

An architectural rendering of modern buildings under a blue sky with clouds. The image is overlaid with a semi-transparent blue filter. On the left is a multi-story building with a grid of windows and balconies. On the right is a taller, more uniform building. In the foreground, there are silhouettes of trees and a street scene with people walking and cars. The text is overlaid on the left side of the image.

June 2023
Building Services Planning Report

Upper Brook Street Masterplan

(McLaren / Kadans)

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Issue / Revision Record

Issue	Date	By	Checked	Comment
P01	04.05.23	AS	DY/IG	Planning Issue
P02	01.06.23	AS	CH	Updated with in line with client and planning consultant comments

1.0 Introduction

1.1 Role of the Building Services Planning Report

This report has been prepared by Wallace Whittle on behalf of McLaren Property Ltd. and Kadans Science Partner, to support a full planning application for a Sci-Tech and purpose-built student accommodation scheme (PBSA) scheme (hereafter referred to as the 'Proposed Development') on the Upper Brook Street Masterplan (hereafter referred to as the 'Site'). This scheme would bring forward development on a Previously Developed site which is earmarked for commercial and PBSA uses in the Oxford Road Corridor SRFG 2019.

This application has been accompanied by a suite of technical documents, reports and plans.

This report outlines the proposed locations and types of plant intended for the new Sci-Tech scheme proposed for the Kadans Science Partner plot of the Upper Brook Street Masterplan.

This report outlines the following system strategies:

- Energy Strategy
- BREEAM Assessment
- WELL-enabled strategy
- Mechanical and Public Health Services
- Electrical Services
- Communications (fibre) services
- Vertical Transport Strategy
- Building Façade Maintenance and Access Strategy

This assessment does not cover the foul or surface water drainage connections to the foul and surface water below-ground drainage systems. These will be covered under a separate report, provided by the project civil engineer.

1.2 Description of the Site

The Site extends to 1.084 hectares (ha) and is partially in use as a temporary paid car park. The paid car park is located on a section of the Site which was formerly in use as a Citroën car dealership and is accessed from both Upper Brook Street (UBS) to the west and Kincardine Road to the east. The remainder of the Site comprises the former Elizabeth Yarwood Court residential complex, which is accessed from Kincardine Road to the east of the Site.

The Site is identified for redevelopment within the Oxford Road Corridor SRF with mixed commercial uses in-line with the SRF being a priority for the UBS site.

The Proposed Development forms one element of the wider Upper Brook Street Illustrative Masterplan which can be seen within the submitted Supporting Planning Statement.

The masterplan proposals are being brought forward by Kadans Science Partner, McLaren Property, Property Alliance Group and Moda Living. The masterplan intends to transform the currently vacant sites, re-establishing their important role in the area by re-introducing permeability, public realm, and active community-facing uses at ground floor. The emerging masterplan includes over 2 acres of new public realm and green spaces, a new public square, as well as a series of high-quality new buildings of varying heights to provide for approximately 700,000ft² of sci-tech accommodation, 1,800 purpose-built student accommodation beds, and 25,000ft² of active ground floor uses.

The existing land uses surrounding the site are as follows:

- To the north of the Site is a vacant single-storey commercial building (also identified for redevelopment within the Oxford Road Corridor SRF) and the Grade II* listed 'Former Unitarian Chapel' which now functions as student accommodation.
- To the east of the Site is Kincardine Road; beyond which is a 4 to 6-storey student accommodation building and 2-storey residential dwellings that form a part of the wider Brunswick Estate. The Brunswick Estate is an area currently undergoing extensive urban regeneration (see Cumulative Scheme 1 (Brunswick Neighbourhood)).
- To the south of the Site is Cottenham Street; beyond which is the Tai Wu restaurant and W.H. Lung Supermarket.
- To the west of the Site is UBS, on the opposite side of which is the University of Manchester's Main Campus, which includes the National Graphene Institute, the Manchester Engineering Campus and the Sir Henry Royce Institute, with buildings ranging from 4-storeys to 10-storeys in height.

1.3 Proposed Development

The site is located on Upper Brook Street in Manchester on a parcel of land currently occupied by Elizabeth Yarwood Court, a former sheltered housing scheme that ceased operations in June 2021, and a display area for the former Citroen car dealership. The extent of the site is identified as the boundary to 'OPTION A' below.

The site is referenced as a key part of the Oxford Road Corridor Strategic Regeneration Framework Guidance and is sited adjacent to now-defunct car showrooms which are also due to be developed as part of an overall scheme.

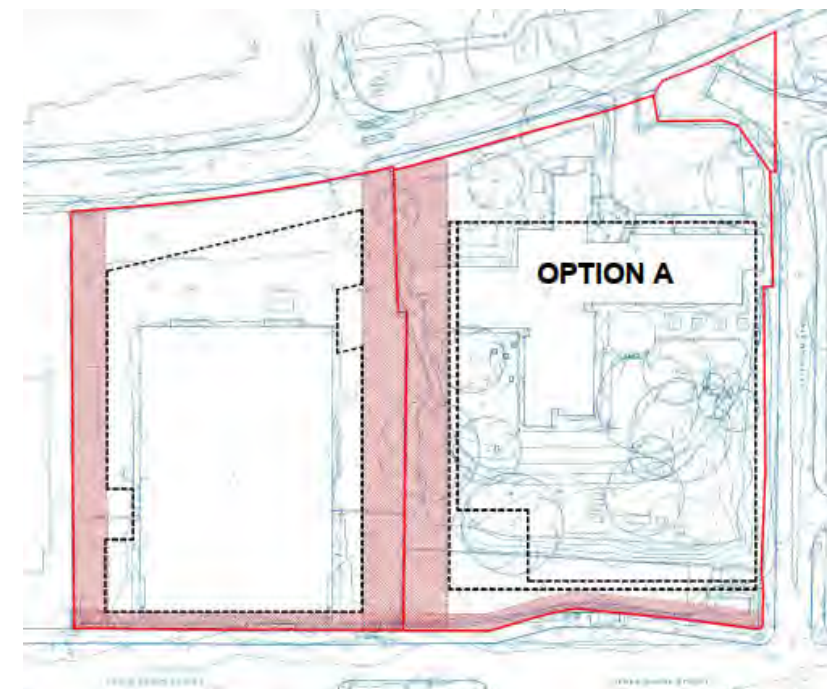


Figure 1.3 - Sheppard Robson Provisional Site Boundary

The proposed building provides 13,723 m² of combined laboratory and office space along with a ground floor publicly accessible café, meeting room suites throughout the building, and a secure cycle store and cycle changing. The building massing is split into a low level 6 storey block (inc. plant) to Kincardine Road, rising to 9 storeys (inc. plant) at Upper Brook Street, with an atrium to the centre of the floorplates that houses informal breakout spaces and forum seating at ground floor.

1.4 Client Brief

Wallace Whittle has been appointed to undertake design duties for the mechanical, electrical and public health (MEPH) services, as well as associated vertical transport, façade access and maintenance and planning energy requirements, from RIBA stage 2 through to stage 4 Coordinated Generic Design for the new Kadans office and laboratory facilities.

Our duties include the following:

- Review of electrical supply strategies and agree on preferred options
- Review of standby power requirements
- Provide designs to provide a BREEAM score of excellent with a route to Outstanding
- Provide designs to ensure the building is WELL enabled
- Provide Electrical, Mechanical, Comms and Control Strategies to achieve WiredScore and SmartScore Gold.
- Provide a vertical transportation solution for the conveyance of people and goods vertically through the building, including for firefighting purposes.
- Provide a strategy for access and maintenance of the façade.
- Provide Stage 2 design information Friday 14th April
- Provide Stage 3 design information including report, principles schematics and strategy drawings
- Provide Stage 4 design information including Schematics, equipment schedules, technical schematics, and drawings

1.5 Basis of Planning Report Design

The information provided in this report is based on the following information provided and interim design team meetings specific to the project:

Sheppard Robson Layouts, sections and elevations (issued 29 March 2023):

- 7025-SRA-ZZ-00-DR-A-20100 Ground Floor – P03
- 7025-SRA-ZZ-01-DR-A-20101 First Floor Plan – P03
- 7025-SRA-ZZ-02-DR-A-20102 Second Floor Plan – P03
- 7025-SRA-ZZ-03-DR-A-20103 Third Floor Plan – P03
- 7025-SRA-ZZ-04-DR-A-20104 Fourth Floor Plan – P03
- 7025-SRA-ZZ-05-DR-A-20105 Fifth Floor Plan – P03
- 7025-SRA-ZZ-06-DR-A-20106 Sixth Floor Plan – P03
- 7025-SRA-ZZ-07-DR-A-20107 Seventh Floor Plan – P03
- 7025-SRA-ZZ-EE-DR-A-20201 East Elevation – P02
- 7025-SRA-ZZ-EN-DR-A-20200 North Elevation – P02
- 7025-SRA-ZZ-ES-DR-A-20202 South Elevation – P02
- 7025-SRA-ZZ-EW-DR-A-20203 West Elevation – P02
- 7025-SRA-ZZ-RF-DR-A-20108 Roof Plan – P03
- 7025-SRA-ZZ-SE-DR-A-20302 East Section – P02
- 7025-SRA-ZZ-SN-DR-A-20301 North Section – P02
- 7025-SRA-ZZ-XX-SH-A-SK020 Area Schedule – P04

2.0 Design Criteria

2.1 General

The new Mechanical, Electrical and Public Health services installations shall be designed by the criteria outlined in this section of the report.

2.2 Standard Guidance

The MEP installation shall comply with the relevant clauses of current editions of the following:

- Project Design Brief Rev.1 (November 2022)
- British Standards and Codes of Practice
- Current Editions of CIBSE Guides and Codes
- CIBSE Technical Memoranda
- BSRIA Technical Publications
- The Building Regulations
- Institute of Plumbing (IoP) Design Guide
- The Electricity at Work Regulations
- BS7671 - IEE Wiring Regulations (18th Edition) and associated documentation
- Fire Alarm Installations BS 5839
- Emergency Lighting Installations BS 5266
- Internal Lighting Installations BSEN 12464-1
- External Lighting Installations BSEN 12464-2
- Buried services - NJUG Standards
- British Council for Offices (BCO) Guide to Specification: Best Practice for Offices
- British Council for Offices (BCO) Guide to Fit Out

2.3 Design Temperatures

External Temperatures	Winter	Summer
General Design Conditions	-4°C saturated	29°C dry bulb/21°C wet bulb
Plant Selection Criteria	-12°C dry bulb	35°C dry bulb
	(Plant shall continue to operate in outside ambient conditions up to 40°C and down to -12°C albeit at reduced output capacity)	

Table 2.3.1 - External Design Temperatures

Area	Heating Temperature (°C)	Cooling Temperature (°C)
Office and Lab Areas	22	24
Meeting and Training Rooms	20	23
Break-Out	20	26
Atrium	18	Uncontrolled
Kitchen	18	Uncontrolled
Cafe	19	24
BoH Offices	22	24
Toilets	19	Uncontrolled
Shower Areas	22	Uncontrolled
Entrance Lobbies	18	24
Corridors and Circulation Areas	18	Uncontrolled
Internal Staircases	16	Uncontrolled
Internal / Enclosed Plantrooms	12	Uncontrolled

Table 2.3.2 - Internal Design Temperatures

2.4 Allowances and Zoning of Installations

The general floor plates have been developed on a base build split area allowance between laboratory and office accommodation as follows:

- Laboratories: 60%
- Offices: 40%

Spatial allowances for the plant have been developed based on the values above with a further allowance of 20% additional spare capacity to facilitate future Cat B fit out

The services installations shall be delivered to provide a Cat A installation based on the proposed SRA indicative layouts and in accordance with BCO recommendations such that the following control zones are applied:

- Perimeter Zone: 4.5m deep (from the façade) and 6m wide
- Internal Zones: 50-80m²

2.5 Ventilation Rates

Primary ventilation shall be provided based on the following criteria.

Area	Ventilation Rate	Occupancy	Comments
Offices	12l/s/person	1:10	20% to be added to final volumes for future
Laboratories	6ach ⁻¹	1:15	20% to be added to final volumes for future
Break-Out	4ach ⁻¹	n/a	
Cafe	12l/s/person	1:5	
Kitchen	Extract rate 50ach/h	N/A	Extract rate to be finalised once catering specialist is engaged Supply to make up 80% of extract volume
WC areas	8ach ⁻¹ extract 6ach ⁻¹ supply	N/A	Maintained under negative pressure
Shower Rooms	10ach extract	N/A	Maintained under negative pressure

Table 2.5 - Ventilation Rates

2.6 Cooling Loads

The thermal loads identified in Table 2.6 shall be used for the development of the design of the heating and cooling installations at Stage 2. External Load shall be determined via the use of standard modelling software such as IES, TAS or HevaComp. For stage 2 costing purposes standard CIBSE values from Table A5.16(g) may be applied.

Area	Occupancy		Lighting	Equipment
	People	Gains		
Open Plan Office	1:10m ²	90W(Sensible); 50W(Latent)	10W/m ²	15W/m ²
Laboratories	1:15m ²	100W(Sensible); 60W(Latent)	10W/m ²	15W/m ²
Break-Out	2	90W(Sensible); 50W(Latent)	10W/m ²	5W/m ²
Cafe	1:5	100W(Sensible); 60W(Latent)	10W/m ²	10W/m ²
Reception	10	80W(Sensible); 35W(Latent)	10W/m ²	5W/m ²
Kitchen	4	115W(Sensible); 120W(Latent)	10W/m ²	35W/m ²
Security	3	90W(Sensible); 50W(Latent)	10W/m ²	25W/m ²
Comms Room (MER)	-	-	-	750W/m ²
UPS Room	-	-	-	500W/m ²

Table 2.6 - Internal Cooling Loads

2.7 Acoustic Criteria

It is proposed that the existing external noise levels shall not be exceeded. As such plant and equipment shall be selected to be better than those associated with the existing installations.

The acoustic consultant shall provide specific information with respect to internal noise levels. However, the building services installations shall be provided to ensure the following noise levels are achieved within respective spaces:

- Open Plan Offices: NR38
- Laboratories: NR40
- Individual Offices: NR35
- Break-Out: NR40
- Equipment Rooms (Comms): NR50
- Café: NR40
- Kitchen: NR45
- Toilets and Shower Rooms: NR40
- Plantrooms: NR75

2.8 Public Health Services

Foul Drainage Above Ground

Design	In accordance with BS EN 12056-2-2000. Part H of the current Building Regulations, CIBSE Guide G: Public Health Engineering and, the Institute of Plumbers Guide.
System Type	III According to BS EN 12056, Part 2, Primary ventilated drainage system.

Domestic Cold-Water Services

Design	In accordance with current: Water Regulations/ WRAS standards, BS EN 806, BS EN 8558 CIBSE Guide G: Public Health Engineering, and, the Institute of Plumbers Guide
Cold Water Storage	General water storage is provided at a minimum of 4 hours (50% of daily load) based on 45 (l) per person (office usage) as indicated in the IoP Guide 2002, with an uplift for laboratory usage TBA. Category five break tanks for laboratory usage to be minimum storage. Min storage to comply with BS 8550, i.e., to provide min. 15-min peak flow rate.
Water Treatment	Electromagnetic water treatment to prevent scale build-up.

Domestic Hot Water Systems

Design	In accordance with current: Water Regulations/ WRAS standards, BS EN 806, BS EN 8558 CIBSE Guide G: Public Health Engineering, and, the Institute of Plumbers Guide
Hot Water Generation	Instantaneous systems proposed, no storage allowance provided. Hot water generation based on estimated peak simultaneous demand calculated according to CIBSE Guide G.

3.0 Energy Strategy

3.1 Introduction

This section presents the Energy Strategy for the proposed building, it sets out all preliminary design considerations and key drivers to develop a low carbon / Net Zero Carbon (NZC) enabled energy strategy for the proposed building.

The key drivers are as follows:

- BREEAM Excellent (with a BREEAM Outstanding aspiration)
- Energy Performance Certificate; A-Rating
- Manchester City Council’s Core Strategy (July 2012)
- Greater Manchester Spatial Framework (Revised Draft Jan 2019)
- Building Regulations Part L2A 2021

3.2 Energy Strategy Framework

The “Energy Hierarchy” framework was used to develop the low-carbon energy strategy for the proposed Upper Brook Street development in Manchester. The approach described by this methodology provides a stage process, BE LEAN, BE CLEAN and BE GREEN (Illustrated below in Figure 3.2) to develop the low carbon and energy efficiency design measures to be applied to this project with the following aims:

- BE LEAN: to reduce the building’s energy demand.
- BE CLEAN: to meet the reduced energy demand in the most energy-efficient way.
- BE GREEN: to apply the most viable Low and Zero Carbon generating technologies to further reduce energy consumption and CO₂ emissions.



Figure 3.2 - Energy Hierarchy Framework

3.3 Outline Energy Strategy

This section presents the early design stage development of the energy strategy proposed for the building. It sets out design principles to deliver a low-carbon and NZC-enabled strategy aimed to comply with the requirements set out by the local planning policy, Building Regulations, and the targeted BREEAM Rating.

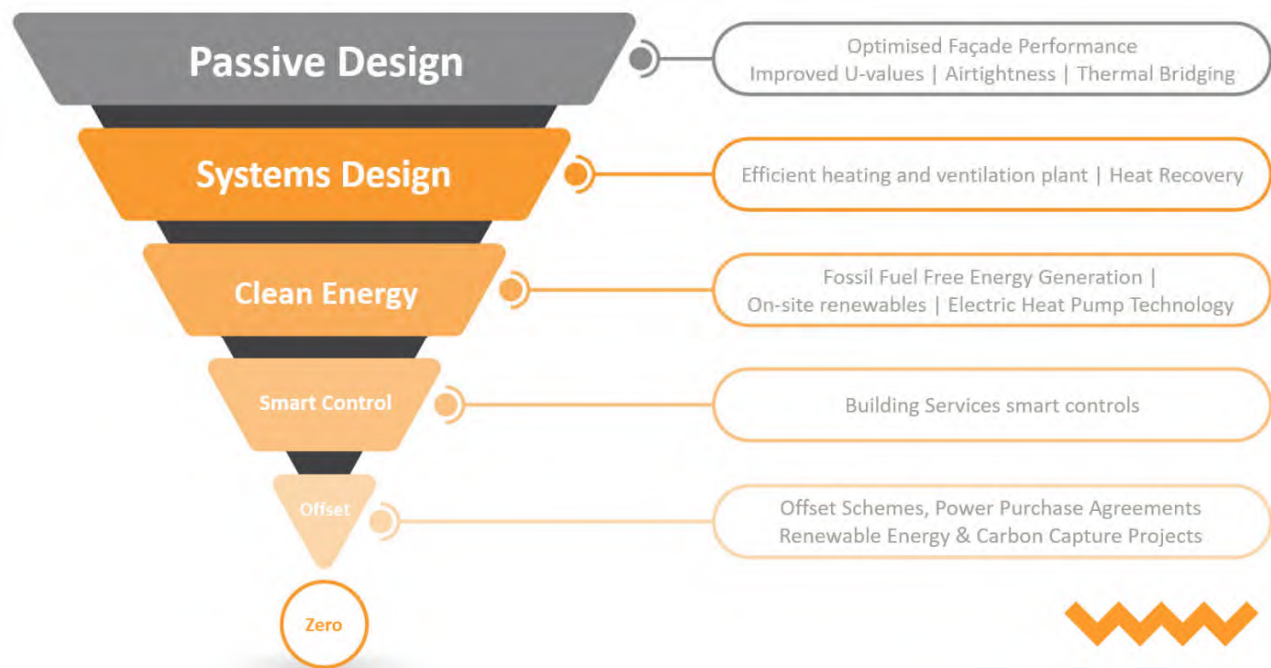


Figure 3.3 - Approach to Carbon Emission Savings

Passive design: This will include high levels of passive design measures to reduce energy consumption and associated CO₂ emissions. Design considerations are to include the following:

- Glazing areas optimised for daylight and thermal performance.
- Enhanced U-values for both opaque and transparent elements. (Recommended values are shown in table 3.4.2 below)
- Very good air tightness where feasible (target < 3m³/h.m²@50 Pa).
- High light transmittance glazing in the façade (> 60% LT).
- Solar shading devices and solar control glazing within the office façade, balancing passive solar control and controlling thermal comfort on the floors.

Systems Design: After minimising the energy demand through passive (or Be Lean) elements, carbon emissions will be reduced further by selecting efficient mechanical and electrical systems, and efficient controls to manage the energy used during operation.

- Energy efficient lighting systems.
- Heat recovery integrated into the ventilation system.
- Variable speed drives on the AHUs.
- Presence detection on lighting controls in most areas and photocell control dimming in office perimeter areas.
- Building Management System to monitor mechanical systems.

Clean Energy: Avoidance of all fossil fuels. All-electric servicing.

- Flexibility for connection to any future District Heating/Cooling Network.
- Integration of air source heat pump (and chillers, where necessary).
- Roof-mounted photovoltaic (PV) arrays, providing renewable electricity.

Smart Control: Demand-side Response Strategy.

- Application of smart energy management to optimise energy use.
- Consider energy storage (Battery) to manage power demands onsite.
- Visualise and educate building energy managers, building users and visitors to drive energy consumption down.

3.4

Passive Design

To align with the BREEAM ENE04: Low Carbon Design credit, the following table presents the passive design measures to be considered as the design develops

Passive Design Measure	Consideration
Site Location	The proposed building is to be set out in an urban setting at Upper Brook Street, Greater Manchester in England. The proposed site is affected by moderated prevailing southerly winds. The location of the building has been previously defined, and the aim is to optimize the use of land and provide adequate accommodation for the proposed Office/Lab building. It has been recommended that provision for adequate roof area to be provided to accommodate solar technologies
Site Weather Microclimate	The proposed building is in the northwest of England. Typically, the weather in this region experiences mild winters, cool summers, and heavy rain all year round. Upper Brook Street is not classed to be an urban heat island.
Building Layouts Building Orientation	The building's layout, orientation and form are currently under development. The recommended consideration highlights the following: ▪ optimize the building footprint ▪ provide adequate daylight and limit excessive solar gains using external shading. This process evaluated the interaction between daylight access, glare and view out.
Building Form and Layout	Developing a compact form will reduce the energy demand of the building. At this stage, the massing and form of the building are being developed and it is recommended to provide a compact design which aims to reduce heat demand. External shading to all south, southwest, and west elevations is recommended to reduce additional solar gains in the building. In addition to the above internal layouts are to be designed to reduce distances in M&E services, this can be achieved by placing toilet and wet areas in close proximity to avoid excessive pipe lengths, which will result in lower heat loss from pipework.
Building Occupancy type	Due to the speculative nature of the development, an extended period of operation when compared to a typical office building has been assumed. The energy and building services strategies are being developed with this issue in mind.
Daylight strategy	Adequate access to natural light not only benefits the visual comfort of building users but can also reduce the energy used to artificially light spaces. The proposed development aims to carefully consider the development of translucent surfaces that will aim to allow useful

Passive Design Measure	Consideration
	daylight into a space without affecting the internal visual and thermal environment. Further design development, and supporting assessments, are required to assess the daylight ingress, glare risks and thermal comfort in all occupied rooms.
Ventilation Strategy	At this stage, the strategy for the proposed building is mechanical ventilation.
Adaptation to Climate Change	Climate projections indicate that the northwest of England is likely to have warmer, wetter winters and hotter, drier summers in the future. Adaptation to these conditions is a crucial consideration for the development of energy and building services strategies. Measures to mitigate climate change such as enhanced ventilation to occupied areas and material selection to withstand increased rainfall, among others, should be considered further as the design of the proposed building progresses.

Table 3.4.1 - Passive Design Considerations

In line with the passive design consideration highlighted above, the following table presents the fabric thermal performance targets recommended for this development. The targeted reduced U-values and air permeability ranges are proposed to exceed the minimum requirements of Part L2A:2021 and are summarized below. This measure aims to reduce the heat demand by reducing fabric and uncontrolled ventilation heat losses.

External Element	Recommended Range of Performance
Roof (Flat / Pitched) U-value	0.10 (W/m ² K)
External Solid Wall. U-value	0.15 (W/m ² K)
Exposed floors or ground contact floors. U-value	0.10 (W/m ² K)
Windows (including frame)	1.20 (W/m ² K) (g-value < 0.33)
Air permeability target	3.00 m ³ /h.m ² @ 50Pa

Table 3.4.2 - Proposed Fabric Thermal Performance

3.5 System Design

After the passive measures discussed above the next step is to define the system design principles. This section presents the energy efficiency design considerations proposed for the Upper Brook Street development:

- Efficient Internal and external lighting: All lighting to be Light Emitting Diodes (LED) to minimize energy consumption.
- Lighting Controls: all lighting designs to include daylight linking with either switching or dimming to be included where applicable for offices and lab areas, Passive Infrared Sensors (PIR), Absence detection and manual switches.
- Pumps and fans with variable speed drives and sensors.
- Heat recovery, all supply and extract ventilation systems with high-efficiency heat recovery technology.
- Energy monitoring: an adequate energy sub-metering strategy should be used to monitor energy use in the building. This system will allow for an understanding of out-of-range values and any abnormality that could identify faults which may cause the building to use more energy.

3.6 Clean Energy

A preliminary Low and Zero Carbon generating technology has been carried out and have identified the following technologies for development:

3.6.1 Heating and Cooling Low Carbon Space Conditioning (to serve the office and lab areas)

RECOMMENDED OPTION: Reverse Cycle Chillers

This technology provides low-carbon space heating and efficient comfort cooling.



Figure 3.6.1 - Airdale Air Cooled (Heat Pump Variant)

Advantages	Disadvantages
Future-proof option – NZC ready.	The system is less efficient than VRF/HVRF
Allow the system to be fully designed as per the client's brief (including bespoke elements)	No simultaneous cooling and heating unless a polyvalent heat pump is specified (although it is a lot more expensive)
The system does not require a cooling tower, meaning less maintenance	The design is not packaged, which means to design for the system hydraulics, controls, internal units etc will need to be designed individually
Common in larger development	Freeze protection is required (i.e., glycol or trace heating) which will reduce the overall efficiency of the system
Higher delivery capacity when compared to than VRF/HVRF system	Expensive system to design and install

Table 3.6.1 - Reverse Cycle Chillers Advantages and Disadvantages

3.6.2 Low Carbon DHW Generation

Dedicated DHW Air Source Heat Pumps

This technology provides low carbon DHW generation recommended at this stage to serve the GF Café and changing room areas

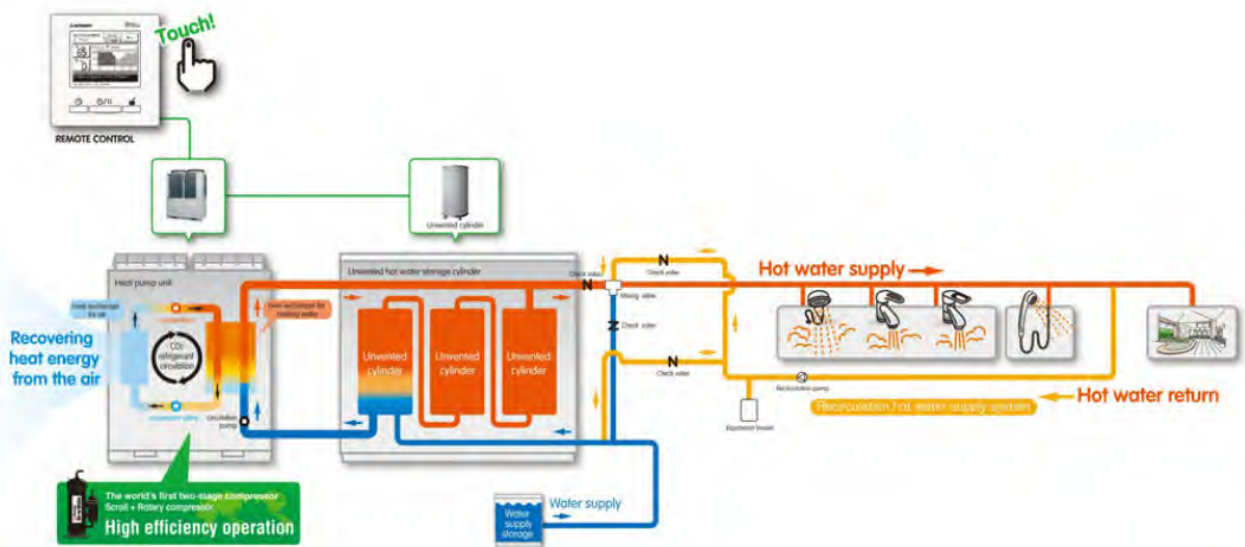


Figure 3.6.2 - Air to Water Commercial Heat Pump Example.

Advantages	Disadvantages
Future-proof option - NZC ready.	System is inflexible and is limited to DHW production only
CO ₂ as a refrigerant has the lowest GWP	It is the most effective when working at maximum capacity
High efficiency for producing water up to 90°C	
System comes in full package	
Easy to control	

Table 3.6.2 - DHW Dedicated ASHP Advantages and Disadvantages

3.6.3 Renewable Energy

At this early stage, it is recommended that all PV areas be optimised. This technology will be placed on all available roof space. With ideally 30-40% of this roof space to be active area of PV. The RIBA Stage 2 compliance calculation require an active PV area of 400m².

Given the current services allowances, at this stage the figure below illustrates the preliminary roof area identified to place this technology on the roof. Please note that this should be reviewed once the massing of the building and plant allocation is finalised. Additional areas may be feasible, such the inclusion of a gantry above core and plant, with the intent to increase and optimise the area of PV on this building to ensure the building achieves the energy and CO₂ emissions targets sought.

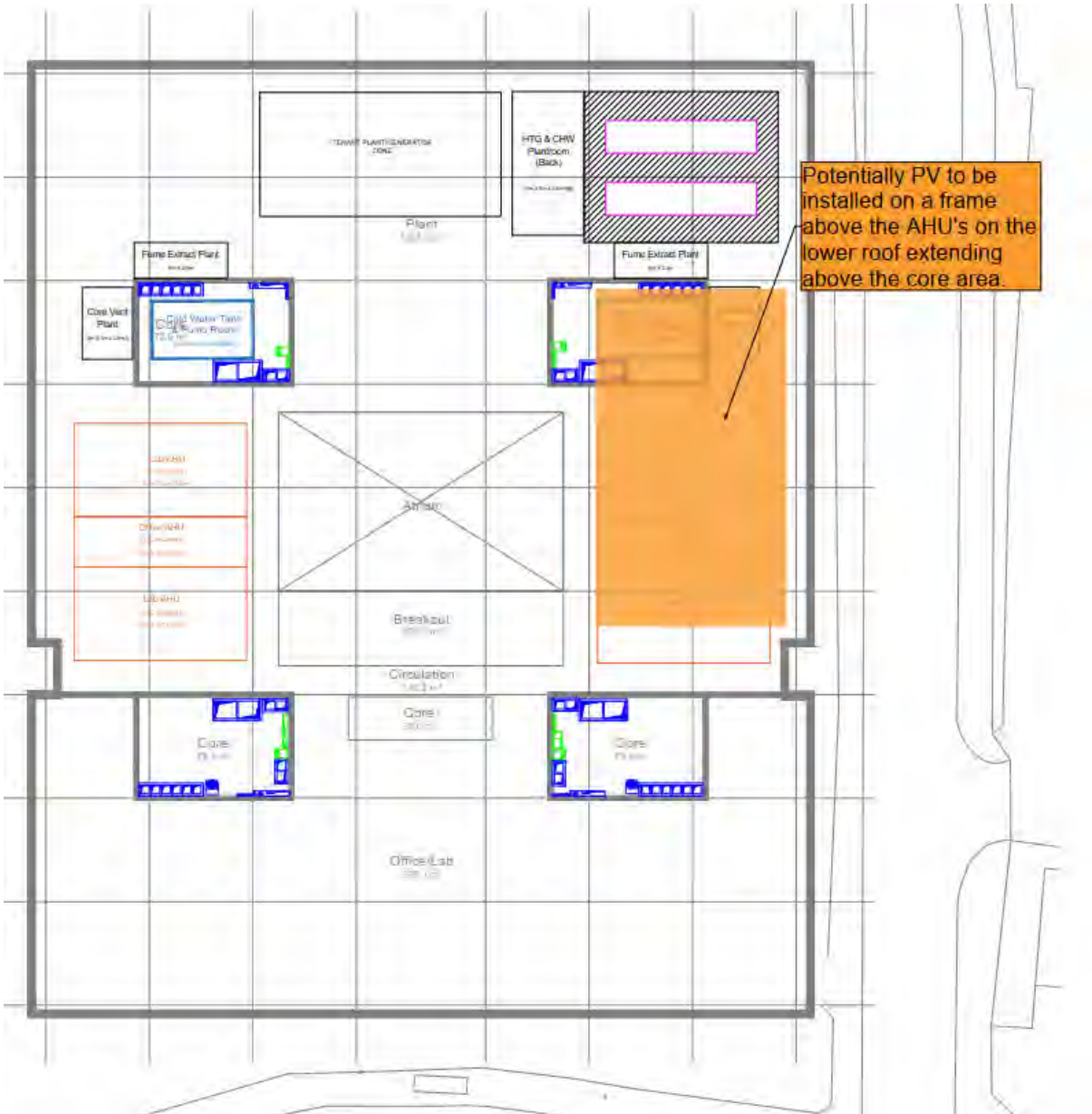


Figure 3.6.3 - Initial indicative Roof Area allocated for PV Technology

3.7 Compliance Results

A series of compliance calculations were carried out at stage 2. This section presents the compliant results and BREEAM ENE 01 checks for the Stage 2 energy strategy proposals set out below.

The table below presents the information used to assess compliance against Part L2a 2021.

Item	Stage 2 Proposals
Target Fabric Thermal Performance	
Roof (Flat / Pitched) U-value	0.10 (W/m²K)
External Solid Wall. U-value	0.15 (W/m²K)
Exposed floors or ground contact floors. U-value	0.10 (W/m²K)
Windows (including frame)	1.20 (W/m²K) (g-value < 0.33)
Air permeability target	3.00 m³/h.m² @ 50Pa
HVAC and Systems	
Space Heating	Office/Lab, Café, Reception and breakout spaces: LTHW – ASHP Chiller SCOP = 3.12 Fan Coil Units (SFP: 0.2 W/l/s). WCs, Corridors: Electric Panel Heaters.
Comfort Cooling	Office/Lab, Café, Reception and breakout spaces: Chilled Water – ASHP Chiller. SEER = 4.67 Fan Coil Units (SFP: 0.2 W/l/s). WCs, Corridors: Electric Panel Heaters
Mechanical Ventilation	Mechanical Ventilation with Heat Recovery. AHU SFP = 2.06 W/l/s (average). HR Eff =73%. With Demand Control Ventilation. WCs/ Showers / Changing Rooms. Dedicated extract ventilation system. SFP 0.4 W/l/s.
Lighting	LED Throughout. Office/Lab Area – Luminaire efficacy 120 lm/CW. Daylight-sensing + automated controls. Other Areas Corridors/Stairs/Stores/WCs. Luminaire efficacy 100 lm/CW. Daylight-sensing + automated controls.
DHW	GF – Level Dedicated ASHP Serving, Café, Café Kitchen and Changing Rooms. All other levels. Point of Use Electric.
Renewable Energy	Active 400m² Photovoltaic System

Table 3.7.1 - Energy and CO2 Compliance Results Summary

The tables below show the compliance results of these two options:

	Part L2a Compliance (BER/TER)	Part L2a Compliance (BPER/TPER)	BREEAM NC V6 ENE 01 Credits.	Stage2 Draft Energy Performance Certificate (EPC) Rating.
UBS Office Block	(2.89(kgCO ₂ /m²)/3.39 (kgCO ₂ /m²)). 14.7% Improvement. Compliant (PASS).	(30.41kWh/m²/34.83 kWh ₂ /m²). 12.7% Improvement. Compliant (PASS).	4.0 (BREEAM Excellent minimum performance achieved)	Stage 2 Draft EPC Rating: A 15

Table 3.7.2 - Energy and CO₂ Compliance Results Summary

The table above shows that the proposed building achieve the following:

- Building Regulations Part L2A 2021 : The building achieves compliance with Part L.
- BREEAM Excellent : 4 Credits achieved under ENE01 Credit.
- EPC Draft Rating : The building achieves an EPC Rating A – 15.

Limitations

The energy assessment was completed using the RIBA Stage 2 Revit model and drawings provided by Sheppard Robson and design information with assumptions based on industry standards and experience. Whilst the information used is provided as an illustration, the final performance will be dependent on the final commissioning results and actual operation of the building.

The Notional and Actual Building calculations use standard NCM operational parameters as required by the NCM rules. These do not match the intended 'Real' building usage exactly but allow a 'like for like' analysis under the Building Regulations. The results presented in this section are therefore not valid for 'Real' building operation

4.0 BREEAM & WELL

4.1 Introduction to BREEAM NC V6

This section presents a BREEAM New Construction V6 (Shell and Core) pre-assessment summary for the proposed Kadans development in Upper Brook Street, Manchester.

Following a BREEAM pre-assessment workshop, the targeted scores were calculated and presented in the tables and figure below.

Target Performance	
Target Rating	BREEAM NC (Shell and Core) (V6) Excellent (≥70%)
Targeted Score	75.56%
Aspirational Rating	BREEAM NC (Shell and Core) (V6) Outstanding (≥85%)
Aspirational Score	89.88%

Table 4.1.1 - Upper Brook Street targeted BREEAM NC Rating

	Available	Weighting	Credits Targeted for Excellent	Credits Targeted for Outstanding
Management	18	11	18	18
Health & Wellbeing	11	8	10	10
Energy	21	14	15	18
Transport	12	11.5	6	8
Water	9	7	7	9
Materials	14	17.5	11	12
Waste	11	7	10	11
Land Use & Ecology	13	15	8	11
Pollution	12	9	9	11
Exemplary/Innovation	10	-	0	2
Total	131	-	94	110
Credits Targeted for Excellent:			75.56%	
Credits Targeted for Outstanding:				89.88%

Table 4.1.2 - BREEAM Summary Table



Figure 4.1 - Upper Brook Street BREEAM Rating Summary

With a final target score of 75.56%, a BREEAM “Excellent” rating will be achieved with a buffer of 5.56% over the 70% minimum score required for a BREEAM “Excellent” rating.

Several risk credits were identified by the BREEAM Assessor at this stage. A list of these credits is given below.

- Man 04 Commissioning and Handover – Testing and inspecting building fabric (1 Credit)
- Hea 01 Visual Comfort – Daylighting (1 Credit)
- Hea 01 Visual Comfort – View Out (1 Credit)
- Hea 02 Indoor Air Quality Plan – Ventilation (1 Credit)
- Hea 07 Safe and healthy surroundings – Safe Access (1 Credit)
- Hea 07 Safe and healthy surroundings – Outside Space (1 Credit)
- Wat 04 Water Efficient Equipment (1 Credit)
- Mat 02 Hard Landscaping and Boundary Protection (1 Credit)
- Wst 02 Recycled Aggregates – Project Sustainable Aggregate Points (1 Credit)
- Le 01 Site Selection – Previously Occupied Land (1 Credit)
- Pol 01 Impact of Refrigerants (1 Credit)

The aspirational target of BREEAM “Outstanding” can be achieved through the targeting of additional credits to improve the score to 89.88% which will give result BREEAM “Outstanding” rating. This score provides a buffer of 4.88% over the 85% minimum score for a BREEAM “Outstanding” Rating.

It must be noted that the project is targeting a BREEAM NC Excellent as a minimum performance.

The following table shows the key RIBA Stage 2 BREEAM actions. These credits are currently being targeted and should be addressed at before the end of RIBA Stage 2.

RIBA Stage 2 BREEAM actions Key	
Information Outstanding	
Ongoing	
Achieved	

Credit	Information required	Responsibility	Progress
Man 01 Project Brief and Design	1. Consultation plan setting out the process and scope of the consultation. 2. Communication records – demonstrating consultation feedback. Independent third-party consultation reports e.g Design Quality Indicator Reports	Client / Client Rep / Planners / Design Team.	
Man 01 Project Brief and Design	The appointment of a BREEAM AP (Achieved)	Client Rep / BREEAM AP. (WW)	
Man 02 Life Cycle & Service Life Planning	1. Elemental LCC Plan.	Quantity Surveyor/Cost Manager	
Hea 02 Indoor Air Quality - Prerequisite	Completion of an indoor air quality plan.	M&E Engineer (WW)	
Hea 06 Security - Security of site and building	A Suitably Qualified Security Specialist (SQSS) conducts an evidence-based Security Needs Assessment (SNA).	Architects / ALO Consultant.	
Ene 01 Reduction of energy use & carbon emissions – Pre-requisite	Preliminary design team workshop focussing on Operational Energy.	Energy Engineer (WW)	
Ene 04 Low Carbon Design – Passive Design Analysis	Develop a passive design and analysis report.	Energy Engineer (WW)	
Ene 04 Low Carbon Design – LZCT	A LZCT feasibility study.	Energy Engineer (WW)	
Mat 01 Environmental Impacts from construction products - Building life cycle assessment (LCA)	Completion of a Building LCA options appraisal for superstructure, substructure, and hard landscaping. Evidence that the LCA options appraisal summary document has been received by the design team and client (meeting minutes, letter of acknowledgement). Evidence of how the LCA design options have informed the design decision-making process (e.g. meeting minutes, documented design development showing how the LCA options have affected the design).	LCA Assessor Architect Structural Engineer Civil Engineer Landscape Architect	
Mat 06 Material Efficiency	Material efficiency report reviewing the chosen material choices at concept design stage	Architect Structural Engineer Civil Engineer M&E Engineer	

Credit	Information required	Responsibility	Progress
Wst 01 Construction waste management - Pre-demolition Audit	Completion of a Pre-Demolition Audit.	Client Agent / Main Contractor Demolition Contractor	
Wst 01 Construction waste management - Diversion of resources from landfill	Completion of a compliant Resource Management Plan.	Main Contractor	
Wst 05 Adaptation to Climate change – Structural and fabric resilience	Completion of a Climate Change Adaptation Strategy Appraisal.	Architect M&E Engineer Structural Engineer	
Wst 06 Design for disassembly and adaptability	Disassembly and functional adaptability study, implementation plan report, building adaptability and disassembly guide.	Architect M&E Engineer	
Le 05 Long term ecology management and maintenance	Completion of a Landscape and Ecology Management Plan.	Ecologist	
Pol 05 Noise Attenuation	Completion of a Noise Impact Assessment.	Acoustician	

Table 4.1.3 - RIBA Stage 2 Credit Summary

4.2

Introduction WELL Building Standard

Wallace Whittle was appointed to carry out a WELL v2 Pre-assessment for the proposed Block B office on Upper Brook Street, Manchester. This section outlines the WELL Building Standard features as discussed with the client and the design team as discussed during the WELL workshop. At this workshop, it was agreed that formal WELL Core certification would not be sought. Instead, the WELL Pre-assessment outlined the route to a “WELL Enabled” building, incorporating all necessary health and wellbeing measures such that a tenant would not be prevented from pursuing formal WELL certification as part of their fit-out to allow a tenant to achieve as high a score as possible and, in theory, a Platinum rating.

The Pre-assessment is subject to a review of the individual requirements by the responsible members of the project team.

In terms of certification, it should be noted that:

Any level of WELL certification requires that all preconditions be met.

- Silver-level certification is awarded when 50 points have been achieved with a minimum of 1 point per concept.
- Gold level certification is awarded when 60 points have been achieved with a minimum of 2 points per concept.
- Platinum-level certification is awarded when 80 points have been achieved with a minimum of 3 points per concept.

4.2.1 WELL Building Standard

The WELL Building Standard v2 is an assessment methodology for buildings and organisations that delivers more thoughtful and intentional spaces that enhance human health and well-being. It is backed up by a review of the latest scientific research and draws upon expertise from practitioners, public health professionals and building scientists. The methodology is divided into ten concepts, with each concept consisting of features with distinct health intents. These features are either preconditions or optional optimisations. Preconditions are considered fundamental parts of a WELL-certified space and therefore preconditions and all parts within them are mandatory for certification.

The WELL v2 methodology operates on a points-based system with 110 points available. Optimisations are weighted with varying point values with the maximum point values being determined by the sum of a building's parts. A primary difference between WELL and other assessment methodologies is that WELL is performance-based. As such, on-site assessments and third-party testing are required for verification of a WELL-certified building. Therefore, objectives determined at the design stage must be implemented and demonstrated in practice once the building becomes operational.

Please refer to the table below for the CAT A Fit-out Requirements for the proposed building.

ID	Feature	Part	Comments
A01.1	Air Quality	Meet Thresholds for Particulate Matter	AHU Filter grades to be reviewed
A01.4	Air Quality	Meet Thresholds for Radon	Comply with A03 Part 1 Option 1
A02.2	Smoke-Free Environment	Prohibit Outdoor Smoking	
A03.1	Ventilation Design	Ensure Adequate Ventilation	AHUs provided by landlord
A05.2	Enhanced Air Quality	Meet Enhanced Thresholds for Organic Gases	AHUs provided by landlord
A05.3	Enhanced Air Quality	Meet Enhanced Thresholds for Inorganic Gases	AHUs provided by landlord
A06.1	Enhanced Ventilation Design	Increase Outdoor Air Supply	AHUs provided by landlord
A06.2	Enhanced Ventilation Design	Improve Ventilation Effectiveness	
A07.1	Operable Windows	Provide Operable Windows	Not achieved.
A09.1	Pollution Infiltration Management	Design Healthy Entryways	Interiors projects may count exterior building entrances that meet the feature requirements, even if they are outside of the project boundary.
A09.2	Pollution Infiltration Management	Perform Envelope Commissioning	Interiors projects may count commissioning performed on the building envelope, even if outside of the project boundary.
A12.1	Air Filtration	Implement Particle Filtration	Specify correct grade of filter AHUs
W01.1	Water Quality Indicators	Verify Water Quality Indicators	Water quality targets to be included in contractors requirements
W02.1	Drinking Water Quality	Meet Chemical Thresholds	Water quality targets to be included in contractors requirements

ID	Feature	Part	Comments
W02.2	Drinking Water Quality	Meet Thresholds for Organics and Pesticides	Water quality targets to be included in contractors requirements
W03.1	Basic Water Management	Monitor Chemical and Biological Water Quality	Water quality targets to be included in contractors requirements
W03.2	Basic Water Management	Implement Legionella Management Plan	Water quality targets to be included in contractors requirements
W04.1	Enhanced Water Quality	Meet Thresholds for Drinking Water Taste	Water quality targets to be included in contractors requirements
W05.1	Drinking Water Quality Management	Assess and Maintain Drinking Water Quality	Water quality targets to be included in contractors requirements
L05.1	Daylight Design Strategies	Implement Daylight Plan	"Basebuild - Visible Light Transmittance of glass must be 40% or more.
V03.1	Circulation Network	Design Aesthetic Staircases	Tenant may use the landlord stair as part of their own WELL certification for the fit-out.
V03.2	Circulation Network	Integrate Point-of-Decision Signage	
V03.3	Circulation Network	Promote Visible Stairs	
V04.1	Facilities for Active Occupants	Provide Cycling Infrastructure	
V04.2	Facilities for Active Occupants	Provide Showers, Lockers and Changing Facilities	
T01.1	Thermal Performance	Provide Acceptable Thermal Environment	Dependant on landlord / tenant scope
T01.2	Thermal Performance	Measure Thermal Parameters	Dependant on landlord / tenant scope
S02.1	Maximum Noise Levels	Limit Background Noise Levels	Acoustician to be appointed to ensure feature requirements are met
S03.1	Sound Barriers	Design for Sound Isolation at Walls and Doors	Acoustician to be appointed to ensure feature requirements are met
S03.2	Sound Barriers	Achieve Sound Isolation at Walls	Acoustician to be appointed to ensure feature requirements are met
X02.1	Interior Hazardous Materials Management	Manage Asbestos Hazards	To be included within contractors requirements
X02.2	Interior Hazardous Materials Management	Manage Lead Paint Hazards	To be included within contractors requirements
X02.3	Interior Hazardous Materials Management	Manage Polychlorinated Biphenyl (PCB) Hazards	To be included within contractors requirements
X03.2	CCA and Lead Management	Manage Lead Hazards	To be addressed in specifications
X06.1	VOC Restrictions	Limit VOCs from Wet-Applied Products	To be addressed in specifications

Table 4.2.1 - WELL Building Standard Target Summary

5.0 Mechanical and Public Health Services

5.1 General

The scope of the mechanical services installations will include but not necessarily be limited to the following:

- Above Ground Waste drainage installations
- Condensate drainage installation
- Domestic cold-water services installations
- Domestic hot water services installations
- VRF Heating and Cooling Installations
- Local DX Spit heating and cooling installations
- Comms Room dedicated close control cooling installation
- Primary supply and extract ventilation installations
- Local toilet extract ventilation systems
- Local tea point extract ventilation systems
- Local gas extract system
- Kitchen extract system
- Kitchen supply ventilation system
- Galvanised Ductwork installations
- Pipework installations
- Insulation of pipework and ductwork to BS5970
- Plant and Equipment support systems suitable for building construction
- Automatic Controls and BMS installations
- Testing and Commissioning

5.2 Above-Ground Waste Drainage Installations

The works will comprise the design, supply, installation, setting to work, commissioning, performance testing (including factory test where notes) and handing over of the fully functional complete above-ground foul drainage system.

A fully vented Above Ground Foul Drainage system will be provided to serve, sinks, toilets, wash hand basins, water fountains and any other appliance requiring a waste/drain connection etc. including drains from mechanical ventilation/heating cooling appliances, from the new building. In addition, a series of dedicated discharge stacks will be provided for future use by notional tenants as part of the fit-out of office and laboratory space.

Generally, all stacks will drop vertically through the building down to Ground Floor before connecting to the new below-slab drainage system. Where practical offsets will be contained within the ground floor ceiling voids.

All Discharge Stacks (DSs) will be designed as far as is practicable to be located/concealed within the IPS service zones provided or dropped adjacent to columns within a suitable boxing detail. All stacks that are located outside of risers will be suitably concealed via a pipework boxing detail.

All soil, waste and ventilation pipework will be installed in uPVC for general toilet areas, sinks and WHB's etc, and Vulcathene were provided to serve sanitary fittings or equipment in laboratory, technical and/or preparation areas.

The following jointing methods are proposed for Vulcathene & uPVC pipework:

- Vulcathene: Fusion welded when located in ceiling voids and other voids where future access may be restricted.
- Vulcathene: Mechanical joints for pipework at a low level above FFL
- uPVC: Solvent welded throughout

All soil and waste pipework located within plant room areas will be in Cast Iron (unless suitably protected from mechanical damage via a pipe boxing detail). All cast iron pipework will be electrically bonded, following the current edition of BS: 7671 The IEE Wiring Regulations.

The foul drainage system for both general and laboratory areas will be a single-pipe primary ventilated system (type III) per BS EN:12056 part 2. As far as is practical, branch soil and waste pipes will be installed in accordance with the limitations as described in BS 12056, part 2, table 6. Where the layout of sanitary fittings does not permit this, the design and installation will incorporate anti-siphonage, branch vent pipes, anti-siphon traps and/or dedicated automatic air admittance valves to protect appliances from loss of water seal. All soil waste and venting pipes will be installed to minimum falls as generally shown on the drawings and dictated by BS 12056, part 2, and Part H of the current building regulations to ensure self-cleansing velocities are maintained.

The system is designed without the use of air admittance valves as a primary ventilation strategy, and these must only be installed where shown on the drawings or with prior written approval. Where an air admittance valve is to be installed the valve provided shall be designated A1 to BS EN 12380.

All soil and ventilation stacks will vent to the atmosphere and terminate at Roof level, via a weathering slate, collar, and vent cowl. Terminals will terminate at approximately 450mm, above the roof finish and located following Part H of the current building regulations.

Sizes of soil waste and vent pipes and the associated common vent pipework will be provided according to the hydraulic load associated with the stacks.

Access to soil and waste stacks will be provided at a low level above floor level on all floors, at all changes of direction and at the base of each soil and waste stack above the connection into the below-ground drainage system.

Drainage from plant areas to accommodate mechanical plant drain down and to reduce the risk of flooding will be provided via a series of floor gullies, and floor gullies with tundish inlets.

The foul drainage pipework installation will where necessary be provided with acoustic insulation by the recommendations within the Acoustician's Report.

Intumescent fire sleeves to BS476 'fire tests on building materials and structures', will be provided on uPVC, and Vulcathene penetrations through all fire compartment floors, walls and fire barriers on 40mm diameter pipework and above, and following the requirements of the Local Building Control Authority and Local Fire & Rescue Officer.

Thermal Expansion Units and anchors points will be installed on uPVC & Vulcathene pipework with a minimum of one expansion joint installed horizontally at a minimum of every 4m, and a minimum of one expansion joint on the vertical lengths between floors, and by the manufacturer's recommendations.

The project will be designed to facilitate speculative laboratory fit-out, and currently, there are no specific defined requirements for laboratory equipment or layout of fixed furniture and equipment to be used in conjunction with laboratories.

To support the speculative approach to the development several dedicated laboratory discharge stacks will be provided and distributed throughout the building. To support a level of flexibility within each floor plate, the intent is to allow for primary discharge stacks to be located on columns, with high-level branch pipework being distributed in the ceiling void(s) terminating with a capped branch. The capped branch for future fit-out is proposed to be located within the screed build-up above the structural slab level, and below the finished floor level. This method is proposed, to ensure the drainage installation is as flexible as possible, reducing potential restrictions to the fit-out of the laboratory spaces and addressing issues between notional tenancies.

On completion of the above-ground foul water drainage system, the system is to be fully tested (including performance testing) and demonstrated to the approval of the Building Control Officer, and client advisors. The test shall include proving the soundness of the interface joint between the above and below-ground drainage and shall be in accordance with the parameters as laid out in part H of the current Building Regulations.

5.3 Domestic Hot & Cold-Water Installation

The works will comprise the design, coordination, supply, installation, setting to work, commissioning, performance testing (including factory tests where noted) and handing over of the fully functional complete domestic water systems.

Water for domestic use within the new building will be provided from a connection to the existing utility infrastructure water main. A separate connection will be provided from the mains water infrastructure for fire, i.e., fire hydrants following the fire engineers' requirements and fire strategy.

The main incoming domestic water service will be metered at the site boundary & the meter is proposed to be of the dual pulse type and shall be linked to the building's BEMS system. In accordance with BREEAM WAT-03, the site boundary meter will provide an indication of major leak detection as a water efficiency measure. An audible alarm shall activate and an indication on the BEMS shall be present, when a continuous flow of water passes through the meter at a flow rate above a pre-set maximum, for a pre-set duration.

The domestic water services main will pass through a main building water meter before connecting to a break tank and booster set located in the incoming services zone. This will boost the incoming supply to the new domestic water storage tank located within the Level 5 roof plant area. The break tank and booster set used to distribute water from the ground floor to the roof level is proposed to be of the wall-mounted type.

Cold-water plant rooms will be provided at the roof level, and installations will be provided following current Water Regulations guidance. The main L05 water storage plant room will incorporate the following plant and equipment:

- Incoming wholesome water supplies
- Wholesome Water Storage Tank
- Domestic Water Service booster pump set(s)
- Wholesome Water Treatment plant (filtration, etc)

A secondary plant room will be provided at the Level 5 roof area to accommodate the Category 5 water storage tank and associated pumps and ancillaries.

The plant space allocations identified have been arranged to permit a full access zone of at least 750mm around and above the tank to facilitate installation, ongoing general maintenance, and plant replacement.

The cold-water storage cistern for general water use will generally accommodate a minimum of 50% of the anticipated total daily water use based on the estimated daily demand. The current daily demand is estimated based on guidance for office water usage with an additional allowance for laboratory water usage.

The main domestic water tanks will be sectional externally flanged, of GRP construction with integral insulated panels, and shall comply fully with applicable WRAS standards.

An intelligent tank level control & monitoring system shall be provided for tank fill, temperature and level monitoring, and a dedicated control panel in the basement plant room, linked to an integrated sensor assembly within each tank compartment shall provide this function.

From the general water storage tank, a packaged domestic water booster set will distribute water throughout the building to serve the general areas. The cold-water booster set will be a packaged unit generally comprising duty, assist and stand-by (variable speed drive) pumps and all necessary expansion & pressurisation vessels, control panels, flexible connections, isolation valves etc. The packaged water booster sets shall operate fully automatically and incorporate all necessary operational and safety controls including interface with the tank level control systems.

The general domestic water booster set will be sized, based on the anticipated peak simultaneous flow rates required and to maintain a minimum acceptable pressure at all fixtures and fittings as dictated by the various equipment manufacturers – this will be assumed as 3.0 bar in the absence of any specific equipment requirements being defined. Where pressures more than this are required additional break tanks and/or booster sets may be required to be provided as part of the fit-out of the laboratory spaces.

From the newly packaged booster set, a dedicated branch will be extended to serve a new category five domestic water storage break tank and booster set. The category five break tank will accommodate a min. storage volume based on the provision of 15-minute peak simultaneous demand from the category five water system as recommended under BS 8558. The system will provide suitable category five backflow protection via a type 'AB' air gap only, no dedicated storage is provided. As such the inflow to the break tank will match the outflow from the tank. Domestic water services pipework from the packaged category five water storage tank and booster set will be designated and suitably identified as fluid category five in accordance with BS 1710.

From the packaged booster sets (both general and category five) the domestic cold-water services will be generally routed roof level, distributing to the primary services risers and serve all notional tenancies at each floor level as well as any landlord areas as required.

The branches from the riser to the floors in each instance will be provided with a water meter, strainer, isolating valves and as required pressure reducing valve sets to ensure that the cold-water pressure at fixture/fittings outlets is within an acceptable range.

Domestic hot water generation to the building is proposed to be via local point-of-use generation to avoid unnecessary standing losses. New local electric un-vented instantaneous water heaters will be utilised. Local electric water heaters will be of the concealed unvented type and located within vanity units or IPS systems and will be sized to suit the estimated peak demand. All unvented water heaters shall be provided with expansion vessels, as well as temperature and pressure relief valves; the valves will be discharged to drain per part G3 of the Building Regulations.

From each local water heater domestic hot water, flow only, pipework will be routed to serve the sanitary fittings within the area of the water heater, subject to confirmation of hot water delivery times ensuring compliance with the current requirements of ACOP L8.

The shower areas are currently proposed to be provided via point-of-use water heating however this is subject to the further development of the energy strategy, and as such an option may be considered for the use of a semi-storage solution adopting an ASHP as the primary heat source.

Local hot water generating equipment will be sized based on mains cold water entering the system at a temperature of 10°C being heated to a temperature set point of 55°C.

Hot water serving all washbasins, (WHBs) & showers will be blended via a thermostatic mixing valve (TMV) to blend with cold water. The blended water will then be routed below the fittings to serve the outlet. Where thermostatic mixing taps (TMTs) are provided there will be no requirement for additional TMVs.

The hot water for WHBs shall be blended to 43°C, and WHBs in accessible WC areas shall be blended to a maximum of 41°C. All TMVs shall be designated type 2 and shall incorporate integral isolation valves double-check valves, and strainers.

Hot water for outlets not intended for hand washing i.e., sinks in cleaners' rooms, will not be provided with TMVs, and hot water will be delivered up to the generated temperature. These fittings will be provided with an appropriate hot water hazard sign.

All water services pipework will be insulated, and vapour sealed to prevent excessive heat gain or loss. Pipework, which is routed through areas susceptible to freezing, will be provided with electrical trace heating to prevent freezing.

Pipework will be installed in a manner to avoid dead legs and minimise the risk of both heat gain to domestic cold-water systems as well as stagnation. This shall be achieved by:

- Ensuring (as far as is practicable) distribution around each floor is set out to reduce the risk of heat gain such that there is a separation between heat-generating services and equipment & cold-water services.
- Ensuring pipework distribution to groups of fittings and WC areas etc. is designed to reduce the risk of stagnation allowing the WC (or another flushing device), to be served as the final element in the branch. In the case of the laboratory areas fittings that are expected to be seldom used i.e., eye wash stations, and drench showers shall not be installed as the terminal fitting.

No water services pipework will be routed above electrical switchgear, motor control centres or electrical switchrooms. In any circumstance where riser space is shared with electrical services, the riser will be fully segregated to separate electrical and wet services.

Generally, all water service pipework will be installed in light gauge copper and utilise appropriate joints and fittings. In this context, crimped fittings are not considered appropriate.

The domestic cold-water service will be fully bonded to earth per the requirements of the current edition of BS 7671 The IEE Wiring Regulations.

Before use, all water systems & pipework (including retained pipework) will be cleaned, flushed, and disinfected as specified in BS EN 806 and BS 8558. During this process, the levels of residual chlorine at selected outlets will be monitored to ensure the minimum concentration is maintained throughout the recommended contact period.

After initial commissioning it is anticipated there may be a significant period from water system filling to full building occupancy, and as a result, measures should be put in place to continually dose the system with biocide from the time of filling. This is recommended to be used in conjunction with regular system flushing and maintaining required temperature regimes to minimise the risk of the development of biofilm in the system.

On completion of the new domestic water services extensions, the system is to be fully tested (including performance testing) & commissioned by CIBSE Commissioning Code W. The system performance shall be demonstrated to the approval of the Building Control Officer, and client. Chlorination of the water systems shall be carried out under HS(G)70 recommendations.

5.4 Air Source Heat Pump Heating and Cooling Installation

The building will be provided with low-temperature hot water (LTHW) heating and Chilled Water (CHW) cooling systems generated via air-source heat pumps located at the roof level.



Figure 5.4 - Typical ASHP

The air source heat pumps will be capable of providing heating and chilled water simultaneously. Due to the loads and spare capacity requirements of the Client brief, two installations will be provided to the building. One will serve the Upper Brook Street 7-storey elevation and the second the rear 4-storey elevation.

Each installation will be complete with an external ASHP compound, internal LTHW & CHW pump room, buffer storage and associated pressurisation requirements.

LTHW and CHW will be distributed around the building via dedicated risers in each core. Each notional tenancy will be provided with a dedicated flow and return connection complete with energy metering

Heating and chilled water will be extended from the risers across the floor plate to each fan coil unit.

ASHP will be charged with a refrigerant with an ODP of zero such as R32 or 410A.

5.5

4-Pipe Fan Coil Installation

Each floor plate will be provided with a 4-pipe fan coil unit installation split to serve the 4 notional tenancies per level.



Figure. 5.5.1 - Typical Chassis Type 4-pipe Fan Coil Unit

The installation will comprise ceiling void mounted chassis type fan coil units positioned in zones commensurate with BCO Specification for Offices guidance.

The installation will comprise:

- External ASHP units (roof-mounted in the existing compound)
- Multiple internal fan coil units (ceiling void mounted)
- LTHW and CHW pipework distribution
- All associated pipework fittings, valves, commissioning and PICV control
- Controllers via return air sensors linked to the BMS
- Secondary ductwork connections to ceiling-mounted swirl diffusers c/w with plenum boxes
- Gravity condensate drainage network (connecting to above-ground waste drainage system)



Figure. 5.5.2 - Typical 4-pipe Fan Coil Unit Installation

The installations shall be designed based on compliance with ISO 7730 Climate Classification B and ensure supply air temperatures are elevated so as not to cause nuisance draughts.

The installation shall be complete with secondary ductwork from the fan coil units to ceiling-mounted swirl diffusers. It is understood that the ceiling may be a raft or panel-type structure and as such the terminal units shall require coordination as well as fan coil units located to facilitate access to the filters, controllers, and fan decks.

Secondary ductwork shall be insulated with a foil-faced Class O vapour-sealed finish.

The distribution will be provided with blank connections to facilitate future tenant Cat B fit-out.

5.6 Local Heating and Cooling Installations

Local DX Heat pump systems shall be provided to the following areas as standalone type systems to facilitate the 24/7 operation of the respective spaces.

- Security Room
- Comms Rooms

Each system shall comprise an external heat pump serving dedicated internal units complete with interconnecting refrigerant pipework. Internal units shall be cassette-type units to ancillary areas and fan coil units to office areas.

Each system shall be provided with a dedicated wall-mounted LCD controller to facilitate local control by the occupants.

General heating to toilet areas and cores shall be provided via local electric panel heaters.

5.7 Primary Ventilation Installation

Primary ventilation will be provided to the building using multiple roof-mounted air handling units. It is proposed that the air handling units will be provided as follows:

- Core 1 – General Supply and Extract AHU
- Core 2 – General Supply and Extract AHU
- Core 3 – General Supply and Extract AHU
- Core 4 – General Supply and Extract AHU
- Level 5-7 – General Supply and Extract AHU
- Reception and GF break-out AHU
- Café Area AHU

These new air-handling units will comprise:

- Fresh Air Shut off Damper
- Synthetic filter
- Thermal Wheel
- Heat Pump based heating/cooling coil (to trim external air temperature only)
- Supply fan
- Return air filter (protect thermal wheel)
- Extract the Air fan
- Exhaust Shut-Off Damper



Figure 5.7.1 - Typical roof-mounted AHU

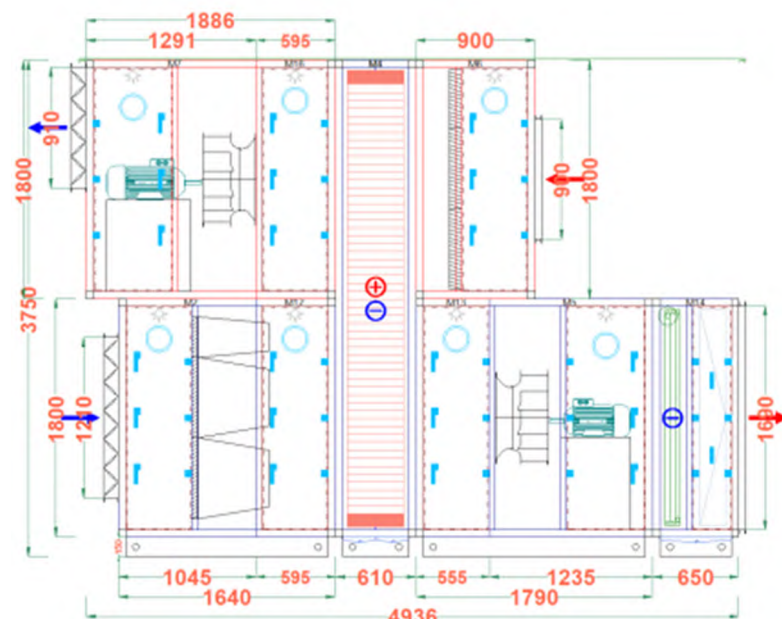


Figure 5.7.2 - Primary AHU Configuration

The units shall be complete with integral controls which can be linked to the BMS installation.

Supply and extract ductwork installation will be provided to each core to deliver air to the building. A variable air volume (VAV) box will be provided for the fresh air and exhaust air connections from the risers to each floor. This will allow a demand-based ventilation strategy to optimise energy usage.

The capability to add enhanced filtration and or HEPA filters will be provided within the central air handling plant.

Spatial provision has been made at the roof level and within the riser to facilitate the future Cat B fit-out. A spatial allowance of 50% shall be provided for any future additional make-up ventilation or fume cupboard ventilation

The air handling units will be operational to suit the hours of the various areas of the building and will be time scheduled under the control of the BEMS

The Back of House (BoH) areas on the ground floor will be provided with local void-mounted air handling equipment. Void-mounted units will comprise filtration, cross flow plate heat recovery device, supply and extract fans, and heater battery where required.

The ductwork installation shall be run in galvanised steel in accordance with BESA DW144 and be complete with all means of volume control, fire segregation (dampers) and access panels. The installation shall also be provided with acoustic control to achieve the noise levels outlined in the acoustic section of this document.

Fresh air and supply air ductwork shall be thermally insulated to BS14303.

5.8 Local Ventilation Systems

5.8.1 Core/Toilet Extracts System

Dedicated toilet extract systems shall be provided to serve each primary core. The systems shall be installed to suit the revised layouts.

The installation shall comprise a twin fan extract unit mounted externally at roof level; galvanised steel ductwork; disc valve extract grilles; volume control dampers; fire dampers (where required).

Make-up air shall be provided via the primary air system to the common corridors with a transfer duct into each space where necessary. Shower areas shall be provided with direct supply connections.

The ventilation systems shall be provided to maintain a negative pressure within the toilet areas to prevent the migrations of odours to other spaces within the building.

5.8.2 Fume Cupboard Ventilation

An allowance has been made in the spatial planning for fume cupboard extract provision. The allowance is based on six fume cupboards per notional tenancy operating at 0.3m³/s air volume each. Risers connect directly to tenant areas between the first floor to their respective roof level. A dedicated route is also provided to the high-level ground floor to serve the incubator space in the Southern corner of the building on the Upper Brook Street elevation.

Spatial allowance is also provided to the level 5 and level 8 roof areas for tenant plant and equipment to discharge to the atmosphere. This will form part of the tenant fit-out works and be subject to CFD analysis to ensure that sufficient dispersal of their specific gases can be achieved

5.9 Atrium Ventilation

The atrium will smoke vented naturally via automatic opening ventilators (AOV) at a high level The free dynamic area of the AOV required will be developed at Stage 3 based on the Fire Engineering Consultants report.

The AOV will also be used for general ventilation in summer to prevent overheating of the space through solar gain. AOV will be linked to temperature sensors to automatically open the vents at a predetermined temperature. AOV operation will be overridden by precipitation sensors to prevent the ingress of rain in environmental mode.

Natural atrium ventilation will be supported via the mechanical ventilation of the break-out spaces opening onto the space. Break-out spaces will be provided with fresh air to the rear of local fan coil units to locally condition these spaces. Air will be extracted at a high level to prevent stagnation and provide airflow through the atrium space.

5.10 Stairwell Smoke Clearance System

Each escape-designated fire-fighting stairwell will be provided with a roof-mounted single flap ventilator to provide a single flap ventilator to provide 1m² free area which acts as both a ventilator and roof access system. Each system shall be provided with a standalone operating system with fireman's override switches located at the foot of the stair and the head of the stair.

5.11 Café Kitchen Ventilation

A new dedicated kitchen extract system shall be provided to connect to the new cooking range canopy.

The installation shall be following the requirements of BESA DW172 and discharge a roof level via a dedicated extract unit and the terminal device.

The extract will discharge at the roof level via a high-velocity terminal located away from openable windows or fresh air intake louvres to prevent the recirculation of stale air.

A dedicated supply system shall be installed to provide make-up air to the kitchen area. Air shall be tempered to heat the kitchen to 18oC.

The supply and extract systems shall be interlocked.

5.12 Dry Risers

Dedicated dry-rising mains will be installed within each Stair Core which will be served from a breeching valve inlet, located within the designated fire brigade access location. Please refer to the fire engineers' fire strategy documentation for confirmation of fire & rescue service tender access and breeching valve inlet locations.

The rising main will incorporate a dedicated breeching valve inlet and be clearly labelled to indicate the staircase served. The dry riser inlet breeching points will be 2-way and located on the building façade. Inlet breeching points will be within 18m of the Fire Service Tender vehicle set-down point.

The rising main and breeching inlet will be connected via a section of horizontal main which will be routed, at a high level, through the Ground Floor to the dry rising main cabinet located within each core. The horizontal length of the dry rising main will be less than 18.0m in length in compliance with BS 9990.

The installation of the rising main will be fully in accordance with the specific requirements listed within BS 9990 and incorporate intermediate isolation valves on the riser, positioned every 10m and be lockable in the open position with a chain and padlock and/or monitored.

The dry rising main will incorporate an automatic air vent, installed at the head of the main, and a valved drain connection installed at the base.

The intermediate isolation valves will be monitored, with their status indicated within a panel located adjacent to the building's main fire alarm panel.

The dry riser will incorporate a single landing valve to each core, at each level. Landing valves will also be provided at ground level. All landing valves will be located within a stainless-steel box arrangement to mitigate the risk of vandalism.

Landing valves will be located based on a maximum coverage of 900m² of floor space or based on a 60m maximum hose length (whichever is the more onerous).

5.13 Automatic Controls and BEMS

An automatic control installation will be provided to serve the mechanical services plant and equipment. Where plant and equipment have dedicated internal controls interfaces these will be compatible with the Building Energy Management System (BEMS) software.

The installation shall be a Trend based system with open protocol and comprise all necessary digital controllers and outstations to provide a remotely monitorable network for all elements of the MEP plant and equipment within the building.

The installations shall include a head-end system within the FM office complete with a remote dial-out facility to allow off-site monitoring, alarms, set point control and metering.

Where equipment and plant have packaged controls, these shall be interfaced with the BMS installation.

The installation shall be in accordance with CIBSE Guide H.

5.14 Plant Support Systems

The mechanical services contractor shall provide all necessary support systems for the plant and equipment installed as part of the refurbishment works.

External Heat Pump units shall be mounted on a Big-foot type system to elevate equipment above the finished roof level and protect finishes.

Unistrut support frames shall be provided to mount dray air coolers or external condensing units associated with the communications room cooling installation.

Pipework and ductwork shall be provided with support systems suspended from soffits and walls.

6.0 Electrical Services

6.1 General

The Electrical Engineering Services outlined in this report consist of the following:

- Main Incoming Supply
- Standby Supplies
- Low Voltage Distribution
- Earthing Installation
- Small Power Systems
- Electrical Vehicle Charging
- Mechanical Plant Wiring
- Comms Systems
- Lighting
- Fire Alarm
- Security Systems
- Facilities for Disabled Persons
- Lightning Protection

6.2 Main Incoming Supply

The incoming electrical supply to the building will be derived from a pair of IDNO substations located on the Cottenham Street elevation of the building. A preliminary application has been made to Electricity Northwest for an authorised supply capacity of 3.6MVA, in line with the current load estimate for the building.

The load estimate is based on the following assumptions based on the client brief and CIBSE rules of thumb:

- Office Area Electrical Load - **90W/m²** comprising:
 - Office Lighting – 10W/m²
 - Office Small Power – 20W/m²
 - Office Heating and Cooling – 60W/m²
- Lab Area Electrical Load - **170W/m²** comprising:
 - Lab Lighting – 10W/m²
 - Lab Small Power – 100W/m²
 - Lab Heating and Cooling – 60W/m²
- Back of House Area Electrical Load - **10W/m²** comprising:
 - BOH area Lighting – 4W/m²
 - BOH Small Power – 5W/m²
 - BOH Heating – 1W/m²
- Comms Room Electrical Load – **55kW**:
 - Comms Room Lighting – 6W/m²
 - Comms Room Power – 40kW (4kW per cabinet)
 - Comms Room Cooling – 14kW
- Café – **225W/m²**
- Lab & Office AHUs – **90kW**
- GF & Breakout AHU – **11kW**
- Lab Extract – **200kW**

- BCWS Pumps – **15kW**
- Cat 5 Pumps – **15kW**

From the IDNO substations, metered LV supplies will be provided to the main LV Switchrooms on the ground floor.

From the new metering positions, low-voltage cables will extend to the new low-voltage switchboards.

6.3 Standby Power - Generator

The building will be provided with a backup generator for life safety purposes and backup power to the comms room, subject to the WiredScore and SmartScore assessment. The generator will provide backup for the firefighting lifts, smoke ventilation fans, fire control centre lighting and power and to the comms room cabinets.

The generator has been sized at 200kVA to allow for motor starting currents and the anticipated impact loads on start-up.

6.4 Low Voltage Distribution

6.4.1 Main Low Voltage Switchboard

Two new main low voltage switchboards will be provided within in the ground floor LV switchrooms; one switchboard in each room. The switchboards will be of the extended modular type, constructed to Form 4, type 6 of BS 5486. Each board will be complete with Air Circuit Breakers (ACBs), Moulded Case Circuit Breakers (MCCBs), automatic power-detuned power factor correction equipment to correct the load to a minimum of 0.95 lagging, and class 1 and 2 surge protection.



Figure 6.4.1 - Typical LV Switchboard

The LV switchboards will include a set of 4 No. Class 1 Current Transformers (L1, L2, L3 & N) each, to be installed to the mains incoming supply, for future connection to active harmonic conditioners. The electrical subcontractor will allow within his tender, to return to the site once the contact centre is fully operational, to carry out a power quality analysis. The analysis will be carried out by a power quality specialist contractor, i.e., MGE, ABB, equal or equivalent. The study will take place over a normal working week.

The board will contain metering facilities to monitor both incoming mains and sub-main circuits. The metering units will be integrated into the information and management system provided as part of the WiredScore and SmartScore requirements to provide consumption information to the building occupants as well as for tenant submetering. All metering will be compliant with the latest requirements of Building Regulations Part L2.

6.4.2 Low Voltage Distribution Boards

New low-voltage distribution boards will be provided throughout. All distribution boards will be fitted with RCBOs and MCBs to the requirements of the 18th edition wiring regulations (BS7671). All distribution boards shall include dual earth bars for high integrity earthing and a minimum 20% spare capacity circuit 'Ways' to allow for future expansion of the system. Split lighting and power distribution boards shall include separate metering for the lighting section and the power section following the requirements of Building Regulations Part L2.



Figure 6.4.2 - Typical Distribution Board

All distribution boards will be fitted with electronic surge protection in line with the requirements of Amendment 2 to BS 7671.

6.4.3 Cable and Containment Systems

Main low voltage distribution will be carried out using XLPE/SWA/LSF sheathed cables with copper conductors.

The main low-voltage switchboards will provide separate supplies to the following services and areas. An additional 20% of spare ways will be provided to accommodate future expansion:

- Tenant Distribution Boards
- Landlord Distribution Boards
- Mechanical Control Panels

- External lighting Distribution Board
- Lift Installations
- Fire alarm system
- Comms Room boards

For electrical safety reasons, the tenant distribution boards will be arranged so that a whole floor plate is fed from the same LV panel to ensure that the supplies are via a single source/transformer. Tenant distribution boards will be fitted with dual earth bars to allow for equipment with high earth leakage currents in line with the requirements of BS 7671

Life Safety systems will be provided with a secondary supply in case the primary/mains supply fails. For the fire alarm and emergency voice communication systems, the secondary source will be via batteries mounted within or immediately adjacent to the respective panel. For all other systems, the supply will be via the standby generator. Life safety supplies will be provided to the following equipment:

- Landlord Distribution Boards serving firefighting cores
- Fire Command Centre Distribution Boards
- Smoke Ventilation Plant
- Fire Fighting Lifts
- Fire Alarm Panel
- Emergency Voice Communication Panel

All life safety cabling will be carried out in 120-minute fire-rated, armoured cabling in accordance with BS 8519. Primary supplies will generally follow the same route as the normal LV cabling but will be mounted on separate containment. Secondary cabling will utilise diverse routes to keep the primary and secondary cabling segregated. Separate risers will be utilised for primary and secondary supplies to the same item of equipment with cabling generally being run in below-ground ducts from the generator room to the relevant riser or room to maintain segregation.

A complete cabling containment system will be designed to route and protect the various cable categories, primarily within the ceiling voids.



Figure 6.4.3 - Containment Types (L-R): Cable Ladder, Cable Tray, Cable Basket, Trunking, Conduit

The vertical and horizontal cable containment systems will include the following:

- Galvanised steel cable tray and/or basket, for ICT, LV sub main, fire alarm, security, lighting control and PA-designated cables
- Basket tray for general lighting and control cabling.
- Galvanised trunking and conduit, (dependent on installation environment), for final circuit wiring small power wiring and lighting and small power wiring to exposed installations such as plant rooms and bin stores.

Cables distributed externally will be contained within underground uPVC cable ducts. Cable access chambers shall be sympathetically located and, where required, interfaced with landscaping relative to the installation, future expansion and circuit addition.

6.5 Earthing Installation

The electrical installation in its entirety will be earthed and protected to comply with the Code of Practice for Earthing – BS7430, and the 18th edition of the IEE Wiring Regulations BS7671, including all supplementary documents and guidance notes. Main equipotential bonding shall be provided to the building structure, lightning protection system, incoming gas and water supplies and all low-voltage switchgear. All metallic mechanical services will be bonded to the electrical earth network.

The IDNO will provide earthing connections to the low-voltage switch rooms as part of their LV power supplies. From these connections, a new earthing installation shall extend from the new main earth bars located in each LV switch room.

Each Comms room will be provided with a dedicated earth bar, connected to each LV switch room earth bar.

6.6 Small Power Systems

A general-purpose power installation will be provided to all landlord areas within the building. The installation will comprise strategically positioned 13amp switched socket outlets, BS4343 socket outlets, fused connection units and isolators distributed throughout the building to facilitate the use of portable and fixed electrical equipment.

Small power within tenant areas will be left for the tenant to fit out except for the cleaner's sockets which will be strategically placed on columns and walls such that all areas of the floor plate will be within reach of a vacuum cleaner with a 10m cord.

Each tenant will be required to install containment and power poles/drops to serve their equipment.

Power circuits within landlord areas will be designed to minimise electromagnetic interference to computer systems and nuisance tripping due to earth fault leakage currents. Surge protection will be provided to ICT equipment where required. Where socket outlets are intended to supply computer equipment loads, high-integrity earthing in accordance with Section 543.7 of BS 7671 will be provided.

Socket outlets to external areas or where the presence of water is envisaged will be ingress protected to a minimum rating of IP56.

Fused connection units/isolators will be installed to serve items of fixed equipment. This includes, but is not limited to:

- Kitchen and catering equipment
- Hand dryers
- Mechanical equipment
- External service yard barriers
- Electrical supplies related to power-assisted doors
- Security
- ICT
- AV
- Fixed induction loops.

6.7 Electric Vehicle Charging

There are 3 no. accessible parking spaces on Kincardine Road which are associated with the development. Subject to agreement with the council, these will be provided with vehicle charging points by a public charging network provider such as BE.EV. These chargers will be fed from a local LV cable such as the existing cable running down Kincardine Road to feed Elizabeth Yarwood Court. If there is no longer capacity on this cable, a new feed will be taken from one of the IDNO substations in the building and run in the footpath to the new vehicle chargers.



Figure 6.7 - Typical Street Electric Vehicle Charging Point

6.8 Mechanical Plant Wiring

Mechanical services equipment will be provided with the appropriate electrical power supplies which will be wired in LSF single-core cables enclosed in conduit/trunking or XLPE/SWA/ LSF multi-core cables clipped to the surface or run on a cable tray. Central Plant supplies will be derived from mechanical control panels located within mechanical plant rooms or direct from the main LV panels for larger supplies such as for the air source heat pumps. Local mechanical equipment will be supplied from local distribution boards.

6.9 Comms Systems

6.9.1 General Data Distribution

By the WiredScore requirements, the building has been designed with two incoming comms rooms over 7m apart. From these rooms, service providers will run their services to individual tenancies and the landlord's comms rooms as required.

An ICT network passive infrastructure certified to Category 6A F/FTP standard to serve landlord voice, data and audio, visual and digital media services will be. Cabling will be home run to comms cabinets in the landlord comms riser on each floor, or to cabinets within one of the two main comms rooms in the building. Hard-wired RJ45 outlets will be installed to support the following:

- The main reception desk and desks, printers etc within landlord offices.
- Audio Visual displays as required by the landlord.
- Security Equipment such as access control and CCTV.
- Building-wide Wi-Fi.
- Meeting room management displays.
- Building control and monitoring equipment
- Landlord and tenant metering systems

Comms rooms have been designed to allow for the anticipated enhanced data provision required to achieve WiredScore and SmartScore Gold certification. The size of the comms rooms will be reviewed following the initial WiredScore and SmartScore assessments.



Figure 6.9.1 - Typical Comms Cabinets

Tenant cabling will be routed to risers via two routes around the atrium to provide supply diversity of routing as well as providers. Fit-out within each tenant space will be by the tenant as part of their fit-out package.

6.9.2 UPS Requirements

UPS requirements will be subject to the WiredScore and SmartScore assessments. It is currently anticipated that any UPS units required will be installed within individual cabinets.

6.10 Lighting

6.10.1 Internal Lighting

The interior lighting installation will be designed in accordance with the Kadans Design Brief, the CIBSE Lighting Guides, BS 12464-1, Building Regulations and associated supporting documentation.

All luminaires will utilise energy-efficient LED light sources, offering enhanced luminaire life, energy efficiency and good colour rendering properties.

Maintained illuminance levels will comply with BS 12464-1 and CIBSE LG7. Calculations of the maintained illuminance will utilise maintenance factors which are relative to the facility, the rooms, and the selected light source.

Luminaires in tenant office areas will form part of their fit-out to ensure that the layout fits with their furniture and partition layouts. Only emergency lighting to meet minimum requirements will be provided.

Luminaires in general circulation areas, toilets and break-out areas will utilise LED downlights.

Luminaires in landlord offices will utilise 600mm x 600mm modular recessed luminaires.

Lighting in the reception and atrium will be developed at the next stage to help create a clear and consistent aesthetic within this space. Light sources will be LED, while the luminaires themselves will be a combination of recessed lighting and architectural suspended or surface-mounted fittings.



Figure 6.10.1 - Typical Cat A Office Lighting

Back-of-house spaces such as MEP plant rooms, bin stores, cycle stores etc. will utilise surface-mounted LED batten fittings.

6.10.2 Emergency Lighting

Emergency lighting will be provided to ensure safe evacuation in an emergency and/or in the event of mains power failure. Emergency lighting will be designed to comply with BS EN 5266, BS EN 1838 and the requirements of the local Building Control Officer.

Emergency escape lighting will be provided to each room within the facility utilising self-contained emergency versions of the standard luminaires. Risers and DB cupboards will not be provided with emergency escape lighting.

Enhanced emergency illumination levels, following BS EN 5266, will be provided to areas where there is a higher risk of injury if the lighting fails, this includes plant rooms, kitchens etc.

Internally illuminated escape signage will be provided throughout the facility, located in accordance with the requirements of BS EN 1838.

Emergency lighting will utilise a centralised monitoring and testing system to verify the operation of the emergency lighting installation and report any faults in line with the recommendations of BS EN 5266.

6.10.3 External Lighting

A new exterior lighting installation shall be designed under the CIBSE Lighting Guides - particularly LG6, BS 12464-2, Building Regulations and associated supporting documentation.

An external lighting system shall be provided to serve the following areas:

- The building perimeter
- The service yard
- The public spaces surrounding the building (this element will be designed and provided in conjunction with the adjacent plot which shares these spaces).

External lighting will generally comprise new building-mounted and column-mounted LED luminaires. Each area will have good colour rendering properties which favour this type of lighting when interfaced with CCTV surveillance. Lighting levels for CCTV cameras will be a minimum of 2 lux. The external lighting scheme and control philosophy will be designed by the regulations regarding light pollution. External light levels will be kept within the limits as required by BS5489.

External lighting shall be fed from a dedicated external lighting distribution board located in one of the main LV switchrooms. Lighting will be controlled via photocell and timer control with a manual override facility.

6.10.4 Lighting Control

Automatic and manual lighting controls will provide simple controls and enhanced energy efficiency.

Spaces shall generally be controlled as outlined below:

- Lighting in large spaces such as the entrance lobby and atrium, will be controlled via presence detection.
- Subject to the final design requirements, lighting in the café will be controlled by manual switches to avoid the impression that it is closed during opening hours.
- Lighting to sanitary areas such as toilets, locker and shower spaces will be controlled via presence detection.
- Lighting in individual or small offices will be controlled via manual switching with absence detection to switch lights off if the space is left unoccupied for a pre-set period of time.
- Lighting control to plant rooms will utilise manual switching to ensure that lights are not accidentally switched off when maintenance is being carried out on items of the plant.
- External lighting will be controlled via a dusk to dawn time clock with photocell and manual override.
- Daylight-linked dimming will be provided to all landlord spaces with external windows.

6.11 Fire Alarm

A fully addressable type L1, fire detection and alarm system complying with the requirements of the Building Control Officer and BS5839 will be installed. The intelligent addressable fire detection and alarm system will comprise addressable detectors, door détentes/magnetic door hold-open devices and manual call points which will be individually identified at the control panel. The system will include audio and visual alarm indicators in the form of electronic sounders and beacons for all areas in compliance with DDA requirements.

The control panel will include a Liquid Crystal Display, which will indicate the device address number and the location of the activated device. The control panel will also include all the necessary test and indication (zones and devices) facilities to comply with British Standards. A printer facility will be provided as a backup to the Liquid Crystal Display. The panel will be modular to accommodate future expansion. The panel will be simple to operate in an alarm or fault condition by following guided instructions and visual indicators. The control panel will be connected to a central monitoring station to provide 24-hour observation of fire alarm activations.

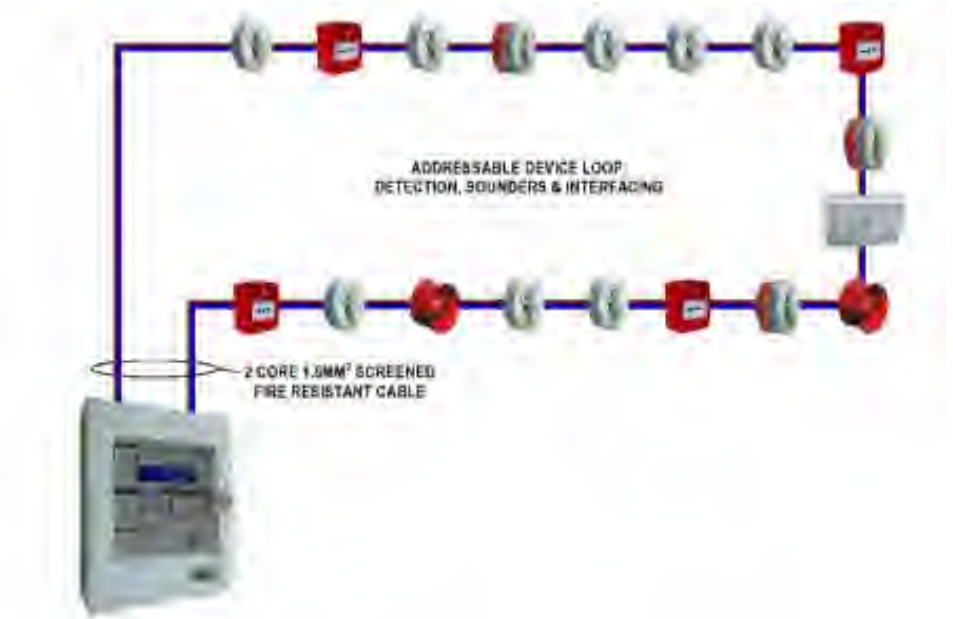


Figure 6.11 - Typical Fire Alarm Schematic

The system will include interfaces to shut down, or operate, a mechanical plant including gas valves, immobilise lifts, de-energise access control systems, and signal any firefighting.

Addressable “Break Glass” call points will be installed to manually initiate an alarm.

The type of detection used will be developed at the next stage but is expected to include point heat and smoke detection in most areas and beam or aspirating smoke detection at the top of the atrium.

The fire alarm panel will be located at the main entrance of the building, subject to the agreement of the Building Control Officer, with a repeat panel located in the fire control centre. The need for any further repeater panels will be reviewed with the Building Control Authority

The fire detection installation will be carried out in fire access-controlled rated cable. The cabling will have low smoke and fume over the sheath and be coloured red. The cabling will be run on a dedicated cable tray system or clipped direct.

6.12 Security Systems

An integrated security system will be provided to the facility. The system shall be designed and installed to ensure that the building and grounds provide a safe and secure environment for the tenants and the external community.

The integrated system will comprise the following security methods for monitoring, surveillance and recognition purposes.

- Pedestrian and vehicular access control system
- CCTV

6.12.1 Access Control

A new access control system will be provided to restrict access to the following groups:

- Landlord Staff will be able to access communal areas, plant rooms, refuse stores and landlord offices.
- Tenants will be able to access the atrium and their tenancy

- Public will be able to access the entrance lobby and café facility

Access control head-end hardware will be located within a cabinet in one of the main comms rooms. Access control readers will be IP based, sitting on the landlord IP network, and recognising proximity access tokens or cards.

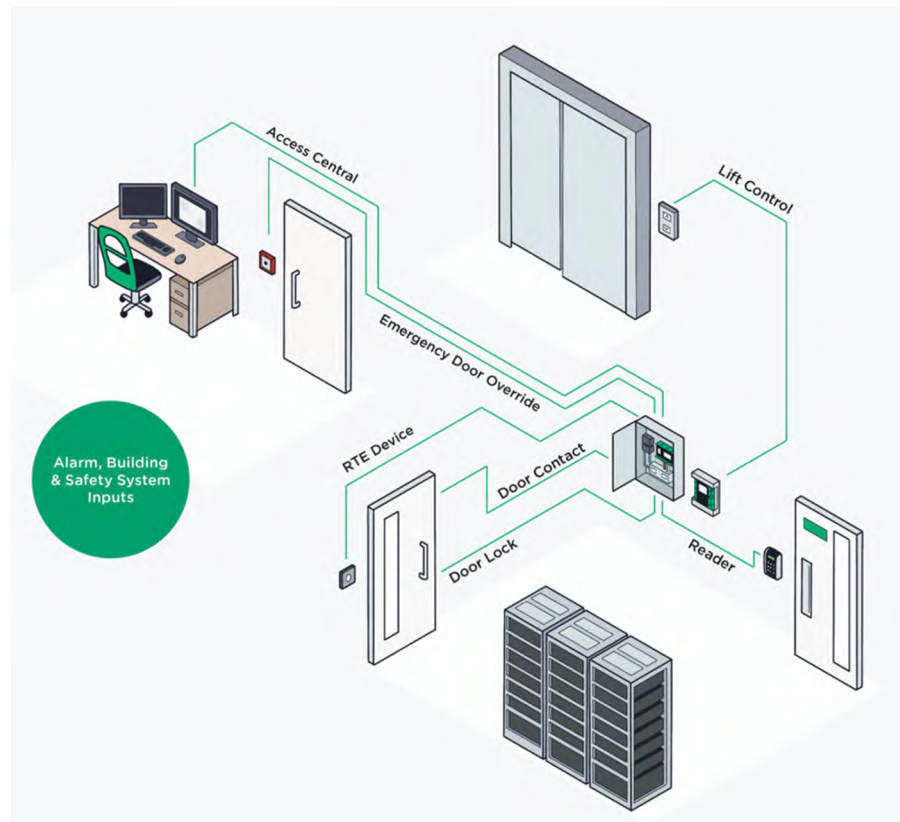


Figure 6.12.1 - Typical Access Control Schematic

During normal opening hours, the public will have access to the entrance lobby and café areas. Movement beyond these areas will require a valid access token or signing in as a visitor at the reception desk.

Out of hours, access into the building will require a valid access token or the main doors will be able to be unlocked remotely from reception when required.

6.12.2 CCTV

An IP CCTV surveillance system, compliant with the requirements of BS EN 62676-4, will provide coverage to external areas and controlled internal areas including:

- External vehicular entrance to the service yard
- Building perimeter
- External gas cylinder area
- Staff, public and delivery doors
- Reception desk
- All internal access-controlled doors

Fixed external cameras will be utilised to monitor the building façade and will provide images of a resolution suitable for recognition and prosecution across the whole façade. The CCTV system will include image analytic software to automatically detect people and vehicles approaching the building and raise an alarm.

All internal CCTV cameras will provide images of a resolution suitable for the recognition of persons passing through access-controlled doors and those approaching the reception desk.

All cameras will be a colour resolution, with external cameras reverting to low-resolution mode at low ambient lighting levels. CCTV images will be digitally recorded and monitored within a dedicated control room. Storage of CCTV images will be kept on the premises for a minimum of one month, i.e., 31 calendar days.

6.13 Facilities for Disabled Persons

6.13.1 Disabled Toilet Alarm

A networked system of disabled toilet alarms will be provided to enable persons using the disabled toilets to signal that they are in distress and summon assistance.

Each toilet will be provided with a full part M disabled alarm pack including a pull cord, reassurance light, reset unit and audible and visual indication immediately outside the toilet.

A central panel will be located behind reception to provide an audible indication of alarm activation and to indicate which alarm has been activated.

6.13.2 Induction Loops

The reception desk will be provided with a fixed induction loop system. The system will be mains powered and include a pre-wired induction loop pad, amplifier, microphone and power supply.

6.14 Lightning Protection

A new lightning protection system will be provided following BSEN 62305.

The system will comprise an air termination network, down conductors and an earth termination network.

The air termination network will utilise copper or aluminium tapes installed in a mesh network across the roofs with additional bonding provided to metallic items of plant and structure, such as the fume extract flues, PV cells, ASHPs and AHUs.

Wherever possible the building's structural frame will be utilised for the down conductor and earth termination network, however, where this is not feasible separate down conductors and earth termination electrodes will be provided.

7.0 Vertical Transportation

Definitions

Handling capacity (HC5): Percentage of the building population which can be transported in a peak 5-minute period by the lift system.

Passenger Demand: Number of people requiring lift service, usually expressed as a percentage of building population per five minutes.

Average waiting time (AWT): Average waiting time between the moment a passenger registers a call and the moment the lift arrives at the landing.

Time to destination (TTD): Time taken for a passenger to reach their destination including AWT.

Destination control system: This system assumes the destination floor is selected from the lift lobby before the passenger enters the car. When the call is registered, the system informs the passenger which lift will be allocated to their call.

Firefighters' lift: A lift with protection, controls and signals which enable it to be used under the exclusive control of the firefighters.

Evacuation lift: Lift used as part of the evacuation sequence for persons with disability and persons requiring assistance, which has appropriate structural, electrical and fire protection and is capable of being taken under the control of a trained and authorised person.

7.1 Introduction

TÜV SÜD Dunbar Boardman has been appointed to undertake an analysis of the vertical transportation (VT) provision and lift system performance for a new office/lab building situated on Upper Brook Street, Manchester.

The report details the design criteria, methods and assumptions used for carrying out lift traffic calculations and analysing the performance of the passenger lift system, and provides advice on the requirements for firefighters', evacuation and goods lifts.

The traffic analysis benchmarks the performance of the proposed lift provision against the recommendations given in BCO Guide to Specification and CIBSE Guide D for commercial offices.

Also, included in this report is a schedule detailing the specific lift sizes to be used along with their function and shaft size requirements.

7.2 Reference Guidelines and Standards

For this report, the following documents are referenced:

- The British Council for Offices (BCO) 2019 Guide to Specification
- The Chartered Institute of Building Services Engineers (CIBSE) Guide D 2020: Transportation systems in buildings
- BS EN 81-70:2021 Accessibility to lifts for persons including persons with disability
- BS EN 81-72:2020 Firefighters' lifts
- BS 9999:2017 Fire safety in the design, management and use of buildings - Code of practice
- ISO 8100-30:2019 Lifts for the transport of persons and goods. Class I, II, III and VI lift installation
- The Building Regulations 2010: Part M Access to and use of buildings - Volume 2: Buildings other than dwellings (2015 edition with 2020 amendments)

7.2.1 Accessibility Requirements

All passenger lifts considered will be specified to meet the accessibility requirements set out in Part M of the Building Regulations and BS EN 81-70, with each lift accommodating one wheelchair person and several other passengers.

7.3 Proposed Lift Provision

The proposed design includes the provision of:

- a main passenger lift group of 4no lifts, all being 1275 kg/17-person, with 2no serving all floors (Ground and Levels 1 to 7) and 2no - Ground and Levels 1 to 4 inclusive;
- 2no firefighters' lifts (630 kg/8-person), both serving all floors; and
- 2no dedicated goods lifts (1600 kg/21-person), one serving all floors as well as the roof and the other – up to Level 4 inclusive.

For the traffic analysis presented in this report, only the main passenger lift group has been considered.

The locations of the proposed lifts are shown in the following figure.



7.4 Traffic Analysis

7.4.1 Building Population

The building data and population given in the following table were taken from Sheppard Robson's design freeze drawings and area schedule issued for Stage 2 (all dated 28.03.2023, revision A) and have been used as the basis for this traffic analysis.

To account for occupants away on holiday, sick leave or working from home etc., a building utilisation of 80% has been considered.

Level	Use	Floor Height (m)	Occupancy		Total Population	80% Utilisation
			Lab	Office		
Ground	Reception	4.480	24	30	54	43
1	Office/lab	4.280	98	123	221	177
2	Office/lab	4.280	104	129	233	186
3	Office/lab	4.280	104	129	233	186
4	Office/lab	4.280	104	129	233	186
5	Office/lab	4.280	39	49	88	70
6	Office/lab	3.885	0	123	123	98
7	Office/lab	4.180	0	123	123	98
Total			473	835	1308	1046

Table 7.4.1.1 - Building Data and Predicted Occupancy

For the lift traffic analysis, stair use has been considered for Levels 1, 2 and 3 as shown below.

Level	Population Using Stairs (%)
Ground	n/a
1	50
2	30
3	10
4, 5, 6 and 7	0

Table 7.4.1.2 - Assumed Stair Use

7.4.2 Performance Criteria

Since the proposed development includes a mixed-used office and lab space, it is recommended that the guidance given in BCO and CIBSE Guide D for commercial offices are followed to assess the passenger lift system performance.

Both Guides recommend assessing the lift system performance by:

- a.) the quality of service measured in terms of waiting times; and
- b.) the quantity of service measured in terms of handling capacity or passenger demand.

The handling capacity relates to the building population determined above. The quality of service represented by waiting times varies depending on the type of building. Guidance for acceptable performance in commercial offices, including waiting times and handling capacity recommendations, is summarised in the following table.

BCO Guide to Specification and CIBSE Guide D:

Performance criteria	Morning up-peak traffic	Lunch peak traffic
Handling capacity	12%	13%
Worst average waiting time	≤ 25 seconds (≤ 30 seconds may be accepted where TTD ≤ 80 seconds)	≤ 40 seconds
Worst average time to destination	≤ 90 seconds (≤ 110 seconds may be accepted where AWT ≤ 25 seconds)	Not specified

Table 7.4.2 - Performance criteria for office buildings based on BCO and CIBSE Guide D

7.4.3 Traffic Analysis Method and Traffic Templates

The traffic analysis has been undertaken by the software simulation program ‘Elevate’. To reflect the traffic in modern office buildings, two office design templates have been used, the first being for morning up-peak traffic and the second – for lunch traffic. Each template has twelve 5-minute periods representing the peak hour experienced in office buildings.

The method considers the following traffic conditions which are in line with the requirements defined in BCO and CIBSE Guide D:

- During up-peak: two-way 85% incoming, 10% outgoing and 5% inter-floor with a peak handling capacity of 12%;
- During lunch peak: two-way 45% incoming, 45% outgoing and 10% inter-floor with a peak handling capacity of 13%.

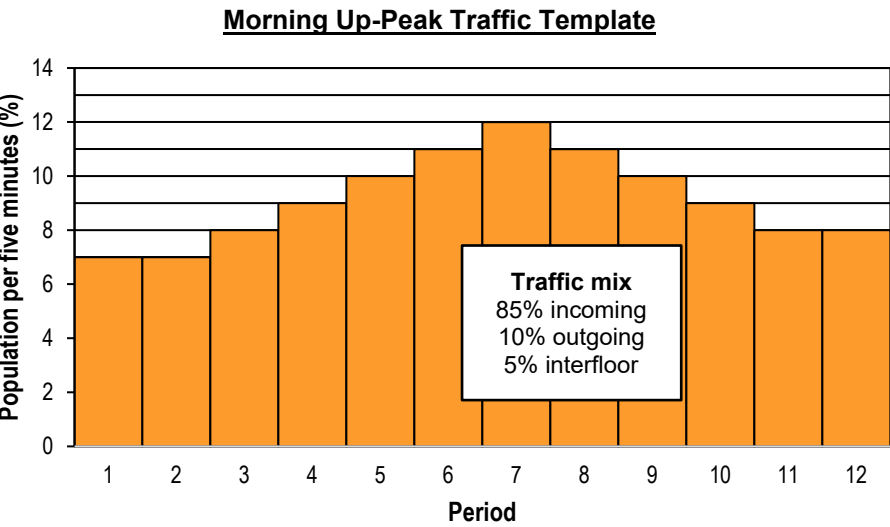


Figure 7.4.3.1 - CIBSE office up-peak traffic template

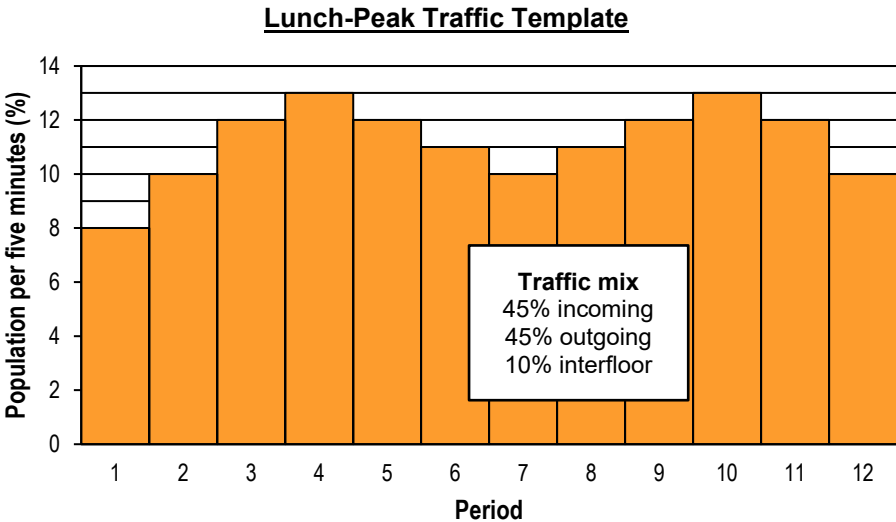


Figure 7.4.3.2 - CIBSE office lunch peak traffic template

7.4.4 Lift Arrangement Considered

The analysis considered the current design provision for a 4-car group arrangement of a size and capacity compatible with the current lift strategy i.e., 4no 1275 kg / 17-person lifts using 1100 mm wide, 2-panel side opening doors.

With the proposed arrangement of lifts where not all lifts serve all floors, destination control is considered the most efficient control system as every passenger will be assigned a lift which serves their destination floor.

An overview of the lift arrangement considered is given below.

Number of Lifts	Capacity	Speed	Floors served	Door Width and Type	Control System
4	1275 kg / 17-person	1.6 m/s	G, 1 - 7*	1100 mm / 2PSO**	Destination control

Table 7.4.4 - Passenger lift configuration analysed, all lifts being electric traction machine roomless (MRL)

*Levels 5, 6 and 7 are served by 2no lifts only.

** 2-panel side opening

7.4.5 Results

Lift Arrangement	BCO / CIBSE Traffic Profile	Worst Average Waiting Time	Worst Time to Destination	BCO / CIBSE Compliant?
4 x 1275 kg / 17-person at 1.6 m/s	Morning up-peak	27.1 seconds	67.5 seconds	Yes
	Lunch peak	34.9 seconds	76.5 seconds	Yes

Table 7.4.5 - Results Summary

Based on the traffic analysis results, the proposed lift arrangement consisting of 4no 1275 kg/17-person lifts (with 2no lifts serving up to Level 4) at 1.6 m/s with destination control would meet the performance recommendations defined in both BCO and CIBSE Guide D.

7.5 Additional Considerations

7.5.1 Firefighters’ Lifts

Firefighters’ lifts and firefighting shafts must be designed in accordance with UK Building Regulations Part B, BS 9999 and BS EN 81-72. They are required where the distance between the Fire Service Access Level (FSAL) and the top floor served is more than 18 m or the lowest level served is 10 m below the FSAL.

Firefighters’ lifts must be a minimum 630 kg rated load (8-person) with internal car dimensions of 1100 mm wide by 1400 mm deep. Each firefighter’s lift needs to travel from the FSAL to the top floor served in less than 60 seconds, which will be achieved with the rated speed considered (1.0 m/s). The lift does not need to serve all storeys; however, it must be within a firefighting shaft which contains stairs, lobbies, a fire main and the lift itself.

The electrical equipment in the firefighters’ lift shaft must be protected against water ingress which will require either a 25 mm high ramp up to the firefighters’ lift threshold or a drain system at all landings. The firefighters’ lifts are required to have both a primary and secondary power supply with both the source of the power supply and any automatic switch gear located in a fire-protected area.

The maximum distance between consecutive entrance sills must not be greater than 7 metres (for all other lifts - 11 metres).

In addition, the firefighters’ lifts must not be used for moving goods or refuse.

The number and location of the firefighters’ lifts required will need to be verified and agreed upon with the Fire Consultant. Currently, the design of the development includes 2no firefighters’ lifts, both with platform dimensions of 1100 mm wide by 1400 mm deep (equivalent to 630 kg /8-person) at 1.0 m/s and serving all levels (Ground to Level 7).

If the firefighters’ lift(s) is intended to be used for evacuation and accommodate a stretcher (requirement to be confirmed by the fire/evacuation strategy), then the minimum rated load must be 1000 kg (13-person) with internal car dimensions of 1100 mm wide by 2100 mm deep. Note that this will require alterations to the current shaft size(s).

7.5.2 Dedicated Goods Lifts

Office Use

BCO recommends that a dedicated goods lift is provided and an additional one considered for redundancy in buildings of up to 10,000 m² NIA, and a second goods passenger lift is provided in buildings between 10,000 m² and 30,000 m² NIA.

CIBSE Guide D recommends that all office buildings of up to 10,000 m² usable floor area contain at least one dedicated goods lift. For larger buildings, additional goods lifts should be provided according to the table below, taken from the Guide.

Table 3.14 Provision of goods lifts

Floor area (m ²)	Number of lifts
Up to 10 000	One lift
10 001 to 20 000	Two lifts
20 001 to 40 000	Three lifts

Figure 7.5.2 - Provision of goods lifts in offices as recommended in CIBSE Guide D

Both Guides recommend that these have a minimum rated capacity of 1600 kg (or sized appropriately for the intended use) and should be able to travel from the main access level to the highest floor served in around 50 - 60 seconds. Kadans have stated a requirement for goods lifts in their buildings to have a minimum rated capacity of 2000kg and it is this more onerous requirement which will be designed to.

Each goods lift should serve all occupied and service floors, including roof and basement plant levels where possible, in conjunction with the building’s management strategy.

Considering the total floor area of the office/lab accommodation (13,700 m²), 2no goods lifts are recommended which is in line with the current lift strategy. The proposed 2no lifts are with a capacity of 2000 kg (26-person) with internal dimensions of 1500 mm wide by 2700 mm deep and have a dual entry arrangement.

7.6 Dimensions

Indicative shaft dimensions for the lift arrangements considered are given below. The lift shaft dimensions are given to suit a range of major lift suppliers' products and are for clear plumb lift shafts and any construction tolerance would need to be added.

Function	Main Passenger	Firefighters*	Goods
Number of Lifts	4 (group)	2 (simplexes)	2 (simplexes)
Lift Type	Machine roomless (MRL)	Machine roomless (MRL)	Machine roomless (MRL)
Capacity	1275 kg / 17-person	630 kg / 8-person	2000 kg / 26-person
Speed	1.6 m/s	1.0 m/s	1.6 m/s
Car Size (w x d x h)	1650 x 1700 x 2300	1100 x 1400* x 2300	1500 x 2700 x 2300
Door Type	2-panel side opening	2-panel side opening	2-panel side opening
Through Car	Yes	No	Yes
Door Size (w x h)	1100 x 2100	900 x 2100	1300 x 2100
Shaft Size** (w x d)	2150 x 2250 excluding tolerances (2150 x 2275 drawn)	1700 x 1800 excluding tolerances (1750 x 1775 drawn)	2400 x 3340 excluding tolerances (2400 x 2850 drawn)
Overhead ¹	4300	4100	4450
Pit depth ²	1700	1450	1900

Table 7.6 - Summary of lift schedule and indicative shaft dimensions (all dimensions are in millimetres)

¹ Overhead – the measurement from the top FFL served to the underside of the lift shaft slab soffit (or the lifting device)
² Pit depth – the measurement from the first FFL served to the pit floor base
*Car depth to be increased from 1400 mm to 2100 mm if required to accommodate a stretcher. The requirement is to be confirmed by the fire/evacuation strategy. Note this will require alterations to the current shaft dimensions.
** Shaft tolerances are to be advised by the Structural Engineer.

7.7 Summary

For the proposed design of the office/lab accommodation, BCO Guide to Specification and CIBSE Guide D Transportation systems in buildings have been used to determine and assess the passenger lift system performance.

The Guides' recommendations are based on modern office passenger demand profiles which consider a target worst average waiting time of fewer than 25 seconds (or less than 30 seconds where time to destination is less than 80 seconds) and a handling capacity of 12% during the morning up-peak; and less than 40 seconds and a handling capacity of 13% during the lunch peak.

The lift analysis shows that a group of 4no passenger lifts, each with a capacity of 1275 kg/17-person at 1.6 m/s using a destination control system, as per the current lift strategy, will provide performance in line with BCO and CIBSE Guide D.

As part of the lift strategy, there are also 2no additional firefighters and 2no dedicated goods lifts, with specific requirements, configurations and car/shaft size recommendations given in Sections 7.5 and 7.6.

8.0 Façade Access and Maintenance

8.1 Introduction

TÜV SÜD Dunbar & Boardman (TSDB) has been appointed to deliver façade access and maintenance strategy for periodic cleaning and long-term maintenance of building fenestration within Industry Regulations and Code of Practice based on current architectural, façade and landscape design.

Window cleaning, lighting access and light facade maintenance will be necessary for all external elevations from the proposed access equipment. The proposed options of access equipment are proven designs and available from several qualified manufacturers. The access strategy will pay particular attention to the safety afforded not only to the operatives but also to the surrounding occupants and the public. The systems are proposed for two-person operation, which shall be a requirement of their use, to perform cleaning and maintenance with an allowance for hand tools and equipment.

Efficient means of access and ease of use are also important considerations to reduce overall operating time, and level of disruption to the occupiers and the public. All systems must be designed for simplicity of use, access/egress, ongoing maintenance and inspection/examination requirements. Even so, there is a requirement on those using and managing the use of the equipment to ensure only those trained and competent in the use of such equipment are given access to the systems for use, maintenance, or inspection/examination.

Ongoing detailed design and coordination with the team designers is necessary and shall be required to continue through the following stages to ensure the correct implementation of the façade access strategy. Changes in legislation have emphasised the need for a more structured and informed approach to the provisions of access and maintenance to facades, which traditionally has not always been the case.

Central to these proposals are Health & Safety concerns, which require control measures by the end user & maintainers to ensure that suitably qualified personnel are used where appropriate. TUV SUD façade access specialists' approach is to choose the highest level of safety whilst not compromising inherent constraints and restrictions imposed by the buildings or structures. Current rendering demands consideration of key access and maintenance design factors:

- Routes to and from the location where cleaning and maintenance activities are carried out will be direct and simple as far as reasonably viable. Regular access (e.g., Monthly or weekly) activities should, where possible, be via permanent access and easily accessible.
- Potential to maximise manual cleaning from floor levels. However, it is important to verify manual access within direct hands-on reach. Surfaces beyond the manual reach radius will need to be catered by alternative means to cater to and maintain façade warranties.
- Minimal disruption to occupants/tenants and visitors particularly during glazing replacements. Design input will be essential at an early stage to coordinate with three key trades i.e., Structural, Façade and M&E for correct integration of the system.
- Facilities shall be available that allow access to the external fabric of each area of the building within this development for routine maintenance and cleaning of the facades.

8.2 Façade Access Selection Criteria

8.2.1 Primary Objectives

Although the primary objective of any façade access system is for gaining access at height to clean the building fabric. This is not the only function that should be considered. Secondary functions should also be considered to achieve maximum benefit from the proposed access solution. The building envelope for this development will require a high degree of hand contact for regular maintenance of the glazed zones with protruding fins. Apart from periodic cleaning, regular inspection of all the façade components such as glass, external gaskets, sealants, structural silicon seals, etc. will be necessary.

The prime consideration is the safe access required to maintain the fabric of the building to a level that is considered "acceptable". The word "acceptable" is subjective and yet it is fundamental to the philosophy to be adopted, the initial capital expenditure and the ongoing maintenance costs.

Standard of Cleaning

The image the development conveyed to the occupants and surrounding developments is important. Both the frequency of cleaning and the ability to gain a certain level of clean quality are factors that require assessment and close control by the building management.

Potential for Surface Contamination

The local environment plays an important part, the primary factors being the city centre pollution and, most significantly, the local weather. The choice of surface treatments and shape will affect the ability of the building fabric to retain or purge itself of airborne contaminants and vary the visual perception of cleanliness.

Some materials do actively attract airborne contaminants by electrostatic attraction. Selecting a non-glazed material will require an increased cleaning frequency to maintain it to the same standard, as well as being more susceptible to scratching during cleaning.

Complex intricate facades will not only make close contact with the cladding very difficult, but also the disruption caused by having to work around many individual elements results in a façade with high maintenance costs.

Ease of Access/Operator Ergonomics

The ease by which an operative can access an area directly without excessive reach improves the quality and efficiency of cleaning. We would normally aim to achieve hands-on access within 750mm of reach from the platform.

In selecting a particular equipment type, it is important to realise the skill levels demanded by the operators. The more sophisticated the equipment the greater the skill level required and the greater the risk of facade damage due to operator error.

It is therefore necessary to assess the actual requirements and attribute the acceptable degree of accessibility, before proposing an appropriate system.

Operating Environment

The particular environment in which the equipment is to be installed and operated will have a significant influence on its selection and specification.

The environment will influence the storage considerations, usage restrictions particularly around the track, and degrees of protection applied to the equipment and operatives, be it mechanical, electrical or aesthetic.

As the equipment may well spend much of its time idle, the effect of the environment on its life may well be an important factor.

Influence on its Surroundings

The selected solutions will influence their surroundings to vary degrees. The effects may be material, visual or operational.

All-access equipment will impart a load into the structure. The nature and magnitude of this load are extremely diverse. Limiting the load that a system may impose on the structure may in some cases limit the options available, as it would not be viable to design the structure to accommodate the loads.

Code and safety factor requirements stipulate the load a structure must be capable of withstanding which may be much larger than would, at first sight, appear to be the case.

8.3 Façade Access Strategy Consideration

Facade access is a major requirement for any new development. The ability to clean and maintain the building fabric safely and efficiently is of prime importance. The location of this building and its public profile are central concerns that impact the access schemes considered. Pollutants from nearby roads are a major contributing factor. There is a need for a structured and informed approach to the provisions of façade access and maintenance. As per CDM 2015, it is the responsibility of the developer and designers to adequately provide suitable means of access to the fabric of any building for the purposes of cleaning and maintenance.

All types of facade systems are subject to some degradation over time by the action of the elements and occupant movement. Long-term replacements (circa every 25 years) include replacement of defective / damaged panels, sealants, sealing coats, gaskets and seals, and will require a combination of external access and glazing manipulator / mobile cranes for substantial works. The main features to consider are access to the system both in normal use and in an emergency, together with the method of fixing the system to the building, each of these is vital.

Risk and hierarchy of risk for each system must be assessed. Concerning as defined in BS8560 Code of Practice for the design of buildings incorporating safe work at height, access shall be required to all areas of the building's external envelope for cleaning, inspection and maintenance. The provision of suitable and sufficient methods of access has been considered and shall continue to be considered and developed with the design team and contractors as the design of the project progresses.

There are requirements and demands on the provision and operation of access systems within the site location and in relation to the surrounding access routes and properties. These specifically relate to: The types of access systems proposed.

- The visual appearance of the equipment particularly when not in use
- The effect of the equipment and its operation on the occupants and general public
- Specific limitations on the operating range of equipment to remain within the oversailing zone

A further consideration will be the warranty requirements of the cladding contractors. There will be a minimum requirement for the frequency and cleaning processes they would expect. These details must be made available to the building management team in order to arrive at the required cleaning cycles.

Most of these parameters are not under our control, but they must be analysed and accounted for in the ultimate scheme. Façade contractors will specify the inspection regime and frequency to comply with the manufacturer's warranty terms similar to those shown below as an example. The frequency of cleaning must be made available to the building management team to establish the exact cleaning cycles. Furthermore, based on the façade design, the periodic cleaning and maintenance of the building envelope will be carried out externally by professional window cleaners (BMU users and abseilers).

TÜV SÜD Has presented options including Roof Mounted BMUs, Industrial Rope Access (abseiling), Manual davit and suspended platform and temporary Mobile Elevated Work Platform (MEWP). The design team is inclined to consider the abseiling approach in comparison to other forms of access to minimise spatial requirements. TÜV SÜD commented that under Working at Height Regulation preference must be given to collective means of protecting (manned platforms for example BMUs and MEWPs) over personnel means (for example abseiling and fall restraint safety lines). This means abseiling is the least preferred means of gaining access at a height which facilitates external access for cleaning compared to BMU which will offer access for both cleaning and future long-term maintenance, for example, glass lifting and cladding

replacement. TSDB produced outline BMU schematic diagrams including track layouts superimposed other than architectural background to illustrate clearances and operating zones.

The use of Industrial Roped Access will only be proposed when determined that the use of a more suitable is neither practicable nor proportionate. This does not negate the need to adhere to the Working at Height Hierarchy of Risk and prioritise the use of collective protection wherever practicable. It is important to note that Environmental Health Officers (EHO) from the Health and Safety Executive may consider abseiling only if all other forms of access are not reasonably practical (for example constraints due to complex building geometry) or if the frequency of least preferred means of access (as per WAHR Hierarchy) is low by combining other safer means of access, for example, using MEWP and/or manual cleaning.

Under Regulation 6 of The Work at Height Regulations 2005, there is a hierarchy of control for determining how to work at height safely. This hierarchy has to be followed systematically and only when one level is deemed not 'reasonably practicable' may the next level be considered. The regulations have advised previously that it is not acceptable to select work/access equipment from lower down the hierarchy in the first instance. In addition, a risk assessment of the access need must be carried out to determine which proposed system is suitable and also 'so far as is reasonably practicable'.

Under CDM 2015, the client takes a designer role and must ensure they meet the requirements of CDM 2015 by demonstrating to the Principal Designer, the rationale behind selecting the preferred strategy over the 'recommended' approach as per the Working at Height hierarchy. Please see below highlighted clauses 1.2 & 1.3 extracted from CDM 2015.

1.2 Who is a designer? A designer is an organisation or individual that prepares or modifies a design for any part of a construction project, including the design of temporary works, or who arranges or instructs someone else to do it. Designers include architects, consulting engineers, interior designers, temporary work engineers, chartered surveyors, technicians, specifiers, principal contractors, specialist contractors and some tradespeople. You could also be carrying out design even if you would normally not identify yourself as a designer. An example would be if you are a client or contractor specifying a particular roof system, deciding what size joists to use or selecting a type of window.	1.3 What is the designer's role? Designers must: • understand and be aware of significant risks that workers and users can be exposed to, and how these can arise from their design decisions • have the right skills, knowledge, and experience, and be adequately resourced to address the health and safety issues likely to be involved in the design • check that clients are aware of their duties • co-operate with others who have responsibilities, in particular the principal designer • take into account the general principles of prevention when carrying out their design work (which are set out in Annex D) • provide information about the risks arising from their design • co-ordinate their work with that of others in order to improve the way in which risks are managed and controlled.
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Most recently when considering high hazards, the designers generally build on this good practice assessment using more formal decision-making techniques including 'Cost Benefit Analysis' to inform their judgment. This can also be interpreted as 'Value Engineering', which need not necessarily be associated with reducing the costs of a project.

By comparing the cost of installing and maintaining a complex Building Maintenance Unit (BMU) system or other cradle operation, which, although relatively comprehensive, may not be able to reach all of the building façades against the cost of installing a Rope Access system, we are likely to find that the latter offers a more complete solution and also shows significant savings not only at installation but also in future maintenance and access costs.

8.3.1 Key Design Consideration

- Tailored strategy specific to building geometry.
- Operator's safety.
- Compliance with BS EN Standards and Industry codes & Regulations.
- Ability to park on systems with minimal visual impact to satisfy aesthetic requirements.
- Back up access strategy for periodic cleaning and not fully rely on a single system
- Minimal disruption to the building occupiers by eliminating the need for manual transfer and access around the private terraces.
- Minimum physical contact with the façade whilst sustaining façade performance.
- Safe and efficient means to access the façade for periodic cleaning and façade lifting (during replacement). Aim to achieve direct hands-on access within an average of 750mm of reach. [Note:

Section 9 of Document K of the Building Regulations as diagram 9.1 suggests 850mm reach for window cleaning. Standards such as BS 8213-1 suggest a Shoulder (acromion) to grip mean reach of 662.5mm. Furthermore, the distance of 750mm is based on past discussions with several window cleaners in the industry based on ergonomic preference]

- Simplicity of operation and maintenance of the equipment.
- Rescue incapacitated operatives in a safe manner.
- Environmentally acceptable materials used, and waste products generated.

8.3.2 Façade Cleaning Frequency – General Principles

Based on the façade geometry and the location of the development, we would recommend a minimum of four external cleaning cycles per annum. The final cleaning cycle must be confirmed by the façade specialist who might suggest alternative access frequencies to fulfil the client's expectations and façade performance demands.

Cleaning activities are carried out during normal hours throughout the year. The frequency will increase for low-level glazing (fortnightly or monthly).

8.4 Façade Access Optioneering

8.4.1 Functional & Operational Comparison

#	Parameters	BMU	Abseil
1	Equipment Capital Cost	Higher if the case of tracked BMU due to plinths, tracks and associated supports.	Lower on the single roof level. Slightly higher for multiple roofs.
	▪ Exposed v/s concealed (dictated by roof use type) ▪ Auxiliary lifting (glass/plant) will exceed BMU cost specific to the project.		
2	Cleaning & Maintenance Cost	Low	Comparatively higher (circa 2-3 times than cradle operatives, high insurance costs).
3	Cleaning & Maintenance Time	Restricted by building geometry and set-up times.	Flexible based on several abseiling teams deployed simultaneously.
	▪ Level of dirt settled on the façade varies based on geographical location. ▪ Cleaning time reduces over a period of time when the cleaners are familiar with the sequence. ▪ Always retain the same team of cleaners since they have 'learned' the façade by experience		
4	Operational & Testing Cost	Slightly higher in the case of tracked BMU	Minimal based on fixing details to minimise testing (resin v/s cast in anchors).
	▪ LOLER inspection costs apply to all systems. ▪ 10-Year LG3 inspection required for BMUs		
5	System Maintenance Cost	Low due to standard unit.	Very limited subject to fixing details (Welded v/s Casted anchors v/s post fixings (resin).
	▪ Hostile environment will demand frequent and detailed maintenance ▪ Services in the vicinity will dictate the maintenance frequency. ▪ Manufacturer's warranties		
6	Operational Impact	Low due to the use of buffered cradles in contact with the building façade.	Very low probability that the building is designed correctly to cope with abseiler foot load, and rope load (if applicable).

#	Parameters	BMU	Abseil
		Low operational error due to simple building geometry.	Abseilers experience (Level 1 & 3), adaptability, multi-skill.
		Noise & vibration	Constrained by rescue procedures and release time (potentially fatal accidents).
		Constrained by rescue procedures and location.	
5	Safety Statistics	Subject to design failure. Bespoke BMU with several components assembling on site (to prepare BMU) adds potential risks.	Very Low Incident Rate (as claimed by IRATA stats).
6	Design Life (periodic use and excludes beneficial use)	Generally, 25 -30 years.	Approx. 15 years.
7	Spatial Requirements	Perimeter-tracked BMU to clear jib and counterweight swing).	Circa 1m wide clear 'abseil corridor'
		▪ Total suspended load (cradle weight, glass lifting, plant lifting) will decide the counterweight extension to the rear of the jib ▪ Ensure to check minimum jib/arm turning circle clearance	
8	Aesthetics	Complies with client requirement to park below plant screen level.	Negligible depending on the concealed or exposed installation
		▪ Traversing BMUs will have a track switch to park the unit central to the roof whilst maintaining minimum reach a ▪ Detailed coordination is required to include a parking garage and concealment lid	
9	Glass & Plant Lifting during	Auxiliary winch included within BMU design. Saves craneage costs in the region of cost range £14k based on location, building height and crane type)	Glazing contractor with certified abseiling skills required to handle façade panels at height. The panel acts as a sail and is challenging for the abseiler suspended on ropes.
10	Façade Restraints	Applies for façade more than 40m. Detailed coordination with façade design (visual, pull load, spacing, etc.)	Abseilers use suction cup devices at the location of use.
11	Breakdown / Rescue	The rescue plan is simple based on standard building geometry and landscape within façade proximity.	Requires detailed rescue plan within the shortest possible to avoid fatal suspension trauma.
12	Management	Can be connected to a BMS system to monitor use and performance.	Building management to monitor the cleaning and assist incapacitated abseilers.
		Connected to a backup generator to retrieve operatives	Often done outside of normal working hours so "invisible" to enforcement. Reliance upon Facility Management to avoid HSE breach.

#	Parameters	MEWP	Davit + Powered Platform
1	Equipment Capital Cost	Not applicable since it will be hired	Higher for multiple roofs.
	Exposed v/s concealed (dictated by roof use type)		
2	Cleaning & Maintenance Cost	Low	Comparatively higher (circa 3-4 times than cradle operatives, high insurance costs).
3	Cleaning & Maintenance Time	Restricted by space and clear zone at ground level. Requires partial/full road closure therefore high cleaning times.	Flexible based on a number of the abseiling teams deployed simultaneously.
	- Level of dirt settled on the façade varies based on geographical location. - Cleaning time reduces over a period of time when the cleaners are familiar with the sequence. Always retain the same team of cleaners since they have 'learned' the façade by experience		
4	Operational & Testing Cost	Not applicable to the client	High. Based on fixing details to minimise testing (resin v/s cast in anchors).
	- LOLER inspection costs apply to all permanently installed systems. 10-Year LG3 inspection required for BMUs		
5	System Maintenance Cost	Not applicable to the client	Subject to fixing details (Welded v/s Casted anchors v/s post fixings (resin)).
	- Hostile environment will demand frequent and detailed maintenance - Services in the vicinity will dictate the maintenance frequency. - Manufacturer's warranties		
6	Operational Impact	Constrained by the ground-level landscape and clear operating width including rescue procedures and location.	Powered platform movement per drop and its setup and storage
5	Safety Statistics	Safe (should be operated with IPAF licence)	Subject to design failure. Bespoke BMU with several components assembling on site (to prepare BMU) adds potential risks.
6	Design Life	The system is hired.	Generally, 25 -30 years.
7	Spatial Requirements	Clear zone at ground level to drive the unit	Circa 2m wide clear corridor at roof level. Exact details to be developed based on short or tall davits
8	Aesthetics	Complies with client requirement as the system is not parked on site	Negligible depending on the concealed or exposed installation
	Detailed coordination is required to include a parking garage and concealment lid		
9	Glass & Plant Lifting during	Requires separate craneage to operate in conjunction with MEWP.	Requires separate craneage to operate in conjunction with MEWP
10	Façade Restraints	Not applicable	Applies for façade more than 40m. Detailed coordination with façade design (visual, pull load, spacing, etc.)

#	Parameters	MEWP	Davit + Powered Platform
11	Breakdown / Rescue	The rescue plan is simple and based on standard building geometry. Requires a clear zone on ground level to carry out the rescue.	The rescue plan is simple based on standard building geometry and landscape within façade proximity.
12	Management	Building FAM team heavily involved to avoid disruption to pedestrians and traffic within proximity.	Building management to monitor cleaning

8.4.2 Façade Maintenance

When necessary, high-level maintenance may be achieved using a variety of methods including BMU, and temporary scaffold towers. Rope access (abseiling) can be considered subject to further review and its impact on landscape design. The optimum choice of the system will depend on the nature and duration of the work to be carried out.

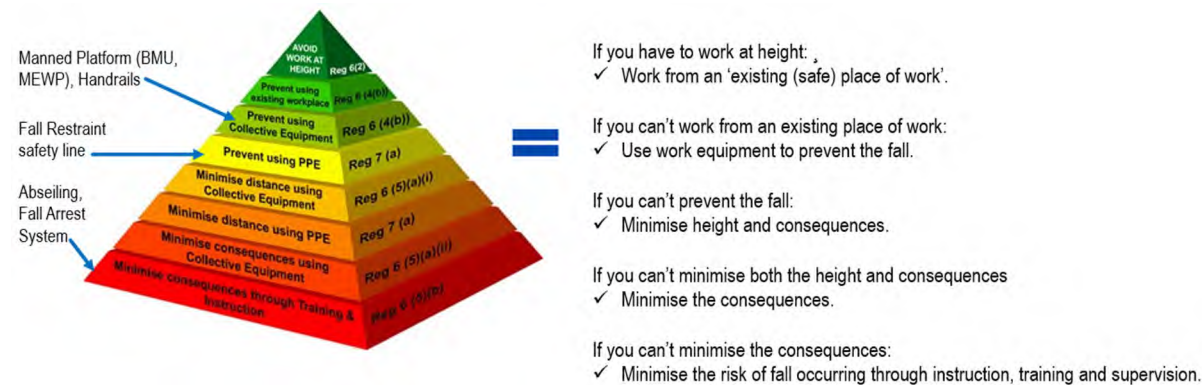
Façade inspections and surveys can be conducted using a drone or Unmanned Aerial Vehicles (UAVs) for visual inspection and to avoid risks associated with working at height. Recent development in drone technology will provide a cost-effective solution for a close visual of the façade cost-effectively without working at height. The drone units will be equipped with GPS for location accuracy, and increasingly radar-based anti-collision systems, to provide non-intrusive access to the building exterior. Drones can also be equipped with sensors to enable thermographic surveys of the façade.

The CAA legislations around drone flights are subject to regular changes due to security-related reasons therefore Building Management must be familiar before deploying the drone units. Therefore, permission to use drones may be challenging in the future during the design life of the development, which cannot be predicted at this stage. Latest legislation around drone flights in recent years with following legal requirements:

- Drone Operators are required to have a certificate of registration from the CAA as SUA operators.
- Drone Operators are required to have valid CAA permission for commercial works/purposes.
- Drone Pilots require a Certificate of Competence issued by the CAA.
- Obtain necessary permissions.
- Acquire additional permission from the CAA to fly above 400 feet (121m).
- Separate permission is required to fly in a flight-restricted zone

8.5 Compliance with Industry Codes & Statutory Regulation

The project is subject to UK regulations, in particular, CDM 2015 (Regulation 9 Designer's duties) and Work at Height Regulations 2005, both of which require the Client, and his designers to prioritise the use of "collective measures" when selecting a working method for work at height, and states that you "shall" prioritise this before you use "individual measures". In formulating the strategy, attention has been paid to designing the strategy based primarily on "collective measures". Furthermore, BS 8560 suggests designers and clients should allow for safe access to clean and maintain building façade and in so doing shall give "Collective" measures priority over "Individual" measures.



Control Measures	Examples of control measures	Desirability
Avoid the need to work at height	Offsite prefabrication: modular construction, precast concrete, unitized curtain walling, steelwork assemblies. On site assembly at ground level: steelwork assemblies. Use of low maintenance materials and equipment: self-cleaning glass, fibre optic lighting, glass reinforced plastic/polyester mansards and chimneys. Ground/floor-based maintenance: lowerable light systems, long-reach washing poles, items requiring regular maintenance reachable from floor/ground level. Inclusion of temporary protection measures: offsite pre-fixed handrails/guardrails to stairs and roof edge beams. Remote access solutions: robotic equipment.	Most Desirability Least
Prevents falls: collective	Parapets, guardrails, BMUs, MEWPs, scaffolds, tower scaffolds, safety decks, no fragile surfaces, podium steps.	
Prevents falls: personal	Rope access, anchors and anchor lines for work restraint.	
Minimizes the height and consequences of falls: collective	Safety nets, perimeter catch fans, crash decks, scaffold fans. All rigged as close as possible.	
Minimizes the height and consequence of falls: personal	Harness, lanyard, anchor or anchor line-based fall arrest methods: window cleaner anchors, ladder fall arrest systems, retractable fall arrest blocks.	
Minimize the consequence of falls: collective	Remote soft landing systems (air bags, bean bags), safety nets fitted at low level.	
Minimize the consequence of falls: personal	Personal injury reduction (inflating suits).	
No fall protection: personal	Ladders, step ladders, hop-ups, stilts.	
No fall protection: collective	Unguarded edges, platforms, stages, loading docks.	

All permanently installed Façade access equipment including temporary systems will be designed in accordance with non-exhaustive BS EN standards and current codes and guidelines appropriate in the UK:

- **BS EN-1808**
Safety requirements on suspended access equipment. Design calculations, stability criteria, and construction. Tests
- **BS 6037-1**
Code of practice for the planning, design, installation and use of permanently installed access equipment. Suspended access equipment
- **BS 6180**
Barriers in and about buildings

- **BS 8610**
Personal fall protection equipment – Anchor systems – Specification
- **BS 7985**
Code of practice for the use of rope access methods for industrial purposes
- **BS EN 795**
PPE against falls from a height. Anchor devices Requirements and testing.
- **BS 7883**
Code of practice for the design, selection, installation, use and maintenance of anchor devices conforming to BS EN 795
- **BS 8437**
Code of practice for selection, use and maintenance of personal fall protection systems and equipment for use in the workplace.
- **BS 8213-1**
Windows doors and roof lights. Design for safety in use and during cleaning of windows, including door-height windows and roof windows. Code of practice
- **BS EN ISO 14122-2**
Safety of machinery. Permanent means of access to machinery. Working platforms and walkways
- **BS EN ISO 14122-3**
Safety of machinery. Permanent means of access to machinery. Stairways, stepladders and guard-rails
- **BS EN ISO 14122-4**
Safety of machinery. Permanent means of access to machinery. Fixed ladders
- **BS EN 13857**
Safety of machinery. Safety distances to prevent hazard zones from being reached by upper and lower limbs
- **BS 22846**
Code of practice for Personal equipment for protection against falls.
- **PD CEN/TS 16415**
Personal fall protection equipment. Anchor devices. Recommendations for anchor devices for use by more than one person simultaneously.
- **BS EN 351**
PPE against falls from a height. Descender devices.
- **BS EN 354**
Personal protective equipment against falls from height. Lanyards.
- **BS EN 361**
Personal protective equipment against falls from a height. Full body harnesses
- **BS EN 362**
PPE against falls from a height. Connectors.
- **BS EN 363**
PPE against falls from a height. Fall arrest systems
- **BS EN 364**
PPE against falls from a height. Test methods
- **BS EN 365**
PPE against falls from a height. General requirements for instructions etc.
- **BS 8460**
Safe use of MEWPs. Code of practice.
- **BS EN ISO 1461**
Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods
- **BS6472-1**
Evaluation of human exposure to vibration in buildings
- **BS EN ISO 1461**
Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods.
- **PD 6484**
Bi-metallic corrosion.
- **BS EN 1004 1**
Mobile Access and Working Made of Prefabricated Elements.

The following Regulations will also apply:

- The Health and Safety at Work etc. Act 1974.
- Construction (Design and Management) Regulations 2015
- SAEMA code of practice
- Lifting Operations and Lifting Equipment Regulations 1998 (LOLER 98)
- The Provision and Use of Work Equipment Regulations 1998 (PUWER 98)
- Work at Height Regulations 2005
- IRATA International Code of Practice
- HSE Sheet MISC612 - Safety in window cleaning using rope access techniques
- GS25 - Prevention of falls to window cleaners
- Manual Handling Operations Regulations 1992 (as amended) (MHOR)
- Personal Protective Equipment at Work Regulations 1992
- Workplace (Health, Safety & Welfare) Regulations
- Management of Health and Safety at Work Regulations
- PASMA Code of Practice & Guidance

8.6 Façade Access System Description

8.6.1 Roof BMUs

It is reasonable to expect that building owners will wish to protect their investment by maintaining warranties on key elements. The expectation is the building will be maintained to a reasonable standard and it is for the design team to propose the safest and most efficient means of undertaking this work.



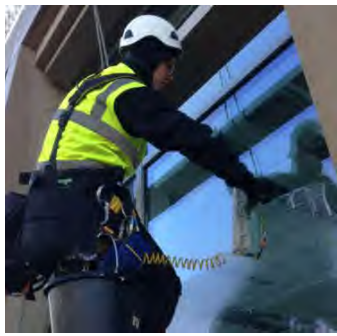
When considering available strategies, several options were reviewed. The proposals made have been shaped by knowledge and experience of the access to maintenance market and the over-arching H&S legislation. Establishing a safe, compliant permanent access system comprising Building Maintenance Units (BMU) requires an initial investment. Once established, the BMU will deliver cost efficiencies over the equivalent rope access solution. Operating from a cradle supplied by a reputable BMU manufacturer allows operatives to perform a full working day with minimal risk to health and welfare. Introducing tools and light materials will allow essential maintenance work to be conducted. Where specified the BMU can provide also both the means of access and method of lifting for façade replacement.

Further permanent access considerations:

- Lower rates of working
- Longer and more consistent work cycles
- Equally effective for both cleaning and Façade maintenance
- Greater potential for the carrying of water, tools, and materials
- Greater potential for glass/plant replacement via auxiliary hoist
- Improved working condition facilitates higher quality clean
- Ability to traverse, slew, telescope, and hoist under power
- No requirement to re-establish rigging points periodically
- Minimum interface with occupied or tenanted areas
- BMU cradle provides s level of protection from elements
- BMU cradle provides means for rest periods at the façade
- Reduction in lost hours through fatigue
- Reduced risk of work-related illness (suspension)
- Established and known factors of safety
- Established and predictable load on the structure
- Established method of rescue to the closest point of evacuation
- Manageable risk with work processes being kept to a minimum
- Minimal effect on tenants and/or the public at ground level
- Delivers collective protection as CDM requires

8.6.2 Industrial Rope Access

Industrial rope access is a method of work positioning that uses a double rope system, in combination with other devices, by which the user descends and ascends a working line to get to or from the workplace while further protected by a safety line. Both ropes are connected to the user's harness and separately secured to a pair of anchors (normally conforming to BS EN 795 – Protection against falls from height – Anchor devices – Requirements & testing). The technique is viewed as a form of fall arrest and as such is placed lower down the hierarchy of acceptable access solutions within the Working at Height Regulations.



The main drawback to the use of rope access is the reliance on individual and organisational competency. Due to the nature of the technique, only Industrial Rope Access Trade Association (IRATA) member companies and qualified individuals should be employed to perform rope access work. Such companies and individuals are audited and assessed against strict operating protocols to assure the safest techniques are used. Under IRATA's requirements, industrial rope access teams must be a minimum of two workers comprising a qualified Level 1 rope access technician and a qualified Level 3 rope access supervisor as a minimum. This minimum combination will ensure that there is constant rescue provision available at the site. As a precautionary measure to mitigate further risk, additional Level 3 personnel must be made available at the roof level to rescue 'Level 3 in work position' during unexpected circumstances.

Further rope access considerations:

- Increased rate of labour (estimated 40%)
- Physically and technically demanding
- Reduced productivity in adverse weather
- Reduced effectiveness for maintenance operations
- Reduced effectiveness for lifting/carrying of material
- Potential for high dynamic loading on anchors and belays
- Increased potential for façade damage from rope abrasion
- Increased potential for façade damage from operative interface
- Increased exposure to wind fatigue when working at a height
- Increased exposure to suspension injury due to extended periods on ropes
- Potentially onerous rescue procedures
- Unpredictable load paths during operation
- Increased tenant interface with rope access operatives re-entering the building after each descent.

8.6.3 Mobile Elevating Platform (MEWP)

- Mobile Elevation Work Platforms (MEWPs) can provide a relatively efficient and cost-effective solutions for cleaning and maintenance. When considering the use of MEWPS it is important to ensure the medium from which the MEWP will operate is conducive to the operation and operational loadings. How operational hours will be affected by the need to accommodate public access? This will require areas where the MEWP are working within the public realm must be able to be effectively cordoned off when the MEWPs are in use without causing too much disruption to normal access paths. Consideration will also have to give to whether the operation of the MEWP will require local road closures and licenses applicable to local authorities.



- Advantages
 - No capital purchase costs if hired
 - No ongoing maintenance costs if hired
 - Collective protection
- Disadvantages
 - Logistically difficult to use and plan around the site. This will require areas where the MEWP are working within the public realm must be effectively cordoned off when the MEWPs are in use without causing too much disruption to normal access paths.
 - Consideration will also have to give to whether the operation of the MEWP will require local road closures and licenses applicable to the local authority.
 - Impacts the landscape on the Ground floor
 - Exclusion zones required

8.6.4 Davits & Powered platform

A pair of high-profile davit arms (one pair per roof) will support a dual-operative self-hoisting powered platform. When not in use, the davit arms will be folded horizontally using a ratchet block as illustrated below. Detailed coordination will MEP be necessary to allow clash-free platform movement.



Overall rigging and de-rigging of the Davit system are carried out manually therefore before each platform drop path, the window cleaners will require high setup time, therefore, impacting overall cleaning and maintenance time.

- High rates of working
- Longer and more consistent work cycles
- Suitable for limited drop path
- Labour intensive
- High setup time
- Very high cleaning time
- Davits need rigging and de-rigging to cradle drops
- Cradle provides a level of protection from elements
- Reduction in lost hours through fatigue
- Established and known factors of safety
- Established and predictable load on the structure
- Require thorough training to operate and rescue operatives
- Minimal affect on tenants and/or the public at ground level
- Delivers collective protection as CDM requires

8.6.5 Atrium

External Access

The external surface of the rooflight will be maintained using two nos. of single person mobile platform ('chariot') system traversing on series of helm tracks (section shown below) in-built within the rooflight mullions.



The chariots will be constructed at the end of the roof light via manually operated travelling ladder and riding cage designed for two operatives and carrying chariot components. The chariot will be designed such that each component will weigh no more than 10kg to enable manual assembly whilst positioned within the ladder riding cage. We recommend retaining (parking) one of the platform base and associated spindle mechanism on the track to assist in assembling of the other unit on the adjacent bay.

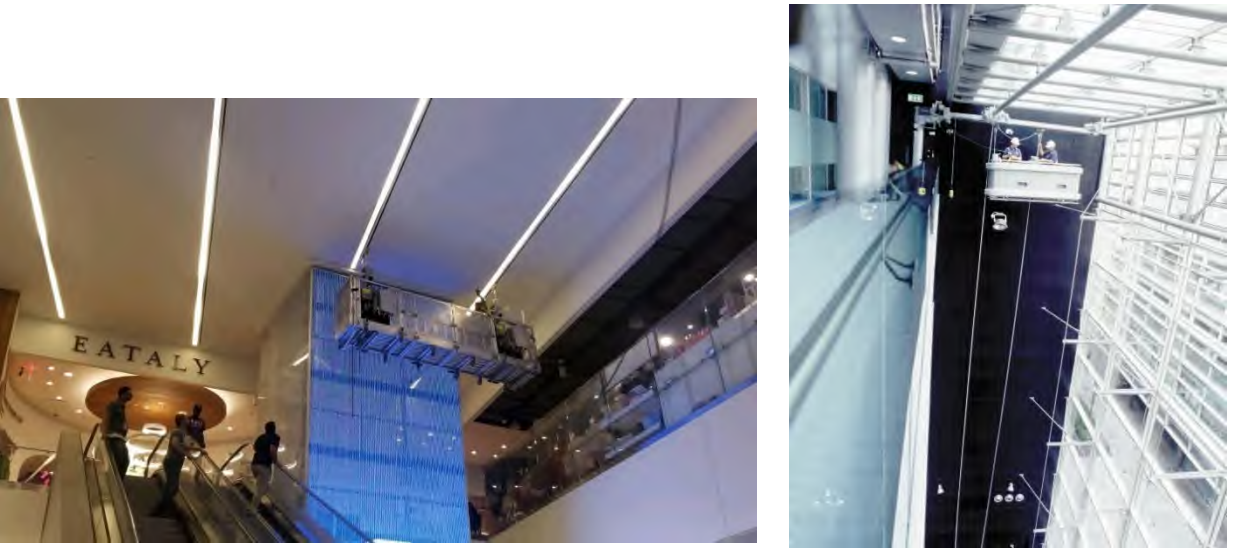


The roof light will include 1m wide trafficable landing strip complete with fall restraint safety line along the drop path of BMU platform from the main roof, designed to cope with self weight of the suspended platform and four operatives. In case of emergency descend, the cradle operatives will egress the BMU platform and walk toward.

Internal Access

In order to access the underside of the rooflight, series of soffit mounted helm tracks will be installed to the underside of the roof structure. The tracks will be designed to support dual operative powered platform which will be shared between the track bays. The powered platform will be rigged from the series of openable windows on the side of the rooflight walls.

Window cleaners will use the travelling ladder described in the previous section. Whilst positioned within the riding platform, nylon ropes will be used to pull the powered cradle ropes positioned on the breakout area. The ropes will be rigged to the manual trolleys housed within the helm tracks.



8.7 Health & Safety

This development falls under safety Regulations followed in the UK. With this in mind, the safety of operatives, those affected by the maintenance operations and members of the public must be considered in developing the proposed scheme and significant emphasis is currently being exercised by the United Kingdom's Health and Safety Executive to reduce risks as low as reasonably practical (ALARP), particularly when considering working at height and maintenance of facades. Recent EC Health & Safety directives and legislation have played a direct role in the manner and application of access equipment systems to buildings.

8.7.1 Statutory Requirements

The proposed access and maintenance strategy for the building must be discussed and agreed upon with the local authorities.

8.7.2 Regulation

The field of "maintenance equipment" offers a very diverse range of applications and types. It is not only important that the equipment will carry out its intended task, but it must offer an acceptable level of safety to its operators and perform reliably.

Codes and standards will give the necessary guidance on the straightforward aspects of the equipment and specific standards exist that we would apply. Various areas will require consideration of different authorities and their specific requirements.

As a minimum, the maintenance contractor shall comply with the Project Health and Safety requirements as laid down in the Contract Documents. They shall include for complying with all current and proposed statutory requirements, Codes of Practice issued by the Health and Safety authorities, guidance issued by the Health and Safety Executives, and use of products, methods of work and protective measures which shall minimise Health and Safety hazards.

Risk assessments shall be made available to ensure that all significant risks likely to arise throughout the construction phase are anticipated and appropriate steps are taken to eliminate, reduce or control the risk. All risk assessments must be submitted before the commencement of Works on site.

All personnel must wear protective clothing, shoes, goggles, gloves, and hard hats whilst on construction sites and use personal protective equipment (PPE) required for specialist operations (e.g., safety harnesses attached to suitable anchorages). All PPE must be regularly inspected, and a log kept. All personnel employed or subcontracted by the contractor must carry out all work in a safe manner. They must take precautions to avoid accidents with others (including the public).

The building facades are generally accessed at height, which signifies that all operatives are to be aware of the dangers when working at height. There is an ever-present danger of dropping tools, etc. All personnel must take care to ensure that at no time tools can be dropped into an area occupied by other persons, including the general public. The area must either be cordoned off or tools attached to a safety line, or both.

8.7.3 Emergency Rescue

The operatives/abseilers will work in pairs at all times, as this will satisfy the requirement to rescue an operative in the event of incapacitation. Each operative should be trained in this technique and where possible be a trained first aider.

8.7.4 Securing Area During Cleaning

During maintenance, the operatives are responsible to secure and cordon off the areas where the cleaning operation is in progress. This includes all levels above and below the path cleaning. Exclusion Zones will

change as they make their way around the building. During the cleaning, a flagman or cone hat will be required to warn people to stay outside of the working zone to prevent potential injuries and accidents. Risk control measures that apply to all rope access work:

- Operatives to be appropriately skilled and trained (competent) to carry out the intended operation.
- Operatives will always be attached to at least two independently anchored safety systems.
- Connection to the rope access system should be in an area where there is no risk of a fall from a height unless there is protection by other means.
- Exclusion zones should be established as appropriate. This may require zones at locations other than the top and bottom of the rope access work.
- An efficient communication system should be established, e.g., mobile phone, radio, whistle etc.
- All practicable measures should be taken to avoid injury-causing impact with the structure or obstructions.
- Operatives should be properly dressed and equipped, appropriate to the work situation and condition.

8.7.5 Pre-Cleaning Documentation

- Before any work commences, the cleaning contractor will provide, confirm or adopt:
- A documented system of work and a documented safety method statement.
- Permits to work, where necessary.
- Site induction requirements.
- Hand-over procedures, e.g., between shift changes or site contractors.
- Site-specific documentation e.g., rope access technicians' logbooks; end of shift documentation; Hours worked/accident/incident report forms; work log; equipment user instructions.
- Worksite facilities, e.g., for resting; for emergency washing; showers; toilets.
- Where appropriate, a documented site inspection, including suitable provision for anchors, and rigging/rescue plan.
- Planning for emergencies, e.g., fire; entrapment (including rescue), suspension trauma, including any equipment required.
- Protection of third parties, e.g., exclusion zones; barriers; warning signs.



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