

OMEGA FIRE

Now part of BB7

Manchester Life - Lampwick

Detailed Fire Strategy – Rev E – Approved

12th May 2021

OF-DFS-3073-01-E



Quality Assurance

Revision	Date	Prepared by	Authorised by	Reason
-	18/06/19	Stuart Hutchinson	Dane Owen	For Discussion
A	20/12/19	Stuart Hutchinson	Dane Owen	Update following ARUP/design team comments
B	12/10/20	Stuart Hutchinson	Dane Owen	Update following BCO/design team comments
C	14/12/20	Stuart Hutchinson	Dane Owen	Minor update following BCO comments
D	15/02/21	Stuart Hutchinson	Dane Owen	Minor amendments following BCO comments. Updated to approved in principle with MCCBC.
E	12/05/21	Salah Benkorichi	Stuart Hutchinson	Update mechanical extract damper sizes in line with the updated CFD reports to reflect as-built damper size

This document has been prepared by BB7 for the sole use of our client (the “Client”) and in accordance with generally accepted consultancy principles, the budget for fees and the terms of reference agreed between BB7 and the Client. Any information provided by third parties and referred to herein has not been checked or verified by BB7, unless otherwise expressly stated in the document. No third party may rely upon this document without the prior and express written agreement of BB7.

BB7 is a trading name of Omega Fire Engineering Limited. Omega Fire Engineering Limited is a private limited company incorporated in [England and Wales] with registered number 06959525 and with its registered address at 23 Star Hill, Rochester, ME1 1XF

This report relates only to statutory requirements for Building Regulations compliance. Additional fire safety measures may be necessary for insurance and other purposes. Where no reference is made within this report to a certain element, all detailed aspects of the design and construction will, unless stated otherwise in this report, be in accordance with the recommendations of BS 9991/BS 9999 and/or the appropriate British Standards.

The validity of this report is dependent upon the recommendations being implemented in full and as described.

This report is based on the Client’s description of their requirements and is subject to assumptions that BB7 can reasonably be expected to make in accordance with sound professional principles and experience. BB7 accept no liability for the accuracy of the information provided by the Client or other third parties. BB7 shall not be held responsible or liable for the designs produced by any other consultants, sub-consultants or sub-contractors, including any original designs produced by others which you may adapt, modify or develop in the carrying out of the Services. The report is based on the drawings referenced. Any subsequent changes to the design which are not agreed with BB7 invalidate the report.

This report relates to a project that is subject to review from Approval Authorities. It should be ensured that the contents of the report are agreed with all the relevant approval bodies prior to implementation.

Contents

Executive Summary..... 4

1 Introduction 5

2 Emergency Escape Strategy..... 8

3 Internal Fire Spread..... 20

4 Compartmentation..... 22

5 External Fire Spread 28

6 Access and Facilities – Fire Service..... 32

7 Emergency Power 34

8 Fire Safety Management 35

9 Conclusion..... 37

Appendix A – Façade Protected Areas..... 38

Appendix B – Façade Assessment Calculations..... 41

Appendix C – Cooking Fire Calculation 44

Appendix D – AFDA Cause and Effect 49

Appendix E – Smoke Ventilation Strategy..... 52

Executive Summary

- 1.1.2 BB7 has been commissioned to develop the fire safety strategy for the provision of a new private residential development in Manchester, it is to be developed as part of the Manchester Life Development Company masterplan.
- 1.1.3 The layout of the Lampwick development is not strictly compliant with the recommendations of the prescriptive guidance document BS 9991:2015. Therefore, where the design deviates from the prescriptive guidance a fire engineered approach has been adopted to demonstrate compliance with the functional requirements of Part B to the Building Regulations. Where fire engineering has been used this will be justified through quantitative analysis and qualitative discussions on the performance of the solutions. The final objective is to produce a level of life safety commensurate with prescriptive guidance documents.
- 1.1.4 The assessment has not primarily considered any requirements associated with property protection additional to those which are inherent within the prescriptive guidance and any discussions associated with variations to the prescriptive approach are on the basis of life safety.
- 1.1.5 ARUP have produced a Stage 3 Employer's Requirements fire strategy report (Ref: SP-00-XX-001-Lampwick-ARUP-YF-ER-ML2 Rev A – 17th October 2017) and the general design philosophy and assumptions made at the earlier stage have been continued through this detailed design.
- 1.1.6 It is considered that the recommendations in this report will provide sufficient guidance to obtain approval from the relevant authorities and achieve a satisfactory level of safety commensurate with the risks of the occupied premises.
- 1.1.7 This report has been agreed with Manchester City Council Building Control.



Figure 1: Manchester Life Lampwick (3D Image)

1 Introduction

1.1.1 This report details the fire engineering design of the Lampwick development. This is to satisfy the functional requirements of Part B to the Building Regulations on the basis of fire engineering principles.

1.2 Legislation

1.2.1 Under the Building Regulations a building owner is required to provide an adequate level of life safety to the building by providing suitable means of escape, means of warning occupants of a fire, limiting internal fire spread, protecting adjacent property from fire and facilitating Fire Service operations. This can be achieved by the adoption of standard guidance as documented within Approved Document B (ADB) 2006 Edition, including 2007, 2010 and 2013 amendments. However, ADB further recognises that alternative solutions may provide a more appropriate design. The use of an alternative approach is detailed in ADB, Use of Guidance page 5:

“The approved documents are intended to provide guidance for some of the more common building situations. However, there may well be alternative ways of achieving compliance with the requirements. Thus there is no obligation to adopt any particular solution contained in an approved document if you prefer to meet the relevant requirement in some other way.”

1.2.2 As an alternative to ADB, BS 9991: 2015 – Fire Safety in the design, management and use of residential buildings will be considered within the design. BS 9991 superseded BS 5588-1 in December 2011, with subsequent revision in October 2015.

1.2.3 As BS 9991 is not applicable to the non-residential aspects of the development, BS 9999:2017 – Code of practise for fire safety in the design, management and use of buildings will be considered.

1.2.4 BS 9999 has been developed to ensure the approach to the scheme is fully co-ordinated with specific reference to:

- Fire safety management;
- The provisions of means of escape;
- The structural protection of escape facilities and the structural stability of a building in the event of a fire;
- The provision of access and facilities for firefighting.

1.2.5 It should be noted that this report considers the requirements of the Building Regulations and the ARUP ER report. It is assumed that any additional non-Building Regulations requirements of the scheme are addressed in the ARUP ER strategy.

1.2.6 Where no reference is made within this report with regards to a certain element, all aspects of the building are to be in full accordance with the recommendations of BS 9991 and BS 9999 and/or the appropriate British Standard. Where the design deviates from BS 9991 / BS 9999 a fire engineered approach will be used.

1.2.7 This report provides at least the minimum level of protection required regarding compliance for Part B of the Building Regulations and also continues with the general design philosophy and assumptions made in the ARUP ER report; any ER requirements that are a variation from standard guidance or variations from the ER report are highlighted in Sections 1.6 and 1.7.

1.2.8 This report is to be made fully available to the building management and will need to be documented within the fire safety file on completion and occupation of the development.

1.2.9 This report has been agreed with Manchester City Council Building Control.

1.3 Building and Site Description

1.3.1 The Lampwick development is located in Ancoats, Manchester and is bound by Lampwick Lane, Old Mill Street and the Ashton Canal. The development is located directly behind the old Ancoats Dispensary building.

1.3.2 The development consists of a detached building ten storeys in height (ground to ninth floor) and will contain private residential accommodation with independent commercial units at ground level and an external car park. The ground floor contains residential apartments alongside ancillary accommodation including reception and amenity space, refuse stores, bicycle store, plant rooms [water tank/sprinkler room, generator room, comms room, substation] and a cleaners/parcel/maintenance store. The upper floors consist of residential apartments and refuse chute rooms.

1.3.3 The building is split into a North and South section that rise independently from first-floor upwards. The North section (ground to seventh) is served by a single stair which is designed as a firefighting core. The South section (ground to ninth) is served by two stairs, one of which is designed as a firefighting core and the other as a protected escape stair. The South block steps back at eighth and ninth floor and is served by the firefighting stair at this level only. Both sections are greater than 18m in height and the building measures approximately 27.85m to the highest occupied floor (ninth floor). The blocks are proposed to be surrounded by external car parking, landscaping and paved areas. The South block will have an undercroft at ground floor that will contain parking spaces.

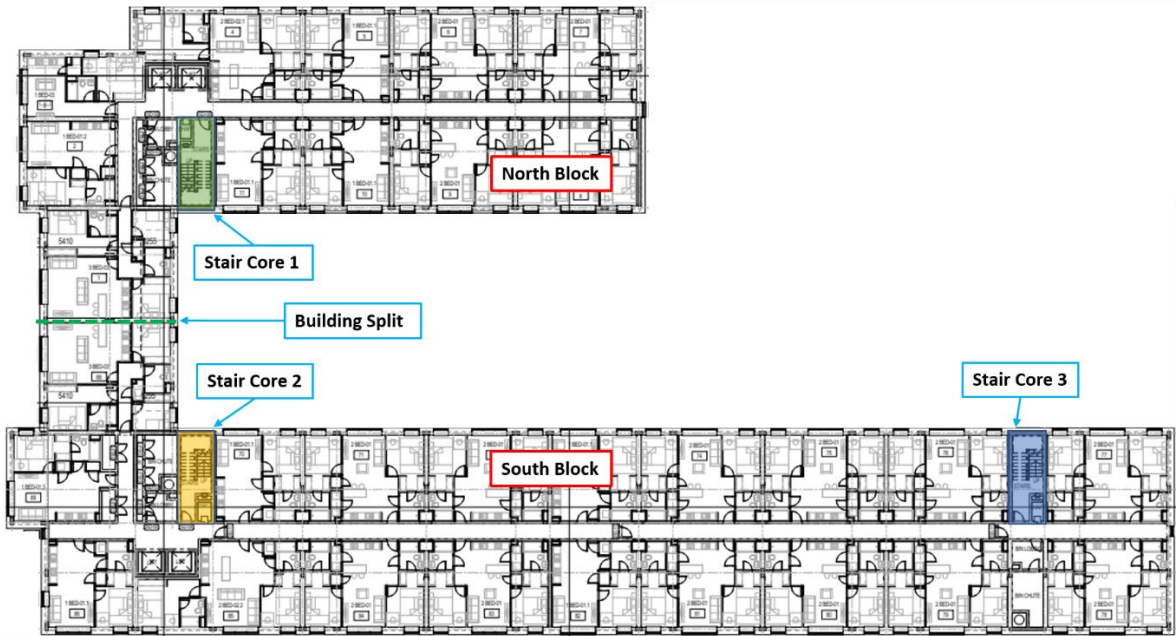


Figure 2: Lampwick – Typical Upper Floor Plan

1.4 Purpose Group

1.4.1 The building is to provide residential accommodation with a mix of single level apartments and duplexes. Therefore, the residential parts of the building will be designed in accordance with the recommendations of ADB as Purpose Group 1(a) – Flats.

1.4.2 Ancillary and non-residential areas will be designed in accordance with the applicable Purpose Group as classified in ADB.

1.5 Project Information

1.5.1 Table 1 provides a summary of the information that has been considered to develop this fire strategy.

Table 1: Drawing Schedule

Author	Drawing Title	Drawing Number	Date	Revision
GA's				
jmarchitects	Site Setting Out Plan	903001	08.12.20	C03
jmarchitects	Proposed Level 00 GA	001000	30.07.20	C06
jmarchitects	Proposed Level 01 GA	001001	23.04.20	C03
jmarchitects	Proposed Level 02 GA	001002	23.04.20	C04
jmarchitects	Proposed Level 03 GA	001003	23.04.20	C04
jmarchitects	Proposed Level 04 GA	001004	23.04.20	C04
jmarchitects	Proposed Level 05 GA	001005	23.04.20	C03
jmarchitects	Proposed Level 06 GA	001006	23.04.20	C03
jmarchitects	Proposed Level 07 GA	001007	04.12.20	C04
jmarchitects	Proposed Level 08 GA	001008	23.04.20	C03
jmarchitects	Proposed Level 09 GA	001009	04.12.20	C04
jmarchitects	Proposed Level 10 GA	001010	23.04.20	C05
Elevations				
jmarchitects	North Elev Setting Out	213001	01.12.20	C04
jmarchitects	East Elev Setting Out	213002	08.10.20	C05
jmarchitects	South Elev Setting Out 01	213003	08.10.20	C03
jmarchitects	South Elev Setting Out 02	213004	09.07.20	C01
jmarchitects	West Elev Setting Out	213005	27.10.20	C02
jmarchitects	Courtyard Sth Elev Setting Out	213006	30.11.20	C04
jmarchitects	Courtyard Nth Elev 01	213007	08.10.20	C05
jmarchitects	Courtyard Nth Elev 02	213008	08.10.20	C03
Sections				
jmarchitects	Proposed Sections 01	002501	30.10.20	C02
jmarchitects	Proposed Sections 02	002502	30.10.20	C02
jmarchitects	Proposed Sections 03	002503	30.10.20	C02
jmarchitects	Proposed Sections 04	002504	30.10.20	C02
Fire Strategy Drawings				
jmarchitects	Proposed Level 00 Fire Strategy	68-0001	10.11.20	C04
jmarchitects	Proposed Level 01 Fire Strategy	68-0002	10.11.20	C03
jmarchitects	Proposed Level 02 Fire Strategy	68-0003	10.11.20	C03
jmarchitects	Proposed Level 03 Fire Strategy	68-0004	10.11.20	C03
jmarchitects	Proposed Level 04 Fire Strategy	68-0005	05.01.21	C04

Author	Drawing Title	Drawing Number	Date	Revision
jmarchitects	Proposed Level 05 Fire Strategy	68-0006	10.11.20	C03
jmarchitects	Proposed Level 06 Fire Strategy	68-0007	10.11.20	C03
jmarchitects	Proposed Level 07 Fire Strategy	68-0008	04.12.20	C04
jmarchitects	Proposed Level 08 Fire Strategy	68-0009	10.11.20	C03
jmarchitects	Proposed Level 09 Fire Strategy	68-0010	04.12.20	C03
jmarchitects	Proposed Level 10 Fire Strategy	68-0011	10.11.20	C02
Employer's Requirements				
ARUP	MLDC, Manchester Life – Lampwick, RIBA Stage 3 Fire Strategy Report	SP-00-XX-001-Lampwick-ARUP-YF-ER-ML2	17/10/17	Rev A

1.6 Alternative Fire Engineering Solutions

- 1.6.1 Where prescriptive codes cannot be met in full or alternative design is deemed to be advantageous, fire-engineering principles have been adopted.
- 1.6.2 The report provides a sufficient level of detail on how the design satisfies Part B of the Building Regulations and has been agreed with Manchester City Council Building Control.
- 1.6.3 An overview of the main fire engineered solutions proposed within the scheme are summarised in Table 2

Table 2: Main Fire Engineering Solutions Summary

Non-Compliance	Solution	Report Section
Open plan apartments greater than 8m x 4m provided with unenclosed kitchens. The stairways provided to duplexes 2 and 3 are open at the upper floor level to the living area/kitchen.	The open-plan apartment designs have been verified through computational fluid dynamics (CFD) analysis to demonstrate the arrangements and alternative safety features provide at least an equivalent, if not greater level of safety to a code-compliant open-plan design. The results have been presented in a separate report (ref: OF-CFD-3073-02) and has been submitted to Building Control in support of the fire strategy.	2.4.7 - 2.4.17
Extended single direction travel distances along residential common corridors up to c.29m.	An enhanced mechanical smoke ventilation solution is proposed to the residential common corridors adjoining each stair core. The enhanced smoke ventilation strategy has been validated through CFD analysis with the results presented in a separate Corridor CFD Analysis report (ref OF-CFD-3073-01-A) and further Common Corridor CFD Comparison report requested by MCCBC (ref OF-CFD-3073-03-C).	2.8 & 2.8.23
Extended multi-direction travel distances along residential common corridors from within an unventilated corridor to the storey exit of c.33m.	The portion of travel within the unventilated corridor from an apartment entrance door to a cross-corridor door is within the 30m travel distance, with the additional 3m of travel being in a ventilated section of corridor provided with enhanced mechanical smoke extract.	2.5.3

Non-Compliance	Solution	Report Section
Refuse chutes are accessed from single direction (dead-end) residential corridors.	The chute rooms are to be sprinklered and approached via a protected lobby provided with not less than 0.2m ² permanent ventilation. In addition, the refuse lobby door is to be enhanced to FD60s with double smoke seals, the bin chutes and refuse hopper doors are to be fire-rated, a fusible link fire shutter provided where the bin chutes pass into the ground floor bin stores and nuisance alarms provided to the refuse lobby doors will be linked to 24-hour reception to alert the concierge if the associated doors have been left open for extended periods of time.	2.5.6
Access and egress from rooftops at Level 5 (North), 6 (North) and 8 (South) are in a single direction and are from residential corridors.	A single sprinkler flow switch is being installed within the main service riser on each floor level. If a sprinkler head activates within any of the apartments on the respective floor level, a signal will be sent to the fire alarm panel via an interface linked to this flow switch. The system is to be programmed to activate a sounder on the relevant roof level should this occur to provide early fire warning to persons on the roof. If hearing protection is likely to be required for roof maintenance, then visual and audible warning should be provided on the rooftops. Additionally activation of the L5 smoke detection on the common residential corridors used to activate the smoke control systems will be programmed to activate all rooftop sounders.	2.6.9
A single firefighting shaft is provided to the South Block that is over 900m ² .	Dry rising main is to be provided in Stair 3 to achieve 60m hose laying distance.	6.2

1.7 Employers Requirements

- 1.7.1 ARUP have produced an Employer’s Requirements RIBA Stage 3 Fire Strategy report (referenced above) which detailed the proposed fire safety systems. The general design philosophy and assumptions made at the earlier stage will be continued through this detailed design.
- 1.7.2 The initial report identified variations from the standard guidance which required further justification, which have subsequently been included into this report. The main fire engineered solutions have been summarised in Table 2 above.

Variations to Employers Requirements

- 1.7.3 The Employer’s Requirements have generally been adhered with however some variations have been proposed, namely:
 - Alternative smoke ventilation strategy is proposed to the ER report. The main reasons were this were due to natural smoke shafts located adjacent to stairs, a lack of inlet air towards the end of some corridors and the space restrictions associated with ducting the larger natural shafts to ground floor. The alternative solutions have been validated with CFD analysis with the results presented in a separate Corridor CFD Analysis report (ref OF-CFD-3073-01-A) and further Common Corridor CFD Comparison report as requested by MCCBC (ref OF-CFD-3073-03-C).
 - At ground floor of the South block, the reception/ancillary accommodation adjoins the residential corridor. To adequately separate the ancillary area from the ventilated residential escape route, a protected lobby affording a minimum 60-minutes fire resisting construction is to be provided.

- The staff room layout has been reconfigured so that it is accessed directly off the reception/entrance lobby (and not via a lobby) to meet current guidance.
- The workshop connecting to the firefighting lobby on the ground floor of the North block has been changed to a cleaners/parcel/maintenance store. On the basis the room is not to be used as a workshop, it is proposed the door between the cleaners/parcel/maintenance store and the firefighting lobby will be retained as per the ER fire strategy report. In lieu of a ventilated lobby between the store and the firefighting lobby, it is proposed that the storeroom will be provided with an AOV in the external wall achieving a minimum 1.0m² free area to ventilate the room directly and the door to the store will be an upgraded FD60s fire door fitted with double smoke seals. The AOV would activate on local activation of the detection within the storeroom only. See Section 2.6.
- Construction of external walls have been specified to comply with Regulation 7(2) of The Building Regulations following The Building (Amendment) Regulations 2018 which came into force on 21st December 2018.
- The Employer’s Requirements state the rainscreen façade system for this building is to be provided with solid state cavity barriers. The proposed cavity barrier design incorporates horizontal open state intumescent cavity barriers which has been agreed for use with MCCBC in a vented rainscreen provided they are proven and approved to meet the industry best practise guidance from the *Association of Specialist Fire Protection* (ASFP). Cavity barriers are to be designed and installed in accordance with the recommendations of BS 9991. This detailed design will be developed by the relevant specialist sub-contractor with the proposals subject to agreement with Building Control and ARUP as the clients design advisory team.
- Additional fire protection requirements are necessary following external fire spread analysis to the East elevation to the Old Ancoats Dispensary. Also the relevant boundary distance to the South East elevation has been reduced to 3.53m and the permitted unprotected area to the main unsprinklered bin store has been reduced slightly from the ARUP ER report to 44%. The protection is required to provide 90-minutes fire resistance (90-minutes fire rating for integrity and loadbearing and 15 minutes insulation) from the inside only.

Employers Requirements Assumptions

- 1.7.4 The following assumptions have been made in the ER fire strategy report when recommending certain fire safety provisions:
 - Residential occupancy – Occupants shall be familiar with the building as they are residents but may be asleep.
 - Ancillary areas – Occupants shall be awake and familiar with the building because these areas will be used by residents, except for plant rooms where occupants may be unfamiliar.
 - On-site building management – Provided 24 hours a day based at the concierge area. They will be awake and familiar with the building.
 - Commercial units – Occupants will be awake but unfamiliar with the building. There is no connection between these units and the residential areas, and the means of escape for both are independent.
 - Car park – As this is assumed to be for residents only, occupants will be awake and familiar with the area.
 - Site boundary – For external fire spread analysis, the site boundary has been taken as the solid red line indicated on the ER architectural drawings and this has been extended to the centreline of a road/canal as appropriate.
 - It is understood the landscaping to the South East elevation is private land and therefore the relevant boundary has not been extended to the centreline of the area. The proposed relevant boundary is a minor variation from the relevant boundary indicated in the ARUP ER report which has resulted in a slight change following the analysis of external fire spread.

2 Emergency Escape Strategy

2.1 Evacuation Principle

- 2.1.1 The principal mode of evacuation for the residential accommodation is a ‘stay put’ strategy whereby only the occupants of the apartment of the fire origin will evacuate. This standard approach reflects the high degree of compartmentation present and minimises the impact of false alarms – an important consideration in residential accommodation.
- 2.1.2 The means of escape from the apartments relies on automatic fire detection and protected ventilated corridors. Further evacuation of apartments will not take place automatically and relies on the Fire Service, management or the independent action of the occupants.
- 2.1.3 The evacuation procedure within the ancillary and non-residential accommodation will follow a simultaneous evacuation policy, whereby on fire alarm activation anywhere in the ancillary areas, the affected ancillary accommodation will evacuate simultaneously, without the fire alarm sounding in the residential accommodation.

2.2 Building Population

- 2.2.1 Given that only a single apartment would ever need to evacuate from the upper levels at any one time, the maximum envisaged occupancy in a fire alarm from a single apartment would be c.10 persons.
- 2.2.2 The cleaners/parcel/maintenance store, the refuse stores and plant rooms are considered as low occupancy, low use spaces which will not be considered in the overall occupancy of the building. Similarly, the rooftops on Levels 5, 6, 8 and 10 are for maintenance only and contain open air plant and have not been considered in the overall occupancy of the building.
- 2.2.3 It is understood the building contains a concierge and there will be on-site building management present 24 hours a day.
- 2.2.4 The entrance lobby/reception and amenity spaces at ground floor level have an approximate floor area of 360m² (approximately 300m² not including the staff accommodation). The exits available to occupants within this area are the 1600mm main lobby double doors and an alternative escape route via the South Block residential corridor that leads through Stair 2 to the external car park. The minimum clear width of the escape route and any door on the alternative exit route is to be at least 1050mm.
- 2.2.5 The occupancy to this area has been calculated in accordance with BS 9999 on the basis that occupants in this area are awake and familiar with the building i.e. A2 Risk Profile. On the basis the largest exit (main lobby double door) is discounted by a fire, the maximum occupancy is to be restricted by the 1050mm width of the alternative exit route. For doors of 1050mm or more, the capacity of the door is calculated by dividing the door width by the minimum door width per person as stated in BS 9999 for an A2 Risk Profile which is 3.6mm/person. The total capacity for a 1050mm escape width is 291 and therefore the maximum egress capacity of the entrance lobby/reception and amenity spaces is 291 persons. On the basis the floor area is approximately 300m² (not including the staff accommodation), assuming a floor space factor of 2.0m² per person which is considered appropriate in this situation, this would give a population of 150 which is within the egress capacity of the doors.
- 2.2.6 The occupancy of the ground floor terrace and any rooms provided with a single direction of escape or, where there only means of escape is via an access room, should be limited to 60 persons.
- 2.2.7 Doors on escape routes and effective clear widths should be in accordance with section 2.8.26.

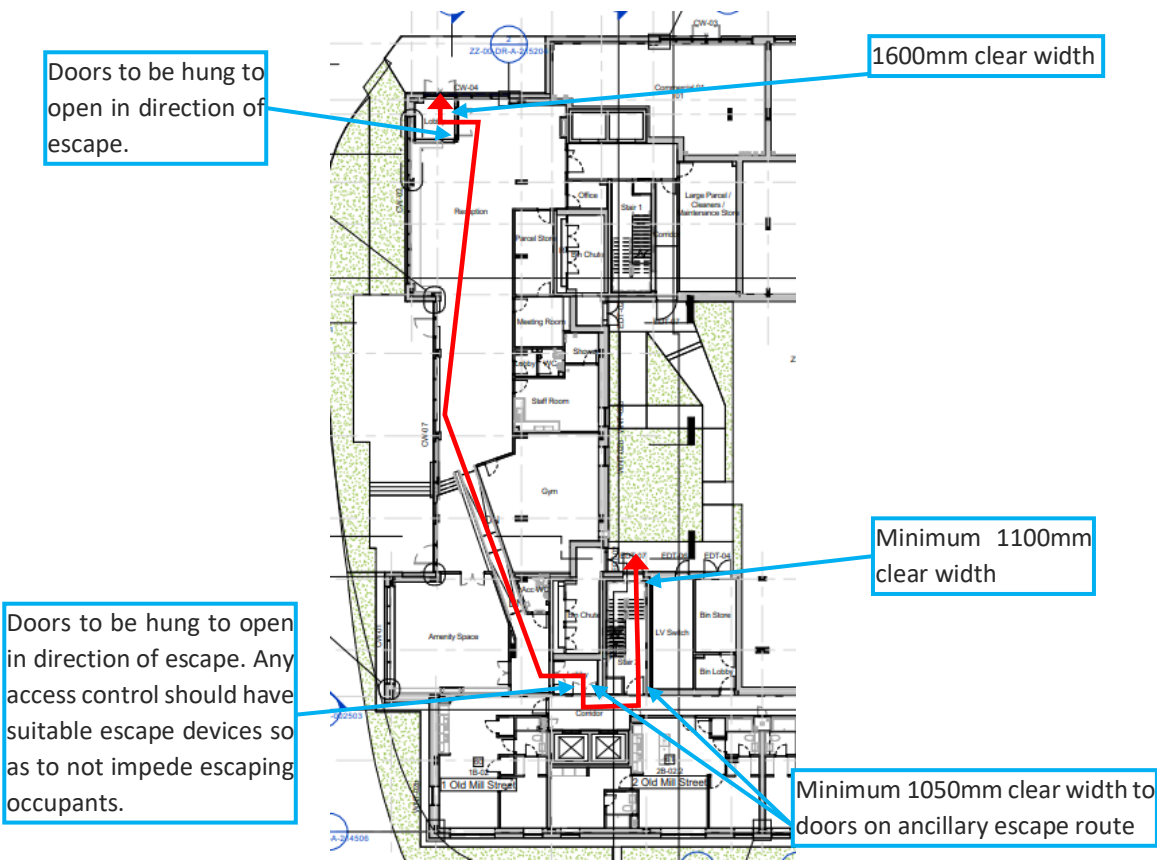


Figure 3: Escape Routes from Amenity Space

Commercial Unit

- 2.2.8 The maximum occupancy of the commercial units has been assessed on a shell and core basis.
- 2.2.9 The Planning Decision Notice confirms there is no permission for the Commercial units to be used as Class A4: drinking establishments – public houses, wine bars or other drinking establishments including drinking establishments with expanded food provision.
- 2.2.10 However, the Planning Decision Notice does permit use of the units as a restaurant and café for the sale of food and drink for consumption on the premises – restaurants, snack bars and cafes. On this basis, the occupancy has been assessed in relation to a restaurant and café as most onerous permitted use and therefore it is not envisaged that there will be a bar area or similar serving point (crush zone) for this type of used that will have a high population density within 2.0m of a serving point i.e. 0.3m²/person.
- 2.2.11 Fit-out layouts are unknown therefore the occupancy of the commercial units has been assessed assuming that 70% of the space will be used for front of house and 30% for back of house.
- 2.2.12 The highest occupancy would be due to a restaurant/café which assumes 1m²/person in the front of house and 7m²/person for back of house (kitchen, stores etc). The resultant occupancies are detailed in Table 3 below.

Table 3: Commercial Unit Occupancy Limitations

Commercial Unit	Total Floor Area (m²)	Front of House - 70%	Back of House - 30%	Occupant Capacity
1	81	56.7	24.3	61
2	69	48.3	20.7	52
3	68	47.6	20.4	51
4	79	55.3	23.7	60

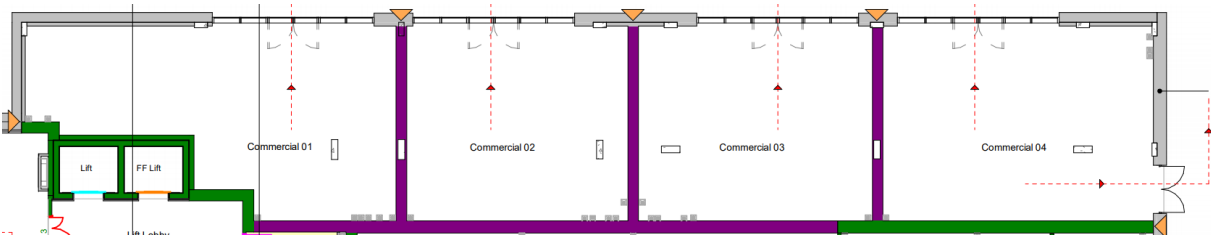


Figure 4: Commercial Units

- 2.2.13
- It is understood the bin store for the commercial units is the area adjacent to Unit 4. Therefore, the second door in Unit 4 is assumed as a back of house area and has not been considered in the escape calculations from this unit. As such, all Units have been assessed on the basis there is a single exit and thus each unit is to be limited to 60 persons. The occupancy capacity for Unit 1 based on the floor space is 61 persons which is greater than the 60 persons recommended in current guidance however, this is proposed to be acceptable on the basis that:

 - It is only 1 person greater than 60 persons;
 - The floor area split between front and back of house doesn't account for furniture etc that would further reduce the usable floor space;
 - Direct travel distances from the furthest point in the room are less than 12m (3m less than the direct distance limit recommended in BS 9999 for an A2 risk profile with no enhancements);
 - AFDA is to be provided to the Commercial units to Category L2 standard which is an enhancement above the minimum Category M standard recommended in current guidance for this use to provide early fire warning and increase the available safe escape time should a fire develop undetected.
- 2.2.14
- This has been agreed with Manchester City Council Building Control and ARUP as the clients design advisory team.

2.3 Automatic Fire Detection and Alarm (AFDA)

- 2.3.1
- A summary of the fire alarm and detection requirements for the building has been provided in Table 4 below, with details on each system listed below. Where referred to in this section, a “Category L” system is a life safety detection system designed in accordance with BS 5839-1:2017 for use in non-domestic areas; a “Category LD” system is a life safety system designed in accordance with BS 5839-6:2019 for use in domestic areas.

Table 4: Fire Detection and Alarm Summary

Area	Coverage	British Standard	Manual Call Points	Sounders
Standard Apartments	Grade D1, Category LD1	BS 5839-6	No	Yes
Open Plan Apartment	Grade D1, Category LD1	BS 5839-6	No	Yes
Duplex Apartments	Grade D1, Category LD1	BS 5839-6	No	Yes
Common Corridor & Stairs	Category L5	BS 5839-1	No	No
Refuse stores / lobbies connecting to residential accommodation	Category L5	BS 5839-1	No	No
Ancillary Areas	Category L2	BS 5839-1	Yes	Yes
Commercial Units	Category L2	BS 5839-1	Yes	Yes
Other non-residential areas (rooftops)	Category M	BS 5839-1	No	Yes
External Car Park	None proposed	-	-	-

- 2.3.2
- All apartment types are to be provided with an AFDA system achieving Grade D1 Category LD1 in accordance with BS 5839-6:2019.
- 2.3.3
- Detection types should be selected based on the use of the room. Most rooms will require smoke detection however, rooms/areas liable to false alarm activations should be provided with heat detection (i.e. duplex kitchens). Open-plan apartments and duplexes must have at least one smoke detector in the access room containing the kitchen and living area which forms part of the escape route from the bedrooms. However, where the dimensions of the open-plan living area require more than one automatic fire detector when designing to the recommendations of BS 5839-6, then it is proposed the detector sited closest to the kitchen area to be a heat detector so long as the other detector is a smoke. If the living area is only large enough for one detector, smoke detection is required as a minimum.
- 2.3.4
- The residential common escape routes (corridors/lobbies/stairs) will be provided with a Category L5 AFDA system designed and installed in accordance with BS 5839-1:2017 to operate the smoke ventilation system only. This system will not include manual call points or sounders on the residential corridors but should provide an alert to the fire alarm panel and should be programmed to sound the alarm on the rooftop levels. On-site building management would then investigate and call the Fire Service to attend, as necessary. L5 Detection in the residential common escape routes should be spaced in accordance with BS 5839-1 i.e. smoke detectors sited at intervals of 15m with the maximum distance from the corridor ends being 7.5m. Additionally, it should be ensured a detector on the corridor is provided within 1m of the apartment doorways that are closest to each escape stair. Each detector should be located between the apartment doorway and the nearest stair.
- 2.3.5
- All refuse stores and refuse lobbies are to be provided with smoke detection which will form part of the L5 system outlined in Table 4. No alarm will sound in the result of a detection within the refuse rooms/refuse lobbies located off residential corridors but should provide an alert to the fire alarm panel. On-site building management would then investigate and call the Fire Service to attend, as necessary.

- 2.3.6

The ground floor refuse lobbies adjacent to the undercroft car park are provided with 0.2m² permanent ventilation via dampers opening to the undercroft, however because the undercroft needs to be compartmented from the remainder of the accommodation, this permanent ventilation is to be provided via fire and smoke dampers that will be designed to activate (close) on activation of the smoke detection within the refuse store lobbies only. If the smoke detector in the refuse store or, on the corridor adjacent to the refuse lobby is activated, the fire dampers will remain open and the damper can't be subsequently overridden by detection in bin lobby (to prevent this detector from subsequently activating and closing fire damper). See section 2.8.17 for cause and effect for these dampers.
- 2.3.7

The ancillary accommodation to the residential areas will be provided with a Category L2 AFDA system designed and installed in accordance with BS 5839-1:2017 including manual call points and sounders. If a detector in these areas is activated an alarm will sound throughout the affected accommodation and should also sound the alarm on the rooftop levels.
- 2.3.8

Only the smoke detection on the residential common corridors is required to operate the smoke ventilation system located on escape corridors. The actuation of smoke detection within refuse stores or ancillary rooms should not operate the corridor smoke ventilation but should provide an alert to the fire alarm panel for on-site building management to investigate and respond as necessary.
- 2.3.9

On detection of fire within a lift shaft or on a common corridor, the lifts in the affected zone should be sent to the ground floor, or to 1st floor if there is a fire on the ground floor corridor.
- 2.3.10

Level 5, 6 and 8 rooftops, that are accessed from residential corridors, should be provided with appropriate sounders (and beacons if deemed necessary) which should be linked to the sprinkler flow switch on the relevant floor level via an interface to the fire alarm panel. Refer to Section 2.6.7 for further details.
- 2.3.11

The commercial units will be provided with a Category L2 AFDA system designed and installed in accordance with BS 5839-1:2017 including manual call points and sounders. If a detector in these areas is activated an alarm will sound throughout the affected unit. It is recommended allowance is made for a notification alert to be sent to the concierge to notify them of an incident in the commercial units.
- 2.3.12

No fire detection is proposed to the external car park area. This area is to be covered by CCTV alongside a 24-hour manned reception area to provide remote monitoring from the concierge and provide early warning in the event of a fire in this area. Note that suitable illumination should be provided to allow this strategy to function at all times.
- 2.3.13

For voids less than 800mm deep, the provision of fire detection is subject to a specific fire hazard risk assessment of the void which should be undertaken by M&E contractor. In voids and cavities that are greater than 800mm deep, smoke detection is generally recommended by BS 5839-1:2017.
- 2.3.14

A summary of the AFDA Cause and Effect has been provided in Appendix D – *AFDA Cause and Effect*.

2.4 Horizontal Means of Escape

- 2.4.1

The travel distance limitations for the development have been highlighted in Table 5. It is noted the travel distances are generally within these limitations with the exception of some residential common corridors, although these extended distances are proposed due to the provision of enhanced mechanical smoke ventilation, see Section 2.5 and 2.8.

Table 5: Travel Distance Limitations

Area	Single direction	Alternative Escape
Apartments with Entrance Halls	See para 2.4.3	N/A
Open Plan Apartment (sprinklered)	20m	N/A
Duplex Apartment Entrance Hall (Entrance Level)	9m	N/A
Common corridor	7.5m *	30m **
Ancillary Areas	22m ¹	55m ¹
Commercial Units	20m ²	50m ²
Refuse Store	9m	18m
Plant Rooms	9m	18m

- Notes:
- **In accordance with BS 9991, the single direction distance can be increased to 15m in a single direction when escape is from a sprinkler protected apartment into a ventilated common corridor.*
- ***In accordance with BS 9991, the multi-direction distance can be increased to 60m in a single direction when escape is from a sprinkler protected apartment into a ventilated common corridor. Escape from an unventilated corridor to a storey exit remains at 30m.*
- *1 Amenity Space based on Risk Profile A2 with no enhancements in accordance with BS 9999.*
- *2 Commercial Unit based on Risk Profile B2 with no enhancements in accordance with BS 9999.*

- 2.4.2

All escape routes should have a clear headroom of not less than 2m and there should be no projection below this height (except for door frames).

Apartments with Entrance Halls

- 2.4.3

There are 8 apartments proposed with entrance halls (1, 12, 23, 34, 68, 87, 106 and 125). In accordance with BS 9991, these apartments are to be provided with automatic water fire suppression systems and an LD1 fire detection and fire alarm system which permits the total travel distance from any point of the flat to the entrance door to be extended to 20m. Travel distances within the apartments is less than 20m, therefore, the entrance halls are not required to be protected entrance halls designed with 30-minutes fire-resisting construction.

Duplex Apartments

- 2.4.4

There are 4 duplex apartments in the scheme.
- 2.4.5

Duplexes 1 and 4 are accessed from Levels 4 and 5 respectively. The distance between the floor of the entrance storey and the floor above does not exceed 7.5m, therefore in accordance with BS 9991, the duplex apartments are to be provided with a protected stair and a Grade D Category LD1 AFDA system in accordance with BS 5839-6. In addition, all apartments are to be provided with automatic fire suppression, see Section 3.5.
- 2.4.6

The lower level of Duplex 1 which has a bedroom as an inner room to the living area is to be designed in accordance with the Open Plan Apartment section below.

2.4.7	Duplexes 2 and 3 are accessed from Levels 6 and 4 respectively. The stairways provided to these duplexes are open at the upper floor level. The upper levels of the duplexes that are open to the stairway contain the kitchen and living area. The lower (entrance) levels contain bedrooms that are enclosed from the stairways.		
2.4.8	To permit an open stair at the upper floor, which standard guidance recommends enclosing, an alternate solution has been developed and two fire scenarios have been considered. It is noted both duplexes are to be provided with a Grade D Category LD1 AFDA system in accordance with BS 5839-6 and will be provided with automatic fire suppression. <u>Scenario 1 – Fire at lower level</u> <ul style="list-style-type: none">The lower level accommodation is to be separated from the stair enclosure by 30-minutes fire-resisting construction and FD30 fire doors (not required to be self-closing). This will protect the escape route for occupants travelling from the upper floor in the event of a fire in a lower level room. The protection afforded to the stair in this scenario is equivalent to a code-compliant design such as in the design of Duplex 4. <u>Scenario 2 – Fire at upper level</u> <ul style="list-style-type: none">The escape route of occupants on the lower storey of the duplex requires that occupants pass through a space that is connected as one volume with the upper storey to reach the final exit, as such there is potential for smoke to affect the escape route.With the apartment layout and provision of early warning and sprinkler protection, the level of protection is considered to be comparable to the open-plan apartment layout permitted within BS 9991. However the proposed layout has the added benefit that the open-plan area is a floor above the level of the sleeping accommodation such that the time taken to reach untenable conditions for persons escaping from bedrooms is increased due to the larger volume and greater ceiling height that provide a larger smoke reservoir when compared to a fire in a single-level open-plan apartment. It is therefore deemed the level of safety for the means of escape route is better than that of an open plan apartment layout permitted by BS 9991, and therefore considered acceptable.		
2.4.9	The open-plan duplex apartment design has been verified through CFD analysis to demonstrate the arrangements and alternative safety features provide at least an equivalent, if not greater level of safety to a code-compliant open-plan design in accordance with BS 9991. The results have been presented in a separate report (ref: OF-CFD-3073-02) which have been submitted to Building Control in support of this fire strategy.		
	Open-Plan Apartments		
2.4.10	Open plan apartments are apartments where the bedrooms are inner rooms accessed directly from a lounge/kitchen. The design is permissible in the guidance of BS 9991 provided that a Category 1 automatic water fire suppression system is provided in accordance with BS 9251:2014, and fitted throughout with a Grade D Category LD1 AFDA system designed and installed in accordance with BS 5839-6. Due to the use of sprinkler protection to reduce the structural rating of the building, the sprinklers have been upgraded to a Category 3 system with a minimum water duration of 60-minutes in accordance with BS 9251.		
2.4.11	The design criteria for open plan apartments from BS 9991 have been listed below: <ul style="list-style-type: none">Open-plan apartment should not exceed 12m x 16m in area. The 12m x 16m dimensions imply a maximum travel distance of 20m as shown in Figure 5. The 20m travel distance is not exceeded in any of the apartments within the scheme and therefore we consider the proposed apartments to be acceptable;Be situated on a single level only;The ceiling should have a minimum height of 2.25m; and		<ul style="list-style-type: none">Have enclosed kitchens where the size of the open plan apartments exceeds 8m x 4m in area. However, there are no requirements of this enclosure meaning that a non-fire rated enclosure without a self-closer would be permitted.
2.4.12		All open-plan apartments are within the recommended maximum compartment size in BS 9991, but exceed the limit of 8m x 4m for an open kitchen. Retaining the open kitchen design is not considered to be a significant issue and is a requirement solely due to the NHBC “ <i>Open Plan Apartment layouts – assessing life safety in the event of fire</i> ” not testing apartments with open kitchens exceeding this area.	
2.4.13		A CFD analysis of the open plan apartment design has been undertaken and published in a separate report (ref: OF-CFD-3073-02) which assesses a variety of open-plan apartment types in the Lampwick Development. This report builds on the CFD open-plan apartment analysis combined report (ref OF-CFD-1361-01-C) produced for the three Manchester Life Developments: Weaver’s Quay, Flour Mill and Blossom Iron; and the separate CFD analysis reports produced for Vesta Street (ref: OF-CFD-2234-01). These results were published in a standalone design note which have similar open-plan apartment design and layouts that has previously been submitted and agreed by Manchester City Council Building Control. The CFD analysis report for the Lampwick development has been submitted and agreed with Manchester City Council Building Control.	
2.4.14		In buildings with occupants who are asleep but familiar with a building the pre-movement time suggested in BS 7974-6 is at least 10 minutes, most sleeping occupancies are significantly higher. In a standard open-plan apartment the Category 1 sprinkler system would have a 10-minute minimum supply duration which could be depleted while occupants are still making their escape. Further to this, as the enclosure to the kitchen is undefined and does not require self-closers or fire resisting construction it is unlikely to be effective at containing smoke spread, other than in the very early stages of a fire which is unlikely to affect sleeping occupants.	
2.4.15		The Category 3 sprinkler system proposed with a 60-minute duration will provide significant benefit as it would still be operating during most occupant’s escape period. The sprinkler head within the kitchen is to be located to provide an adequate water spray over any cooking facilities. Apartments with 3 bedrooms are proposed to be provided with two sprinkler heads above the cooking facilities to further ensure the fire is either suppressed or limited in growth. Water spray onto an oil fire can cause a peak in fire size as the water vaporises and disperses oil droplets, however this peak is generally for a short duration. Continued sprinkler operation (as opposed to a single pour) will aid in controlling the effects of the fire as it peaks. Locating the sprinkler head to give an 'adequate supply' gives a higher probability of extinguishing the fire and is the preferred option, as opposed to a head located further away which may be insufficient to extinguish the flame. The solution results in a fire which is likely to be extinguished quicker but may have a larger fire size prior to extinguishment, as opposed to a fire which is likely to continue to burn for longer periods but with a reduced fire size. In the small area of an apartment it is considered a priority to extinguish a fire as soon as possible as combustion products can produce untenable conditions very quickly even at small fire sizes.	
2.4.16		An 'adequate water supply' is considered to be achieved where the cookers fall within the spray zone of sprinkler head which should be achieved to comply with BS 9251 i.e. sprinklers shall be spaced a maximum 5.5m apart, and a maximum of half this distance from any wall. Any sprinkler installed within the maximum distance from a wall should be capable of wetting the entire wall up to a height of 0.7m below the ceiling. Caution should be taken not to locate the sprinkler head too close to the cooker. This is due to the potential for the spray pattern to be obstructed by any cooker extract hood installed directly above the cooker. Any obstruction placed within the discharge pattern of the sprinkler will potentially prevent water from wetting the cooker surface together with the back wall. Also, the minimum distance should be sufficient to reduce the likelihood of nuisance activations where the ambient temperature could significantly increase for instance from the opening of the oven door or steam from the hob that may result in a rapid rise in temperature close to the sprinkler activation temperature.	

2.4.17 It is considered that the overall size of the open plan apartment has limited impact on the level of life safety so long as the implied travel distance is achieved, as the operation of the sprinkler system would prevent fire spread to adjacent areas by suppressing the fire and controlling the fire size (or may extinguish the fire completely). It is proposed that the kitchens in this development would not require enclosing as the alternative safety features proposed would provide greater benefit.

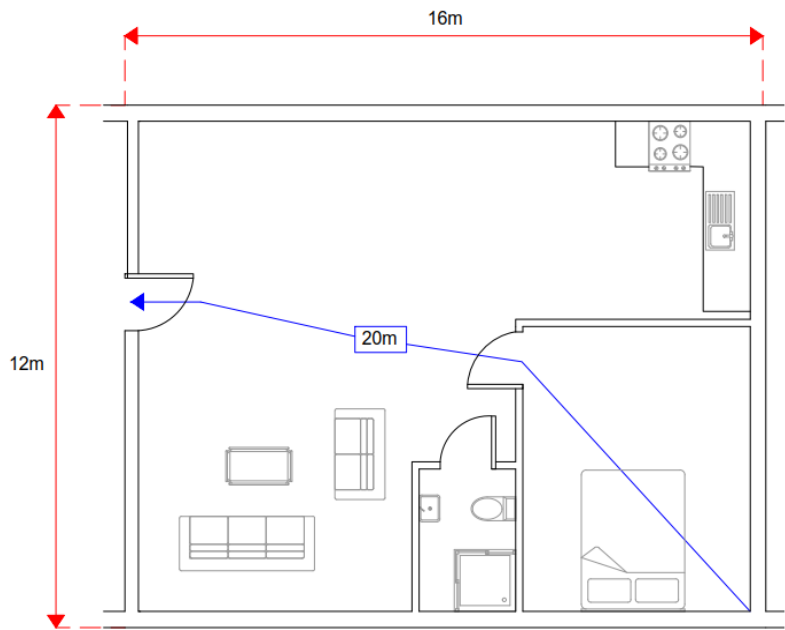


Figure 5: Travel Distance in Open Plan Apartments

Location of Cooking Facilities in Open-Plan Apartments

2.4.18 The cooking facilities must be located such that they will not prejudice the escape from any point within the apartments if they are involved in a fire. In order to ensure that the cooking facilities are located such that they will not prejudice the escape route from any part, the following analysis has been undertaken to determine the likelihood of the egress route being affected by the radiant heat from a cooking fire. The analysis will seek to determine that an appropriate separation distance can be maintained between the cooking area and the egress route such that the escaping occupants are not exposed to excessive radiation. In accordance with PD7974-6 (British Standards Institution, 2019) Table I.4 the tenability limits for received radiation are as follows;

- <2.5kW/m² for over 5 minutes
- 2.5kw/m² for 30 seconds
- 10kW/m² for 4 seconds

2.4.19 Generally, a tenability criteria of 2.5 kW/m² will be adopted as a received radiant heat flux on the basis that any received thermal radiation less intense than that value is tolerable for over 5-minutes. Detailed calculations for the locations of the cooking facilities have been provided in Appendix C – Cooking Fire Calculation of this report. A summary of the results has been provided below in Table 6. The “Dimension of x” as given in Table 6 refers to the x dimension indicated in Figure 6 below.

Table 6: Calculated Definition of “Remote” for Means of Escape

Additional Fire Protection System Provided	Dimension of x
None for a 2.5 kW ring	Greater than 1250 mm ^[1]

Note 1 : This is based on the electric cooker hobs not exceeding 2.5kW per hob which has been confirmed to be the case. Hobs specified as CDA HC6211FR Four Zone Ceramic Hob with max power of 1.8kW per ring.

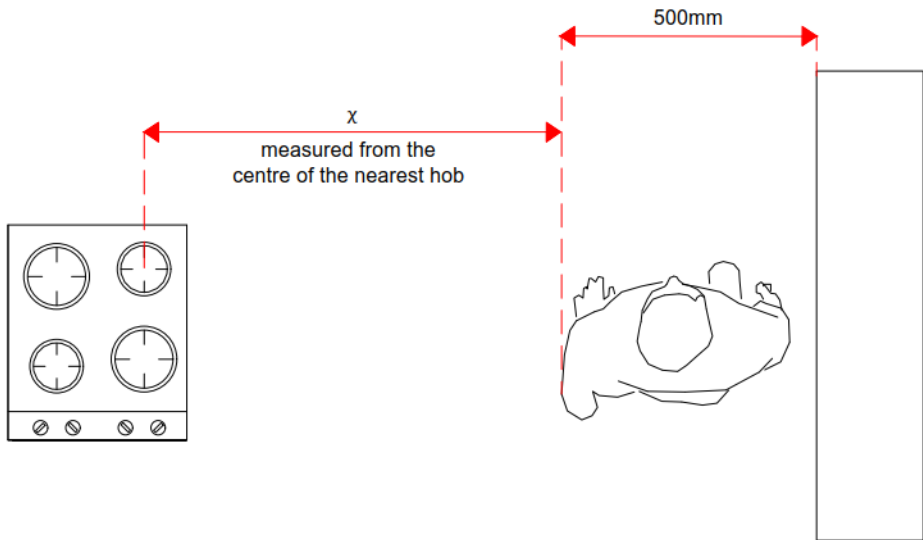


Figure 6: Separation distance from nearest hob to escape route

2.4.20 The open plan apartment types in Lampwick all have separation distances between cooking facilities and the nearest obstruction greater than 1750mm. Therefore, no additional fire protection systems are proposed to be provided to the cooking facilities. The separation distance (radii) between the cooking hob and the egress route in the open plan apartments has been highlighted on the fire strategy plans produced by JM Architects referenced in Table 1.

2.4.21 The following apartment types are to be provided with imperforate walls constructed to full height at the end of the kitchen worktop between the cooker and the escape route to act as a thermal shield.

- Apartment Type: 2Bed-02.1
- Apartment Type: 2Bed-02.2

2.4.22 A sample of the locations of the thermal shields based on the different apartment type layouts are shown below in Figure 7.

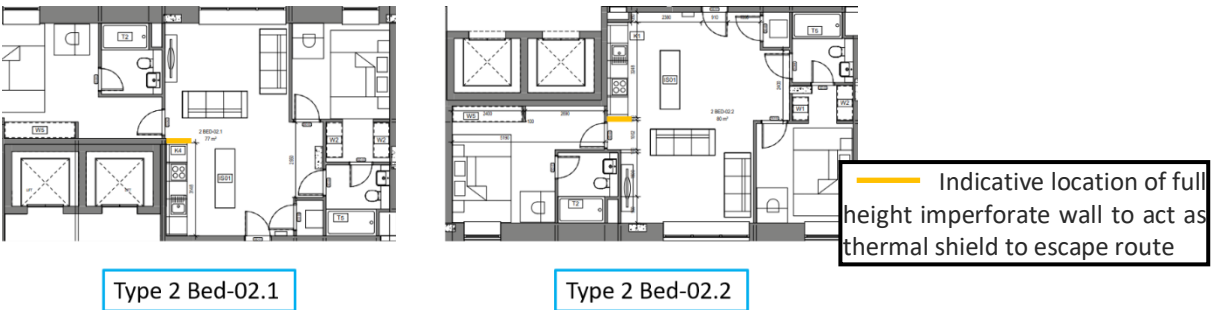


Figure 7: Thermal Shield Location

2.5 Horizontal Means of Escape (Common Corridors)

- 2.5.1 In accordance with BS 9991, travel distances in common corridors should be limited to 7.5m in a single direction or 30m where two directions of escape are possible. This is increased to 15m and 60m respectively when residential sprinklers in accordance with BS 9251 and smoke ventilation are provided. In unventilated corridors with alternative directions of escape, the travel distances remain limited to 30m to the storey exit.
- 2.5.2 The single direction travel distances comply with the recommended limits with the exception of Levels 1 to 5 of the North block and Levels 8 and 9 of the South Block which the single direction distance is extended up to c.29m. To compensate for these extended distances, enhanced mechanical smoke ventilation systems are to be provided to the common corridors adjoining the escape stairs. The smoke ventilation provision to the residential common corridors has been verified through CFD analysis to demonstrate tenable conditions are maintained to enable safe escape for the occupants to the storey exits. The results have been presented in a separate report which has been submitted to Building Control in support of the fire strategy. The proposed smoke ventilation strategy is a variation from the proposals within ARUPs ER's fire strategy report and is discussed in further detail in Section 2.8.
- 2.5.3 There is also a slightly extended multi-direction travel distance in the South block (Levels 1 to 7) where the travel distance from within an unventilated corridor to the storey exit is c.33m. However, the portion of travel within the unventilated corridor from an apartment entrance door to a cross-corridor door is within the 30m travel distance with the additional 3m of travel being in a ventilated section of corridor adjoining the escape stair. Given the enhanced mechanical smoke ventilation system proposed, this slightly extended travel distance is not considered to place occupants at an increased risk.
- 2.5.4 It is not proposed to sprinkler the main reception/amenity area. This is on the basis that:
- the amenity area is to be fire separated from the remainder of the building by 90-minutes fire resistance i.e. reduction in elements of structure to 60-minutes will not be applied here.
 - the amenity is separated from the residential stair in the north block by a ventilated firefighting lobby (and there is no residential accommodation adjoining this lobby on the ground floor level)
 - the stair is the north block discharges direct to external and does not require residents to enter the firefighting lobby to escape
 - to separate the ancillary area from the ventilated residential escape route of the south block, an additional protected lobby affording a minimum 60-minutes fire resisting construction is to be provided.
- 2.5.5 At Levels 1 to 7 of the South block, there are unventilated common corridors that do not adjoin the escape stairs. These corridors are to be separated from the ventilated corridors by self-closing cross-corridor doors designed to FD30s standard. Vision panels are to be provided to all doors on circulation routes.
- Refuse Stores**
- 2.5.6 Refuse chute rooms are located off the residential corridors. These are to be approached via a protected lobby provided with not less than 0.2m² permanent ventilation and the refuse chute rooms are to be sprinkler protected. Where the permanent ventilation is provided by a common shaft between floors, all vents to the common shaft should be fitted with a smoke control damper achieving the same period of fire resistance as the shaft. In the event of a fire in a bin store, the vent to the common shaft on the fire floor should remain open. The vents on all other storeys should close to avoid spread of smoke, regardless if smoke is detected on levels other than the fire origin level.
- 2.5.7 BS 9991 recommends that no ancillary accommodation should be accessed from a single direction (dead-end) escape route although this is currently the case for a number of refuse chute rooms. However, additional fire

protection measures are proposed between the risk posed by the bin chutes and the residential common corridors to include:

- The refuse lobby fire doors to the ventilated common corridors are to be enhanced to FD60s doors with double smoke seals.
- The bin chute enclosure extending from the unsprinklered main bin store should be constructed in a non-combustible material affording 90-minutes fire resistance. The other bin chute enclosures are required to be constructed in 60-minutes fire resistance.
- Refuse hopper doors should be fire-resisting and self-closing (counterweighted).
- All bin chutes should be provided with a fusible link fire shutter where the bin chute passes into the ground floor bin store. The fire shutter should provide an equivalent period of fire resistance as the bin chute it protects (see Table 8 for fire ratings).
- Contents of the lobby/chute room will be limited to sinks, water heaters with the only other electrical components being lighting, wiring for the fire alarm and cleaner's sockets.
- The refuse lobby doors are to have nuisance alarms linked to reception to alert the concierge if the associated doors have been left open for extended periods of time (specific time to be agreed with client).

2.5.8 Given the sprinkler protection to the chute room, enhanced fire-resisting construction, protected ventilated lobby between the chute room and common corridor, together with the low probability of ignition due to limited potential ignition sources, the proposed locations are considered acceptable. This has been agreed with MCCBC.

2.6 Horizontal Means of Escape (Ancillary Areas)

- 2.6.1 The staff room is accessed directly off the reception/entrance lobby with provision appropriate for the inner room in accordance with current guidance.
- 2.6.2 The cleaners/parcel/maintenance store connects to the firefighting lobby on the ground floor of the North block. As such, the storeroom is accessed directly from the firefighting lobby as there is no permanently ventilated lobby provided to the store. However, it is proposed that the storeroom, which is accessed directly from the firefighting lobby, will be provided with an AOV in the external wall achieving a minimum 1.0m² free area to ventilated the room directly and the door to the store will be an upgraded FD60s fire door fitted with double smoke seals. The AOV would activate on local activation of the detection within the storeroom only. To further mitigate the slight variation to the guidance:
- the store is sprinklered;
 - the enhanced mechanical smoke extract to the firefighting lobby will protect the residential stair;
 - the store is significantly smaller than the open-plan apartments opening into firefighting lobbies/corridors on the upper levels therefore the potential fire load of the room is not considered to be significantly different (or greater) than the potential fire load within the much larger open-plan apartments; and
 - the room would be under the control of management such that the risks can be managed/mitigated as part of the Responsible Persons duties under the Regulatory Reform (Fire Safety) Order 2005 to undertake a fire risk assessment. In comparison, management have no such control over the risks within the private apartments.
- 2.6.3 Where escape from the amenity space is through the residential corridor and Stair 2 of the South Block, any doors should be readily openable in the event of a fire. This will need to be taken account of in the selection of the security measures provided, see Section 2.8.26 for recommendations for doors on escape routes serving more than 60 people.

- 2.6.4

It is to be ensured that escape from the car park area is available at all times and any access-controlled doors/gates are fitted with appropriate escape hardware and failsafe devices as necessary.
- 2.6.5

The single direction travel distance in the water tank room and generator room following fit-out of equipment should be ≤ 9m.

Commercial Units

- 2.6.6

Travel distances within the Commercial units are compliant and the final exit doors are to open inwards to prevent collision with pedestrians. Refer to Section 2.2 for occupancy limitations.

Rooftop

- 2.6.7

Due to the design of the building, there are five rooftops:

 - Level 5 of the connection between the two buildings
 - Level 6 of the North block
 - Level 8 of the North block
 - Level 8 of the South block
 - Level 10 of the South block
- 2.6.8

The rooftops at Level 8 of the North block and Level 10 of the South block are accessed via an escape hatch and fixed ladder that leads directly into the escape stair. They are accessed within the 60m single direction of travel limit and so are compliant.
- 2.6.9

Level 8 of the South block and Levels 5 and 6 rooftops accessed from the North Block have escape routes leading onto residential corridors and therefore are not in accordance with the recommendations of BS 9991. As such it is proposed a single sprinkler flow switch is being installed within the main service riser on each floor level. If a sprinkler head activates within any of the apartments on the respective floor level, a signal will be sent to the fire alarm panel via an interface linked to this flow switch. The system is to be programmed to activate a sounder on the relevant roof level should this occur to provide early fire warning to persons on the roof. Additionally, the smoke detection on the common residential corridors should be programmed to activate the sounders on all roof levels should a corridor smoke detector activate. If hearing protection is likely to be required for roof maintenance, then visual and audible warning should be provided on the rooftops.
- 2.6.10

The above proposals are considered acceptable on the basis that the rooftops are to be for maintenance and authorised persons only. The roof access doors/hatches should be secured to that residents cannot access the rooftops. The building management will be required to implement permit to work procedures for roof access.

Roof Access/Exit Doors Providing Replacement Air for Smoke Control Systems

- 2.6.11

There are two doors giving access to the roofs for maintenance from the residential common corridors that also serve as AOV’s providing replacement air for the mechanical smoke extract systems. These are located on Level 6 North Block and Level 8 South Block. Where roof access doors also serve a dual purpose as AOVs, a suitable method of preventing unauthorised access onto the roofs should be provided that does not affect the operation of the AOVs which are life safety systems. Both doors will be fitted with a RAM (actuator) and are required to power open and act as a source of inlet air.
- 2.6.12

These doors should be able to be isolated or, an override provided when roof access is required. This is so the smoke vent dampers do not lock-out on all other floors when the AOV is opened for roof maintenance purposes i.e. in the event of a fire on another floor when roof maintenance works are ongoing, the smoke control system on the fire floor should still operate even if the roof door AOV has been opened.

- 2.6.13

These doors must fail safely into the open position in the following occurrences:

 - On operation of fire detection system within the common corridor to support the smoke ventilation regime
 - On system error.
 - On loss of power or the system to be provided with emergency power supply.
- 2.6.14

The fail-safe system of the door shall be provided in accordance with BS 7036-0, which references durability testing in accordance with BS EN 16005. To ensure the reliability of the system, the number of cycles the door set is tested for to be more than the actual frequency of use.

2.7 Vertical Means of Escape

- 2.7.1

The North block is served by a single stair (Stair 1) from ground floor to Level 7. The South block is served by two stairs (Stairs 2 & 3) from ground floor to Level 7, with one stair (Stair 2) continuing up to Level 9.
- 2.7.2

Stairs 1 and 2 will be designed as firefighting stairs and are to have a minimum clear width of 1100mm. The width should be measured between the walls and/or balustrades (where handrails and strings that do not intrude more than 100mm into these widths may be discounted).
- 2.7.3

Stair 3, which is designed as a protected stair, is also to have a minimum clear width of 1100mm as part of the justification for the South Block containing one firefighting shaft as discussed in Section 6.2.
- 2.7.4

The final exits from each stair should be at least as wide as the stair they serve.
- 2.7.5

All stairs will be vented at the head via an AOV achieving a minimum 1.0m² free area that can be remotely operated within the stair at Fire and Rescue Service access level.
- 2.7.6

Clear signage should be provided on the landing in the stair and adjacent to the firefighting lift entrances to identify the floor level number.
- 2.7.7

Measures should be provided to ensure vehicles do not block the stair final exits. It is understood landscaping is to be provided outside the final exits of stairs 1 and 2. A suitable barrier should be provided outside final exit to stair 3 i.e. vehicle bollards.

External Fire Protection to Stair 2

- 2.7.8

Stair 2 is adjacent to and at a 90-degree internal angle to the bin chute room at ground floor. Therefore, it is proposed that the final exit door from stair 2 is an FD60 self-closing fire-resisting door (hung to swing outwards towards the bin store). We have assessed the fire protection of the external enclosures between the bin store and stair 2 against the recommendations of BS 9991 and consider the FD60 door acceptable to afford protection to the stair from the bin store on the basis that:

 - In unlikely event of fire in bin store, the bin store is protected with sprinklers which will control/suppress the fire limiting its size given it’s a relatively small room.
 - Given the bin store is at ground floor with external access, the Fire Brigade would fight the fire externally rather than from stair 2.
 - The products of combustion would vent through the louvre panels either in or above the external bin store door to external and the suppressing effect of the sprinklers would likely reduce the heat output from having a significant effect on the FD60 self-closing door protecting the stair.
 - The building will operate a ‘defend in place’ evacuation strategy so an outbreak of fire in bin store would not initiate evacuation of any apartments. However, should any persons be at the base of Stair 2 or, in an ancillary area at the time of the outbreak of fire, these persons would have alternate means of egress from Stair 2 via the ground floor corridor to the final exit from Stair 3 or through the ancillary/entrance area.

2.8 Smoke Ventilation Provisions

Common Corridors/Lobbies

- 2.8.1
- The corridor smoke ventilation adjoining all escape stairs will be provided by an enhanced mechanical ventilation solution. This is a variation from the smoke ventilation strategy in ARUPs ER’s fire strategy report.
- 2.8.2
- The use of the mechanical smoke ventilation solutions has been validated with CFD analysis with the results presented in a separate Corridor CFD Analysis report (ref OF-CFD-3073-01-A) and further Common Corridor CFD Comparison report requested by MCCBC (ref OF-CFD-3073-03-C). A number of worst-case apartment fire locations (opposite stair doors to the longest corridors) have been modelled to demonstrate tenable conditions are maintained to enable safe escape for the occupants to the final exits. A fire in an apartment furthest from the stair has also been modelled (on the longest corridors) as a comparison to the apartments located opposite stair doors. Additionally, a further two ventilated corridors of different geometry in the South Block have been validated through CFD analysis with the results incorporated in the CFD report that has been submitted and agreed with MCCBC.
- 2.8.3
- The smoke ventilation for the residential common corridors is illustrated on drawings in Appendix E – *Smoke Ventilation Strategy* and is summarised below. The design criteria principle for the smoke ventilation strategy should be read in conjunction with the CFD analysis report.
- 2.8.4
- Confirmation the system installed on site meets the performance specification outlined should be provided from the smoke control installer at testing and commissioning.

North Block - Ground Floor

- 2.8.5
- The lobby adjoining Stair 1 at ground floor will be provided with a mechanical extract shaft (extending down from the floor above) which achieves 0.8m² cross-sectional free area with a damper opening into extract shaft from the common corridor achieving a geometric free area of 0.6m².
- 2.8.6
- The system will be a pressure-controlled system at this level such that, on actuation of smoke detection in the ground floor firefighting lobby, the extract fan will automatically ramp up, and ramp down based on the pressure levels in the lobby. The extract rate will depend on the pressure differential system in the lobby throughout all stages of the fire. The extraction rate will increase up to 4.5m³/s when suitable inlet is provided via the stair/external door and will reduce as the pressure decreases when the stair/external door is closed. The system has been designed to ensure that the pressures in the corridor do not drop below -50Pa.

North Block – Level 1 to 5

- 2.8.7
- The common corridors at Levels 1 to 5 of the North block have been designed as a single undivided corridor which is provide with:
 - a mechanical smoke extract shaft (0.8m² free area with dampers opening into smoke extract shaft from the common corridor achieving a geometric free area of 0.6m²);
 - the fans to the mechanical smoke extract shaft will extract at a rate of 4.5m³/s;
 - natural replacement air inlet shaft (0.4m² free area with dampers opening into inlet shaft from the common corridor achieving a geometric free area of 0.4m²); and
 - AOV to external providing replacement air achieving a minimum free area of 0.8m² at opposite end of corridor to inlet shaft

North Block – Level 6 and 7

- 2.8.8
- The common corridors at Levels 6 and 7 of the North block have been designed as a single undivided corridor which is provide with:
 - a mechanical smoke extract shaft (0.8m² free area with dampers opening into smoke extract shaft from the common corridor achieving a geometric free area of 0.6m²);
 - the fans to the mechanical smoke extract shaft will extract at a rate of 4.5m³/s;
 - natural replacement air inlet shaft (0.4m² free area with dampers opening into inlet shaft from the common corridor achieving a geometric free area of 0.4m²); and
 - AOV to external providing replacement air achieving a minimum free area of 0.6m² at opposite end of corridor to inlet shaft.

South Block Ground Floor (Stair 2)

- 2.8.9
- The common corridor adjoining Stair 2 at ground floor of the North block is to be provided with:
 - a mechanical smoke extract shaft (0.8m² free area with damper opening into smoke extract shaft from the common corridor achieving a geometric free area of 0.6m²);
 - the fans to the mechanical smoke extract shaft will extract at a rate of 3.5m³/s;
 - natural replacement air inlet duct (0.2m² free area ducted to external in fire-resisting construction within 2m from end of corridor); and
 - AOV to external providing replacement air achieving a minimum free area of 0.6m² at opposite end of corridor to inlet duct. This vent/opening to the undercroft is to be protected by 60-minute fire and smoke rated louvre/damper.

South Block Ground Floor (Stair 3)

- 2.8.10
- The common corridor adjoining Stair 3 at ground floor of the South block is to be provided with:
 - a mechanical smoke extract shaft (0.8m² free area with damper opening into smoke extract shaft from the common corridor achieving a geometric free area of 0.6m²);
 - the fans to the mechanical smoke extract shaft will extract at a rate of 3.5m³/s; and
 - AOV to external providing replacement air achieving a minimum free area of 0.6m². This vent/opening to the undercroft is to be protected by 60-minute fire and smoke rated louvre/damper.

South Block Level 1 to 4 (Stair 2)

- 2.8.11
- The common corridors adjoining Stair 2 at Levels 1 to 4 of the South block are to be provided with:
 - a mechanical smoke extract shaft (0.8m² free area with dampers opening into smoke extract shaft from the common corridor achieving a geometric free area of 0.6m²);
 - the fans to the mechanical smoke extract shaft will extract at a rate of 3.5m³/s;
 - natural replacement air inlet shaft (0.4m² free area with dampers opening into inlet shaft from the common corridor achieving a geometric free area of 0.4m²); and
 - AOV to external providing replacement air achieving a minimum free area of 0.4m².

South Block Level 5 to 7 (Stair 2)

- 2.8.12
- The common corridors adjoining Stair 2 at Levels 5 to 7 of the South block are to be provided with:
- a mechanical smoke extract shaft (0.8m² free area with dampers opening into smoke extract shaft from the common corridor achieving a geometric free area of 0.6m²);
 - the fans to the mechanical smoke extract shaft will extract at a rate of 3.5m³/s; and
 - AOV to external providing replacement air achieving a minimum free area of 0.6m².

South Block Level 1 to 7 (Stair 3)

- 2.8.13
- The common corridors adjoining Stair 3 at Levels 1 to 7 of the South block are to be provided with:
- a mechanical smoke extract shaft (0.8m² free area with dampers opening into smoke extract shaft from the common corridor achieving a geometric free area of 0.6m²);
 - the fans to the mechanical smoke extract shaft will extract at a rate of 3.5m³/s; and
 - AOV to external providing replacement air achieving a minimum free area of 0.6m².

South Block Levels 8 and 9

- 2.8.14
- The common corridor adjoining Stair 2 at Levels 8 and 9 of the South block have been designed as a single undivided corridors which are provide with:
- a mechanical smoke extract shaft (0.8m² free area with dampers opening into smoke extract shaft from the common corridor achieving a geometric free area of 0.6m²);
 - the fans to the mechanical smoke extract shaft will extract at a rate of 3.5m³/s; and
 - two AOVs to external providing replacement air achieving a minimum free area of 0.6m² and 0.4m² respectively.

Other Smoke Ventilation

- 2.8.15
- An AOV with a minimum 1.0m² free area is required at the head of each stair. The AOV at the head of each stair should be controllable with a fire service override located in the stair at Fire and Rescue Service access level in addition to opening automatically on detection of smoke in the common lobby/corridor.
- 2.8.16
- The refuse rooms (located off residential corridors) shall be accessed from ventilated lobbies adjoining the residential common corridors. The refuse lobbies shall be provided with no less than 0.2m² of permanent ventilation. See also paragraph 2.5.6.
- 2.8.17
- Where the 0.2m² fire and smoke rated dampers are provided in the independent ground floor refuse lobbies (Zone 2 and 3), the vents/openings to the undercroft from the ground floor bin chute lobbies would be protected by 60-minute (E60S_a) fire and smoke rated louvre/dampers. These will operate as follows:
- the dampers should be in the open position for day to day operation to provide the permanent ventilation to the bin lobby.
 - smoke detector in refuse lobby activated – damper closes to maintain 60-minute compartmentation to bin lobby.
 - smoke detector in bin store or corridor adjacent to bin lobby activated – damper stays open to vent lobby & cannot be subsequently overridden by detection in bin lobby (to prevent this detector from subsequently activating and closing fire damper).

Mechanical Smoke Extract Shaft Design

- 2.8.18
- Where specified, the mechanically assisted smoke extract shafts will meet the following criteria:
- Have a minimum cross-sectional free area of 0.8m² and a 0.6m² free area AOV opening into the corridor from the shaft.
 - The operation of the mechanical shafts would be upon a smoke detector activating in the common corridor. The extract fans to the shaft in the North Block will extract at a rate of 4.5m³/s and the extract fans to the shafts in the South Block will extract at a rate of 3.5m³/s.
 - Note the extract fan serving ground floor of the North Block is to be configured as a pressure controlled system whereby, on actuation of smoke detection in the ground floor lift lobby, the extract fan will automatically ramp up, and ramp down based on the pressure levels in the lobby. The extraction rate will increase up to 4.5m³/s when suitable inlet is provided via the stair door and will reduce as the pressure decreases when the stair door is closed. The system will be designed to ensure that the pressures in the corridor do not drop below -50Pa.
 - The smoke shafts are to include duplicate fans (duty and standby) with alternative power supplies. The fans in the extract shafts are to be fire rated in accordance with the recommendations of BS EN 12101 and BS 7346-7.
- 2.8.19
- Upon detection of smoke in a common corridor adjoining an escape stair, the relevant smoke control system serving the affected corridor should activate. The smoke vents/air inlets on the fire floor, the vent at the top of the natural inlet shaft and the vent at the head of the relevant stair should open and mechanical smoke extract fans should begin to run at design speed. The vents on all other storeys should remain closed to avoid spread of smoke and loss of ventilation rate, regardless if smoke is detected on levels other that the fire origin level.
- 2.8.20
- The extract fans should be positioned to extract smoke in the opposite direction to the stair AOVs to prevent recirculation.
- 2.8.21
- The mechanical extract shafts and replacement air shafts should be constructed of materials classified as A1 in accordance with BS EN 13501-1:2007+A1, or of materials determined to be non-combustible when tested in accordance with BS 476-4, or of any material which when tested in accordance with BS 476-11 does not flame or cause any rise in the temperature on either the centre of the specimen or the furnace thermocouple. It should be noted that the non-combustibility requirement also applies to grilles at floor level, and so GRP grilles cannot be used in the smoke shafts and paper-faced plasterboard is not A1-rated.
- 2.8.22
- No services other than those relating to the smoke shafts should be contained within the smoke shafts.

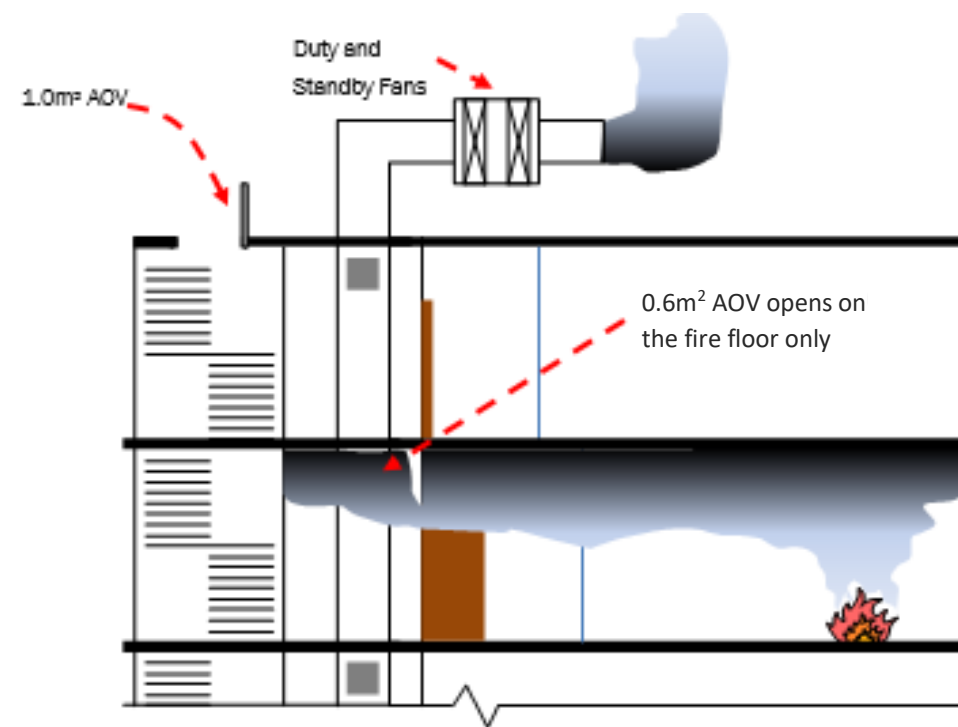


Figure 8: Typical Mechanical Vent Shaft

2.8.23 With regards to the location of the smoke extract shafts, it has been noted by Building Control that Clause 14.2.3.2 j) (for natural ventilation) of BS 9991 states that the smoke shaft should be located at the remote end of the corridor away from the staircases, and that Clause 14.2.4 (for mechanical ventilation) states that this clause should be followed. This is applicable to mechanical smoke ventilation systems where no inlet air is provided, and the system is designed for schemes with compliant layouts. Appendix A of BS 9991 specifically addresses mechanical ventilation systems provided in circumstances there are extended corridors in Section A.3. The clause states that the primary objective of these systems is to return the extended corridor and associated staircase enclosure to tenable conditions for means of escape and rescue purposes. BS 9991 then defers to the SCA guidance and PD 7974-6 for further guidance. The smoke ventilation system provided has been assessed in accordance with those documents and deemed to meet the functional requirement of the Building Regulations. The position of the smoke shaft is referenced in the SCA guide as a consideration for fire service access, such that the fire service can approach an apartment fire in the direction of air flow. This is not given as a requirement, and the SCA guide advises that where this is not achieved, the authority having jurisdiction should be consulted. Given that the apartments are sprinklered, the solution is proposed to be acceptable based on the additional deterministic CFD modelling in accordance with BS 7974 submitted that demonstrates that the conditions (temperature, visibility, velocity compared against recognised tenability criteria) in the fire engineered solution return to safe levels and therefore, provide justification for the proposed solution. The proposed suppression system would significantly reduce the risk of a fire spreading beyond the compartment of fire origin. Should a fire start in one of the apartments or ancillary areas, the quantity (cubic volume) of smoke produced would be significantly lower and would have significantly lower temperature due to the growth of the fire being limited by the automatic suppression.

2.8.24 A separate CFD comparison report between the proposed case and a model of the same layout with the extract shaft at the far end of the corridor has been submitted and agreed with MCCBC that demonstrates that the alternative solutions provide equal levels of safety over the recommended code-compliant cases and that the alternative solution fulfils the intent of the functional requirements of the Building Regulations.

Automatic Opening Vents (AOVs)

2.8.25 The typical method to calculate the free area of the AOVs is highlighted in Figure 9. All AOVs/dampers in the Lampwick development should conform to the method outlined below.

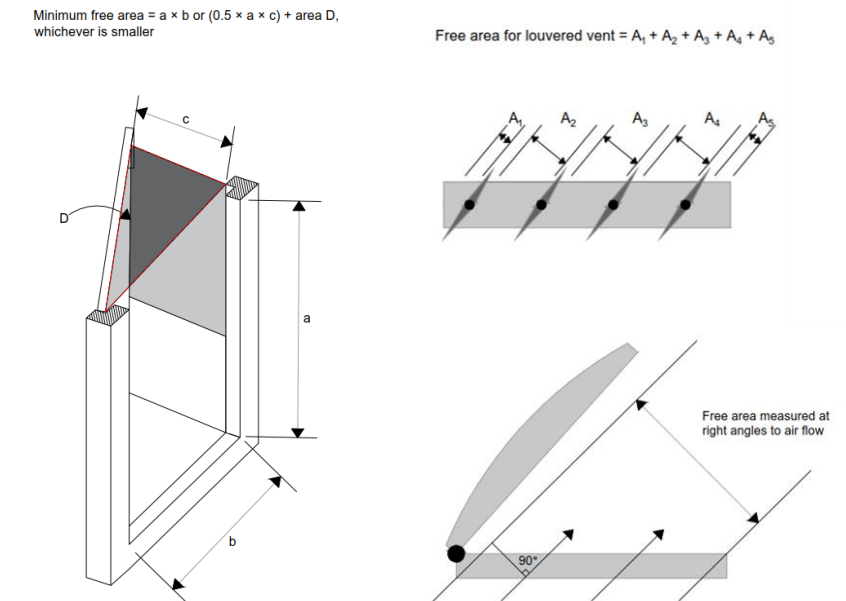


Figure 9: Free Area of Smoke Ventilation

2.8.26

2.9 General Means of Escape

Doors on Escape Routes

- 2.9.1 Access control measures incorporated into the design of the building which restrict access or egress from the building should not adversely affect the means of escape. If some escape routes are secured outside of normal hours the remaining measures should be sufficient to allow safe egress of any persons remaining within the building.
- 2.9.2 Doors on escape routes (whether or not the doors are fire doors) should:
- Only be fitted with simple fastenings that can be readily operated from the side approached by persons making an escape without the use of a key, code and without having to manipulate more than one mechanism;
 - Be hung to open not less than 90 degrees;
 - Should be sufficiently recessed to prevent its swing from encroaching on the required egress route of the escape route or stair;
 - Provided with vision panels if they are provided to sub-divide corridors or where doors are hung to swing both ways.
- 2.9.3 Doors on escape routes serving more than 60 people should be:
- Provided with panic fastenings in accordance with BS EN 1125 if locks are required;
 - Hung to swing in the direction of escape, if escape is available in both directions these doors should be double swing door sets.
- 2.9.4 Final exit doors at the base of the common stairs should be as wide as the stair they serve (i.e. 1100mm).
- 2.9.5 Clear door widths to other doors along escape routes are to be a minimum of 800mm based upon the proposed occupancies, unless specified otherwise within the report. It should be ensured the clear width of all doors in the building are measured in accordance with Figure 10.
- 2.9.6 If electrically powered locking mechanisms are provided, these should be configured to return to the unlocked position on operation of the fire alarm system or loss of power and be designed and installed in accordance with BS 7273 Part 4 - *Actuation of release mechanisms for doors*.
- Where electromechanical locks are used for access purposes, these should be capable of being manually overridden with a simple thumb turn or lever handle on the escape side and occupants should not have to manipulate more than one release mechanism.
 - Where electromagnetic security devices are used, a double-pole emergency override (typically a green break glass box) door release unit should be provided adjacent to the exit to comply with BS 7273 Part 4. A suitable sign should be provided which indicates the emergency operation of the release mechanism.
- 2.9.7 Where access to the means of escape is provided via a room, it should be ensured that appropriate measures are in place which would allow for the access doors to be opened without the need of a key. Doors should either failsafe open or, be provided with a break glass unit, or other appropriate systems.

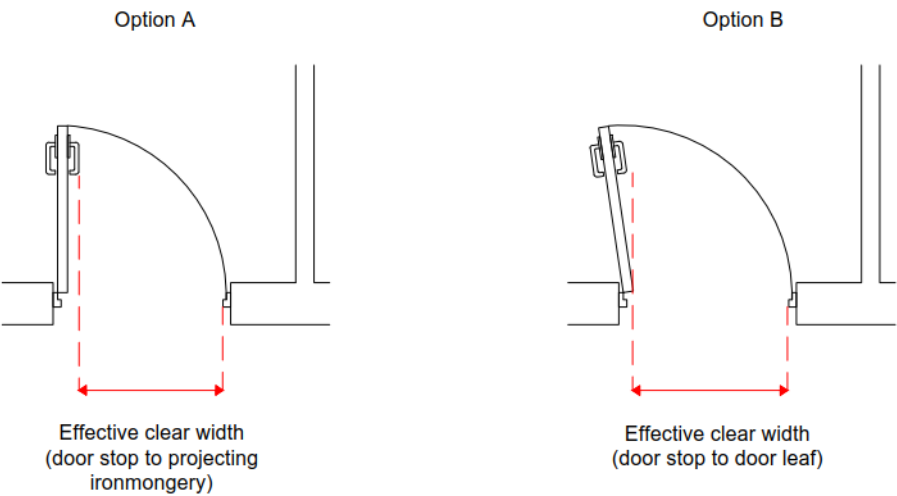


Figure 10: Measurement of Door Width

2.10 Evacuation of Disabled People

- 2.10.1 There is no requirement in Building Regulations for disabled provisions within the residential accommodation. In the event of a fire, the building is afforded with enhanced levels of compartmentation which allows occupants to remain in the non-fire affected apartment. If a fire was to initiate within an apartment, the disabled occupants can evacuate to the relative safety of the protected common corridor. Furthermore, the disabled occupants could then move into the protected stair core (very few occupants should be using the stairs for evacuation at any one time, such that the implications of restrictions in the stair would be minimal).
- 2.10.2 Consideration ought to be given for people who are deaf and hard of hearing in the design of the fire warning system. If the adoption of flashing beacons or vibrating pagers is considered, an appropriate interface will need to be provided to the alarm system.
- 2.10.3 All the ancillary areas are located on ground floor level. It has been confirmed there is level access from ground floor to the final exits therefore the provision of disabled refuges would not be required.
- 2.10.4 Each of the commercial units at ground floor will be provided with escape direct to external without negotiating steps therefore no additional provisions are required for disabled occupants.

2.11 Emergency Escape Lighting

- 2.11.1 Emergency lighting will be designed and installed in accordance with BS 5266-1:2016 and BS EN 1838:2013 to conform with the recommendations of BS 9991.
- 2.11.2 The escape lighting should be sited to provide an appropriate luminance near each exit door and where it is necessary to emphasise potential danger or safety equipment. The following bullet points indicate some of the critical areas:
- At each exit door intended to be used in an emergency
 - Near stairs so that each flight of stairs receives direct light
 - Near any other change in level
 - Mandatory emergency exits and safety signs
 - At each change of direction
 - At each intersection of corridors
 - Outside and near to each final exit
 - Near each first aid post
 - Near each piece of firefighting equipment, call point and control and indicating equipment (fire alarm/smoke vent panels).

2.12 Emergency Escape Signage

- 2.12.1 Except within an apartment, fire escape signs are to be provided to guide occupants from any point in a building, via a place of relative safety (the escape route) to the place of ultimate safety (outside the building). Exit and directional signage should be provided in accordance with the requirements of BS ISO 3864-1:2011 and BS 5499-4:2013.
- 2.12.2 Signage is provided to identify the primary escape route from each location within the building. To achieve this, the following principles have been adopted:
- At least one escape route or doorway leading to an escape route should be visible from any place within every room or enclosure.
 - Where direct sight of the escape route is obstructed, additional signage is to be considered
 - Escape route signage is to take precedence over all other signs
 - All changes of direction in corridors, stairways and open spaces forming part of an escape route will be marked with intermediate signs. Each intermediate door or junction will also be similarly signed.
 - Signs are not to be fixed to doors or sited where they are obscured by open doors
- 2.12.3 Escape route signs are to be sited conspicuously within the normal field of vision. The following principles, which will assist the evacuating occupants to predict the location of successive signs should be applied:
- Signs above doors or open spaces should be mounted between 2m and 2.5m from the floor level, measured to the base of the sign and be sited as close to the centre line of the escape route as practicable
 - Signs sited on walls should be mounted between 1.7m and 2m from the floor level to the base of the sign
 - Signs should be sited at the same height throughout the escape route, so far as is reasonably practicable.

3 Internal Fire Spread

3.1 Linings

- 3.1.1

The choice of materials for walls and ceilings can significantly affect the spread of a fire and its growth, even though they are not likely to be the materials that first ignited. It is particularly important in circulation spaces where the rapid spread of fire is most likely to prevent occupants from escaping. The surface linings are restricted by limiting the surface spread of flames and minimising heat release rates.
- 3.1.2

All surface finishes are to achieve the classification in Table 7 when tested under the national classifications in accordance with BS 476 or the European classifications in accordance with BS EN 13501-1.

Table 7: Classification of Internal Linings

Location	National Class	European Class
Small room not more than 4m ² in the residential accommodation	3	D-s3, d2
Rooms not more than 30m ² in the non-residential areas	3	D-s3, d2
Other rooms/Circulation spaces within dwellings	1	C-s3, d2
Escape routes, stairs	0	B-s3, d2

- 3.1.3

Parts of walls in rooms may be of poorer performance than specified in Table 7 (but not less than Class 3 / 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 20m² in residential accommodation and 60m² in non-residential accommodation.

3.2 Construction of Escape Stairs

- 3.2.1

The flights and landings of every escape stair should be constructed of materials of limited combustibility as each stair serves a storey having a floor level more than 18m above ground and stairs 1 and 2 are firefighting stairs.
- 3.2.2

In satisfying the above conditions, combustible materials may be added to the horizontal surface of stair 3 which is not designed as a firefighting stair.

3.3 Structural Requirements

- 3.3.1

Premature failure of the structure can be prevented by provisions for load bearing elements of structure to have a minimum standard fire resistance, in terms of resistance to collapse or failure of load bearing capacity.
- 3.3.2

The purpose of providing the structure with fire resistance is:
 - To minimise the risk to occupants
 - To reduce the risk to firefighters who may be engaged on search and rescue operations
 - To reduce the danger to people in the vicinity of the building
- 3.3.3

The height of the building is between 18m and 30m when measured from the lowest external ground to the topmost occupied floor therefore, in accordance with the requirements of BS 9991 the building should be afforded with 90 minutes structural fire protection.

- 3.3.4

The inclusion of sprinklers allows a reduction in elements of structure to 60-minutes; however, it is not proposed to provide sprinklers to all the ancillary accommodation located at ground floor. On this basis, where sprinkler protection is not provided, 90-minutes structural fire resistance is to be provided.
- 3.3.5

The exceptions to this are the fire protection of the elements of structure for a firefighting shaft, as these will require 120 minutes fire-resisting construction.
- 3.3.6

The period of fire resistance refers to the performance achieved by the structural elements when tested in accordance with the appropriate parts of BS 476 for load bearing elements of structure.

3.4 Elements of Structure

- 3.4.1

Elements of structure are defined as follows:
 - A member forming part of the structural frame of a building or any beam or column;
 - A load bearing wall or load bearing element of wall;
 - A floor;
 - A gallery;
 - An external wall structure supporting fire rated elements for the prevention of external fire spread;
 - A compartment wall.
- 3.4.2

The following are excluded from the definition of elements of structure
 - A structure that only supports a roof unless
 - The roof performs the function of a floor such as parking vehicles or as a means of escape
 - The structure is essential for the stability of any wall which needs to have fire resistance
 - The lowest floor of the building
- 3.4.3

Where one element of structure supports, carries or gives stability to another, the fire resistance of the supporting element should be no less than the minimum period of fire resistance for the other element (whether that other element is load bearing or not).

3.5 Residential Sprinkler System

- 3.5.1

The building is to be sprinkler protected in accordance with BS 9251:2014 – *Sprinkler systems for residential and domestic occupancies – Code of practice* and BS 9252:2011 – *Components for residential sprinkler systems – Specification and test methods for sprinkler systems*.
- 3.5.2

The sprinkler system to the residential areas shall be to Category 3 standard and have a water duration of a minimum of 60 minutes to achieve the reduction in period of fire resistance from 90 minutes to 60 minutes for the sprinkler protected areas including parts of the ground floor and all upper floors as per Table 2 of BS 9991.
- 3.5.3

Sprinkler protection is to be provided to all apartments (including duplexes) and to the refuse stores and lobbies that connect with the residential accommodation located on both the ground and upper floor levels. Sprinklers will also be provided to the cleaners/parcel/maintenance store located in the North Block.
- 3.5.4

Sprinklers are not proposed in other ancillary spaces including the large, externally accessed bin store at ground level, amenity spaces, back of house areas or plant rooms. Sprinklers are not proposed to the commercial units. This is on the basis that these areas are fire separated from the remainder of the building by 90-minutes fire resistance.
- 3.5.5

It is not proposed to provide sprinklers to the common corridors or stairs as these will be fire sterile areas.

- 3.5.6 As LD1 detection is to be provided to all apartments a sprinkler alarm valve is only required per floor.
- 3.5.7 Sprinkler protection should be provided in full accordance with BS 9251:2014 to all areas of the premises where the elements of structure are being reduced to 60-minute fire protection. However, the following may be excluded:
- bathrooms with a floor area of less than 5m²;
 - cupboards and pantries with a floor area of less than 2m² or where the least dimension does not exceed 1m and the walls and ceilings are covered with non-combustible materials or materials of limited combustibility;
 - crawl spaces;
 - ceiling voids;
 - uninhabited loft/roof voids;
 - residential common corridors;
 - common escape stairs;
 - lift cores;
 - Large bin store externally accessed;
 - Amenity space/reception/and adjoining ancillary accommodation (see section 2.5.4 for further justification);
 - Cycle store, comms room, water tank room, LV/switch room, generator room, essential switch room, substation; and
 - Independent commercial units.

4 Compartmentation

4.1 Compartmentation Requirements

- 4.1.1 Each apartment is to be a separate compartment and all-party walls (and walls to common areas) are to be compartment walls. As the building provides residential accommodation all floors are to be constructed as compartment floors. The compartment floors should achieve 60-minutes fire resistance (REI60). Where sprinkler protection is not provided, 90-minutes fire resistance (REI90) is to be provided.
- 4.1.2 Fire doors should be provided with positive action self-closing devices except doors to risers, stores, plant rooms that are to be kept locked shut.
- 4.1.3 Table 8 and Table 9 provide a summary of the specific fire compartmentation requirements.

Table 8: Compartmentation Summary

Floor/Wall Location	Fire Rating (Minutes)	European Standard (Minutes) *	Method of Exposure
Compartment Floors Above 120-minute fire-resisting enclosures i.e. Water Tank Room, Generator Room, Essential Switch Room, LV/Switch Room and Substation	120 ¹	REI 120 ¹	From underside
First Floor slab separating other non-sprinklered areas from the residential floor above (including undercroft)	90	REI 90	From underside
All Other Compartment Floors	60	REI 60	From underside
Firefighting Stairs	120	REI 120	From both sides
Firefighting Lifts	120	REI 120	From both sides
Protected Stairs	60	REI 60	From both sides
Passenger Lift	60	REI 60	From both sides
Service risers/shaft walls ²	60 (90 where they connect to non-sprinklered ancillary areas at ground), see Figure 12	REI 60 (REI 90 where they connect to non-sprinklered ancillary area at ground)	From both sides
Walls separating apartments	60	REI 60	From both sides
Walls separating apartments from common corridor	60	REI 60	From both sides
Separation between undercroft car park and residential corridor and bin store/lobbies	60 ³	REI 60 ³	From both sides
Walls separating apartments from ancillary accommodation at ground floor	90	REI 90	From both sides
Smoke extract and natural air inlet shafts	60	REI 60	From both sides

Floor/Wall Location	Fire Rating (Minutes)	European Standard (Minutes) *	Method of Exposure
Commercial Units	90	REI 90	From both sides
Comms Room	90	REI 90	From both sides
Water tank/Sprinkler room	120	REI 120	From both sides
Generator/Essential Switch Room	120	REI 120	From both sides
LV Switch Room	120	Rei 120	From both sides
Substation	120 ¹	REI 120 ¹	From both sides
Walls to other unsprinklered ancillary compartments	90	REI 90	From both sides
Duplex with Protected Stair Enclosure	30	REI 30	From both sides
Underside of protected stairs in duplex apartments from store cupboards	30	REI 30	From underside
Residential Corridor Ceilings ⁴	60	EI 60	From underside
Refuse Stores located off residential corridors	60	REI 60	From both sides
Bin chute enclosures (to sprinklered refuse rooms)	60	REI 60	From both sides
Bin chute enclosure (from unsprinklered main bin store)	90	REI 90	From both sides
Place of special fire hazard	30	REI 30	From both sides
Protected areas of external walls more than 1m from the boundary (Sprinklered Areas)	60 to loadbearing and integrity, 15 minutes to insulation	RE 60, REI 15	From inside
Protected areas of external walls more than 1m from the boundary (Non- Sprinklered Areas)	90 to loadbearing and integrity, 15 minutes to insulation	RE 90, REI 15	From inside
External walls within 1.8m and at an internal angle to residential corridors ⁵	60	REI 60	From inside

*: 'R' rating applies to load-bearing elements only.

¹: Some utility suppliers may require a higher period of fire resistance to substation (up to 4 hours). This should be confirmed.

²: It is recommended the smaller risers are fire stopped at floor slab level due to difficulty in gaining access to fire stop walls due to their limited size.

³: This includes the inlet vents to the South block ground floor corridors and the fire-and smoke rated dampers within the refuse lobbies opening to the undercroft and these will need to achieve 60-minutes (EI 60) fire resistance. These vents/openings to the undercroft are to be protected by 60-minute fire and smoke rated louvre/dampers. The corridor inlet vents should remain shut and should not be openable except on detection of smoke within the affected common corridor so that a fire in the undercroft cannot spread to the corridors. Where the vents in the refuse lobbies are required for smoke ventilation (0.2m² permanent ventilation), the vents should close upon detection of fire in the respective refuse lobbies (see section 2.8.17 for cause and effect).

⁴: If building services are to be routed through the common corridor ceiling, a fire-resisting ceiling may be needed. However, in lieu of a fire-resisting corridor ceiling it is proposed to control the fire load in the ceiling space through the specification and selection of low-risk materials See 4.5.

⁵: e.g. Levels 5 to 9 of South Block and Level 6 of North Block. Note 90-minutes fire resistance between ground floor Amenity Area to Apartment

Table 9: Fire Door Summary

Locality of the door	Fire rating (minutes)	European Standard (minutes)	Self-closing device required?
Doors leading to Firefighting Stairs	FD60S	E60Sa	Yes
Doors leading to Protected Stairs	FD30S	E30Sa	Yes
Door discharging from Firefighting Stair 2 to external	FD60	E60	Yes
Apartment/Duplex Entrance Doors	FD30S	E30Sa	Yes
Doors to protected entrance halls/protected stairs in duplexes	FD30S	E30Sa	No
Between firefighting lobby and ancillary areas	FD60s	E60Sa	Yes
Cross Corridor Doors	FD30S	E30Sa	Yes
Service Shaft/Riser Doors and Access Hatches	FD60S (Half the fire resistance for a riser enclosed in 60-minutes fire resistance – FD30S)	E60Sa (Half the fire resistance for a riser enclosed in 60-minutes fire resistance – E30Sa)	No (to be kept locked shut)
Doors/dampers to smoke extract and natural air inlet shafts	Equivalent fire resistance as the shaft and leakage rated	Equivalent fire resistance as the shaft and leakage rated	N/a
Firefighting Lift Doors	FD60	E60	N/a
Passenger Lift Door	FD30	E30	N/a
Places of Special Fire Hazard	FD30s	E30Sa	No (to be kept locked shut)
Refuse Store to refuse lobby	FD30s	E30Sa	Yes
Refuse lobby to residential corridor doors	FD60s (double smoke seals)	E60Sa (double smoke seals)	Yes
Refuse chute hatch	FD60s (90-minute chute) FD30s (60-minute chute)	E60Sa E30Sa	Yes (Counterweighted)
Parcel/Cleaners/Maintenance Store	FD60s (double smoke seals)	E60Sa (double smoke seals)	Yes

4.2 Junction of Compartment Wall with Floors/Roof

- 4.2.1The integrity of compartment walls within roof voids that are continuous with the compartment walls between flats on the top storey is essential to prevent fire spread between flats.
- 4.2.2The lines of compartmentation between flats, and between flats and the common area/ancillary accommodation located on the top floor of a building should extend through the roof void in a continuous vertical plane to the underside of the roof and be fire stopped at the wall/roof junction to afford the required degree of fire resistance in accordance with the requirements of Section 4.1. This will ensure that the fire-resisting ‘box’ principle extends

into the common roof voids, to prevent fire spread between flats, and fire spread from a flat into other areas of the building, via the common roof void.

- 4.2.3The provision of fire-resisting ceilings within top floor flats would not normally provide an alternative means of achieving an equivalent standard of safety as it would fail to address, for example, the possibility of a fire that starts within the roof void or one that enters the roof void externally (e.g. as a result of flames projecting from a top storey window). A fire-resisting ceiling will afford protection against the spread of fire from a flat into the roof void, but not normally vice versa.
- 4.2.4It is not appropriate to complete the line of compartmentation within roof voids by installing cavity barriers above the compartment walls that separate flats, or to treat the roof void simply as a concealed space within which cavity barriers are installed at regular intervals.
- 4.2.5Any compartment wall construction should be carried up to full storey height to a compartment floor, or to the roof as appropriate. Similarly, a compartment floor should continue to the external wall to maintain the standard of fire resistance. Any junction between compartment walls, compartment floors, external walls, or roofs should be appropriately fire stopped.

4.3 Protection of Openings and Fire Stopping

- 4.3.1To ensure all fire separating elements are effective, every joint or imperfection of fire, or opening to allow services to pass through the element suitable fire protection is to be provided by sealing or fire stopping so that the fire resistance of the element is not impaired.
- 4.3.2Fire stopping/sealing should be undertaken with suitable products to maintain the standard of fire resistance of the surrounding structure in accordance with BS 476 Pt 22 or BS EN 1364 Pt 1 to 6.
- Fire Stopping
- 4.3.3All openings for pipes, ducts, conduits or cables that pass through and/or any joints between fire separating elements should be appropriately fire stopped with consideration for a potential thermal movement of pipes and ducts.
- 4.3.4Where non-rigid materials are adopted or unsupported spans exceeding 100mm are adopted, the fire stopping material should be reinforced with materials of limited combustibility.

Openings for Pipes

- 4.3.5Where services pass through a fire separating element, the following three fire stopping measures will need to be considered to evaluate the most appropriate fire protection measure.

Method 1 – Proprietary Seals

Provide a proprietary sealing system e.g. intumescent collar which has been tested to maintain the fire resistance of the walls, floor or cavity barrier for a pipe of any diameter.

Method 2 – Pipes with a restricted diameter

On the provision that the type and internal diameter dimension satisfies the requirements in Table 10, fire stopping such as cement mortar or intumescent mastic may be used around the pipe.

Method 3 – Sleeving

A pipe of lead, aluminium alloy, fibre cement or uPVC with a maximum nominal internal diameter of 160mm may be used with a sleeving of non-combustible pipes. The specification for non-combustible and uPVC are given in Table 10.

Table 10: Maximum nominal internal diameter of pipes passing through a compartment wall/floor

Situation	Pipe material and maximum nominal internal diameter		
	Non-combustible material ¹	Lead, aluminium, aluminium alloy, uPVC ² , fibre cement	Any other material
Structure enclosing a protected shaft which is not a stairway or lift shaft	160	110	40
Compartment wall or compartment floor between apartments	160	160 (stack pipe) ³ 110 (branch pipe) ³	40
Any other situation	160	40	40

Note 1 :Any non-combustible material (such as iron, copper or steel) which if exposed to a temperature of 800 degrees will not soften or fracture to the extent that flame or hot gas will pass through the wall of the pipe.

Note 2: uPVC pipes complying with BS 4514 and uPVC pipes complying with BS 5255

Note 3: These diameters are only in relation to pipes forming part of an above ground floor drainage system and enclosed in Method 3. In other cases the maximum diameters against situation 3 apply.

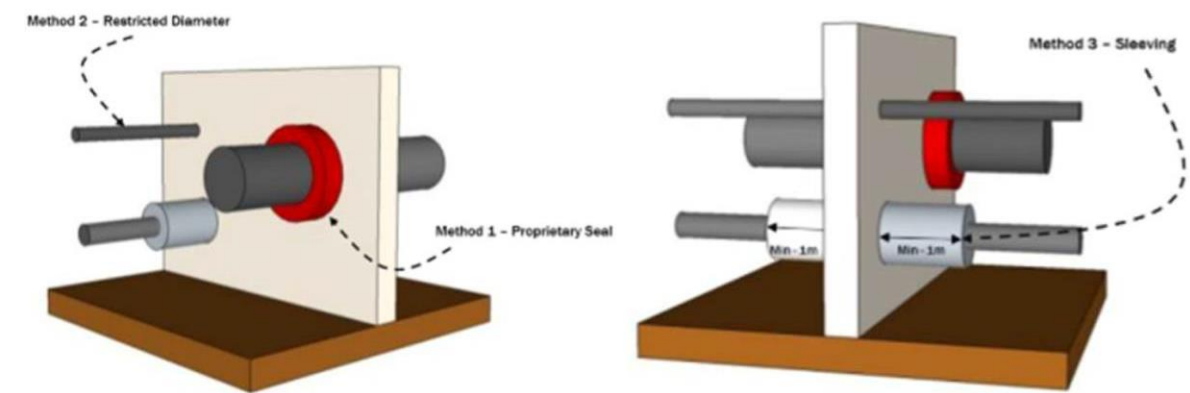


Figure 11: Service breaches to compartment walls

Risers

4.3.6 If protected riser shafts are to connect non-sprinklered and sprinklered areas, the period of fire resistance provided to the risers should vary between the ground floor and the first floor due to the change in periods of structural resistance, which therefore requires careful design to ensure the protection is not compromised at the change point. The protection to risers should be in accordance with Figure 12.

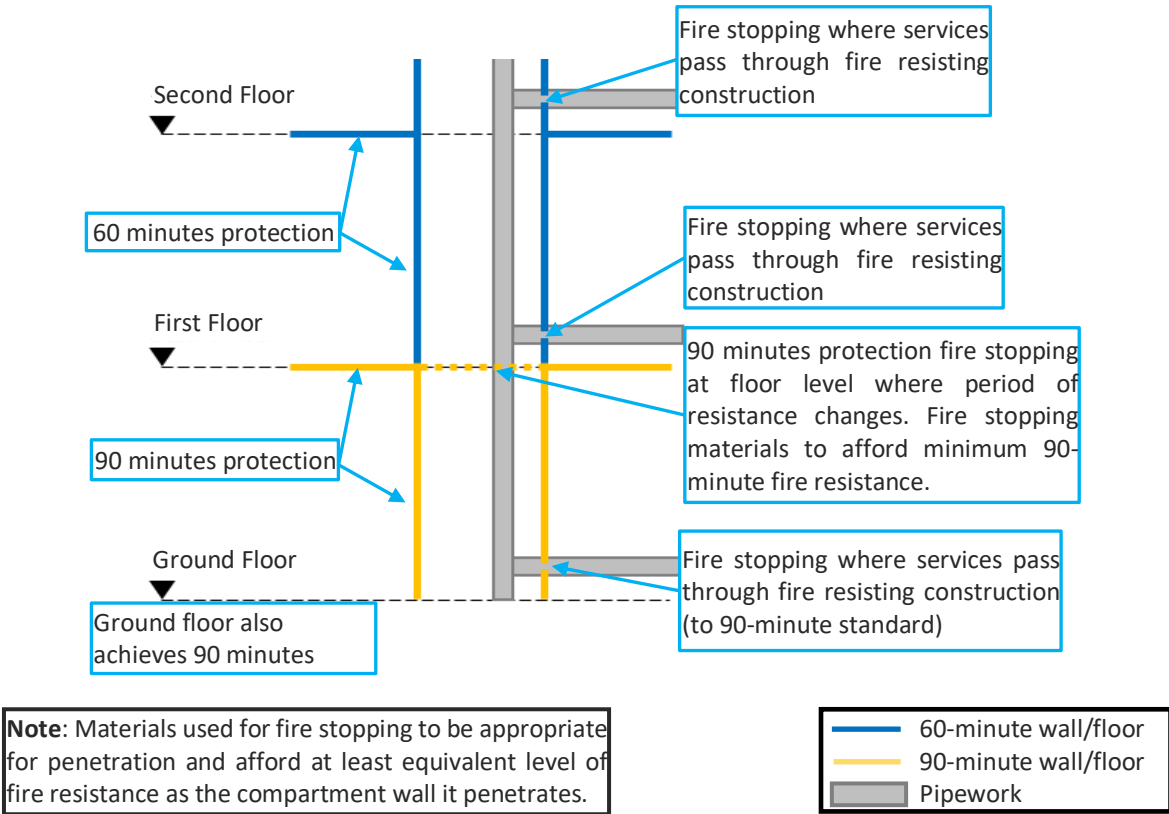


Figure 12: Protection of Risers

4.4 Fire/Fire and Smoke Dampers

- 4.4.1 Fire and smoke dampers are to be operated by smoke detection and thermal fusible link if ducts access or leave a compartment that form part of fire protected escape route (apartment/corridor/stair etc.)
- 4.4.2 All fire and smoke dampers are to be tested to BS EN 1366-2 and be classified to BS 13501-3. The dampers are to have the same fire resistance (integrity) as the wall or floor they penetrate (subject to a minimum fire resistance of 60-minutes).
- 4.4.3 Dampers are not required within internal protected entrance halls if:
- The ductwork used is of rigid steel construction and all joints in the ductwork are sealed with an intumescent sealant to prevent any leakage of hot smoke into the corridor.
 - All penetrations in walls are fire stopped to the minimum fire resistance of the wall duct it passes through.
 - Ventilation ducts supplying or extracting air directly to or from a protected entrance hall, should not also serve other areas.
 - Any system of mechanical ventilation which re-circulates air and which serves both the stairway or entrance hall and other areas should be designed to shut down on the detection of smoke within the system.
- 4.4.4 If PVC ductwork is to be used and pass through (but does not serve) the enclosure to a protected entrance hall, an intumescent fire collar shall be fitted at the point at which the ductwork crosses the enclosing walls of the protected entrance hall. This is in accordance with NHBC guidance note on “ductwork passing through protected entrance halls in dwellings”.

- 4.4.5
- Dampers should not be fitted within ductwork serving any commercial kitchen as there will be a likely build-up of grease within the duct, which can adversely affect the dampers.
- 4.4.6
- Where dampers cannot be provided in general ductwork for any reason, the duct will be fire-rated or enclosed in fire-resisting construction (integrity and insulation) to the highest period of fire-rated construction through which it passes. The ductwork would need to be fire rated from the point it penetrates the compartment wall of the compartment it serves (or furthest compartment it serves if multiple compartments are served) to the point it terminates.

4.5

Services in Common Corridor

- 4.5.1
- The routing of building services through the common residential corridor introduces a fire risk in the space and BS9991 recommends against this where possible. However, where the routing of services through the corridor is unavoidable, the services should be run in separating construction or in a secured fire-resisting method.
- 4.5.2
- This is proposed to be achieved by controlling the fire load in the ceiling space through the specification and selection of low-risk materials and has considered the following principles as a minimum:

a.

Minimising the number of electrical connections within the residential corridor.

b.

Correctly sized cables and follow up with comprehensive on-site testing and inspection.

c.

The surfaces of materials exposed to the corridor (i.e. the ceiling void) will be of Class 0 (National class) or Class B-s3, d2 or better (European class);

d.

The materials within the corridor (inclusive of any insulation) will be of limited combustibility (National class) or Class A2, s3, d2 or better (European class);

e.

The services to be located within the corridor ceiling void will be of low fire risk;

f.

Any electrical cabling will be laid in metal trays or metal conduit; and

g.

Access panels into ceiling voids to be secured (this can be by releasing devices or screw fixings to close).

h.

Any material or equipment located within the common corridor which have not been fire tested will have been fire risk assessed to demonstrate its low risk in terms of ignition, combustibility and flammability by the system designer and system manufacturer.

i.

Methods of cable support should be non-combustible (such as cable clips, cable ties or trunking).
- 4.5.3
- Taking the above into consideration the services/materials above common corridor ceilings have been specified to minimise the fire load and consist of the following:

•

Steel cable baskets for containment of low voltage and extra low voltage services

•

Cables of LSF, LSZH and FP200 types

•

LED downlights, LED illuminated escape signage, PIR sensors

•

Emergency light units with 3-hour integral battery packs (the integral battery packs are installed within a flame-retardant tubing)

•

CPVC sprinkler pipework

•

PAROC stone wool pipe insulation (achieves at least A2-s1, d0 classification)

•

Y-wall (non-combustible) patressing

•

Corridor ceiling tiles with acoustic fleece lining (achieves A2-s1, d0 classification).
- 4.5.4
- The M&E should design and install the services above the common corridors considering the principles outlined in a to i above.

- 4.5.5
- It is acknowledged there are integral battery packs supplying the emergency lighting that may be considered a localised hazard given they have the potential to cause fire. As such, the following risk-based considerations have been given

•

Batteries are to be installed in accordance with manufacturer’s instructions with flame retardant tubing and should be free of any other coverings to reduce risk of overheating.

•

In the unlikely event a battery was to catch fire, it is unlikely the fire could spread beyond the immediate vicinity of the battery on the basis the wall/ceiling surfaces achieve Class 0 surface spread of flame, the materials used for pipe insulation, patressing and acoustic lined ceiling tiles specified in the ceiling void are all classified as limited combustibility or better.

•

Should any products of combustion percolate beneath the false ceiling on to the common corridor beneath, all residential corridors are provided with automatic smoke detection that is installed to operate the smoke control systems to protected the common corridors and staircases.

•

The enhanced mechanical smoke vent systems serving the residential corridors has been validated with CFD analysis to demonstrate tenable conditions are maintained to enable safe escape based on a 0.6MW sprinklered apartment fire. It is considered the smoke vent systems provided to these corridors would therefore be more than sufficient to extract combustions products from a single battery pack should sustained combustion occur given the significantly more onerous conditions the smoke control system has been validated to.

•

Given the emergency lighting layout in the common corridors, these battery packs will be spaced at least 5m distance apart from one another so there is reasonable distancing between them reducing the risk of fire spreading from one battery to another. The 5m distance is to emphasise the extent of sterile space between the packs which forms part of this holistic risk assessment, as to quantify the specific heat output of the batteries specified (which weigh less than 150g) is considered overly onerous when compared to what the safety systems (smoke control) protecting the corridor has been designed to withstand to maintain tenable conditions given the potential fire load in an open plan apartment.

•

The emergency lighting system can be expected to be tested and maintained by the end user given this will be a legal requirement on occupation to maintain compliance with requirements of The Regulatory Reform (Fire Safety) Order 2005. This should minimise the risk of faulty/damaged batteries going unnoticed as they should be replaced prior to end of their working life before they could deteriorate.
- 4.5.6
- Based on the above, the likelihood that a battery pack catches fire is considered unlikely but in the event a fire did occur, the severity of a fire is likely to be limited owing to the services/materials/surface linings in the vicinity of the battery unlikely to assist in the spread of fire and aid combustion. If sustained combustion were to occur resulting in smoke/gases percolating on to the escape corridor, the fire protection measures affording to the common corridors mean it is unlikely to create untenable conditions therefore the provision of integral battery packs in the ceiling void above common corridors is not considered to pose a significant risk providing the principles and selection of materials outlined above is incorporate into the design.
- 4.5.7
- It is noted the latest edition of the IET Wiring Regulations (BS 7671:2018) has been release and came into force in January 2019. The previous version includes a requirement that wiring systems in escape routes shall have fire-resisting supports and in the latest edition this extends the requirement to all areas, i.e. any wiring in the building that could fall prior to fire service arrival should be restrained to prevent entanglement. All wires need to be supported such that they wouldn’t present an entanglement risk to firefighters, it’s not just a requirement for wires serving life safety equipment. Cables run along walls should be fixed with metallic ties/clips rather than plastic.

Fixing of Cables – Fire-resisting Cable Supports

4.6 Cavity Barriers

- 4.6.1
- Concealed spaces or cavities in the construction of a building provide a route for smoke and flame spread. This is particularly in the voids above and below the construction of the building e.g. walls, floors, ceilings, roofs, around the windows and compartment walls. The provision of cavity barriers within the voids is intended to restrict the spread of smoke and flames.
- 4.6.2
- Fire resistant cavity barriers are to be installed in cavity spaces exceeding 20m in any direction. The cavity barriers will offer a minimum of 30 minutes fire resistance and 15 minutes fire resistance insulation (European standard E30 and EI 15)
- 4.6.3
- See Figure 13 for a summary of cavity barrier locations and the differentiation between cavity barriers and fire stopping.
- 4.6.4
- Table 11 indicates the maximum dimensions of undivided concealed spaces for the different classifications of cavity barriers.

Table 11: Maximum Dimensions of Cavities

Location of Cavity	Class of surface / product exposed in cavity		Maximum dimensions in any direction (m)
	National	European	
Between roof and a ceiling	Any	Any	20
Any other cavity	Class 0 or 1	Class A1 Class A2-s1, d0 Class B-s3, d2 Class C-s3, d2	20
	Not class 0 or 1	Not any of the above classes	10

- 4.6.5
- Any exclusion from Table 11 should be in full accordance with the recommendations and specifications with BS 9991.
- 4.6.6
- Cavity barriers are required at all floors, compartment walls and openings (e.g. windows and doors). Additional cavity barriers are required where a compartment walls meets an external wall of the building.
- 4.6.7
- Where a concealed space is undivided area which exceeds 40m in either or both directions on plan there is no limit to the size of the cavity if:
 - The room and the cavity together are compartmented from the rest of the building
 - An automatic detection system compiling to BS 5839-1 is installed. Detectors are only required in the cavity to satisfy BS 5839-1.
 - The cavity is used as a plenum and the recirculation air distribution systems in BS 5588-9 are followed.
 - The surface of the material/product used on the construction of the cavity is Class 0 (National class) or Class B-s3, d2 or better (European class) and the supports and fixings on the cavity are non-combustible.
 - The flame spread rating of any pipe insulation system is Class 1 (National class) or Class C-s3, d2 or better (European class)
 - Any electrical wiring in the voids is laid in metal trays, or in a metal conduit
 - Any other materials in the cavity are of limited combustibility or Class A2 or better (European class)

4.7 Construction and Fixing of Cavity Barriers

- 4.7.1
- Cavity barriers should be constructed to provide 30 minutes fire resistance (E30, EI15 when exposed from each side separately). The cavity barriers should be tightly fitted to a rigid construction and mechanically fixed in position. Where this is not possible (e.g. junctions with slates, tiles, corrugated etc.) the junction should be fire stopped in accordance with Section 4.3 of this report. Cavity barriers should also be fitted so that their performance is unlikely to be made ineffective by movement of the building due to subsidence, temperature change etc. failure of their fixings, material or construction they abut or collapse of any services penetrating them.
- 4.7.2
- Cavity barriers in a stud wall or partition or provided around openings may be constructed from:
 - Steel at least 0.5mm thick
 - Timber at least 38m thick
 - Polythene sleeved mineral wool slab, in either case under compression when installed in the cavity
 - Calcium silicate, cement based or gypsum-based boards at least 12mm thick
- 4.7.3
- It should be noted that cavity barriers provided around openings may be formed by the window or door frame if the frame is constructed of steel or timber of the thickness above. Any openings in a cavity barrier should be limited to those for:
 - 30-minute fire rated doors
 - The passage of pipes which meet the provisions set in this report
 - The passage of cables or conduits
 - Openings or ducts (unless fire rated) fitted with a suitable automatic fire damper where they pass through the cavity barrier.
- 4.7.4
- The Employer’s Requirements state the rainscreen façade system for this building is to be provided with solid state cavity barriers. The proposed cavity barrier design incorporates horizontal open state intumescent cavity barriers which has been agreed for use with MCCBC in a vented rainscreen provided they are proven and approved to meet the industry best practise guidance from the *Association of Specialist Fire Protection* (ASFP). Cavity barriers are to be designed and installed in accordance with the recommendations of BS 9991. This detailed design will be developed by the relevant specialist sub-contractor with the proposals subject to agreement with Building Control and ARUP as the clients design advisory team.

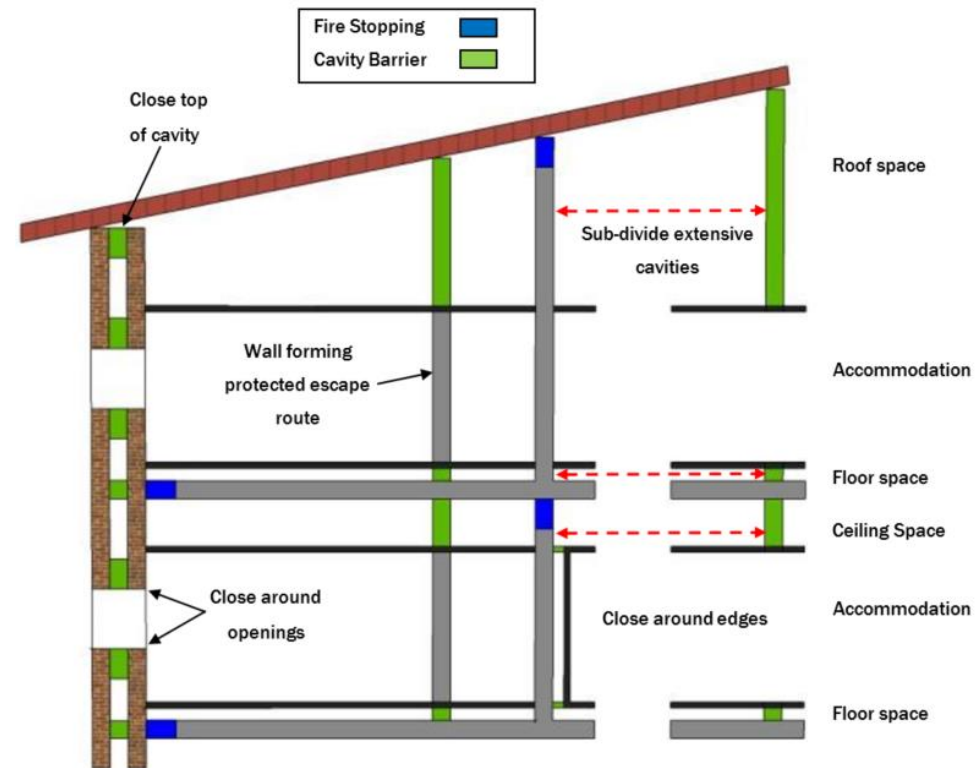


Figure 13: Typical Provision of Cavity Barriers

5 External Fire Spread

5.1 Site Boundary

- 5.1.1
- Figure 14 highlights the assumed relevant boundary for the Lampwick Development. The site plan referenced in Table 1 has been used which shows a dashed red line assumed to be the site boundary and has been used for analysis of external fire spread.
- 5.1.2
- Where the building adjoins a road, canal etc, the site boundary has been taken as the middle of that area as it is considered that further development or alteration of that area is unlikely. In all other cases, the ownership boundary of the building is taken as the relevant boundary.
- 5.1.3
- It is understood the landscaping to the South East elevation is private land and therefore the relevant boundary has not been extended to the centreline of the area. The proposed relevant boundary is a minor variation from the relevant boundary indicated in the ARUP ER report which has resulted in a slight change following the analysis of external fire spread.

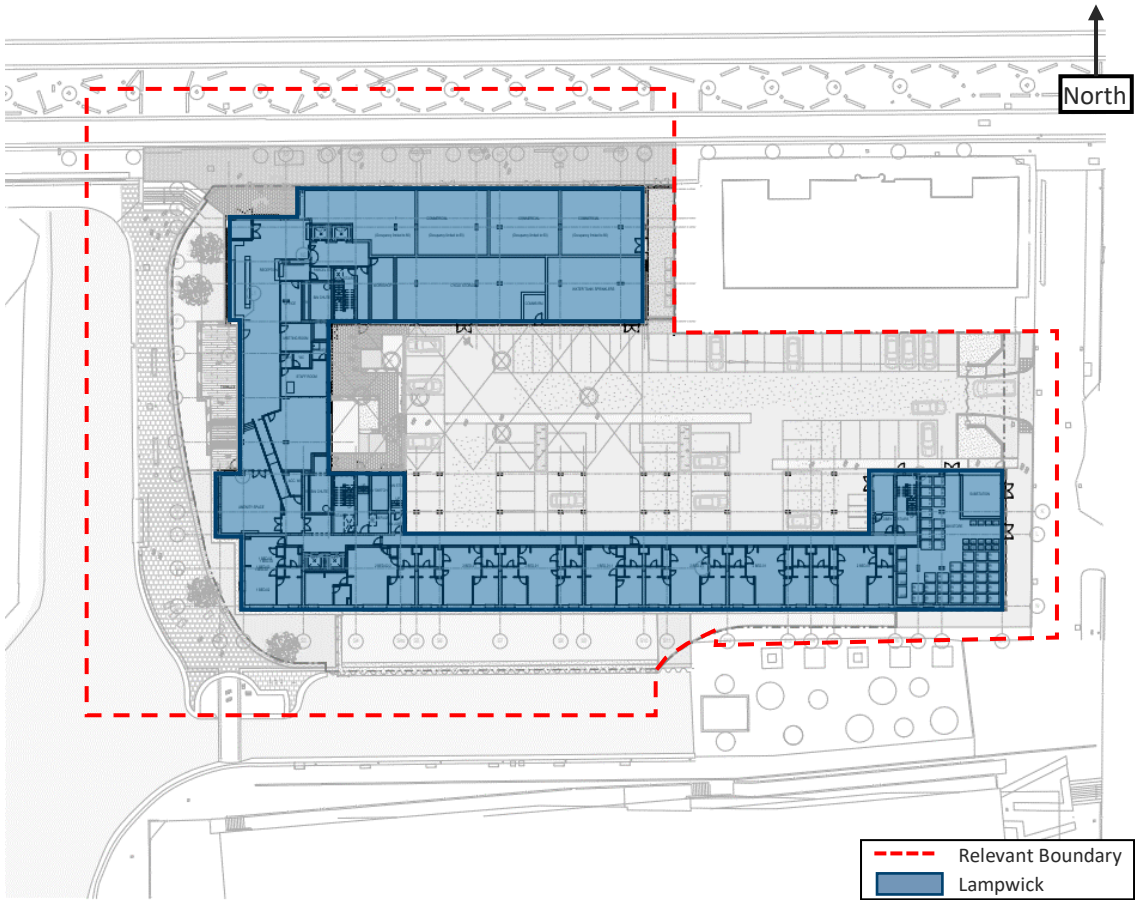


Figure 14: Site Boundary

5.2 Space Separation

- 5.2.1
- The space separation of the building from its relevant boundaries has been assessed in relation to preventing external fire spread. This is achieved by limiting the area of non-fire rated elements of the façade where the separation is less than the minimum requirement within BR 187 – *External Fire Spread; Building Separation and Boundary Distances* using the detailed calculation method.
- 5.2.2
- The Unprotected Area (UPA) for each type of compartment within the building was calculated considering the distance from the relevant boundary, the compartment height and width along with the occupancy profile.
- 5.2.3
- The distances to the relevant boundaries on each elevation is provided in Table 12.

Table 12: Boundary Distance

Elevation	Distance to Relevant Boundary
North Elevation	11.8m
East Elevation – to Old Ancoats Dispensary	4.4m
East Elevation – to Lampwick Lane	6.4m
South Elevation	Varies from 3.53m to 12.8m
West Elevation	15.5m

Elevations greater than 1m to relevant boundary

- 5.2.4
- To ascertain if the external façade of building need fire protecting, the calculations within BR 187 have been used to calculate the protected area required to each of the main facades and the results are listed below in Table 13.
- 5.2.5
- The required fire protected areas to the non-sprinklered areas should achieve 90-minutes fire rating for integrity and loadbearing and 15 minutes insulation (RE90, REI15) from the inside only.

Table 13: External Fire Spread

Compartment	Floor	Sprinklered?	Width of Panel (m)	Height of Panel (m)	Distance to Boundary (m)	Permitted Unprotected Area (%)	Required Protected Area (%)
1	Ground	No	7.35	3.6	4.52	82	18
2	Ground	No	8.75	3.125	4.57	83	17
3	Ground	No	13.2	3.07	3.53	44	56

- 5.2.6
- The compartments that require limitations on the facades in Table 13 have been highlighted in red on Figure 15 below.
- 5.2.7
- While not all floors or compartments have been incorporated into Table 13, the results of the analysis can be transferred for the remaining floors or similar size adjacent units. It should be noted where a compartment has not been incorporated into the table, these achieve 100% permitted unprotected area. All facades facing the North and West Elevation, and the East elevation to Lampwick Lane do not require any fire protected areas on the façades and 100% fire unprotected area is permitted.
- 5.2.8
- These limitations should be distributed to the relevant subcontractors so others can develop their designs to achieve the required fire resistance to the external elevations as necessary.

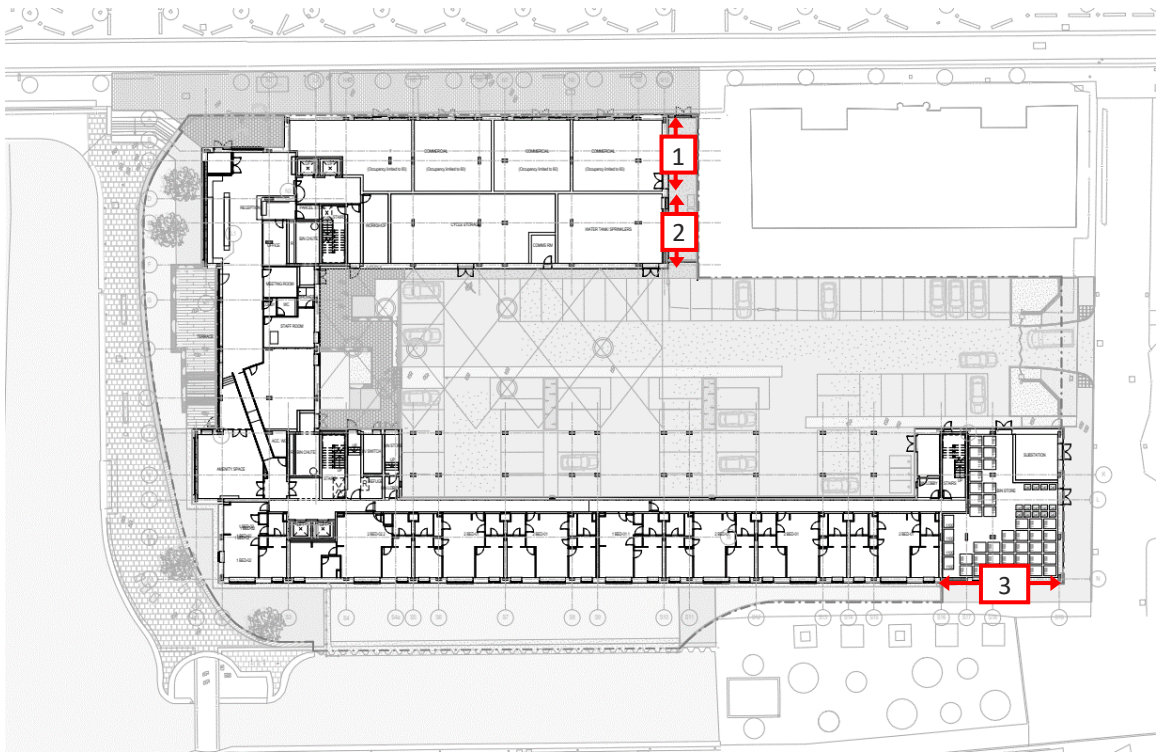


Figure 15: External Fire Spread – Ground Floor

5.3 Unprotected Areas

5.3.1 Small unprotected areas in an otherwise protected area of wall construction are considered to pose a negligible risk of fire spread and maybe disregarded. Figure 16 highlights the permitted openings in relation to each other and to the lines of compartmentation inside the building.

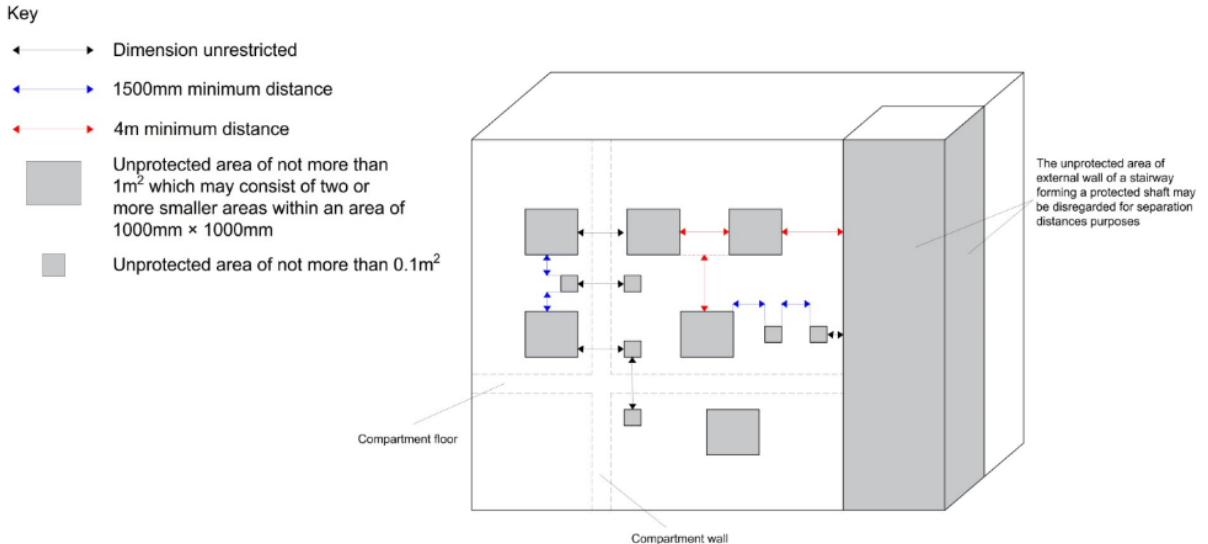


Figure 16: Unprotected Areas

5.4 Roof Coverings

- 5.4.1 Part of a roof is defined as having a slope less than 70°. As such, any part of a roof greater than 70° will be classified as forming part of the wall.
- 5.4.2 The provisions limit the use, near a boundary of a roof which will not give adequate protection against the spread of fire over them. The term roof covering is used to describe constructions which may consist of one or more layers of material but does not refer to the roof structure as a whole. The provisions in this section are principally concerned with the performance of roofs when exposed to a fire from outside.
- 5.4.3 Limitations of the roof covering are to be in accordance with the BS 9991 and must be constructed from a material which gained a designation of either AA, AB, AC, in the test methods defined by BS 476-3 as the minimum distance of the roof from a relevant boundary is less than 6m.

5.5 Construction of External Walls

- 5.5.1
- The main components of the façade are to consist of:
 - Masonry
 - Zinc rainscreen cladding panels
 - Aluminium curtain walling
 - Mineral wool insulated glazed windows and aluminium frames
 - Mineral wool insulation
 - Glazed balconies –note these need to achieve A2-s1, d0 rating as they are specified attachments

- 5.5.2
- In a residential building with a storey 18m or more in height (when measured from the lowest adjacent side of the building to the upper floor surface of the topmost storey, excluding any floors consisting exclusively of plant), Regulation 7(2) and 7(3) is applicable and it prevails over the provisions stated within ADB/BS 9991.

Note 1: Consideration should be given to the choice of material used for any other parts of an external wall or attachments to the wall which could impact on the risk of fire spread over the wall.

Note 2: Best practice guidance for green walls (also called living walls) can be found in Fire Performance of Green Roofs and Walls, published by the DCLG.

Regulation 7(2) of Building Regulations 2010

- 5.5.3
- Regulation 7(2) applies to any building with a storey at least 18m above ground level (when measured from the lowest adjacent side of the building to the upper floor surface of the topmost storey, excluding any floors consisting exclusively of plant), and contains one or more than one dwelling.

- 5.5.4
- Subject to exclusions stated in Regulation 7(3), building work shall be carried out so that materials which become part of an external wall, or specified attachment, of a relevant building are of European Classification A2-s1, d0 or Class A1, classified in accordance with BS EN 13501-1:2007+A1:2009 entitled “Fire classification of construction products and building elements. Classification using test data from reaction to fire tests” (ISBN 978 0 580 59861 6) published by the British Standards Institution on 30th March 2007 and amended in November 2009. Therefore, materials achieving limited combustibility cannot be deemed to meet the requirement using an alternative classification method.

Regulation 7(3) of Building Regulations 2010 – Exclusions

- 5.5.5
- Paragraph (2) does not apply to the following (but not limited to):
 - Cavity trays when used between two leaves of masonry;
 - Any part of a roof (other than any part of a roof which falls within the definition of Building Regulations 2010) 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.

- 5.5.6
- A summary of the information above has been tabulated in Table 14. Note, please refer to Section 5.5.7 for further considerations on additional provisions, depending on the building type.

Table 14: Exclusions from Regulation 7(2)

Product	Definition
Membranes	Membranes is a common term used in the industry and does not need any specific definition
Roofing Materials	Components of a roof that extends to the junction of the external wall
Internal Decorative Finish	Internal wall finish - inner most surfaces directly exposed to the interior of the building on the external wall
Windows	Windows made out of glass and transparent and associated window frame including glazing, features, fixings and ironmongery
Doors	Doors and door sets located on the external wall including associated frames and ironmongery.
Thermal Breaks	Thermal breaks where they are necessary to prevent thermal bridging and meet the requirements of Schedule 1 Paragraph L.
Cavity Trays	Cavity trays as part of a masonry wall systems including two leaves of masonry construction
Seal, Fixings, Gaskets, Sealants and Backer Rod	Seal, fixings, gaskets, sealants and backer rod
Electrical Installations	All electrical installations as defined in the Building Regulation already, i.e. fixed electrical cables or fixed electrical equipment located on the consumer’s side of the electricity supply meter.
Fire Stopping and Intumescent Materials	Fire stopping and intumescent materials where they are necessary to meet the requirements of paragraph B of Schedule 1
Insulation Used Under Ground Location	Insulation used where it is located underground.

- 5.5.7
- In addition to the above, where a building type is in either category stated in Section 5.5.3, the following should also be considered:
 - Membranes used as part of the external wall construction should achieve a minimum classification of European Class B-s3, d0;
 - Internal linings should comply with the guidance provided in Section 6 of ADB;
 - Any part of a roof should achieve the minimum performance as detailed in Section 14 of ADB.
 - As per Regulation 7(3), window frames and glass (including laminated glass) are exempted from Regulation 7(2). Window spandrel panels and infill panels must comply with Regulation 7(2).
 - Thermal breaks are small elements used as part of the external wall construction to restrict thermal bridging. There is no minimum performance for these materials. However, they 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 to be regarded as a thermal break).
 - Regulation 7(2) only applies to specified attachments. Shop front signs and similar attachments are not covered by the requirements of Regulation 7(2), although attention is drawn to paragraph below.
 - Whilst Regulation 7(2) applies to materials which become part of an external wall or specified attachment, consideration should be given to other attachments to the wall which could impact on the risk of fire spread over the wall.

- 5.5.8 Note, specified attachments referenced below are defined as follows:
- A balcony attached to an external wall;
 - A device for reducing heat gain within a building by deflecting sunlight which is attached to an external wall;
or
 - A solar panel attached to an external wall.

6 Access and Facilities – Fire Service

6.1 Vehicle Access

- 6.1.1
- Fire Service vehicle access is proposed to the external car park via Old Mill Street and Lampwick Lane, see Figure 17.
- 6.1.2
- Fire Service access is to be provided through security gates into the external car park. The width of the gateways should meet the minimum width detailed in Table 15. On-site building management is to be provided 24 hours a day based at the concierge area, such that management staff can open gates for Fire Service access to the car park. The structural engineer should confirm the yard is suitable for the weight of a fire tender.
- 6.1.3
- Fire service vehicle access to the development is understood to be via the existing highways infrastructure and it is not proposed to undertake any works to these roads. If the access roads are to be altered, the road is to comply with the recommendations of Table 15.

Table 15: Fire Appliance Access Route Specification

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

Notes: This table is subject to agreement with the fire service as some services may have appliances of greater weight or different sizes.

- 6.1.4
- Turning facilities should be provided such that the appliance does not have to reverse more than 20m. This can be achieved by a hammerhead or a turning circle, designed based on Table 15. As an alternative to the above, a turning facility is to be provided that has been supported by tracking undertaken from the M&E consultants.

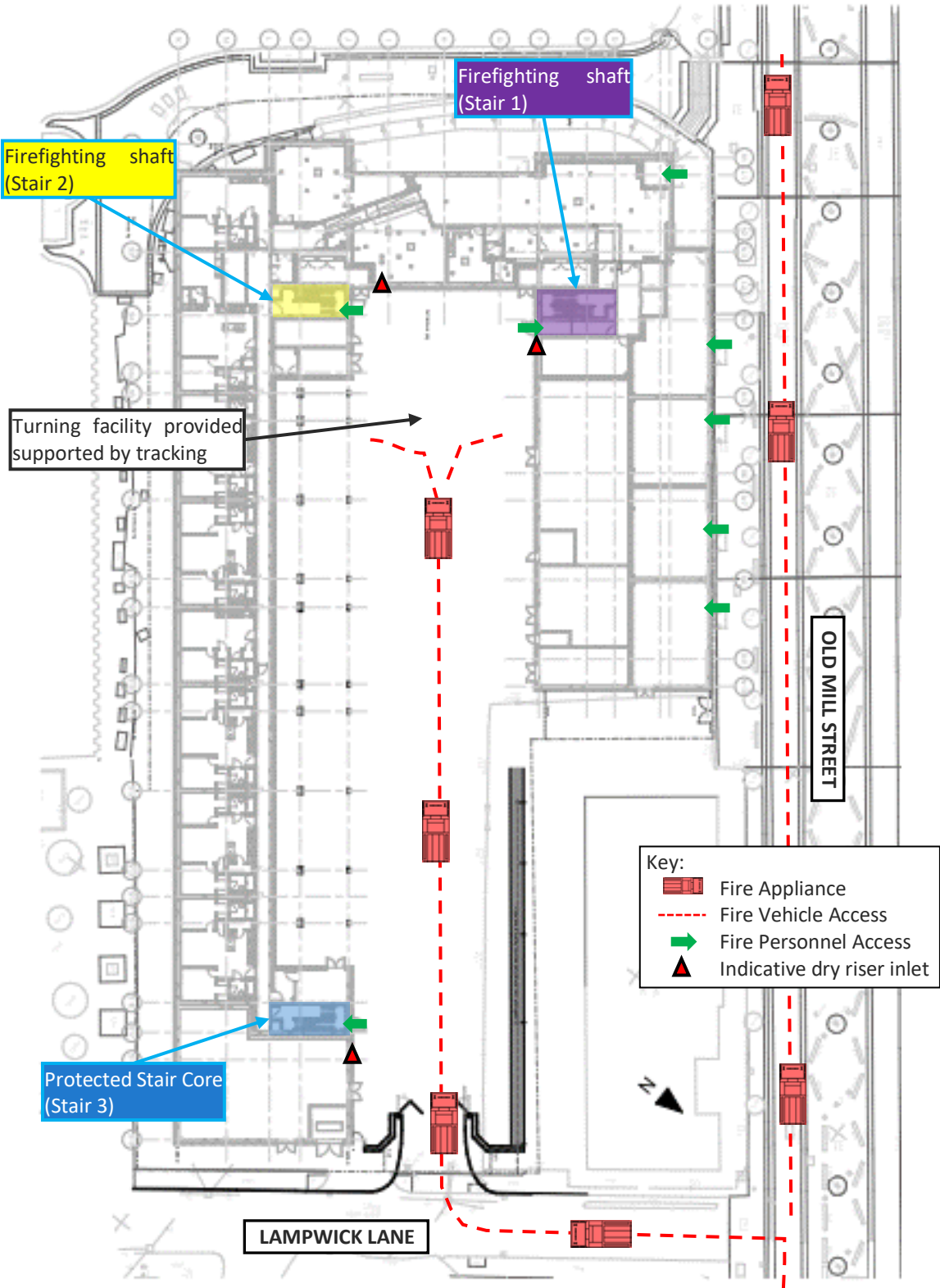


Figure 17: Fire Service Access

6.2 Firefighting Provisions

- 6.2.1
- BS 9991 recommends buildings with floors at more than 18m above the Fire and Rescue Service vehicle access level should be provided with firefighting shafts containing firefighting lifts. BS 9991 also recommends at least two firefighting shafts be provided for buildings with a floor area greater than 900m². Additionally, all areas are to be within 60m from a fire main outlet within a firefighting shaft.
- 6.2.2
- The building is split into a North and South section that rise independently from first-floor upwards so in effect act as two separate buildings of approximately 770m² (North block) and 1500m² (South block). Therefore, the North block requires one firefighting shaft and the South block requires two firefighting shafts.
- 6.2.3
- It is proposed that one firefighting shaft will be provided in each block. These will be stair cores 1 and 2, with an additional protected escape stair (Stair 3) also provided in the South block.
- 6.2.4
- The firefighting shafts will contain the following:
 - A firefighting stair with a minimum clear width of 1100mm;
 - An AOV at the head of the stair which achieves minimum 1.0m² free area;
 - A ventilated corridor/lobby into the stair (see Section 2.8);
 - A dry rising main within the stair in full accordance with BS 9990; and
 - A firefighting lift within 7.5m of the firefighting stair. The lifts should be installed in accordance with BS EN 81-72:2015 and to BS EN 81 Parts 20 & 50:2014 as appropriate for the particular type of lift including a method of preventing water ingress and drainage from the lift pit.
- 6.2.5
- In providing a single firefighting shaft to the South block, there is an extended hose laying distance of up to 88m. However, to ensure all areas of the floor plate are within 60m from a dry riser outlet, an additional dry rising main is to be provided in the protected stair (Stair 3). This is proposed to be acceptable on basis that sprinkler protection is provided to all apartments, and the high degree of compartmentation and small fire compartment sizes due to the premises consisting of residential apartments enclosed in 60-minutes fire-resisting construction. This has been agreed with the approval authorities.

6.3 Dry Rising Mains

- 6.3.1
- Dry fire mains should be provided within each stair core (1, 2 and 3) and should be designed and installed in accordance with BS 9990. Where riser pipework is not within the protected shaft from the inlet location it will need to be enclosed in 120 minutes fire-resisting construction (EI 120) for the mains located in the firefighting cores (stairs 1 & 2). Where the riser inlet serving the protected stair (stair 3) is located in the bin store façade and pipework traverses the bin store before entering the stair, the riser pipework will need to be enclosed in 90-minutes fire-resisting construction (EI 90)
- 6.3.2
- The entrance to each stair, and connection to each dry fire main inlet, should be accessible within 18m from a pumping appliance parking location. The dry riser inlets serving each stair should be visible from the fire appliance access route.
- 6.3.3
- The dry riser outlets should be sited as such that the distance from an outlet to the furthest point on the floor is less than 60m, measured on a route suitable for hose laying. Hose laying distances appear to be within 60m to all points from a dry riser outlet. The outlets are to be located at every level within the staircases including at ground floor level.
- 6.3.4
- The dry risers are to be silver in colour as a client request. There are already alternative identification methods present in multiple buildings in Manchester and this is proposed to be a low risk providing the inlets are clearly

indicated using the appropriate notice in accordance with BS ISO 3864-1 and BS EN ISO 7010 and using a letter height of 50 mm.

6.4 Fire Hydrants

- 6.4.1
- BS 9991 recommends for buildings provided with dry fire mains, hydrants should be provided within 90m of the dry fire main inlets.
- 6.4.2
- There is no reference in the ER fire strategy to the requirements for additional fire hydrants on the site. However, the distance from the nearest existing fire hydrant to the entry points to the firefighting shaft/dry fire main inlets for both the North and South Block appears to exceed the 90m distance recommended in BS 9991. With the dry fire main inlets located up to a maximum of 18m from the entrance to the stair core (accounting for run of horizontal connecting pipe), the distance from the existing fire hydrant to the inlet location would still be in excess of 90m.
- 6.4.3
- ARUP, as the clients design advisory team, should provide confirmation that the existing hydrant arrangements have been agreed with the approval authorities (Building Control and Local Fire Authority) and no additional fire hydrants are needed. If this is not the case a fire hydrant may be required to be provided within 90m of all the dry fire main inlets.
- 6.4.4
- The working order and the suitability of the fire hydrants are to be determined by Greater Manchester Fire and Rescue Service (GMFRS) with testing to be arranged by the contractor.

7 Emergency Power

7.1 Secondary Power

- 7.1.1
- Fire protection systems designed to operate in a fire require enhanced provisions to ensure a secure supply is available. To reduce the risk of the loss of the electrical supply to critical fire safety systems a secondary power system is required to maintain a continuous power supply during a fire condition in accordance with BS 9991.
- 7.1.2
- Secondary power is to be provided by an emergency generator. The full details will be developed by the M&E contractor for the relevant life safety systems.
- 7.1.3
- The systems in the Lampwick development to be supplied by secondary power are as follows:

- Sprinkler Suppression System;
 - Firefighting lifts;
 - Smoke extract ventilation systems.
- 7.1.4
- In addition, the automatic fire detection and alarm systems, emergency lighting, electronically powered doors/electronic door control mechanisms are to be provided with integral battery back-up in accordance with the relevant British Standards and with appropriate fail safes where necessary.
- 7.1.5
- All power supplies, electrical wiring and control equipment should be protected against fire for an appropriate period of time where the effects of fire are likely to result in the failure or incorrect operation of the life safety system. Power and control cables should be installed in accordance with BS 8519.
- 7.1.6
- The electrical distribution system should conform to BS 7671, the relevant parts of BS EN 60947, and BS 7346-8.

8 Fire Safety Management

8.1 Regulatory Reform (Fire Safety) Order 2005

- 8.1.1

The Regulatory Reform (Fire Safety) Order 2005 places a general duty of fire safety care on employees, occupiers and/or owners of businesses to provide and maintain adequate fire precautions.
- 8.1.2

The legislation is supported by requiring a fire risk assessment and a fire safety plan.
- 8.1.3

The Order places a responsibility on the responsible person to carry out a fire risk assessment on the premises. This process looks to:

• Identify potential fire hazards;

• Evaluate the risk from the hazards

• Identify who would be at risk

• Identify an adequate level of fire precautions to compensate for the risk
- 8.1.4

The significant findings of the fire risk assessment should be recorded if the responsible person employs five or more employees.
- 8.1.5

The fire safety management plan details the arrangements to implement, control, monitor and review fire safety standards and to ensure those standards are maintained. The plan describes the arrangements for effectively managing fire safety so as to prevent fire occurring and, in the event of fire, to protect people and property.
- 8.1.6

A fire safety management plan should be completed on occupation of the building and a fire risk assessment should be undertaken following the occupation of the premises to comply with Article 9 of The Regulatory Reform (Fire Safety) Order 2005.
- 8.1.7

The responsible person on occupation should provide adequate fire safety information to all eventual residents of the flats. This could be in the form of a home user guide to include basic prevention measures and the fire evacuation strategy and procedures. Further information on advice to occupiers of dwellings in residential buildings including an example fire evacuation plan is provided in Annex F of BS 9991:2015.
- 8.1.8

The fire emergency plan ought to be communicated to each resident on occupation. Residents ought to have a clear understanding of what actions to take should a fire situation change, and they need to evacuate the building.

8.2 Regulation 38

- 8.2.1

Regulation 38 requires that, where work involves the erection or extension of a relevant building, or relevant changes of use of a building, fire safety information shall be given to the responsible person at the completion of the project or when the building or extension is first occupied. The information will facilitate the production of the fire risk assessment, a requirement under the Regulatory Reform (Fire Safety) Order 2005. This fire strategy should accurately reflect the complete design. Table 16 provides a précis of the active and passive systems provided within the building.
- 8.2.2

It will need to be ensured that the building fabric and fire protection measures are maintained throughout the life cycle of the premises. All fire safety systems, installations and equipment should be maintained in accordance with the manufactures recommendations.

Table 16: Active & Passive Systems

System		Reference in Strategy
Passive System	Provision	
Compartmentation	In accordance with the recommendations of BS 9991 and architects drawings.	Section 4.1
Fire Doors	In accordance with the recommendations of BS 9991 and architects drawings.	Section 4.1
Internal Linings	In accordance with BS 9991 Section 31.	Section 3.1
Structural Elements	<div>Due to the installation of sprinkler protection throughout the residential parts of the scheme, elements of structure to these areas are to achieve 60-minutes structural fire resistance.</div> <div>Where sprinkler protection is not provided (ground floor ancillary and non-residential accommodation), 90-minutes structural fire resistance is to be provided.</div> <div>All elements of structure which contribute to firefighting shafts or other 120-minute enclosures should achieve 120 minutes structural fire protection.</div>	Section 3.3
Cavity Barriers	In accordance with BS 9991.	Section 4.6
Roof Coverings	AA, AB, AC	Section 5.4
External Fire Spread	<div>Fire protected areas should be provided to those compartments requiring it as follows:</div> <div>More than 1m from relevant boundary (non-sprinklered area) – RE 90, REI 15 from inside only.</div>	Section 5.2
External Wall Classification	<div>In accordance with Regulation 7(2) of The Building Regulations.</div> <div>Subject to the exclusions stated in Regulation 7(3), materials which become part of the external wall, or specified attachment are to be of European Classification A2-s1, d0 or Class A1, classified in accordance with BS EN 13501-1:2007+A1:2009.</div>	Section 5.5
Signage	In accordance with BS ISO 3864-1:2011 and BS 5499-4:2013.	Section 2.12
Active System	Provision	Reference in Strategy
Alarm & Detection	<div>All Apartment Types -Grade D1, Category LD1 to BS 5839-6</div> <div>Common Corridor/Common Stairs -Category L5 to BS 5839-1 (note spacing of smoke detectors on common corridors)</div> <div>Refuse stores/lobbies connecting to the residential accommodation – Category L5 to BS 5839-1</div> <div>Ancillary Areas - Category L2 to BS 5839-1</div> <div>Commercial Units - Category L2 to BS 5839-1</div> <div>Non-Residential Areas (Roof Level) - Category M to BS 5839-1</div> <div>Undercroft Car Park – Category L5 to BS 5839-1</div>	Section 2.3 & D1
Emergency Lighting	In accordance with BS 5266 and BS EN 1838 to meet the recommendations of BS 9991.	Section 2.11

System		Reference in Strategy
Corridor Smoke Ventilation	In accordance with horizontal evacuation section. The head of each stair will require AOV achieving 1.0m ² free area	Section 2.8
Refuse Store Smoke Ventilation	Refuse lobbies to be provided with not less than 0.2m ² permanent natural ventilation	Section 2.8.16
Secondary Power	Emergency generator	Section 7
Sprinklers	Category 3 sprinkler protection and minimum water duration of 60-minutes in accordance with BS 9251. A full list of exclusions to the sprinkler coverage is provided in Section 3.5.	Section3.5
Fire and Smoke Dampers	All fire and smoke dampers are to be tested to BS EN 1366-2 and be classified to BS 13501-3.	Section 4.4
Fire Fighting Systems	Provision	
Dry Risers	To be provided within the firefighting stairs and protected stair in accordance with BS 9990 including outlets at ground level.	Section 6.3
Fire Hydrants	Fire hydrants are to be positions near to the building's entry points (including entry points to fire-fighting shafts containing fire mains) and fire appliance parking positions. As the building is provided with dry fire mains, hydrants are to be located 90m of the dry fire main inlet.	Section 6.4
Firefighting Shaft (Stair, Lift, Ventilation)	To each firefighting stair. The lifts to be installed in accordance with BS EN 81-72:2015 and to BS EN 81 Parts 20 & 50:2014 as appropriate.	Section 6.2
Management Responsibilities	Provision	Reference in Strategy
On site building management	Provided 24 hours a day based at the concierge area	Section 2.2.3
Occupancy	Amenity space and Commercial Units. Maximum occupancy should not exceed egress capacity.	Section 2.2

9 Conclusion

- 9.1.1 The design of the building, in general, meets with prescriptive requirements of BS 9991. The key prescriptive requirements have been stated within this report as a performance specification and shall be adhered to by the design team in the design of the project. Unless explicitly stated otherwise all aspects are to be in full accordance with the relevant British Standards and codes of practice. Where codes of practise are restrictive to the design, an alternative (fire engineering solution) has been considered.
- 9.1.2 The drawings used in Table 1 have been used in the production of this report and no other drawings have been reviewed. If you feel additional information should be considered or may have an impact on this report we are to be informed as it may have a bearing on the conclusion of this report.
- 9.1.3 The fire engineering design is based on first principles and utilises accepted design practice and tools for assessment. The fundamental criteria set were to ensure that occupants would be exposed to conditions commensurate or improved to that of the prescriptive requirements.
- 9.1.4 It is considered that between a culmination of the prescriptive requirements and fire engineering approach, a solution will be provided which is adequate to address the risk, therefore providing a detailed strategy how compliance with the functional requirements of the Building Regulations can be met if the strategy is adopted in full by all design team members.
- 9.1.5 This report has been updated following comments from Manchester City Council Building Control. The engineered solutions presented within this report are a variation from accepted guidance and have been agreed with Manchester City Council Building Control and ARUP as the clients design advisory team.

Appendix A – Façade Protected Areas

A1 East Elevation to Old Ancoats Dispensary

Compartment	Colour	Floor	Maximum Unprotected Area (m²)	Measured Unprotected Area (m²)	Compliant	
					Yes	No
1	Orange	Ground	21.7	3.9	× ¹	
2	Green	Ground	22.7	1.7	× ¹	

¹ On basis masonry external wall achieves 90-minutes fire rating for integrity and load-bearing and 15 minutes insulation (RE90, REI15) from the inside

Key –

Unprotected Area



A2 South Elevation

Compartment	Colour	Floor	Maximum Unprotected Area (m²)	Measured Unprotected Area (m²)	Compliant	
					Yes	No
3		Ground	17.83	0.6	× ¹	

¹ On basis remainder of external wall achieves 90-minutes fire rating for integrity and loadbearing and 15 minutes insulation (RE90, REI15) from the inside

Key –

Unprotected Area



Appendix B – Façade Assessment Calculations

B1 Façade Assessment

B1.1 Introduction

- B1.1.1 This assessment is intended as supplementary material to the previously conducted unprotected area analysis featured within Section 5 of this report.
- B1.1.2 It is intended that this section will provide the required clarification for Manchester City Council Building Control to approve the assessment and its findings.

B1.2 General

- B1.2.1 The corresponding elevations with the relevant facades requiring protected areas can be found in Appendix-A and in Section 5.

B1.3 Assessment

- B1.3.1 To obtain the required data the following calculation is used. As specified in BR 187: *External fire spread, Building separation and boundary distances, Second Edition*. Page 20, Part 2.2.4. Figure 25 of this section was also used to calculate the 'F' factor, this can be seen in graphical form in Figure 18 below.

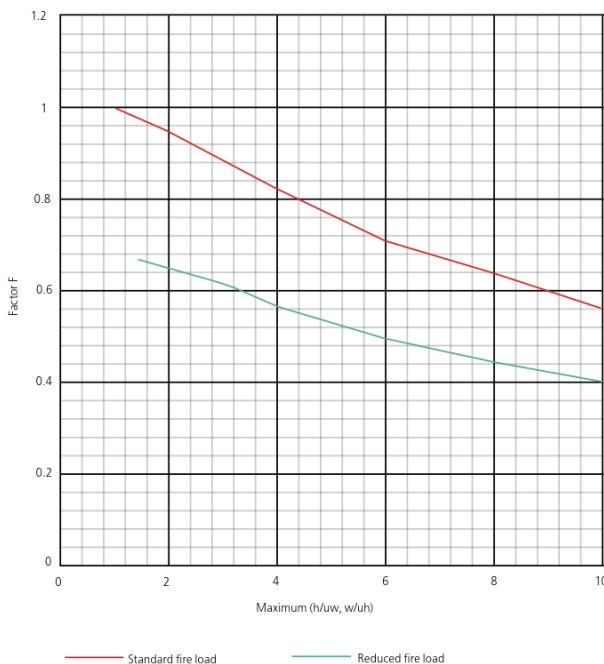


Figure 18: Factor 'F' – Figure 25 in BR 187

$$u = 100 \frac{(d/F)^2}{wh} \%$$

d = Boundary Distance

$$F = F - Factor$$
$$w = Width of the elevation$$
$$h = Height of the elevation$$

Compartment 1

$$w = 7.35m$$
$$d = 4.52m$$
$$h = 3.6m$$
$$w > h$$

Hence:

$$\frac{w}{d}$$
$$\frac{7.35}{4.52} = 1.63$$

Using the corresponding data in Figure 25, BR 187

$$F = 0.97$$

Therefore:

$$u = 100 \frac{(4.52/0.97)^2}{7.35 \times 3.6} = 82\%$$

$$Max UPA = 21.7m^2$$

Compartment 2

$$w = 8.75m$$
$$d = 4.57m$$
$$h = 3.125m$$
$$w > h$$

Hence:

$$\frac{w}{d}$$
$$\frac{8.75}{4.57} = 1.91$$

Using the corresponding data in Figure 25, BR 187

$$F = 0.96$$

Therefore:

$$u = 100 \frac{(4.57/0.96)^2}{8.75 \times 3.125} = 83\%$$

$$Max UPA = 22.7m^2$$

Compartments 3

$w = 13.2m$

$d = 3.53m$

$h = 3.07m$

$w > h$

Hence:

w/d

$\frac{13.2}{3.53} = 3.74$

Using the corresponding data in Figure 25, BR 187

$F = 0.84$

Therefore:

$u = 100 \frac{(3.53/0.84)^2}{13.2 \times 3.07} = 44\%$

$Max\ UPA = 17.83m^2$

Appendix C – Cooking Fire Calculation

C1 Fire Size Calculation

- C1.1.1

It is assumed the cooking hobs will not exceed 2.5 kW per ring. These calculations are conservative as the hobs specified are CDA HC6211FR Four Zone Ceramic Hob with max power of 1.8kW per ring. The calculations will be assuming that the hob is on full power and that the heat transfer process from the hob into the pan is 100% efficient and all the heat is transferred straight to the fuel, without accounting for any energy lost. Calculations will be made based on a worst-case scenario pool fire based on the hob. A pool fire is chosen as this will allow for accurate estimations of pan fires. The scenario calculated will be of a 0.25m diameter pan containing cooking oil (data gathered is based on properties of olive oil as this has the highest heat of combustion).
- C1.1.2

It should be noted that while these calculations are theoretical rather than experimental, this will result in estimations higher than expected in real world cases. This is due to the fact that no consideration is given to heat loss from the pan etc. so it is assumed that the fire is 100% efficient and all heat that is not radiated outwards is radiated back into the base of the fire. It also assumes that all energy provided by the hob is transferred directly to the oil with no energy lost to the pan or surroundings. It is also to be assumed that the flame from the pan is conical.
- C1.1.3

To calculate the heat release rate of a self-sustaining oil fire i.e. the pan is on fire but the hob is switched off the following properties of olive oil need to be considered:

• Heat of Combustion, ΔHc – 39.6 MJ/kg

• Regression Rate, m'' – 0.02 kg/m²s
- C1.1.4

For a 0.25m diameter, an area, Af of 0.049m² can be calculated. The fire should be circular as it the fuel is held in shape by the pan. A radiative heat fraction of 0.35 has been selected for this case. 0.35 has been selected as a conservative value, as materials that produce more soot when they burn have higher radiative fractions, and the value of 0.35 was taking from a plastic and wooden crib (which produce more soot than olive oil).
- C1.1.5

Putting the data into the equation for heat release rate:

$$Q' = \dot{m}'' \Delta H_c A_f$$
$$Q' = 0.02 * 39.6 * 0.049$$
$$Q = 0.0396MW$$
$$0.0388MW = 38.9kW$$
- C1.1.6

This calculated result of 38.9 kW is similar to the experimental results recorded by a recent study on oil fires in woks by Chow (Experimental Evaluation on Performance of Open Kitchen Fire Suppression Systems. Chow, W.K. & Ni, X. 2014), where a solution of multiple cooking oils was used. Olive oil was selected for this case as it has the highest heat of combustion as listed in the SFPE handbook. Using a wok of the same diameter of the theoretical frying pan used in these calculations, the control test from Chow and Xi's experiment resulted in a measured average HRR of between 24-27kW with peak HRR's nearer to the calculated value. However, the peak heat release rate from this experimental data may have only being recorded for a fraction of a second whereas the higher HRR acquired from the calculations is assumed to be constant which has resulted in a much higher HRR overall.
- C1.1.7

It is assumed that 50% of the thermal radiation travels towards the seat of the fire. This results in a worst-case scenario as all radiation that is not heading directly out of the fire is used to supply further energy to the liquid fuel. Thermal radiation to the fire bed, $\dot{Q}_{Rf}$ can be calculated with the following equation:

$$\dot{Q}_{Rf} = \frac{F \dot{Q}_R}{2}$$

- C1.1.8

To calculate $\dot{Q}_{Rf}$, the configuration factor, F needs to be found, which has the equation:

$$F = \frac{1}{(1 + H^2)^{0.5}}$$

- C1.1.9

To calculate F, H needs to be found, which has the equation:

$$H = \frac{2L}{D}$$

- C1.1.10

To calculate H, Flame Length, L must be found, which has the equation:

$$L = 0.23 \dot{Q}_c^{\frac{2}{5}} - 1.02D$$

- C1.1.11

Where $\dot{Q}_c$ is the convective fraction of heat transfer from a pool fire. Heat generated in the flame will be partly convected away by smoke flow in the plume and partly radiated to the surrounding. The fraction of heat radiated out of the flame, as stated earlier, is 0.35 which is adequate for small pool diameter. This gives a convective fraction of 0.65.

$$L = 0.23 * (0.65 * 38.9)^{\frac{2}{5}} - 1.02 * 0.25$$

$$L = 0.5821\ m$$

Now a value of H can be found:

$$H = \frac{(2 * 0.5821)}{0.25}$$

$$H = 4.657$$

NOTE: H has no units.

Now the configuration factor, F can be found:

$$F = \frac{1}{(1 + 4.657^2)^{0.5}}$$

$$F = 0.21$$

NOTE: The configuration factor has no units.

- C1.1.12

The thermal radiation that transfers back into the fire bed can then be calculated using the configuration factor and the radiative fraction of heat transfer (0.35 multiplied by the overall heat release rate):

$$\dot{Q}_{Rf} = \frac{0.21 * (0.35 * 38.9)}{2}$$

$$\dot{Q}_{Rf} = 1.428\ kW$$

- C1.1.13

This means that when there is a heat release rate of 38.9 kW in the oil fire there is 1.428 kW being radiated back into the bed of the fire. As the reaction is self-sustaining it can be said that 1.428kW is enough heat to evolve the liquid fuel into gas for combustion and result in the 38.9 kW HRR.

- C1.1.14

In the worst-case scenario, the hob will still be active and so the 2.5 kW from the hob to the pool needs to be accounted for. It is assumed that the heat from the hob is transferred entirely into the pool fire with no loss. The 2.5 kW will be defined as $\dot{Q}_s$

- C1.1.15

Now that there are two heat sources available to evolve the liquid fuel into gas the original 1.428kW value changes to $(\dot{Q}_{Rf} + \dot{Q}_s)$. Only $\dot{Q}_s$ is only known now because as the HRR rate increases, the fire size increases, and so more heat is available to be radiated back into the bed of the fire. To calculate the new $\dot{Q}_{Rf}$ it can be assumed

to be 1.428kW initially, this will result in a much lower value for HRR but the answer will be improved to within 1% accuracy through further calculations. The accuracy increases inverse-exponentially each time the method is repeated with the new numbers.

C1.1.16 The mass burning rate of this fire can be calculated with the follow equation:

$$\dot{m} = \frac{\dot{Q}_{Rf} + \dot{Q}_s}{L_t}$$

C1.1.17 L_t is the specific latent heat of evaporation. The mass burn rate is linearly proportional to the heat input into the liquid. Using the values from the self-sustaining fire calculated earlier, as well as taking into account the additional 2.5kW heat source

$$\frac{1.428}{38.9} = \frac{\dot{Q}_{Rf} + \dot{Q}_s}{\dot{Q}}$$

Transpose equation to find $\dot{Q}$

$$\dot{Q} = \frac{38.9}{1.428}(\dot{Q}_{Rf} + \dot{Q}_s)$$

Using the initial 1.428 kW value for $\dot{Q}_{Rf}$ the equation becomes:

$$\begin{aligned}\dot{Q} &= \frac{38.9}{1.428}(1.428 + 2.5) \\ \dot{Q} &= 106.9 \text{ kW}\end{aligned}$$

C1.1.18 Now that there is an initial estimate for HRR for the pan fire which is being supplied with heat from the hob, it can be improved upon through repeating previous steps. Finding new values for the flame length to the heat release rate and calculating all values repeatedly until the change in magnitude is minimal.

Second Iteration:

New Flame Length:

$$\begin{aligned}L &= 0.23 * (0.65 * 106.9)^{\frac{2}{5}} - 1.02 * 0.25 \\ L &= 0.9996 \text{ m}\end{aligned}$$

New H:

$$\begin{aligned}H &= \frac{2 * 0.9996}{0.25} \\ H &= 7.997\end{aligned}$$

New F:

$$\begin{aligned}F &= \frac{1}{(1 + 7.997^2)^{0.5}} \\ F &= 0.1241\end{aligned}$$

New $\dot{Q}_{Rf}$:

$$\begin{aligned}\dot{Q}_{Rf} &= \frac{0.1241 * (0.35 * 106.9)}{2} \\ \dot{Q}_{Rf} &= 2.321 \text{ kW}\end{aligned}$$

With the new $\dot{Q}_{Rf}$ found, a new estimate of heat release rate can be calculated:

$$\begin{aligned}\dot{Q} &= \frac{38.9}{1.428}(2.321 + 2.5) \\ \dot{Q} &= 131.2 \text{ kW}\end{aligned}$$

C1.1.19 Then the method is repeated again to increase accuracy:

Third Iteration:

New Flame Length:

$$\begin{aligned}L &= 0.23 * (0.65 * 131.2)^{\frac{2}{5}} - 1.02 * 0.25 \\ L &= 1.107 \text{ m}\end{aligned}$$

New H:

$$\begin{aligned}H &= \frac{2 * 1.107}{0.25} \\ H &= 8.854\end{aligned}$$

New F:

$$\begin{aligned}F &= \frac{1}{(1 + 8.854^2)^{0.5}} \\ F &= 0.1122\end{aligned}$$

New $\dot{Q}_{Rf}$:

$$\begin{aligned}\dot{Q}_{Rf} &= \frac{0.1122 * (0.35 * 131.2)}{2} \\ \dot{Q}_{Rf} &= 2.578 \text{ kW}\end{aligned}$$

New Heat Release Rate:

$$\begin{aligned}\dot{Q} &= \frac{38.9}{1.428}(2.578 + 2.5) \\ \dot{Q} &= 138.2 \text{ kW}\end{aligned}$$

Fourth Iteration:

New Flame Length:

$$\begin{aligned}L &= 0.23 * (0.65 * 138.2)^{\frac{2}{5}} - 1.02 * 0.25 \\ L &= 1.135 \text{ m}\end{aligned}$$

New H:

$$\begin{aligned}H &= \frac{2 * 1.135}{0.25} \\ H &= 9.081\end{aligned}$$

New F:

$$\begin{aligned}F &= \frac{1}{(1 + 9.081^2)^{0.5}} \\ F &= 0.1095\end{aligned}$$

New $\dot{Q}_{Rf}$:

$$\dot{Q}_{Rf} = \frac{0.1095 * (0.35 * 138.2)}{2}$$
$$\dot{Q}_{Rf} = 2.647 \text{ kW}$$

New Heat Release Rate:

$$\dot{Q} = \frac{38.9}{1.428} (2.647 + 2.5)$$
$$\dot{Q} = 140.1 \text{ kW}$$

Fifth Iteration

New Flame Length:

$$L = 0.23 * (0.65 * 140.1)^{\frac{2}{5}} - 1.02 * 0.25$$
$$L = 1.143$$

New H:

$$H = \frac{2 * 1.143}{0.25}$$
$$H = 9.142$$

New F:

$$F = \frac{1}{(1 + 9.142^2)^{0.5}}$$
$$F = 0.1087$$

New $\dot{Q}_{Rf}$:

$$\dot{Q}_{Rf} = \frac{0.1087 * (0.35 * 140.1)}{2}$$
$$\dot{Q}_{Rf} = 2.665 \text{ kW}$$

New Heat Release Rate:

$$\dot{Q} = \frac{38.9}{1.428} (2.665 + 2.5)$$
$$\dot{Q} = 140.6 \text{ kW}$$

C1.1.20 After repeating enough times, the change in heat release rate starts to become negligible. In order to check if the newest one is accurate enough it is necessary to calculate how similar it is to the previous calculated heat release rate. In this particular case 140.6 kW and 140.1 kW. This can be done by calculating the percentage difference.

$$\text{Percentage Difference} = \frac{140.6 - 140.1}{140.6} * 100$$

C1.1.21 The result is 0.36%. This means that the most recent calculation of HRR is less than 1% larger than the previous one, the increase from here on will be negligible.

Radiation Calculations

C1.1.22 As calculated above for a 0.25 diameter pan fire on a 2.5 kW heat source, a **HRR of 140.6 kW** is estimated as a peak fire size.

C1.1.23 The analysis will seek to determine that an appropriate separation distance can be maintained between the cooking area and the egress route such that the escaping occupants are not exposed to excessive radiation. In accordance with PD7974-6 (British Standards Institution, 2019) Table I.4 the tenability limits for received radiation are as follows;

- <2.5kW/m² for 5 over minutes
- 2.5kw/m² for 30 seconds
- 10kW/m² for 4 seconds

C1.1.24 Generally, a tenability criteria of 2.5m kW/m² will be adopted as a received radiant heat flux on the basis that any received thermal radiation less intense than that value is tolerable for over 5 minutes. To work out the radiative intensity for this case we can use the HRR of the fire and the distance to a specific point away from the pool fire. As well as the radiative fraction of heat transfer for the fire (which is still 0.35).

$$\dot{q}'' = \frac{X_r \dot{Q}}{4\pi R_0^2}$$

C1.1.25 Where X_r is the radiative fraction, Q is the heat release rate of the fire and R_0 is the distance to the point where radiation is to be measured. This is taken as the distance to the nearest obstruction, less 500mm to allow an occupant room to escape. The method of measuring R_0 has been illustrated in Figure 19.

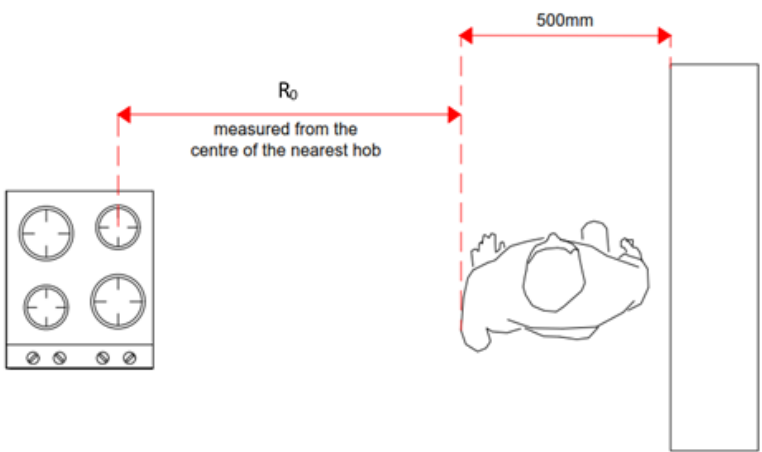


Figure 19: Separation distance from Hobs to Escape Route

C1.1.26 The equation can be rearranged to determine a minimum safe distance to achieve a received radiant heat flux of 2.5 kW/m² or less. This would result in the below equation:

$$R_0 = \sqrt{\frac{X_r \dot{Q}}{\dot{q}'' 4\pi}} = \sqrt{\frac{0.35 * 140.6}{2.5 * 4\pi}} = 1.25m$$

C1.1.27 It can be seen from the above analysis that the tenability criteria for escape passed a radiating source as detailed in PD 7974-6 (1) Table G.3 of 2.5kW/m² for 30 seconds is not breached when considering the worse credible fire scenario for a cooker hob fire. As such, the above demonstrates that any open-plan apartments with a separation distance exceeding 1.25m (i.e. 1.75m from the centre line of the hob to the nearest obstruction or the apartment

	entrance door which allows an additional 500mm for an occupant to escape) are deemed acceptable with no additional fire safety features.
C1.1.28	The separation distance of the hob to the escape route in each open-plan apartment should be confirmed by the architect to determine what (if any) additional fire protection systems will be required to the cooking facilities.
C1.1.29	Where the separation distance is greater than 1250mm (1750mm including 500mm to account of width of person), then no further fire protection measures are considered necessary.
C1.1.30	<p>The separation distance (radii) between the cooking area and the egress route in the open plan apartments are to be highlighted on the fire plans produced by JMA. Two radii will be highlighted to show:</p> <ol style="list-style-type: none"> 1. A separation distance of at least 1250mm from the centre of the nearest hob; and 2. The 500mm width required for an occupant (to give total separation distance of at least 1750mm from centre of nearest hob to nearest obstruction.

Bibliography

1. British Standards Institution. PD7974:6 The Application of fire safety engineering principles to fire safety design of buildings. Part 6, Human factors: Life safety strategies : Occupant evacuation behaviour and condition. London : BSI, 2019.
2. SFPE Handbook of Fire Protection Engineering, Third Edition. 2002. pp. Appendix C, Table C.4.
3. Babrauskas, V. & Grayson, S. J. Heat Release in Fires. pp. 203-205.
4. Karlsson, B. & Quintiere, J.G. Enclosure Fire Dynamics. 2000.
5. Drysdale, D. An Introduction to Fire Dynamics, Second Edition. p. Equation 4.52.
6. Experimental Evaluation on Performance of Open Kitchen Fire Suppression Systems. Chow, W.K. & Ni, X. 2014, FIRE SAFETY SCIENCE-DRAFT PROCEEDINGS OF THE ELEVENTH INTERNATIONAL SYMPOSIUM .
7. <http://www.thermalradiation.net/sectionc/C-109.html>. [Online] [Cited: 21 08 2014.]
8. Friedman, R. Principles of Fire Protection Chemistry and Physics Third Edition. 1998. p. Equation (12.1).
9. Karlsson, B. & Quintiere, J. G. Enclosure Fire Dynamics. 2000, p. Equation (7.16).

Appendix D – AFDA Cause and Effect

D1 AFDA Cause and Effect

D1.1.1 The fire alarm and detection systems shall be provided as described in section 2.3. The fire alarm system cause and effect for systems operation are to be provided as follows:

Apartments

- A detector activated in an apartment shall result in an automatic alarm signal throughout the apartment of fire origin and activate the fire safety systems within the apartment (any fire and smoke dampers provided for compartmentation). No automatic alarm signal will be generated in any other apartment or part of the building.

Residential Common Areas

- The system installed within the residential common corridors shall not sound an alarm in the event of detector activation either in an apartment or the corridor or escape stairs. On activation of a smoke detector within a common corridor, the following shall occur in the corridor/section of the building where the detector is located:
 - Mechanical smoke ventilation system should activate and following should be initiated simultaneously:
 - The damper to the smoke extract shaft should open on the fire floor;
 - The dampers providing replacement air (AOVs to external and/or dampers to replacement air shaft) should open on the fire floor;
 - The vents at the top of the natural air inlet shaft and the vents at the head of the stair should open;
 - The vents/dampers on all other storeys should remain closed to avoid spread of smoke and loss of ventilation rate, regardless if smoke is detected on levels other than the fire origin level.
 - Lifts in area of activation sent to ground level, or to 1st floor if detection occurs on ground floor;
 - Any plant other than those serving life safety systems shall automatically shut down.
 - A notification will be sent to the concierge.
 - Fire alarm signal should activate on rooftops.

Note: In the ground floor lift lobby of the North Block, no replacement air is provided to the mechanical smoke extract shaft. As a result, on activation of a detector in this lift lobby, the mechanical extract will be controlled by a pressure sensor on the stair door at this level only. All other effects should be in accordance with the above.

- A smoke detector activated in a common stair will result in the 1.0m² AOV at the head of that stair opening. No alarm signal will be activated. A notification will be sent to the concierge.
- A smoke detector activated in any lift shaft:
 - The lift shall be sent to ground floor
- No alarm will sound in the result of a detector activating within the refuse rooms/refuse lobbies located off residential corridors but should provide an alert to the fire alarm panel.

Ancillary and Non-Residential Accommodation

- Commercial Units -- Simultaneous evacuation area 1 (see Figure 20): a detector or manual call point activated in a commercial unit shall lead to the following:
 - An automatic fire alarm signal shall be activated throughout the affected commercial unit;
 - The fire alarm should not sound in the unaffected commercial units on the basis each commercial unit is its own fire compartment.
 - Any fire and smoke dampers provided for compartmentation to the affected commercial units shall be activated;
 - A notification will be sent to the concierge.
- Cleaners/parcel/maintenance store - Simultaneous evacuation area 2 (see Figure 20): a detector or manual call point activated in this area shall lead to the following:
 - An automatic fire alarm signal shall be activated throughout this area and should activate on rooftops;
 - AOV in parcel store to open;
 - Any fire and smoke dampers provided for compartmentation in this zone shall be activated;
 - Plant other than those serving life safety systems shall automatically shut down;
 - A notification will be sent to the concierge.
- Bicycle Store - Simultaneous evacuation area 3 (see Figure 20): a detector or manual call point activated in this area shall lead to the following:
 - An automatic fire alarm signal shall be activated throughout this area and should activate on rooftops;
 - Any fire and smoke dampers provided for compartmentation in this zone shall be activated;
 - Plant other than those serving life safety systems shall automatically shut down;
 - A notification will be sent to the concierge.
- Comms Room - Simultaneous evacuation area 4 (see Figure 20). a detector or manual call point activated in this area shall lead to the following:
 - An automatic fire alarm signal shall be activated throughout this area and should activate on rooftops;
 - Any fire and smoke dampers provided for compartmentation in this zone shall be activated;
 - Plant other than those serving life safety systems shall automatically shut down;
 - A notification will be sent to the concierge.
- Water Tank/Sprinkler Room/Generator Room - Simultaneous evacuation area 5 (see Figure 20). a detector or manual call point activated in this area shall lead to the following:
 - An automatic fire alarm signal shall be activated throughout this area and should activate on rooftops;
 - Any fire and smoke dampers provided for compartmentation in this zone shall be activated;
 - Plant other than those serving life safety systems shall automatically shut down;
 - A notification will be sent to the concierge.

- Reception/Amenity Space - Simultaneous evacuation area 6 (see Figure 20). a detector or manual call point activated in this area shall lead to the following:
 - An automatic fire alarm signal shall be activated throughout this area and should activate on rooftops;
 - Any fire and smoke dampers provided for compartmentation in this zone shall be activated;
 - Plant other than those serving life safety systems shall automatically shut down;
 - A notification will be sent to the concierge.
- LV/Switch Room - Simultaneous evacuation area 7 (see Figure 20). a detector or manual call point activated in this area shall lead to the following:
 - An automatic fire alarm signal shall be activated throughout this area and should activate on rooftops;
 - Any fire and smoke dampers provided for compartmentation in this zone shall be activated;
 - Plant other than those serving life safety systems shall automatically shut down;
 - A notification will be sent to the concierge.
- Main bin store - Simultaneous evacuation area 8 (see Figure 20). a detector or manual call point activated in this area shall lead to the following:
 - An automatic fire alarm signal shall be activated throughout this area and should activate on rooftops;
 - Any fire and smoke dampers provided for compartmentation in this zone shall be activated;
 - Plant other than those serving life safety systems shall automatically shut down;
 - A notification will be sent to the concierge.
- Substation - Simultaneous evacuation area 9 (see Figure 20). a detector or manual call point activated in this area shall lead to the following:
 - An automatic fire alarm signal shall be activated throughout this area and should activate on rooftops;
 - Any fire and smoke dampers provided for compartmentation in this zone shall be activated;
 - Plant other than those serving life safety systems shall automatically shut down;
 - A notification will be sent to the concierge.
- Rooftop Level 5 (North), 6 (North) and 8 (South) - a sprinkler head activated within any of the apartments on the respective floor level shall triggered the sprinkler flow switch on that level that will send a signal to the fire alarm panel via an interface. The system is to be programmed to activate a sounder on the relevant roof level should this occur to provide early fire warning to persons on the roof. Additionally, the smoke detection on the common residential corridors should be programmed to activate the sounders on all roof levels should a corridor smoke detector activate. If hearing protection is likely to be required for roof maintenance, then visual as well as audible warning should be provided on these rooftops.
- Ground floor independent refuse store lobbies adjacent to undercroft – a smoke detector activated in these bin lobbies shall lead to the following:
 - 0.2m² fire and smoke rated dampers will close to maintain 60-minute compartmentation between refuse lobby and undercroft. stay open to vent refuse lobby & smoke detection in undercroft is isolated (to prevent this detector from subsequently activating when smoke is being vented through the damper as this would then close the damper)
 - A notification will be sent to the concierge.

Note: If smoke detector in bin store or corridor adjacent to bin lobby is activated – the fire and smoke dampers will stay open to vent lobby & can't be subsequently overridden by detection in bin lobby (to prevent this detector from subsequently activating and closing fire damper).

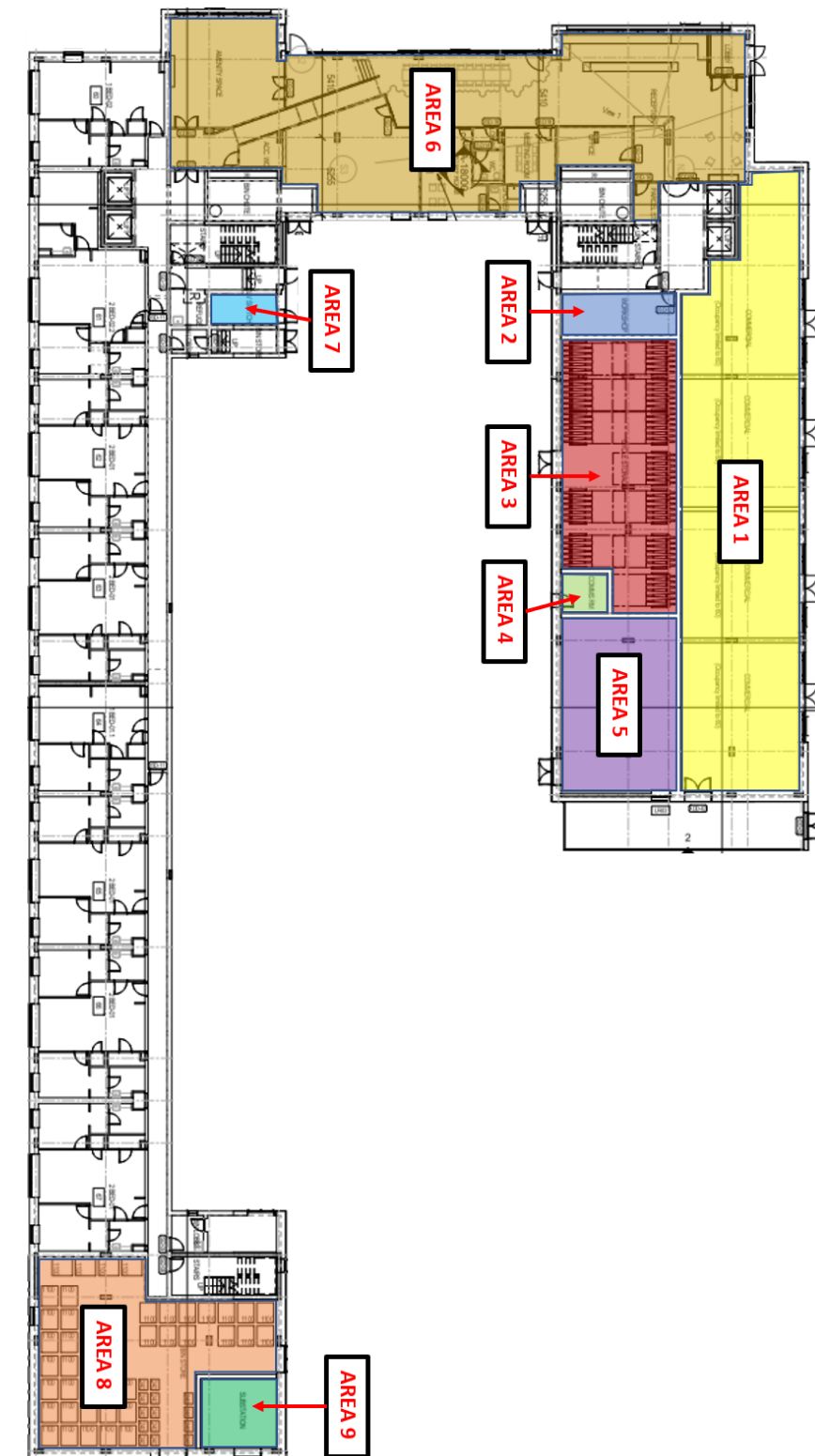
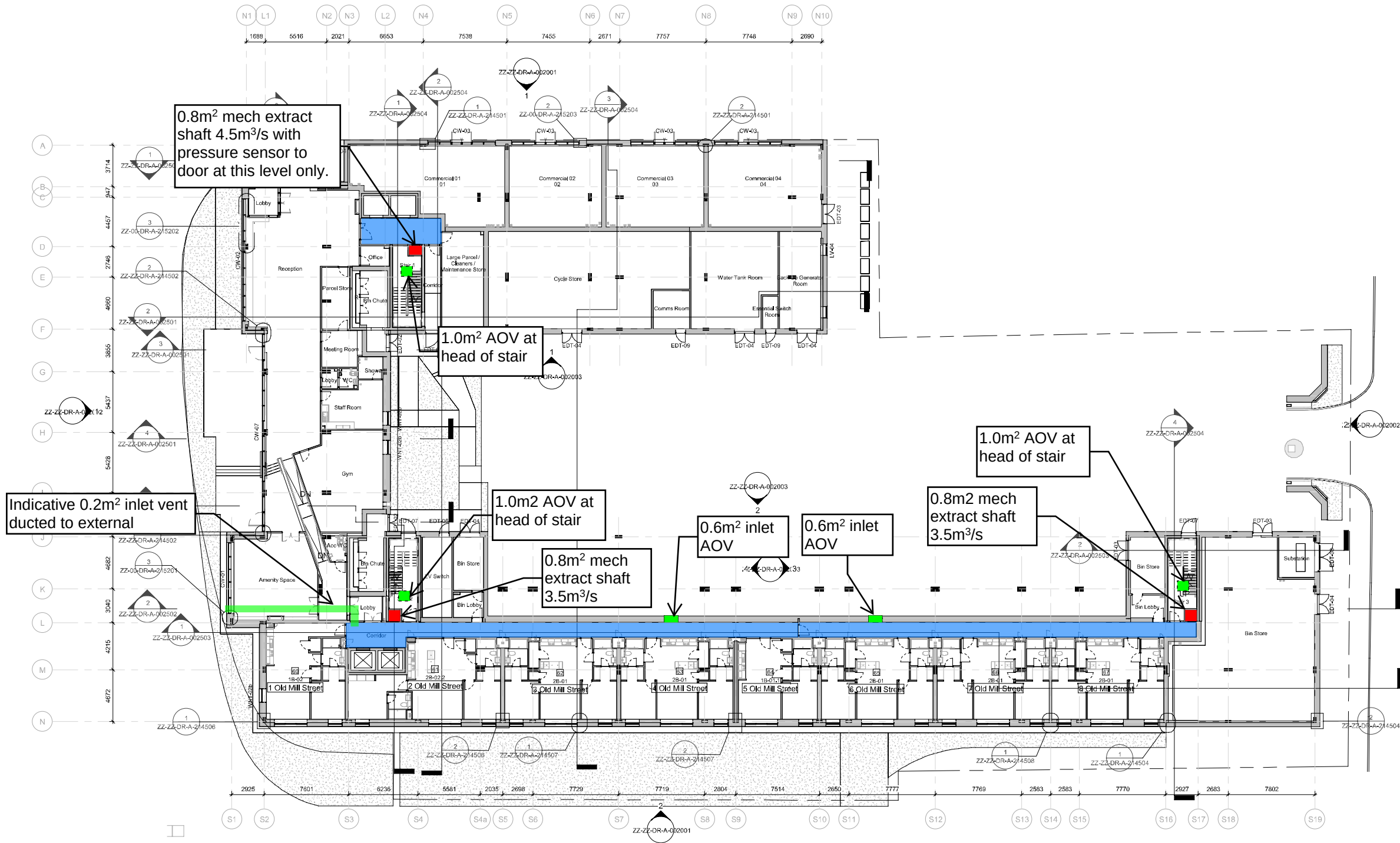
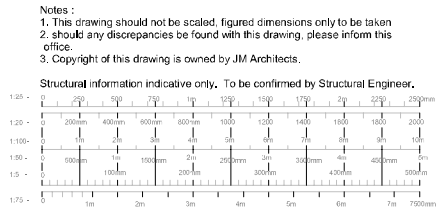


Figure 20: Ground Floor Simultaneous Evacuation Areas

Appendix E – Smoke Ventilation Strategy



1 00-GA-00-AP_Net
1 : 200



P04	Apartment addresses added and site context added	2019.11.04	CJ	SI/V
P03	Old dimensions, window types, external door types, elevations, section, room names, unit numbers and unit types added.	2019.08.30	KW	SI/V
P02	Structural and M&E model added and fire doors switched off.	2019.07.10	SW	SI/V
P01	Final issue.	2019.05.24	JH	SI/V
Rev	Description	Date	Drawn By	Check By

Project
Lampwick, Ancoats

Title
Proposed Level 00 GA

Client
John Sisk Ltd

Purpose
For CDSP Approval

Drawing Number
MLLW-JMA-ZZ-00-DR-A-00 1000

54 Princess Street
Manchester
M1 6HS

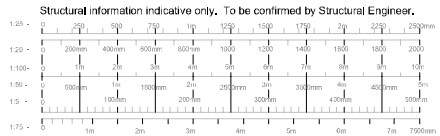
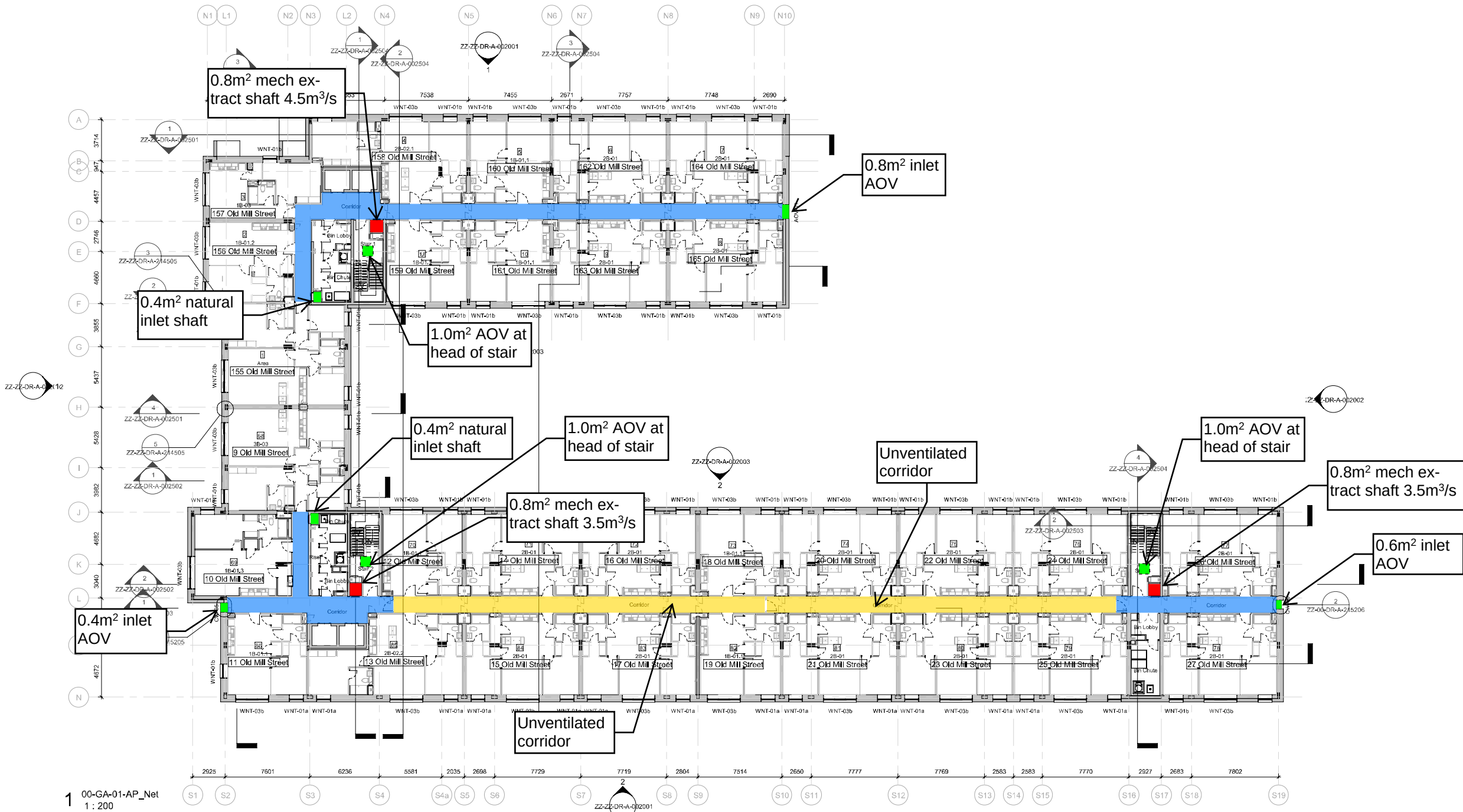
T : 0161 200 6300

man@jmarchitects.net
www.jmarchitects.net

jmarchitects

Status
S4 P04

Notes :
1. This drawing should not be scaled, figured dimensions only to be taken
2. should any discrepancies be found with this drawing, please inform this office.
3. Copyright of this drawing is owned by JM Architects.



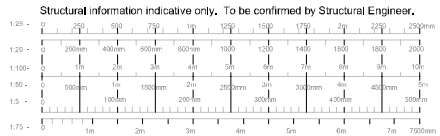
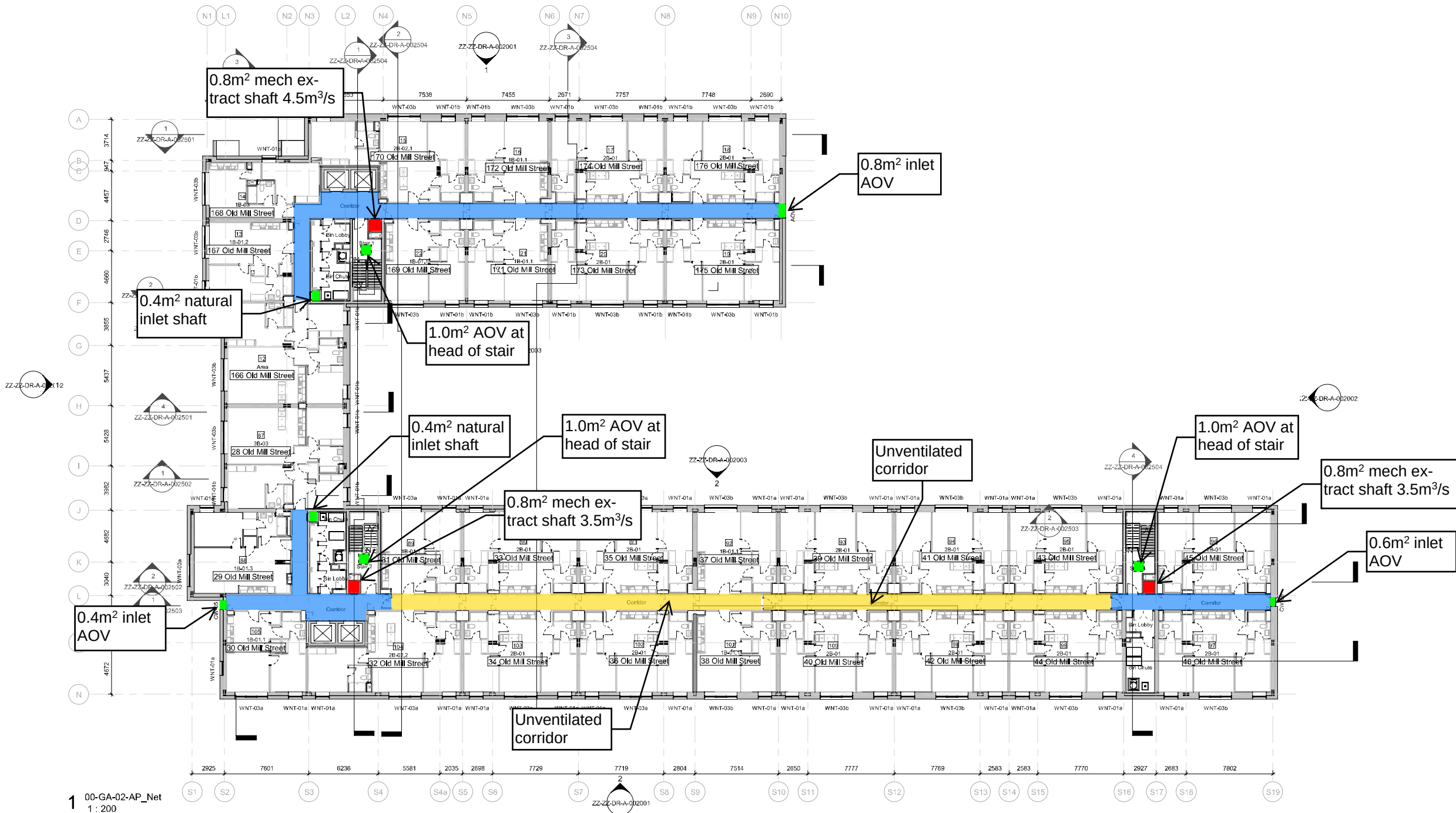
1 00-GA-01-AP_Net
1 : 200

PI1	Apartment addresses added.	2019.11.04	CJ	SV
PI2	Grid dimensions, window types, external door types, elevations, section, room names, unit numbers and unit types added.	2019.06.30	KW	SV
PI3	South block column size amended to 225mm following receipt of Hydrock mark-up and direction from Sisk on 24.05.2019.	2019.05.24	SW	SV
PI4	Final issue.	2019.05.23	SW	SV
Rev	Description	Date	Dr By	Chk By

jmarchitects

Project	Lampwick, Ancoats	54 Princess Street Manchester M1 6HS
Title	Proposed Level 01 GA	T : 0161 200 6300
Client	John Sisk Ltd	man@jmarchitects.net www.jmarchitects.net
Purpose	For CDSP Approval	Scale : 1 : 200 @ A1
Drawing Number	Project - Originator - Volume - Level - Type - Role - Class - Number MLLW-JMA-ZZ-01-DR-A- 00 1001	Status Revision S4 P04

Notes :
1. This drawing should not be scaled, figured dimensions only to be taken
2. should any discrepancies be found with this drawing, please inform this office.
3. Copyright of this drawing is owned by JM Architects.



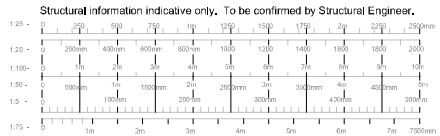
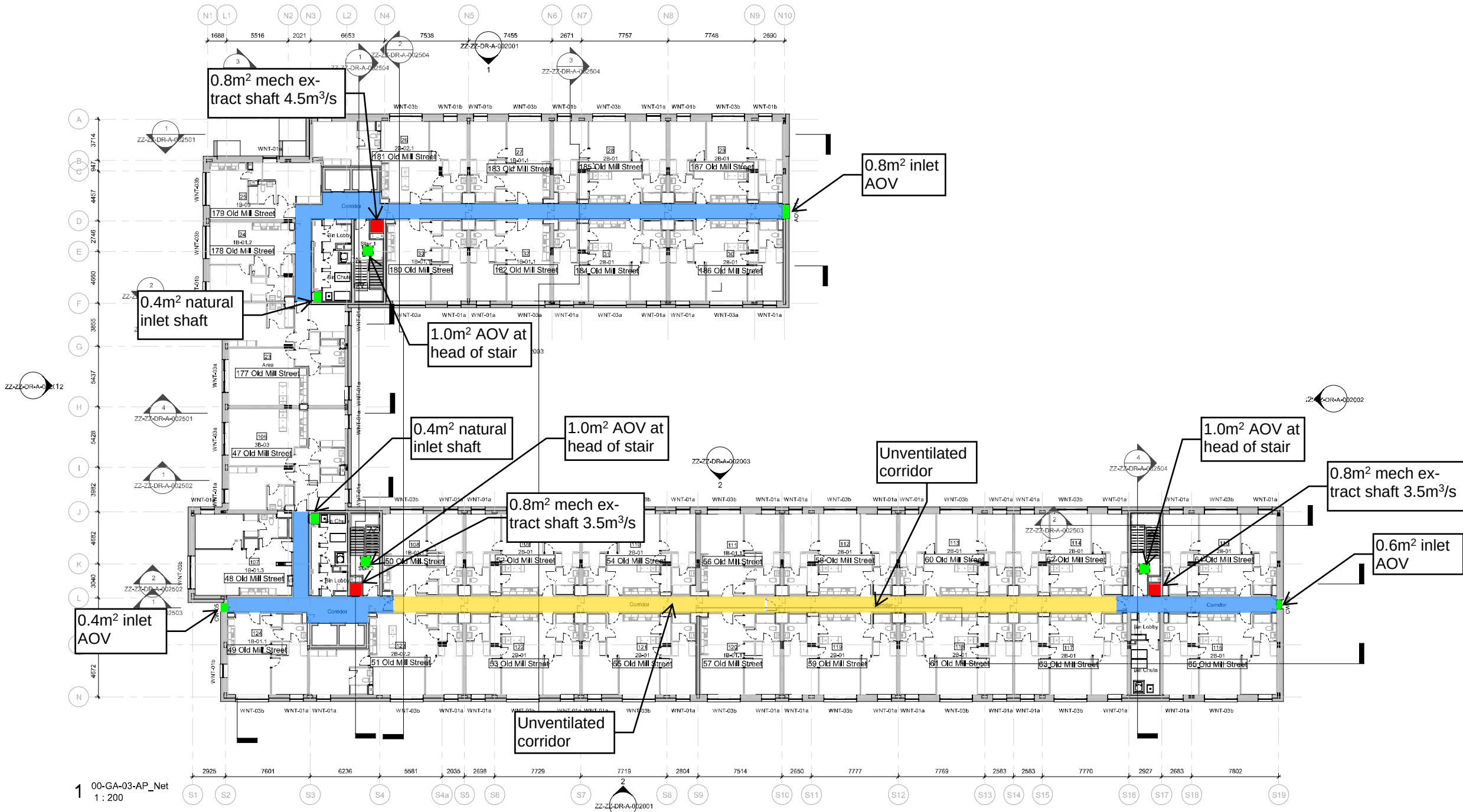
1 00-GA-02-AP_Net
1 : 200

PI3	Apartment addresses added	2019.11.04	CJ	SV
PI2	Grid dimensions, window types, external door types, elevations, section, room names, unit numbers and unit types added.	2019.06.30	RM	SV
PI1	Final issue.	2019.05.24	VM	SV
Rev	Description	Date	Dr By	Chk By

jmarchitects

Project	Lampwick, Ancoats	54 Princess Street Manchester M1 6HS T : 0161 200 6300
Title	Proposed Level 02 GA	
Client	John Sisk Ltd	man@jmarchitects.net www.jmarchitects.net
Purpose	For CDSP Approval	Scale : 1 : 200 @ A1
Drawing Number	Project - Originator - Volume - Level - Type - Role - Class - Number MLLW-JMA-ZZ-02-DR-A- 00 1002	Status Revision S4 P03

Notes :
1. This drawing should not be scaled, figured dimensions only to be taken
2. should any discrepancies be found with this drawing, please inform this office.
3. Copyright of this drawing is owned by JM Architects.



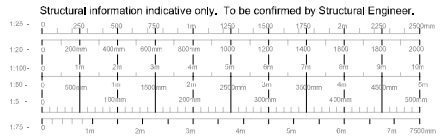
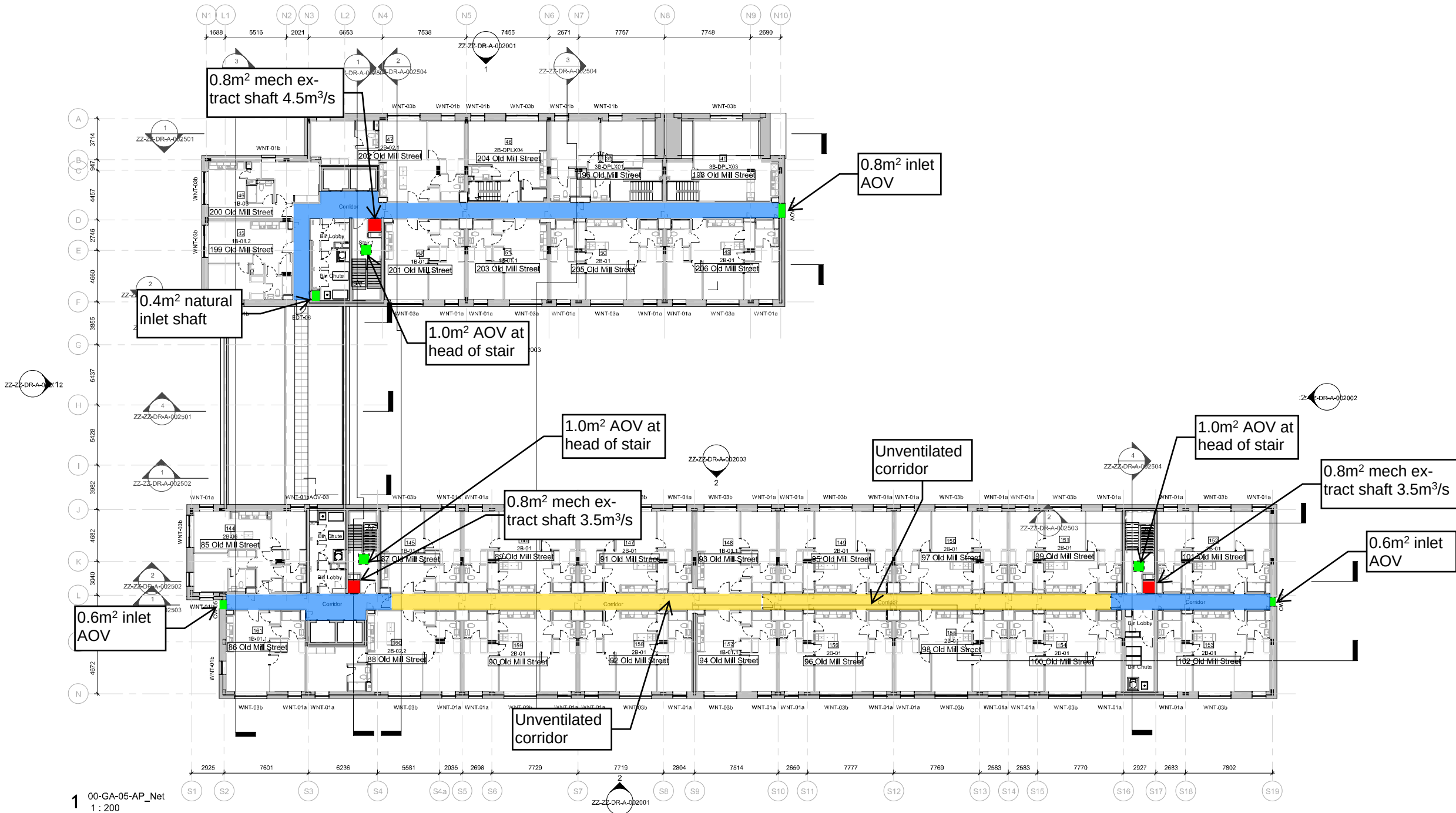
1 00-GA-03-AP_Net
1 : 200

PI3	Apartment addresses added	2019.11.04	CJ	SV
PI2	Grid dimensions, window types, external door types, elevations, section, room names, unit numbers and unit types added.	2019.08.30	RM	SV
PI1	Final issue.	2019.05.24	VH	SV
Rev	Description	Date	Drn By	Chk By

jmarchitects

Project	Lampwick, Ancoats	54 Princess Street Manchester M1 6HS T : 0161 200 6300
Title	Proposed Level 03 GA	
Client	John Sisk Ltd	
Purpose	For CDSP Approval	man@jmarchitects.net www.jmarchitects.net
Drawing Number	MLLW-JMA-ZZ-03-DR-A- 00 1003	
Status	S4 P03	

Notes :
1. This drawing should not be scaled, figured dimensions only to be taken
2. should any discrepancies be found with this drawing, please inform this office.
3. Copyright of this drawing is owned by JM Architects.



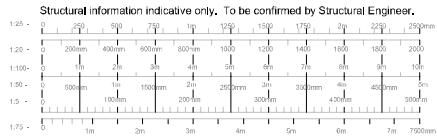
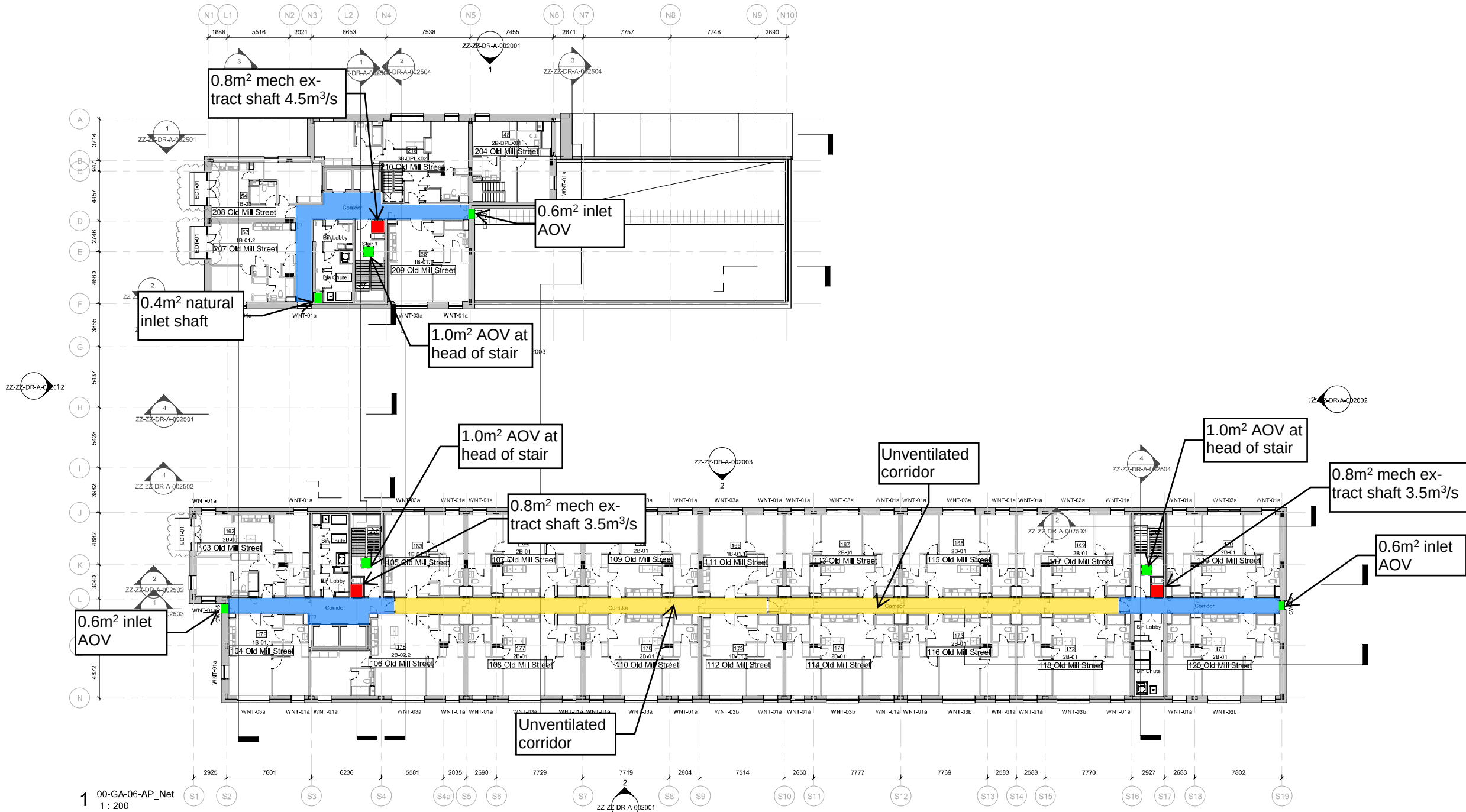
1 00-GA-05-AP_Net
1 : 200

PI3	Apartment addresses added	2019.11.04	CJ	SV
PI2	Grid dimensions, window types, external door types, elevations, section, room names, unit numbers and unit types added.	2019.08.30	MM	SV
PI1	Final issue.	2019.05.24	VM	SV
Rev	Description	Date	Dr By	Chk By

jmarchitects

Project	Lampwick, Ancoats	54 Princess Street Manchester M1 6HS
Title	Proposed Level 05 GA	T : 0161 200 6300
Client	John Sisk Ltd	man@jmarchitects.net www.jmarchitects.net
Purpose	For CDSP Approval	Scale : 1 : 200 @ A1
Drawing Number	MLLW-JMA-ZZ-05-DR-A- 00 1005	Status Revision S4 P03

Notes :
1. This drawing should not be scaled, figured dimensions only to be taken
2. should any discrepancies be found with this drawing, please inform this office.
3. Copyright of this drawing is owned by JM Architects.

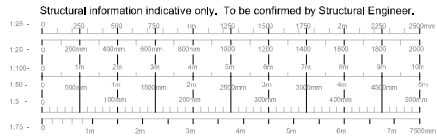
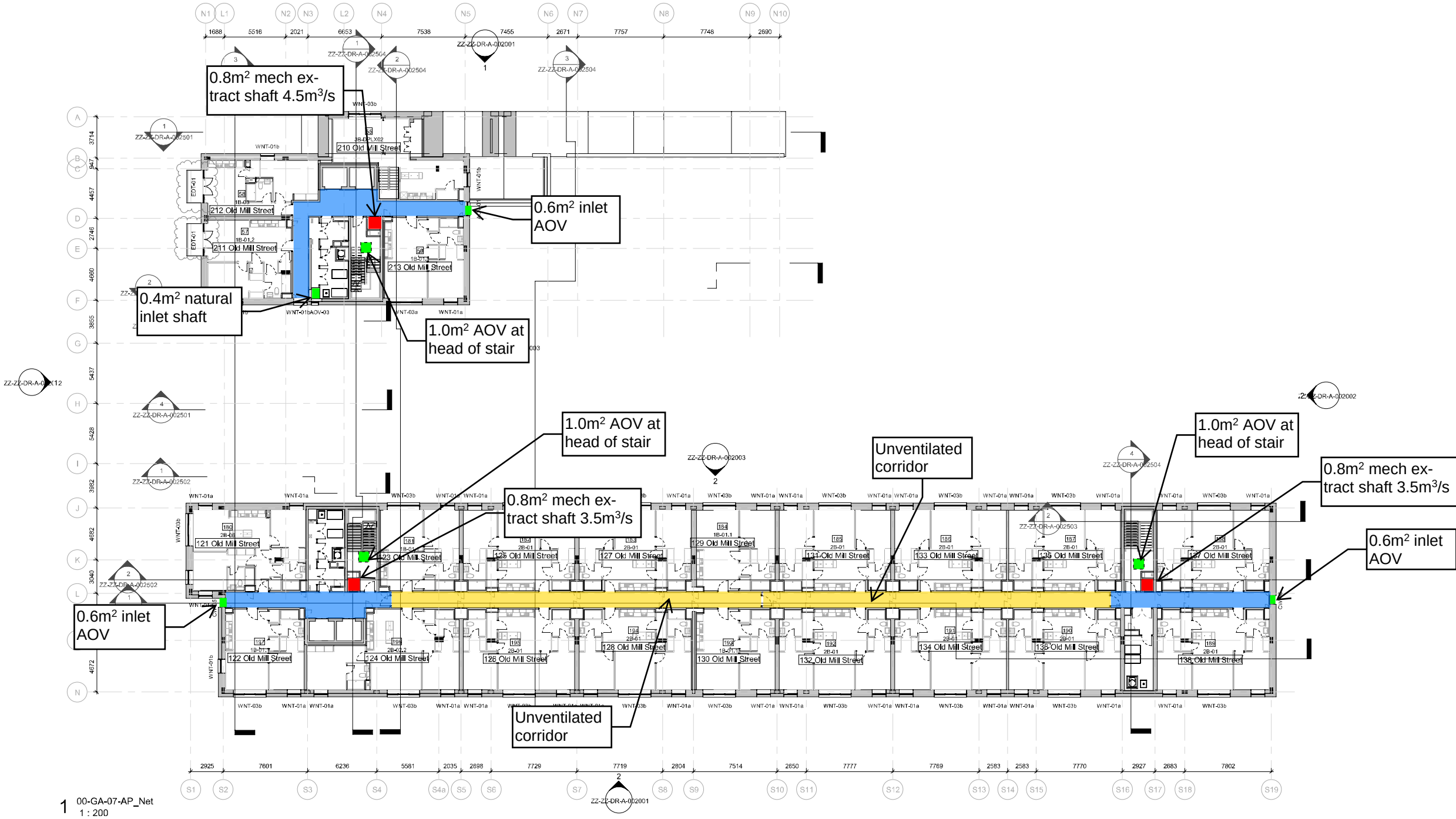


P03	Apartment addresses added and balconies added to GA plans	2019.11.04	CJ	SV
P02	Grid dimensions, window types, external door types, elevations, section, room names, unit numbers and unit types added.	2019.08.30	BM	SV
P01	Final issue.	2019.05.24	VH	SV
Rev	Description	Date	Drawn By	Check By

jmarchitects

Project	Lampwick, Ancoats	54 Princess Street Manchester M1 6HS
Title	Proposed Level 06 GA	T : 0161 200 6300
Client	John Sisk Ltd	man@jmarchitects.net www.jmarchitects.net
Purpose	For CDSP Approval	Scale : 1 : 200 @ A1
Drawing Number	Project - Originator - Volume - Level - Type - Role - Class - Number	Status Revision
	MLLW-JMA-ZZ-06-DR-A- 00 1006	S4 P03

Notes :
1. This drawing should not be scaled, figured dimensions only to be taken
2. should any discrepancies be found with this drawing, please inform this office.
3. Copyright of this drawing is owned by JM Architects.



1 00-GA-07-AP_Net
1 : 200

PO3	Apartment addresses added and balconies added to GA plans	2019.11.04	CJ	SV
PO2	Grid dimensions, window types, external door types, elevations, section, room names, unit numbers and unit types added.	2019.08.30	RM	SV
PO1	Final issue.	2019.05.24	VM	SV
Rev	Description	Date	Drawn By	Check By

Project
Lampwick, Ancoats

Title
Proposed Level 07 GA

Client
John Sisk Ltd

Purpose
For CDSP Approval

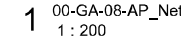
Drawing Number
MLLW-JMA-ZZ-07-DR-A- 00 1007

54 Princess Street
Manchester
M1 6HS

T : 0161 200 6300

man@jmachitects.net
www.jmachitects.net

Status
S4 PO3



jmarshitects

Project	54 Princess Street Manchester M1 6HS
Lampwick, Ancoats	
Title	
Proposed Level 08 GA	T : 0161 200 6300
Client	
John Sisk Ltd	
Purpose :	man@marchitects.net www.jmarchitects.net
For CDSP Approval	Scale : 1 : 200 @ A1
Drawing Number	
Project - Originator - Volume - Level - Type - Role - Class - Number	Status Revision
MLLW-JMA-ZZ-08-DR-A- 001008	S4 P03

Structural information indicative only. To be confirmed by Structural Engineer.

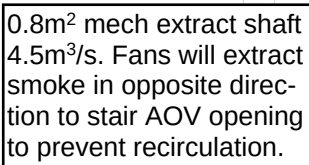
1.25
1.20
1.10
1.50
1.60
1.75

0 200mm 400mm 600mm 800mm 1000mm 1200mm 1400mm 1600mm 1800mm 2000mm 2200mm 2400mm 2600mm 2800mm

0 200mm 400mm 600mm 800mm 1000mm

0 1m 2m 3m 4m 5m 6m 7m 7500mm

	J31/365	STONE BALLAST
	J31/370A	PRECAST CONCRETE PAVING SLABS
	H74/110A	ZINC STANDING SEAM NON-VENTILATED COMPOSITE WARM ROOF SYSTEM TO SAWTOOTH ROOF



1.0m² AOV at head of stair

1.0m² AOV at head of stair

0.8m² mech extract shaft
3.5m³/s. Fans will extract
smoke in opposite direction
to stair AOV opening to pre-
vent recirculation.

1.0m² AOV at head of stair

0.8m² mech extract shaft
3.5m³/s. Fans will extract
smoke in opposite direc-
tion to stair AOV opening
to prevent recirculation.

P05	Apartment addresses added and balconies added to GA plans	2019.11.04	CJ	SW
P04	Paved walkways added, Roof Types Key Added, Falls annotated.	2019.08.06	KW	SW
P03	Fall slope arrows added to pitched roof.	2019.07.23	SW	SW
P02	Indicative AOVs and mechanical ventilators added to roof plan, RW's indicated to sawtooth roof.	2019.06.21	KW	SW
P01	Final Issue	2019.05.24	VH	SW
Rev	Description	Date	Drn By	Chk By

Project	54 Princess Street Manchester M1 6HS
Lampwick, Ancoats	
Title	
Proposed Level 10 GA	
Client	T : 0161 200 6300
John Sisk Ltd	
Purpose : For CDSP Approval	man@jmachitects.net www.jmachitects.net
Drawing Number	Scale : As indicated @ A1
Project - Originator - Volume - Level - Type - Role - Class - Number	Status Revision
MLLW-JMA-ZZ-10-DR-A- 00 1010	S4 P05

OMEGA FIRE

Now part of **BB7**

2 Jordan Street Manchester M15 4PY | 0161 279 8470 | www.omegafire.co.uk

