same time.	The stair door is also simulated to close 20 s following occupants first opening the stair door, consistent with the flat of fire origin door.	120 s following initial occupant egress (440 s following ignition), means of escape tenability acceptance criteria along the escape path are assessed. The modelling timeline is often extended for an additional 60 to 160 s to consider any further corridor clearance after this time.

Figure 7: Realistic means of escape timeline

0 s	60 s	300 s
Fire starts at steady state	**Flat of fire origin door opens**	**Simulation ends, acceptance criteria assessed**
Fire starts with a nominal growth period to reach maximum HRR (1.0 MW), smoke ventilation system activates and ramps up immediately, stair door is fully open.	Temperatures up to 500 °C observed in the room of fire origin, indicating a potential transition to flashover [31]. Sprinkler activation observed in the flat of fire origin if sprinklers are simulated. Fire and rescue service begin to attack the fire.	Simulation ends, with conditions observed to have stabilised. Firefighting tenability criteria along the retreat path and within the stair are assessed.

Figure 8: Firefighting timeline

7.7 Results

The preliminary simulation results for the means of escape and firefighting phases can be found in Section 9. This includes contour plots of visibility, temperature, pressure, and velocity within the common corridor at strategic time intervals presented at a horizontal plane height of z = 2.0 m from FFL during means of escape.

For the firefighting phase, contour plots of visibility, temperature, pressure, and velocity through the stair and in the common corridor at a horizontal plane height of z = 1.5 m from FFL, presented at a simulation time of 300 s. Stair conditions are observed in a vertical plane via the stair door and the height of the stair. For clarity, only conditions on the floor of fire origin, and one level above and below are presented in the results. However, the full stair height has been simulated.

During firefighting, the simulated conditions occur when the stair and flat of fire origin doors remain fully open, with the maximum HRR remaining at 1.0 MW for a 240 s period following the arrival of the fire and rescue service. This is a conservative representation of fire and rescue service operations, where it would be expected that the deployment of water (such as prior to the full opening of the flat door) would reduce the temperature and buoyancy of smoke both within the common corridor and the flat of fire origin, as well as significantly reducing the HRR of the fire.

7.7.1 Means of Escape Phase

In all MOE scenarios, the door opens at 131 s and the occupant escapes. The common corridor is filled with smoke; however, the smoke ventilation system is active before the flat door initially opens due to the provision of a Category L2 automatic fire detection system within the flats. The preliminary results demonstrate smoke does not spread into the lift lobby and the common corridor is returned to tenable conditions after a period of 120 s of the flat door closing.

The maximum FED recorded in the lift lobbies for all MOE scenarios are equivalent to zero. The velocities in the common corridor and through the stair doors are generally below 5 m/s, except for areas close to the shaft. Throughout the simulated duration, pressures within the common corridor remained between ± 60 Pa.

The preliminary CFD results show that for means of escape phase, the proposed arrangement meets the primary objective of the smoke control system, by preventing smoke ingress into the lobby and stairs, which meets the acceptance criterion stated in Section 6.3.

7.7.2 Firefighting Phase

For all FF scenarios, the stair is kept clear of smoke for the duration of the simulation; therefore, the protection of the stair core is achieved during the firefighting phase.

The velocities in the common corridor are below 5 m/s, except for areas close to the mechanical extract and supply shaft. The pressures within the common corridor remain between ± 60 Pa.

The smoke control system demonstrates adequate performance in protection of the stair core during the fire and rescue operations and no smoke enters the stair cores. In a summary, all the FF scenarios considered for the study achieve the acceptance criterion stated in Section 6.3.

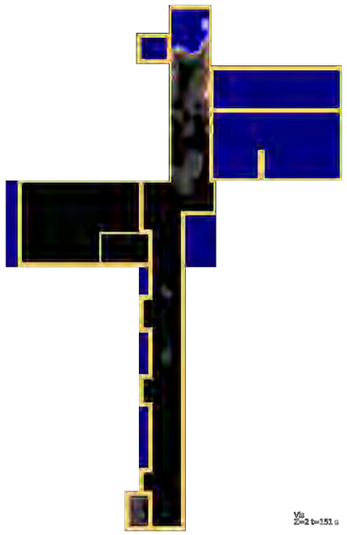
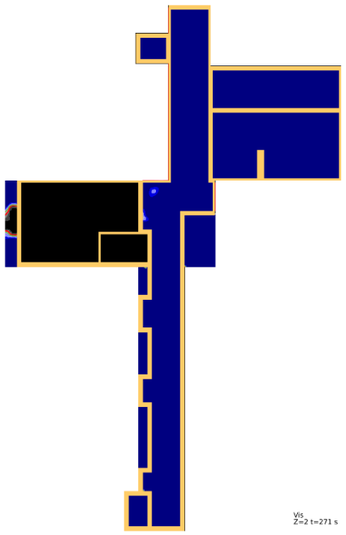
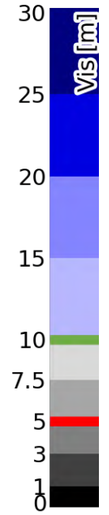
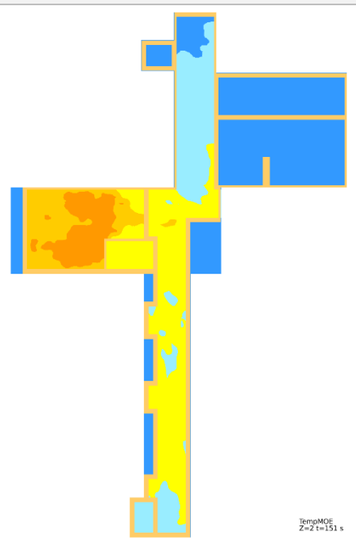
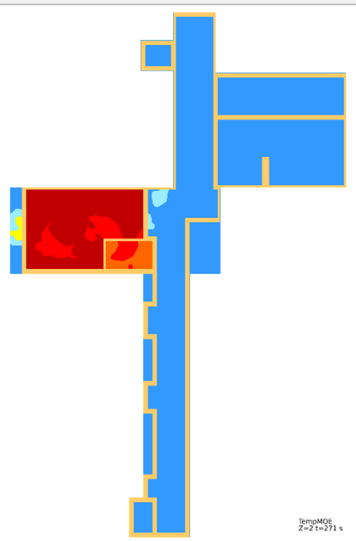
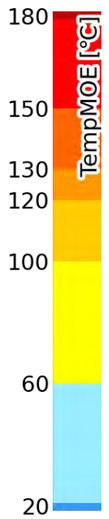
8 Fire Strategy Summary

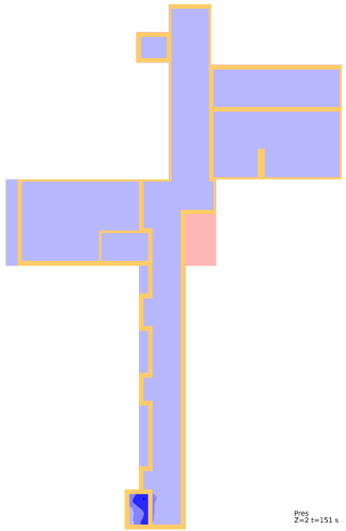
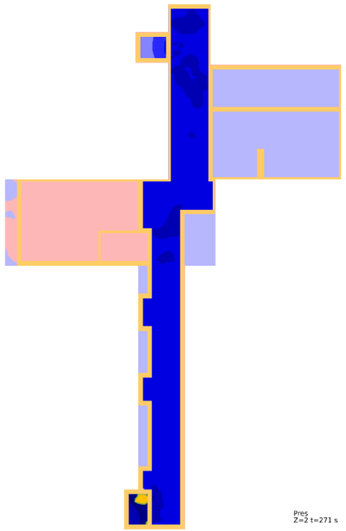
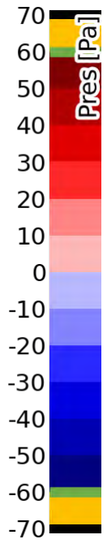
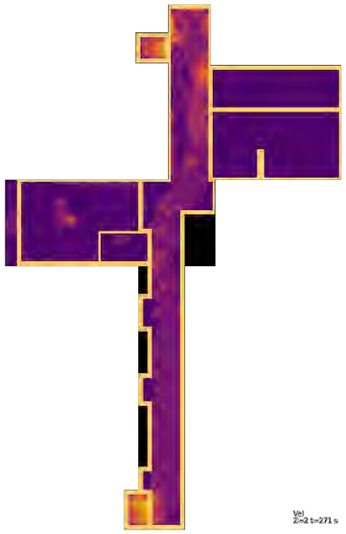
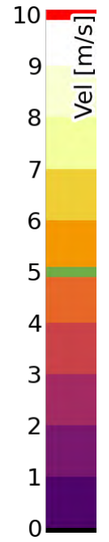
Further to the QDR Report issued within Stage 2, the following are to be provided in full detail at a later stage.

- Fractional Effective Dose (FED) Report
- Comparative Assessment of Likelihood and Severity of Fire in Flats with Plant/Ancillary Spaces
- Computational Fluid Dynamics (CFD) Report
- Probabilistic Reliability Assessment (PRA) Report

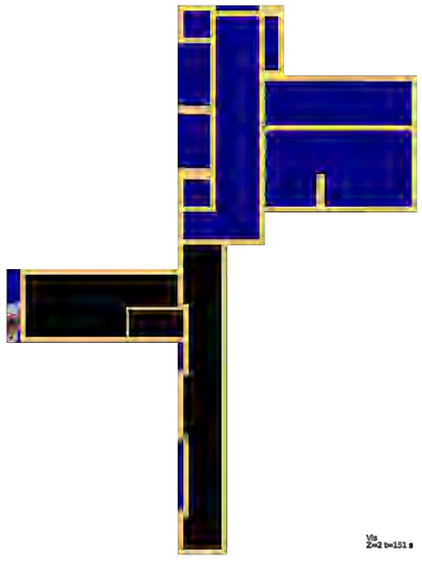
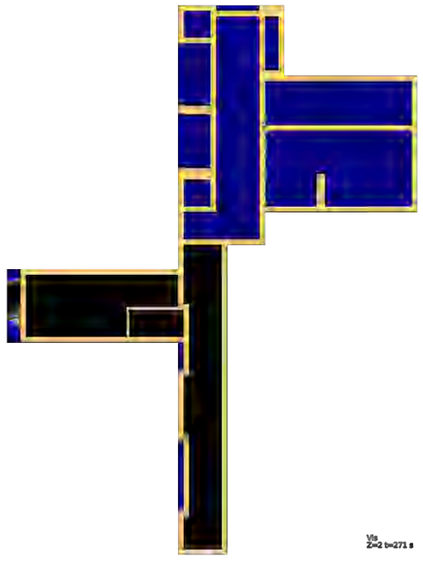
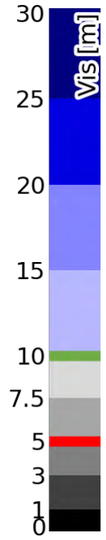
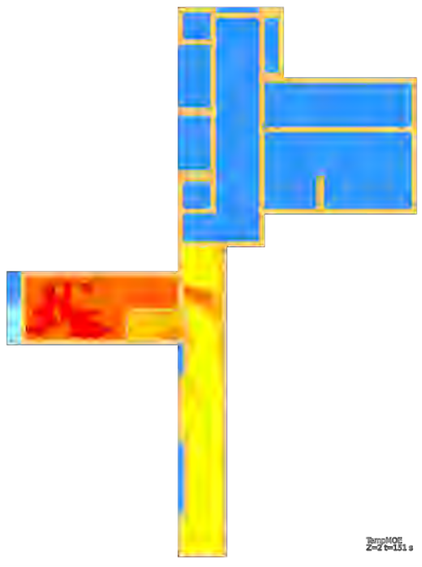
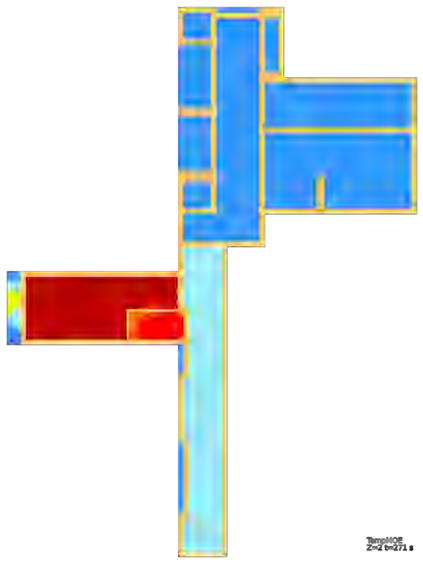
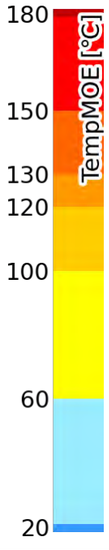
9 FDS Simulation Output Slice Visualisation

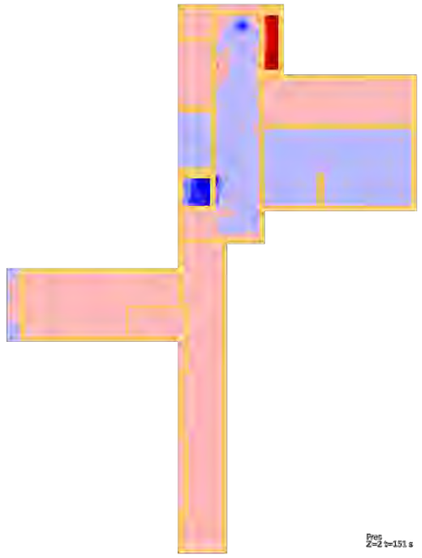
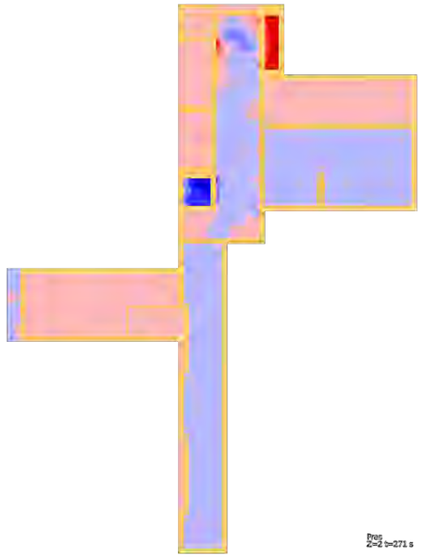
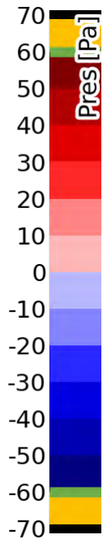
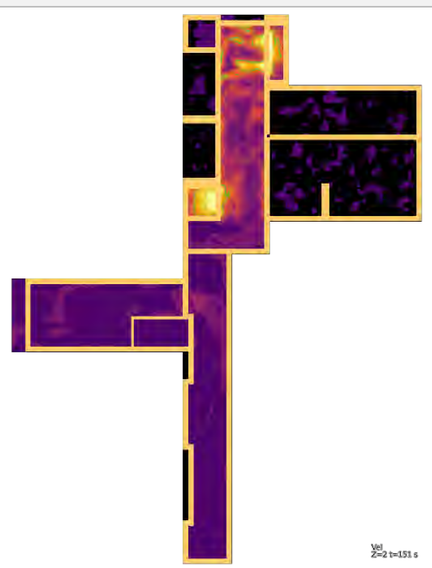
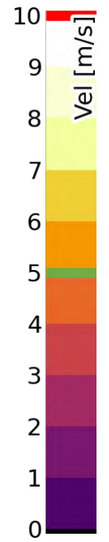
9.1 A-MOE02

2.0 m Above FFL **Simulation Time at 151.0 s** At Time of Room of Fire Origin Door Closing	**2.0 m Above FFL** **Simulation Time at 271.0 s** 120 s Following Room of Fire Origin Door Closing	**Colour** **Bar**
Visibility		
		
Temperature		
		

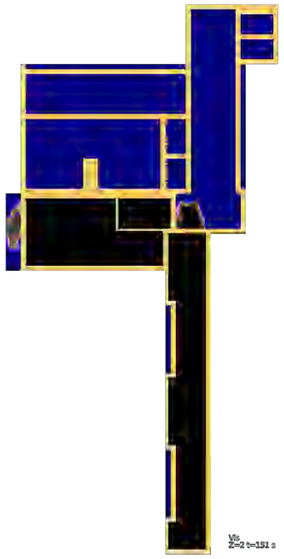
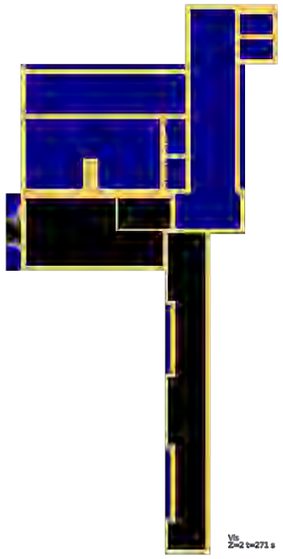
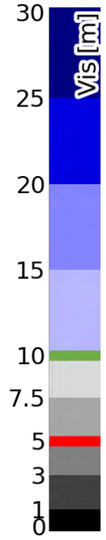
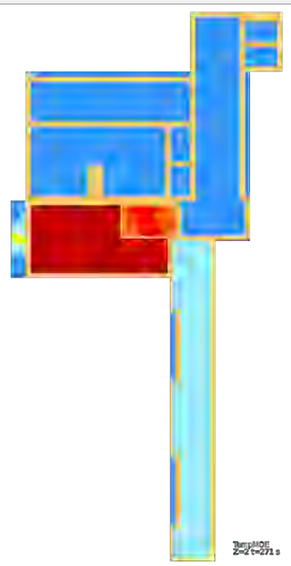
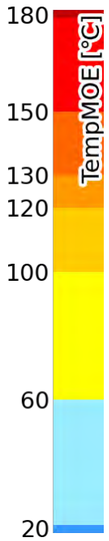
2.0 m Above FFL Simulation Time at 151.0 s At Time of Room of Fire Origin Door Closing	2.0 m Above FFL Simulation Time at 271.0 s 120 s Following Room of Fire Origin Door Closing	Colour Bar
Pressure		
		
Velocity		
		

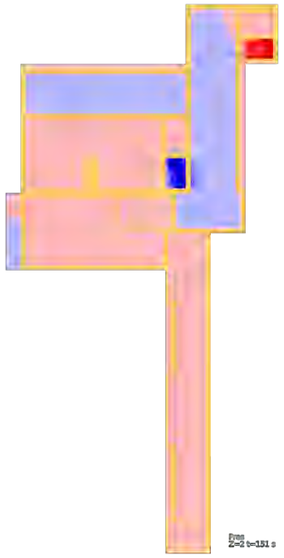
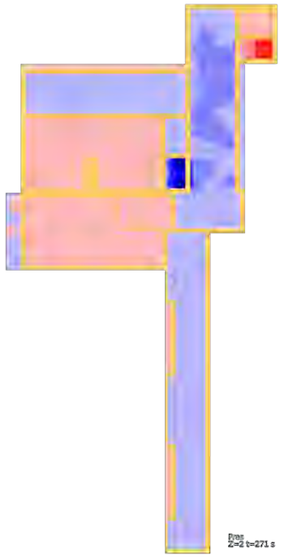
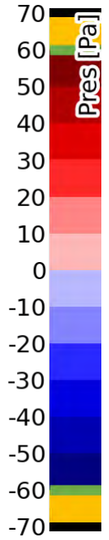
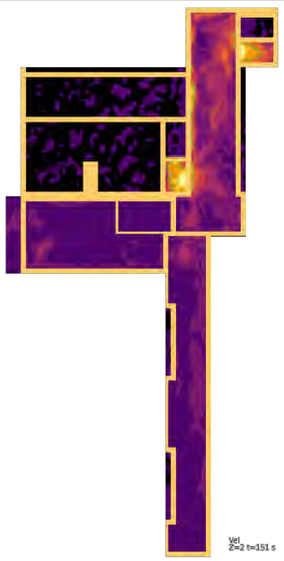
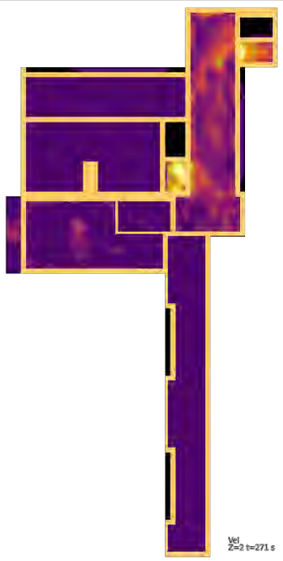
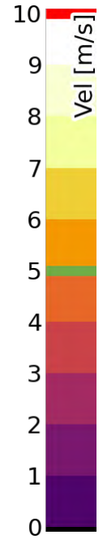
9.2 B-MOE02

2.0 m Above FFL **Simulation Time at 151.0 s** At Time of Room of Fire Origin Door Closing	**2.0 m Above FFL** **Simulation Time at 271.0 s** 120 s Following Room of Fire Origin Door Closing	**Colour** **Bar**
Visibility		
		
Temperature		
		

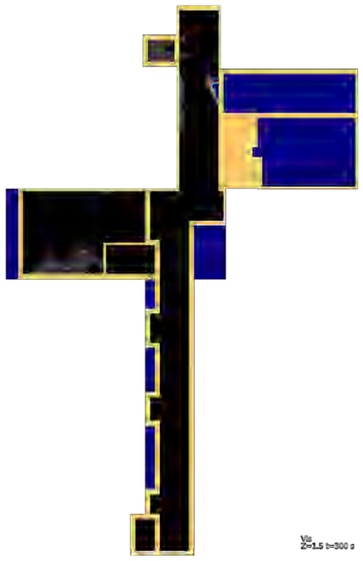
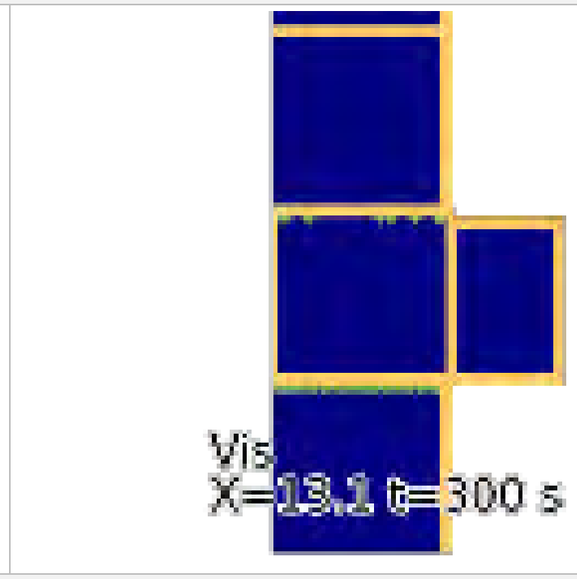
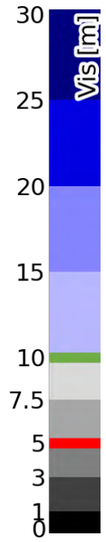
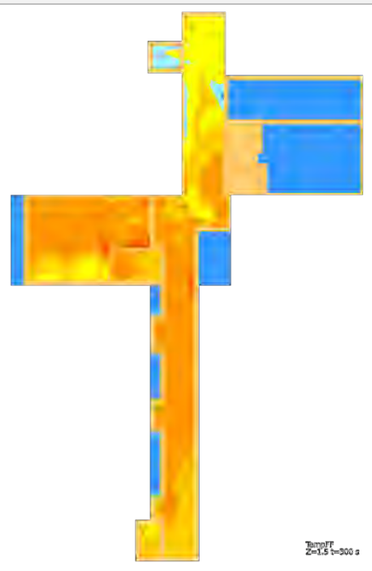
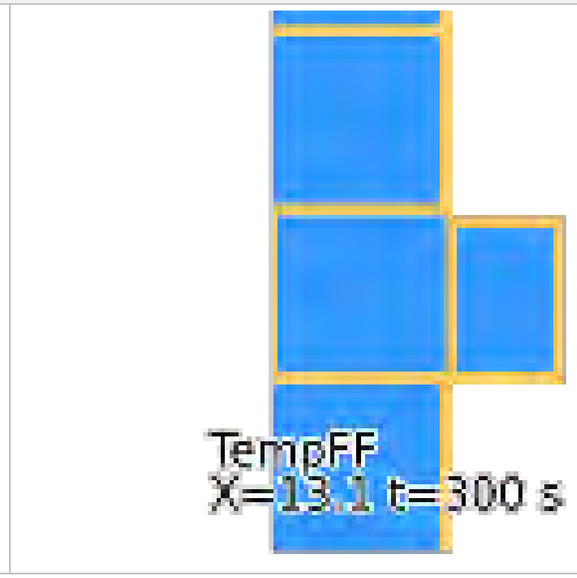
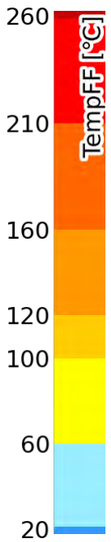
2.0 m Above FFL Simulation Time at 151.0 s At Time of Room of Fire Origin Door Closing	2.0 m Above FFL Simulation Time at 271.0 s 120 s Following Room of Fire Origin Door Closing	Colour Bar
Pressure		
		
Velocity		
		

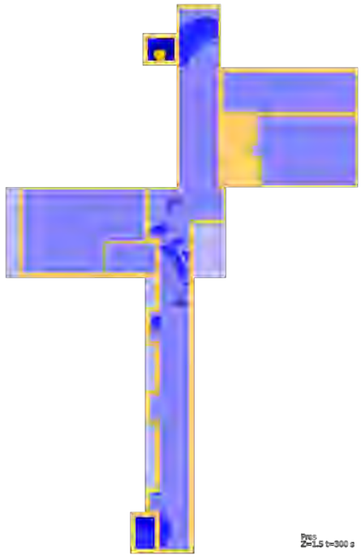
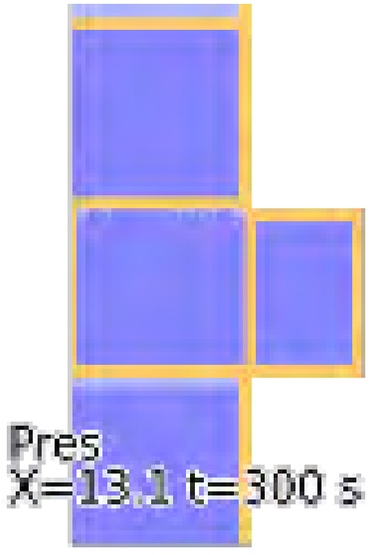
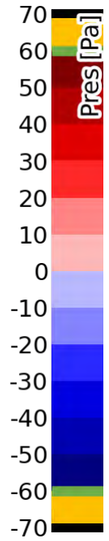
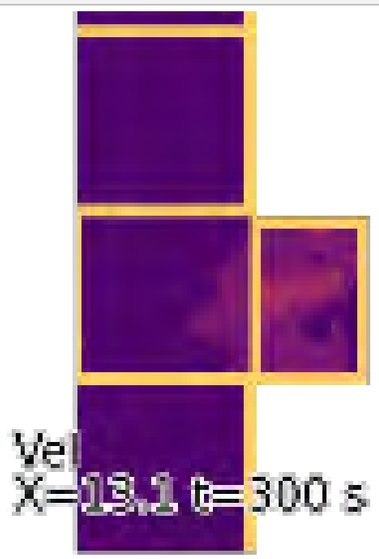
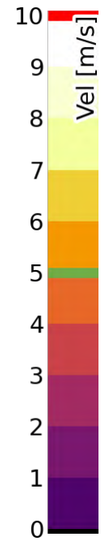
9.3 C-MOE02

2.0 m Above FFL **Simulation Time at 151.0 s** At Time of Room of Fire Origin Door Closing	**2.0 m Above FFL** **Simulation Time at 271.0 s** 120 s Following Room of Fire Origin Door Closing	**Colour** **Bar**
Visibility		
		
Temperature		
		

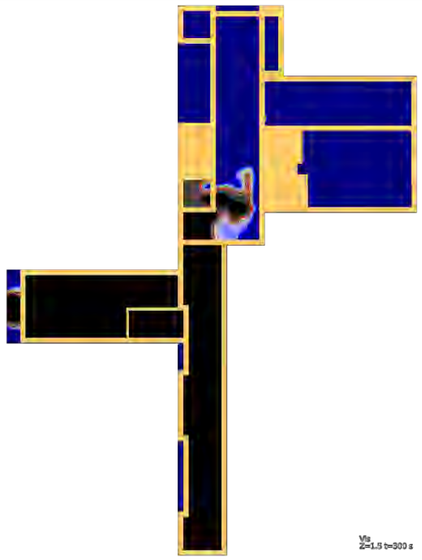
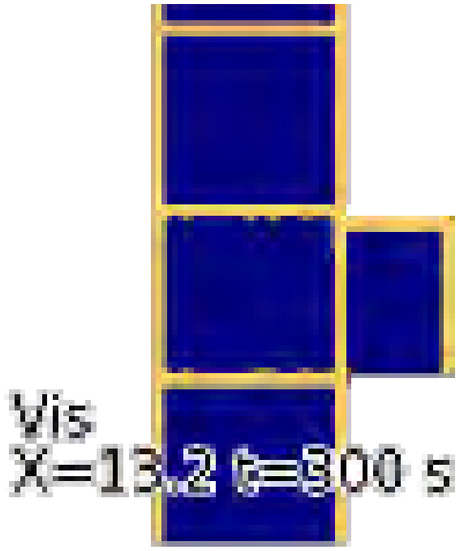
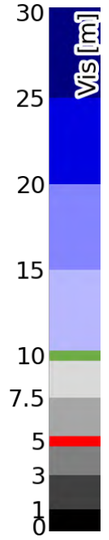
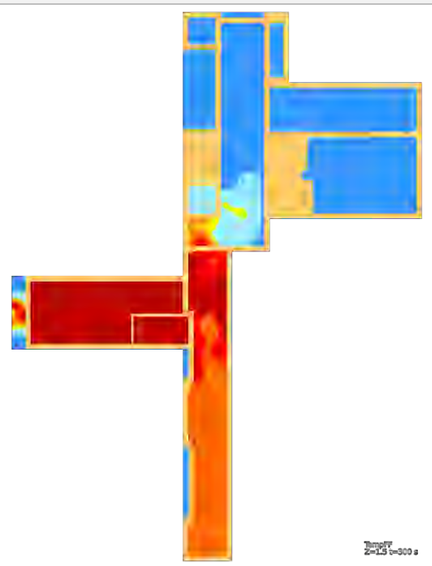
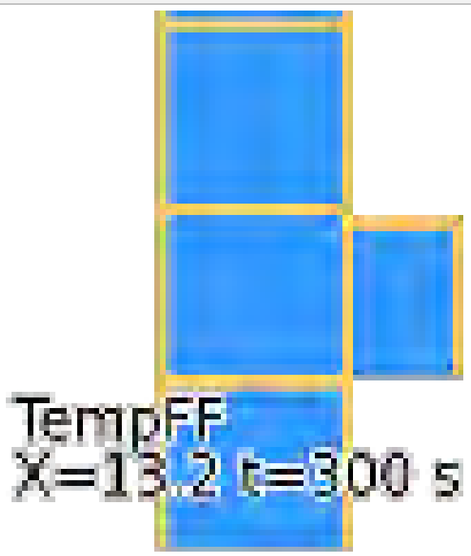
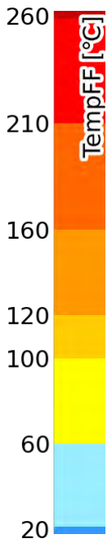
2.0 m Above FFL Simulation Time at 151.0 s At Time of Room of Fire Origin Door Closing	2.0 m Above FFL Simulation Time at 271.0 s 120 s Following Room of Fire Origin Door Closing	Colour Bar
Pressure		
		
Velocity		
		

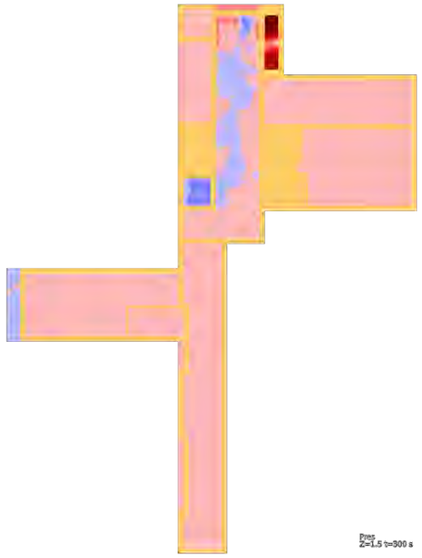
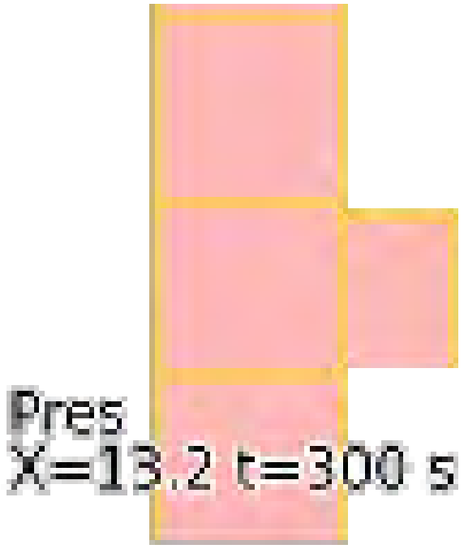
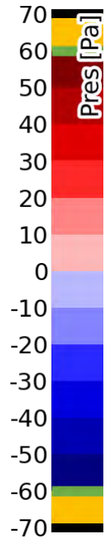
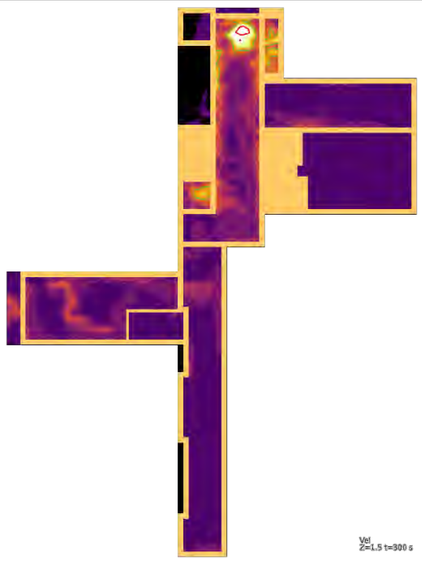
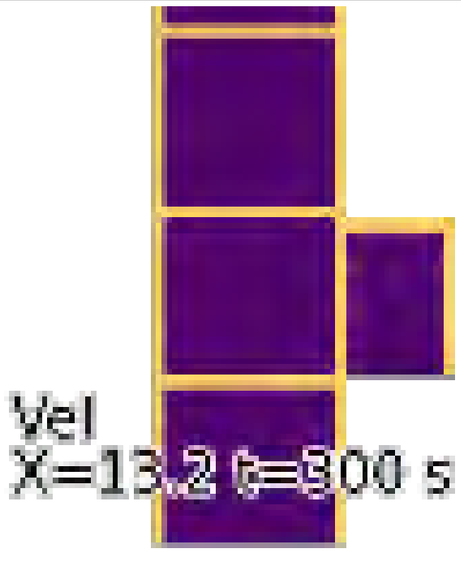
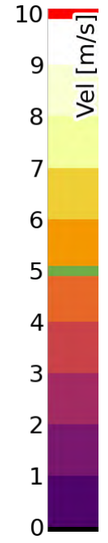
9.4 A-FF10

Corridor 1.5 m Above FFL **Simulation Time at 300 s** 240 s following flat door opening, acceptance criteria assessed	**Stair Vertical Section** **Simulation Time at 300 s** 240 s following flat door opening, acceptance criteria assessed	**Colour** **Bar**
Visibility		
		
Temperature		
		

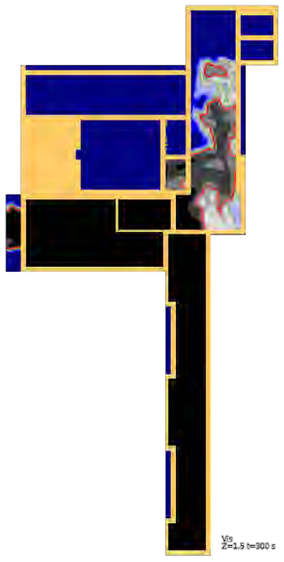
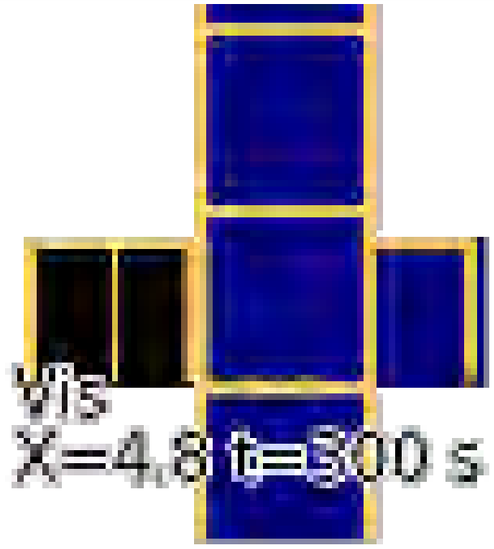
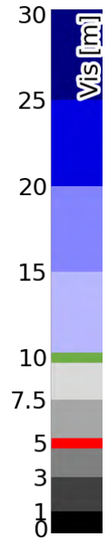
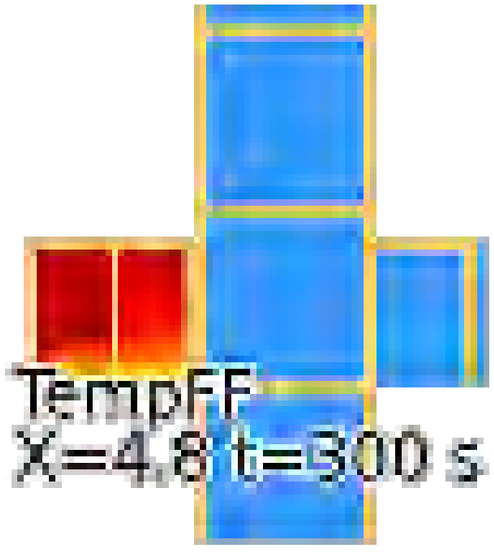
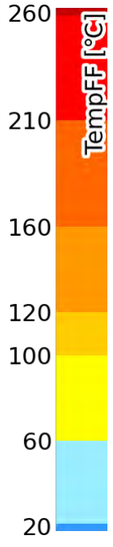
Corridor 1.5 m Above FFL Simulation Time at 300 s 240 s following flat door opening, acceptance criteria assessed	Stair Vertical Section Simulation Time at 300 s 240 s following flat door opening, acceptance criteria assessed	Colour Bar
Pressure		
		
Velocity		
		

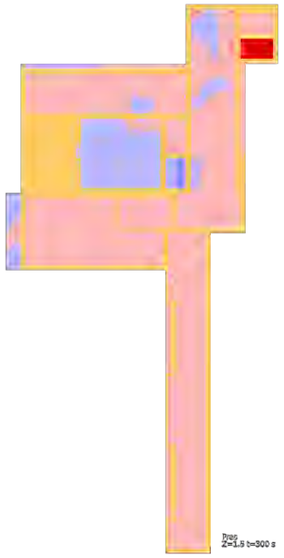
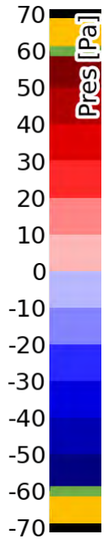
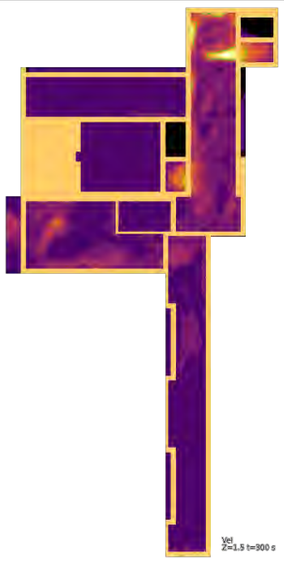
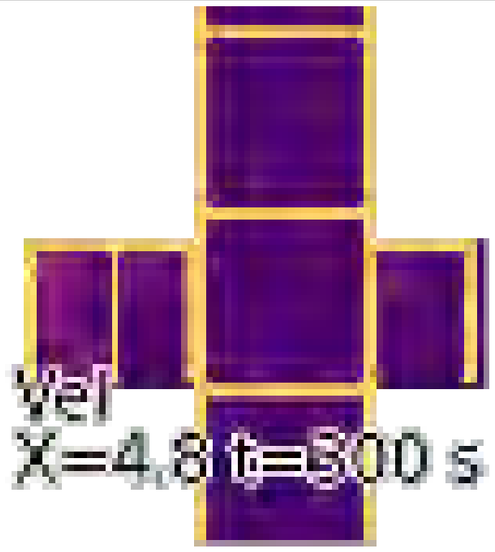
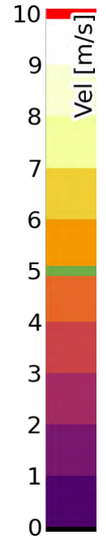
9.5 B-FF10

Corridor 1.5 m Above FFL Simulation Time at 300 s 240 s following flat door opening, acceptance criteria assessed	Stair Vertical Section Simulation Time at 300 s 240 s following flat door opening, acceptance criteria assessed	Colour Bar
Visibility		
		
Temperature		
		

Corridor 1.5 m Above FFL Simulation Time at 300 s 240 s following flat door opening, acceptance criteria assessed	Stair Vertical Section Simulation Time at 300 s 240 s following flat door opening, acceptance criteria assessed	Colour Bar
Pressure		
		
Velocity		
		

9.6 C-FF10

Corridor 1.5 m Above FFL **Simulation Time at 300 s** 240 s following flat door opening, acceptance criteria assessed	**Stair Vertical Section** **Simulation Time at 300 s** 240 s following flat door opening, acceptance criteria assessed	**Colour** **Bar**
Visibility		
		
Temperature		
		

Corridor 1.5 m Above FFL Simulation Time at 300 s 240 s following flat door opening, acceptance criteria assessed	Stair Vertical Section Simulation Time at 300 s 240 s following flat door opening, acceptance criteria assessed	Colour Bar
Pressure		
		
Velocity		
		

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APPENDIX C – FIRE STATEMENT

Fire Statement – Echo Street, Manchester

Project No.: MA22153 | Date: 27/04/2023 | Revision: R02

Author: AT | Reviewer: MH | Approver: RR

1 INTRODUCTION

OFR Consultants Ltd (OFR) have been appointed by IQ Student Accommodation to develop a fire statement for the Echo Street development in Manchester. The fire statement is required under Article 9A of the Town and Country Planning (Development Management Procedure) (England) Order 2015 (*'the 2015 Order'*) inserted by article 4 of the Town and Country Planning (Development Management Procedure and Section 62A Applications) (England) (Amendment) Order 2021.

This fire statement aims to provide an abridged version of the outline fire strategy report developed by OFR named *'230427-R02-WP1-MA22153-Echo Street Outline-Fire Strategy-DF-CIC'*, and follows the process as outlined within the UK Government Guidance issued on 24.06.21 that came into effect on 01.08.21. Said guidance requests submission via a form published by the Secretary of State (or a form to similar effect) containing the particulars specified or referred to in the form, which includes information about the following (not an exhaustive list):

- The principles, concepts and approach relating to fire safety that have been applied to each building in the development;
- The site layout;
- Emergency vehicle access and water supplies for firefighting purposes;
- What, if any, consultation has been undertaken on issues relating to the fire safety of the development; and what account has been taken of this.

The following pages contain the fire statement, in the format provided by the UK government.

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2 FIRE STATEMENT FORM

Application information	
1. Site address line 1	Echo Street
Site address line 2	Granby Row
Town	Manchester
County	Greater Manchester
Site postcode (optional)	M1 3QJ
2. Description of proposed development including any change of use (as stated on the application form):	The Echo Street development includes purpose-built student accommodation comprising 3no. interlinked tower blocks (Blocks A, B and C) with intermediary linking block buildings (Link Blocks A-B and B-C), associated amenity spaces and external landscaping. Further information relating to each block is as follows: **Block A** Height - 16no. storeys Amount – 225 bed spaces / 371m^2 amenity space Mix of rooms – 150 studios, 75 cluster bedrooms (15 cluster flats) **Block B** Height - 22no. storeys Amount – 370 bed spaces / 189m^2 amenity space

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	Mix of rooms – 115 studios, 255 cluster bedrooms (43 cluster flats) **Block C** Height - 28no. storeys Amount – 437 bed spaces / 110m^2 amenity space Mix of rooms – 162 studios, 275 cluster bedrooms (55 cluster flats) **Link Block A-B** Height - 12no. storeys Amount – 80 bed spaces / 284m^2 amenity space Mix of rooms – 80 studios **Link Block B-C** Height - 16no. storeys Amount – 112 bed spaces / 155m^2 amenity space Mix of rooms – 112 studios Total number of bed spaces – 1,224 Total building GIA – 38,359 m^2 Total amount of amenity space – 1109 m^2 Total no. of cycle parking – 313m^2

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3. Name of person completing the fire statement (as section 15.), relevant qualifications and experience.	 Richard Rankin Design Director CEng, MEng (Hons), MIFireE E: Richard.Rankin@ofrconsultants.com Richard has 17 years' experience of UK and International regulations and approval processes whilst designing fire strategies for a wide range of projects, from small department refurbishments to large and complex new builds.
4. State what, if any, consultation has been undertaken on issues relating to the fire safety of the development; and what account has been taken of this.	Consultation during this early design stage has been undertaken between the fire engineers (OFR Consultants Ltd) and the architectural team (Sheppard Robson) with regards to meeting the requirements of the Building Regulations 2010 (as amended). Recommendations from these preliminary consultations have been considered and incorporated into the outline fire strategy report developed by OFR. Preliminary consultation with Greater Manchester Fire and Rescue Service (GMFRS) was undertaken via Microsoft Teams call on 08.02.2023 to discuss fire service access to the site via Echo Street and Granby Road. The proposals were agreed in principle. Correspondence with the Building Control body (Socotec) has been ongoing during the preliminary design stage, with regular attendance at various design team meetings (DTM's). An initial review of the OFR fire safety information was undertaken by Socotec dated 14.04.2023, with comments incorporated into the OFR fire strategy report. No objections have been raised with the current design proposals. The outline fire strategy report includes a design risk register where alternative solutions to the standard guidance may provide suitable and practicable solutions to the design. These are to be developed in more detail at the next stage of the design in conjunction with the authorities and the design team.
5. Site layout plan with block numbering as per building schedule referred to in 6. (Consistent with other plans drawings and information submitted in connection with the application)	

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The principles, concepts and approach relating to fire safety that have been applied to the development									
6. Building schedule									
Site information				Building information			Resident safety information		
a) block no. as per site layout plan above	b) • block height (m) • number of storeys excluding those below ground level • number of storeys including those below ground level	c) proposed use (one per line)	d) location of use within block by storey	e) standards relating to fire safety/ approach applied	f) balconies	g) external wall systems	h) approach to evacuation	i) automatic suppression	j) accessible housing provided

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Block A	Height c.51.9m 16 (GF + 15) 17 (Basement, GF + 15)	Student Accommodation	Basement, GF + 15	BS 9991, BS 9999, AD B v1, AD B v2, BS 7974	no balconies	class A2-s1, d0 or better	Phased	Yes – residential sprinklers, full (residential levels) Yes – commercial sprinklers, full (non-residential levels)	none
Block B	Height c.69.9m 22 (GF + 21) 23 (Basement, GF + 21)	Student Accommodation	Basement, GF + 21	BS 9991, BS 9999, AD B v1, AD B v2, BS 7974	no balconies	class A2-s1, d0 or better	Phased	Yes – residential sprinklers, full (residential levels) Yes – commercial sprinklers, full (non-residential levels)	none

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Block C	Height c.83.3m 28 (GF + 27)	Student Accommodation	GF + 27	BS 9991, BS 9999, AD B v1, AD B v2, BS 7974	no balconies	class A2-s1, d0 or better	Phased	Yes – residential sprinklers, full (residential levels) Yes – commercial sprinklers, full (non-residential levels)	none
Link A-B	Height c.34m 12 (GF + 11)	Student Accommodation	GF + 11	BS 9991, BS 9999, AD B v1, AD B v2, BS 7974	no balconies	class A2-s1, d0 or better	Phased	Yes – residential sprinklers, full (residential levels) Yes – commercial sprinklers, full (non-residential levels)	none

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Link B-C	Height c.45m 16 (GF + 15)	Student Accommodation	GF + 15	BS 9991, BS 9999, AD B v1, AD B v2, BS 7974	no balconies	class A2-s1, d0 or better	Phased	Yes – residential sprinklers, full (residential levels) Yes – commercial sprinklers, full (non-residential levels)	none

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7. **Specific technical complexities**

Explain any specific technical complexities in terms of fire safety (for example green walls) and/or departures from information in building schedule above

Guide: no more than 500 words

During this stage of the design, the following items have been highlighted as they are likely to require alternative solutions to the recommendations in standard guidance.

- **Refuse Ventilation** - Currently the refuse store opens directly into the central basement area without additional lobby protection.
  - The central basement area is to be provided with a means for permanent natural ventilation via openings (10m^2 free area) in the ground floor slab above the basement level which discharge to the external. In addition, a minimum of 10m^2 free area will be provided via the entrance ramp opening to the basement via louvred gates.
- **Cooking Appliances** – Cooking appliances within the studio flats are currently proposed to be located centrally as opposed to the extremity of the flat.
  - It is proposed to introduce hob cut-off devices and localised hob suppression to all cooking appliances within the scheme to reduce the risk and potential radiation exposure to occupants escaping from the studios adjacent to the cooking appliances.
- **Travel Distances** - There is a single direction travel distance within the common corridors for Block A which exceeds the recommendations in BS 9991.
  - A smoke ventilation strategy incorporating 2no. shafts in *'supply'* and *'extract'* will be implemented to demonstrate that tenable conditions are maintained within the corridor during both the means of escape and firefighting phases. A detailed Computational Fluid Dynamic (CFD) assessment will be undertaken at the next design stage. Preliminary *'proof-of-concept'* CFD modelling has demonstrated that this performance criteria will be suitably met.
- **Smoke Control -** In Blocks A, B and C, for some corridor configurations, a mechanical smoke extract shaft is proposed to be located adjacent to the stair enclosure as opposed to the far end of the corridor as recommended in BS 9991.
  - A full detailed Computational Fluid Dynamic (CFD) assessment will be undertaken at the next design stage to demonstrate that the stair remains tenable during the firefighting phase.
- **Stair Discharge Route -** One of the stairs serving Block B discharges into a central corridor with 2no. separate escape routes and is not lobby protected from the accommodation for one of the escape routes along its entire length.

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- It is proposed to introduce 2no. exit routes from this stair, separated via fire resisting construction and supplemented by Dynamic Signage. The proposed layout is arranged such that a single seat of fire would not compromise both stairs to Block B and that in all fire scenarios, persons would have protection via 2no. layers of passive fire protection (fire doorsets) and a ventilated protected lobby.

- **Firefighting Access -** Access to the central firefighting core (Core B) is not currently possible from the main fire service vehicle parking position on Granby Row. As such, access to Core B is via the main reception.
  - OFR and IQ Student Accommodation held a meeting with Greater Manchester Fire and Rescue Service (GMFRS) (Simon Whittaker and Neil Helmrich) via Microsoft Teams on 8th February 2023 to discuss the above proposals. GMFRS agreed to the proposed arrangement in principle.

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8. Issues which might affect the fire safety of the development

Explain how any issues which might affect the fire safety of the development have been addressed.

Guide: no more than 500 words

Evacuation Strategy

- Basement Level – Simultaneous Evacuation
- Ground Level (Ancillary Areas) – Simultaneous Evacuation
- Residential – Cluster Flats - Phased Evacuation
- Residential – Studios – Phased Evacuation
- The fire alarm cause and effect will be developed in agreement with all relevant stakeholders. A *'double-knock'* system will be proposed with a soon to be agreed investigation period.
- A BS 8629 evacuation alert system is proposed.
- Signal to Redcare (Alarm Receiving Centre) is proposed.
- The fire strategy has been designed to ensure flexibility such that if required, a 'stay-put' or 'simultaneous' evacuation strategy can be implemented.

Sprinklers

- Due to the height of the building exceeding 11m, the recommendations in Approved Document B: Volume 1 (2022) will be followed for sprinkler protection, as the recommendations are more onerous than those outlined in the 2015 edition of BS 9991. The following is recommended at this stage:
    - Basement Level – BS EN 12845 commercial sprinkler system (Hazard classification to be determined).
    - Ground floor (ancillary areas) – BS EN 12845 commercial sprinkler system (Hazard classification to be determined).
    - Residential Areas – Category 4 residential sprinkler system in accordance with BS 9251.

External Wall

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- All materials which are part of the external wall or specified attachment will achieve at the minimum European Classification A2-s1,d0 or Class A1 as per the requirements in Regulation 7(2). Regulation 7(3) sets out some exceptions from the requirements in Requirement 7(2) which will also be followed where applicable. Membranes are to achieve at the minimum European Class B-s3,d0.
- A preliminary BR 187 external fire spread assessment has been undertaken which demonstrated that none of the external walls would require fire resisting construction from a space separation perspective. However, some walls would require fire resisting construction to limit fire spread between flats located at right angles.

Roof Coverings

- All roof level roof elements are exempt from Regulation 7, however, to reduce the risk of ignition to the outside surface of the external walls to Blocks A, B and C, it is proposed that the build-up of the roof for the A-B and B-C link blocks aligns with Regulation 7 as they directly adjoin the external walls of the main tower blocks (Blocks A, B and C). The roof coverings proposed are as follows:
  - Link A-B and B-C roofs - All elements to achieve at the minimum Class A2-s1,d0 unless exempt as per Regulation 7(3). Ensure roof covering achieves B_{ROOF}(t4) in accordance with BS EN 13501-5.
  - Block A, B and C roofs - No provisions with regards to the insulation product. Ensure roof covering achieves B_{ROOF}(t4) in accordance with BS EN 13501-5.

Persons with Reduced Mobility (PRM)

- For all residential levels it is proposed to provide a protected refuge to the primary firefighting lobby at each level, supplemented with an associated EVC.
- It is proposed to provide an evacuation lift to serve each level. The smoke ventilation strategy is such that the refuge will remain tenable from fire and/or smoke to facilitate egress for persons with reduced mobility from each level.

9. Local development document policies relating to fire safety

Explain how any policies relating to fire safety in relevant local development documents have been taken into account.

Guide: no more than 500 words

Not applicable

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Emergency road vehicle access and water supplies for firefighting purposes
10. Fire service site plan Explanation of fire service site plan(s) provided in 14. including what guidance documents have informed the proposed arrangements for fire service access and facilities? BS 9991 recommends that a building where the topmost story is over 18m should have a fire-fighting shaft, comprising a firefighting lift, firefighting stair, and ventilated firefighting lobby provided with a wet riser where the top occupied storey is also above 50m (BS 9991 Figure 35). As the top storey of Blocks A, B and C exceeds 50m, wet risers have been provided in all stairs in the building. Each block will be served by a firefighting shaft serving all residential levels. In addition to the firefighting shaft, each block will have a second stair enclosed within fire resisting construction and provided with wet riser outlets. The wet riser outlet and the firefighting shaft (excluding the firefighting lifts) also serve the basement level. The fire service site plan proposals were agreed in principle by Greater Manchester Fire and Rescue Service (GMFRS) in a Microsoft Teams meeting on 08.02.23. IQ Student Accommodation have advised that a visit with the Local Fire and Rescue Service will be completed as part of the handover process, for familiarisation purposes.
11. Emergency road vehicle access Specify emergency road vehicle access to the site entrances indicated on the site plan Vehicle access to the site is via either Granby Road or Echo Street. This allows for a fire service vehicle to park within 18m of the wet riser inlet adjacent to Block A, and within 18m of an entry point to Blocks A and C. Access to the firefighting shaft to Block B is via the reception at ground floor level. This was agreed in principle by Greater Manchester Fire and Rescue Service (GMFRS) on 08.02.23. Is the emergency vehicle tracking route within the site to the siting points for appliances clear and unobstructed? yes
12. Siting of fire appliances Each block is served by 2no. stairs. Each stair will be fitted with a wet riser serving all levels. The wet riser replenishment inlet is located adjacent to Core A, within 18m of the fire service vehicle parking position.

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13. Suitability of water supply for the scale of development proposed

Guide: no more than 200 words

External fire hydrants are provided within 90m of the wet riser inlets. The water main supplying these will provide pressure and flow in accordance with BS 9990.

This will be confirmed by the infrastructure engineer during detailed design.

Nature of water supply:

hydrant- public

Does the proposed development rely on existing hydrants and if so are they currently usable / operable?

yes

Existing hydrants will be surveyed and supplemented with new/additional hydrants as necessary to ensure compliant provision in terms of pressure, flow rate and distance from dry riser inlets and fire service vehicle locations.

14. Fire service site plan

Fire service site plan is: inserted in the form

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Fire statement completed by	
7. Signature	
8. Date	27/04/2023

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