Cream
engineering services

3-5 Bedford Row
London

Mechanical, Electrical and Public Health Stage 2 Report

Issue 2
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3-5 Bedford Row
Mechanical, Electrical and Public Health
Stage 2 Report

Audit Sheet

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P01	Stage 2	A. Maliss / C. Evans	30th September 2022
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1 EXECUTIVE SUMMARY

The Stage 2 document outlines the building mechanical, electrical and public health systems proposals for the 'Category A' works associated with the speculative office accommodation at 3-5 Bedford Row, London.

This document is the first milestone of the design audit with the primary aim of reconciling the client's aspirations with our proposed design solutions.

The report sets out our understanding of the client brief and outlines the ways in which the following are going to be dealt within the project:

- Incoming utility supplies for the building
- An overview of the Electrical Engineering principles
- An overview of the Mechanical Engineering principles
- An overview of the Public Health Engineering principles

2 INTRODUCTION

2.1 Purpose of Report

The purpose of this document is to present our RIBA Stage 2 design proposals for the Mechanical, Electrical and Public health services, which shall form the basis of the Stage 3 and Stage 4 design upon client's approval.

2.2 Proposed Development

The development comprises the refurbishment and remodelling of existing buildings (Bedford Row side, Jockey's Fields side and 'link' building) to provide a single property offering approximately 2500m^2 of office accommodation over six levels (basement, ground and first to fourth floor levels).

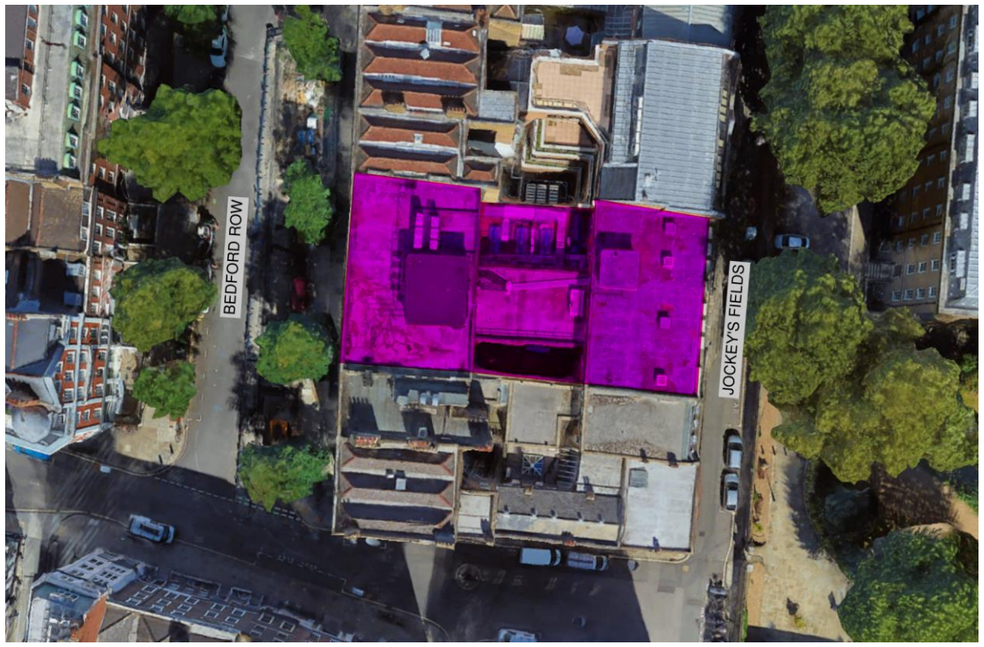

Figure 1 - Site Plan

2.3 MEP Scope of Services

This report covers MEP services to the 3-5 Bedford Row that shall be required to enable the project to be built.

2.3.1 Scope of Services

The Engineering systems to be designed by Cream Engineering, and described in this report, are as follows:

Environmental Services

- VRV Heating / Cooling Systems
- Mechanical Ventilation Systems
- BMS & Automatic Control Systems
- Direct Expansion Refrigerant Systems
- Vibration and Noise Control
- Domestic Cold Water Services
- Domestic Hot Water Services
- Above Grounds Foul & Waste Water Drainage Services
- Above Ground Rainwater Drainage Services

Electrical Services

- Incoming Electricity Supply
- Low Voltage Distribution & Energy Metering
- Interior, Exterior and Emergency Lighting
- Lighting Controls
- Small Power & Mechanical Plant Supplies
- Fire Detection & Alarm
- Security Systems
- Telecommunications Systems
- Lightning Protection
- Earthing & Bonding Systems
- Photovoltaic System (PV)

2.3.2 Work Packages Excluded from Services Scope

The following Works packages are excluded from Cream Engineering's scope and shall be provided by others.

- Fire Protection services including Fire Strategy and systems' 'cause & effect'
- Voice & Data Hardware and Active System Equipment
- Acoustics Design including:

- Internal and external background noise criteria for sizing/ selection of external plant and equipment
- Noise reduction scope for the building envelope (outside to inside)
- Internal treatment for noise reduction between spaces and reverberation times

- Below ground drainage systems
- Irrigation & rainwater harvesting systems
- Rainwater collection and disposal (external to building)

2.3.3 **Contractor Design Items**

The following items are the Contractor design items that should be included within the mechanical and electrical works package. The Contractor shall design, supply, install, test and commission all elements of the following systems:

- Automatic controls and BMS for correct operation of plant
- Refrigerant pipework sizing
- Supports for all services distribution
- All bracing including expansion joints and fixings of support systems and equipment
- Sizing and setting out of all 'builders' work' penetrations, including excavation works
- Plinths and plant bases
- Final selection of all spring hangers and anti-vibration mountings to suit the particular application of the mounts for each major plant item and distribution throughout the building
- Design and installation of sealing, weather and fire proofing of services' penetrations
- Movement joints in all services
- Temporary works for contractors
- BWIC & fire stopping
- Fire alarms (system element selection, zoning, etc.)
- Photovoltaic system
- Accessways/ gantries/ access ladders/ stairs/ step-overs & plant platforms (to meet CDM requirements)
- Detail all access requirements including access to false ceilings for maintenance
- Production of working drawings and co-ordination as required by the specification
- Lightning Protection
- Bipolar Ionization Systems

2.4 **BREEAM**

The development is targeting BREEAM 'Excellent' and is assessed under following:

- BREEAM Refurbishment and Fit-Out - covering the refurbished areas
- BREEAM New Construction – covering the new floors

3 REQUIRED DESIGN STANDARDS

The design and installation of Engineering Services for the project shall be in accordance with the latest edition of the following documents, as a minimum.

3.1 **Required Design Standards**

- The Health and Safety at Work Act
- Health and safety Executive (HSE) Guidance
- The Environment Act
- The Environment Protection Act
- The Control of Pollution Act
- Relevant British Standards
- Relevant ISO and EN Standards
- Relevant EEC Directives
- Building Regulations
- Electricity Supply Regulations
- The Electricity at Work Regulations 1989
- BS 7671 Requirements for Electrical Installations – IET Wiring Regulations
- The Fire Precautions (Work Place) Regulations
- The Construction, Design and Management (CDM) Regulations
- COSHH – Control of Substances Hazardous to Health
- Local Statutory Requirements
- Local Fire Services Regulations
- SI 1999 No.1148 The water supply (water fittings) regulations
- Gas Safety Regulations

3.2 **Reference Document & Guidelines**

- Chartered Institute of Building Services Engineers Guides & Technical Notes
- American Society of Heating, Refrigeration and Air Conditioning Engineers Guides.
- British Fire Protection Systems Association (BFPSA) Code of Practice.
- The National Approval Council for Security Systems (NACOSS) Codes of Practice and Guidelines.
- Loss Prevention Council.
- BSRIA Guidelines.
- Regulation (EU) No. 517/2014 on Certain Fluorinated Greenhouse Gases (F-Gas Regulations)
- HSG 274 Legionnaires' disease - Technical guidance
- BS 5588 Fire precautions in the design, construction and use of buildings
- BRE Guidelines.

- EN12056-2 – Gravity drainage systems inside buildings. Parts 1 to 5.
- EN 806-2 – Specification for installations inside buildings conveying water for human consumption. Parts 1 to 4
- The Institute of Plumbing Engineering (I.O.P.) services design guide.
- L8 HSE Approved Code of Practice and Guidance The control of legionella bacteria in water systems.
- Water Supply (Water Fittings) Regulations 1999.

3.3 CDM Regulations

The Health & Safety "of those who are to construct, maintain or repair the structure" shall be considered within the Contractors' installation in accordance with the requirements of the Construction (Design & Management) Regulations. Detailed risk assessments shall be prepared at each stage of construction with foreseeable hazards considered.

4 DESIGN CRITERIA

The design and installation of Engineering Services shall be based upon the following Design Criteria derived from recommended guidelines identified within the aforementioned Design Standards and References.

4.1 Mechanical Services Basis of Design

4.1.1 External Design Conditions

Description	Design Criteria
Summer Temperature	30˚C (db) 20˚C (wb)
Winter Temperature	-4˚C (saturated)

4.1.2 Internal Design Conditions

Area	Design Criteria Temperature (Heating)	Design Criteria Temperature (Cooling)
Office / Reception	21°C± 2°C	23°C± 2°C
Shower / Change	22°C± 2°C	Uncontrolled
WC	20°C ± 2°C	Uncontrolled
Circulation / Cycle Store	18°C min	Uncontrolled
Cleaner's Store	Uncontrolled	Uncontrolled
Plant Room	Uncontrolled	Uncontrolled

4.1.3 Occupancy

Area	Occupancy
Office	1p/10m2

4.1.4 Ventilation Rates

Area	Design Criteria
Office	12 l/s per person supply and exhaust
WCs	10 ACH (natural makeup)
Shower / Change	10 ACH (supply and extract)
Cleaner's Stores	6 ACH (Extract)

4.2 Noise Criteria associated with Plant

Ambient noise criteria for the selection of mechanical plant and equipment shall be advised/ confirmed by the Acoustic Consultant.

Subject to any conditions within the detailed planning application, at this stage it is envisaged that all plant and equipment noise shall be attenuated such that the Rating Level does not exceed 10 dB(A) below the existing background noise level.

This would be measured or calculated at 1m from the façade or at the nearest existing noise sensitive premises.

Area	NR
Office	38
WCs / Cleaners Store	40
Shower / Change	40

4.2.1 Building Fabric & Leakage

U-values

As Architect's specification (to meet building regulations requirements where applicable).

Fabric Leakage

Building air leakage performance is line with Building Regulations Part L requirement and is set at maximum of 8m³/hr per m² (Architect to confirm).

4.3 Public Health

The design of the Public Health systems in the centre has been undertaken with reference to relevant documents and guides, including (but not limited to) the following:

- BS EN 806 "Specification for installations inside buildings conveying water for human consumption"
- BS EN 12056 "Gravity drainage systems inside buildings"
- Building Regulations Approved Document G "Sanitation, hot water safety and water efficiency"
- Building Regulations Approved Document H "Drainage and waste disposal"
- CIBSE Guide G Public health and plumbing engineering
- CIPHE Design Guide.
- HSE L8 Approved Code of Practice "The control of legionella bacteria in water systems".
- Water Supply (Water Fittings) Regulations 1999.

4.3.1 Domestic Water Services

The design and sizing of the Domestic Hot and Cold Water system shall utilise the Loading Unit diversity method as set out in the IOP design guides Graphs 3 & 4 and relevant BSEN Guides.

A Frequency factor "medium use" shall be utilised, and sanitary appliance loading units shall be as follows:

Equipment	Load Units (LU)
WC	2
WHB	2
Urinal	1

Sink (General)	5
Cleaners Sink	5
Shower	3
D/W	2

Loading Unit values listed are for the purposes of calculation and may be superseded by stated product flow rates upon final selection of sanitary fittings / equipment.

Flow Rates and Copper pipework sizes shall be derived by reference to IOP Design Guide Graph 3.

4.3.2 Above Ground Drainage Services

The design and sizing of the foul and waste drainage system shall utilise the Discharge Unit diversity method as set out in BS EN 12056: Part 2:2000.

A “System III” configuration shall be adopted and a Frequency Factor (K) of 0.5 (“Intermittent use”) used.

Sanitary appliance Discharge Units shall be as follows:

Equipment	Load Units (LU)
WC	1.7
WHB	0.3
Urinal	0.4
Shower	0.4
Cleaners Sink	1.3
Sink (Gen)	1.3
D/W	0.2

Discharge Values listed are for the purposes of calculation and may be superseded by stated product discharge rates upon final selection of sanitary fittings / equipment.

Sizes and limitations for unventilated branch discharge pipework to be as BS EN 12056: Part 2:2000 Table 6.

4.3.3 Below Ground Drainage Services

The design of the below ground drainage system has been undertaken by Structural Engineers.

4.4 Electrical Load Allowances

For the basis of infrastructure and plant design/ selection the following load requirements have been assumed for the project, based on BSRIA Rules of Thumb – Guidance for Assessing Building Services (BG9-2011) 5th Edition.

Area	Electrical Allowance (W/m²)	
	Lighting	Small Power
Office	8	25

4.5 Electromagnetic Compatibility (EMC)

The electrical installations must be compliant with the requirements of the Electromagnetic Compatibility Regulations 2016. The regulations describe the electrical installation as a manufactured item, and therefore require the installation to be tested for electromagnetic radiation and absorption. All electrical equipment and the associated distribution installation shall be compliant with the Electromagnetic Compatibility Regulations 2016.

To show compliance with the Electromagnetic Compatibility Directive, the installation shall comprise equipment that is CE-marked.

4.5.1 Lighting Requirements

Illuminance Levels

Area Description	Description of Lighting Scheme	Average Maintained Lux Level
Office and Admin	Suspended or surface LED luminaires with indirect/ direct louvres to suit the ceiling installation. Colour temperature of light sources to be 4000K. Minimum lamp colour render to be 80 Ra.	350-450
Circulation	Recessed/suspended LED luminaires to suit the ceiling installation. Colour temperature of light sources set to be 4000K. Minimum lamp colour render to be 80 Ra.	100-200
WCs	Recessed LED down lights to suit the ceiling installation. Colour temperature of light sources to be 4000K. Minimum lamp colour render to be 80 Ra.	100-150

4.6 Building Management

The development shall be provided with a Building Energy Management System (BEMS) to fully control, monitor and record the various Mechanical, Electrical and Public Health systems.

The BEMS has full stand-alone intelligent outstation and/or local controllers, linked via main LAN to an Operator terminal. The BEMS shall not only control the MEP systems but also fully monitor the energy usage by the installation of local energy monitors. This shall be linked to software to record energy usage and identify where improvement to energy consumption can be made.

5 UTILITIES INFRASTRUCURE

5.1 Electricity

The building shall be provided with a new low voltage service (400A TPN, 270kVA) from UKPN’s local low voltage distribution network and shall enter the building’s main switchroom at basement level via the Jockey’s Fields elevation.

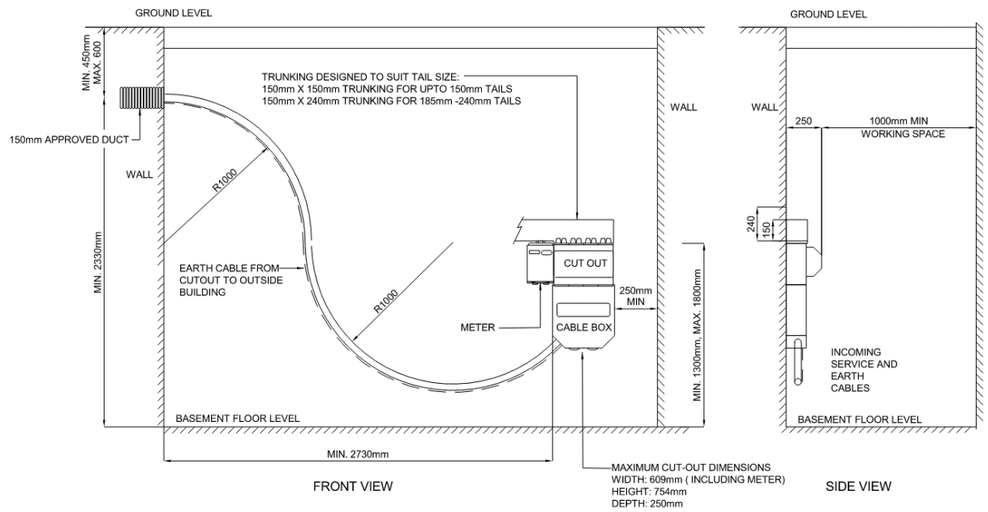

Figure 2 - UKPN Service Termination Arrangement

5.2 **Gas**

The existing building is provided with a gas service and a gas meter (U25) located externally in front of the vaults at the Bedford Row elevation.

A gas service is not required for this development and the existing gas services pipe and meter shall be removed.

5.3 **Water**

The existing building has 2No. incoming mains water services, one at the Bedford Row side and the other at Jockey's Fields side.

The Bedford Row side incoming mains water service (15mm) enters the property via an existing pavement vault with the water meter located within the same space. This incoming mains water service to Bedford Row shall be removed.

Jockey's Fields incoming mains water service (lead pipework) enters building at basement level with a water meter located locally.

At the Jockey's Field side, the existing lead incoming mains water service shall be replaced with a new MDPE plastic incoming mains water service. Thames Water have been approached and response proposals are awaited.

Figure 3 – Bedford Row Side Water Main

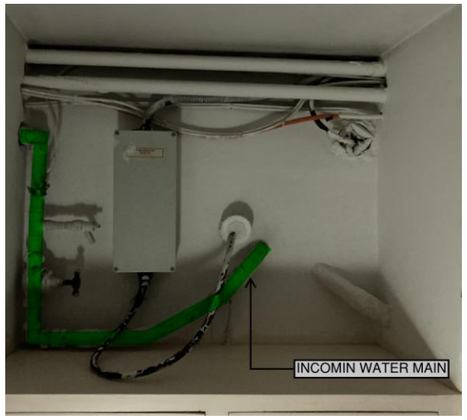

Figure 4 – Jockey's Fields Side Lead Water Main

5.4 **Telecommunications**

The building is currently provided with an existing BT service to the Bedford Row vaults and a further Colt Telecommunications service at basement level to Jockey's Fields side of the building. Both existing services shall be removed.

New ducted entries shall be provided at basement level for incoming telecommunications services from both BT & G-Networks, allowing the tenants to procure telecommunications and broadband services from either supplier.

5.5 **Foul and Surface Water Drainage System outfalls from building**

The existing external drainage systems shall be CCTV surveyed and a condition report and visual record be prepared to ascertain the condition and routes of the existing pipework.

It is proposed that the ground floor and all upper levels shall be discharged by gravity and that drainage from basement level shall need be pumped to the discharge level (final strategy to be confirmed following CCTV survey investigation works).

6 MECHANICAL SERVICES INSTALLATIONS

6.1 Ventilation Services

6.1.1 Office Accommodation

The office accommodation on each floor level shall be ventilated using mechanical ventilation with heat recovery to achieve the required environmental criteria.

A number of ventilation solutions have been analysed and the preferred solution is to mechanically ventilate the building via central ventilation plant located in the basement. However, due to building constrains and anticipated ventilation equipment dimensions, it was decided that the building shall be served from two locations, basement and roof level.

A summary of the ventilation strategy is described below:

Level	Basement AHU	Roof AHU
Basement	✓	
Ground Floor	✓	
First Floor	✓	
Second Floor (JF)		✓
Second Floor (LB)		✓
Second Floor (BR)	✓	
Third Floor (JF)		✓
Third Floor (BR)	✓	
Fourth Floor (BR)	✓	

The mechanical ventilation plant shall comprise a supply and extract AHU, with heat recovery via plate/rotary heat exchangers complete with DX heating/cooling coils to temper supply air.

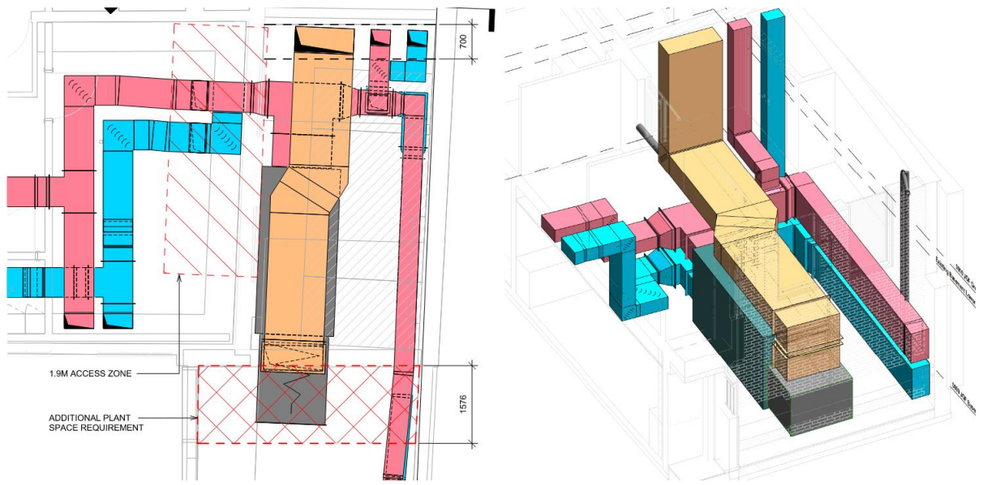

Figure 5 - Basement AHU

To minimise the visual impact, rooftop AHU is positioned on the Jockey's Fields roof and is proposed to be a flat low height unit.

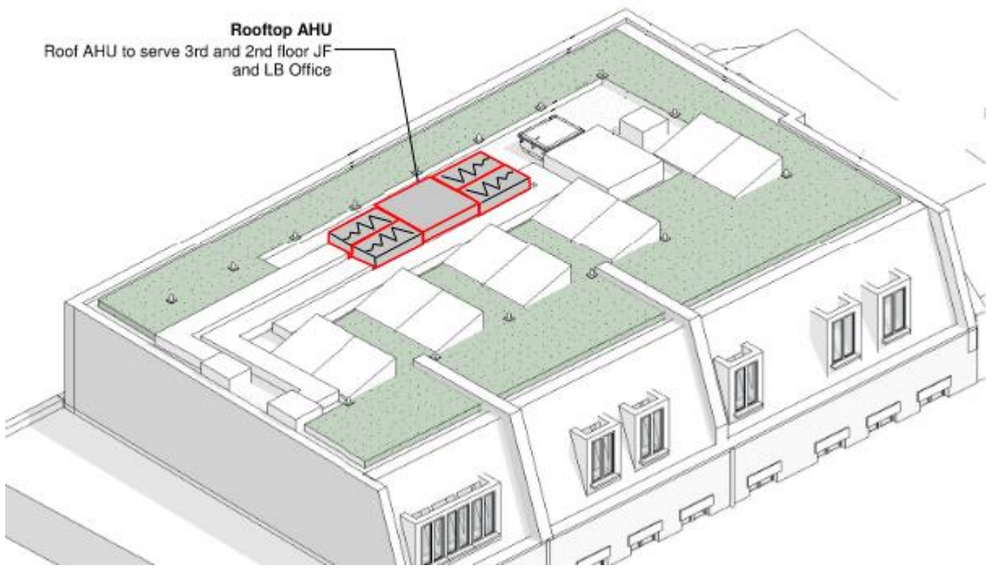

Figure 6 - Rooftop AHU at Jockey's Field side

The common spaces within the building, including rooms or spaces used solely or mainly for circulation, such as corridors and lift lobbies, should be provided with mechanical ventilation where natural ventilation is not possible i.e. no windows.

The office ventilation systems are to be provided with 'Bipolar Ionization Systems' to improve the air quality by reducing airborne particles including certain odours, viruses and bacteria.

6.1.2 Basement Areas (Showers, Toilets, Cycle Storage, Drying Lockers)

Dedicated MVHR unit shall provide supply and extract ventilation to the landlord areas including the basement showers, toilets, drying lockers and cycle store.

The ventilation unit is to be suspended from the ceiling in the shower room lobby or positioned in the adjacent plantroom if space shall permit.

6.1.3 Toilets, Cleaners Cupboard and Ancillary Areas

Mechanical extract systems shall be required for all toilet to remove vitiated air, with make-up air via undercut doors.

Extract fans shall be located on both Bedford Row and Jockey's Fields roofs.

6.1.4 Bin Store

The bin store is located at ground floor level and shall be ventilated naturally, direct to outside, through louvred doors.

6.2 Heating / Cooling Systems

6.2.1 Office Accommodation

The comfort cooling and heating shall be provided to the office areas by Variable Refrigerant Volume (VRV) simultaneous heating / cooling room fan coil units.

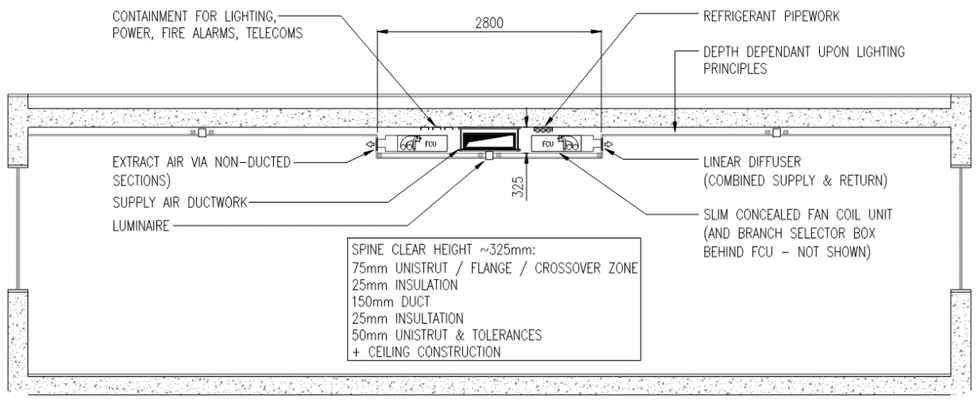

Figure 7 - Services Spine

Several solutions have been explored and the preferred option for locating fan coil units is to form a service 'spine' that shall conceal high level services.

Due to low floor to ceiling height on the 4th floor at Bedford Row side, low level perimeter fan coil units are proposed.

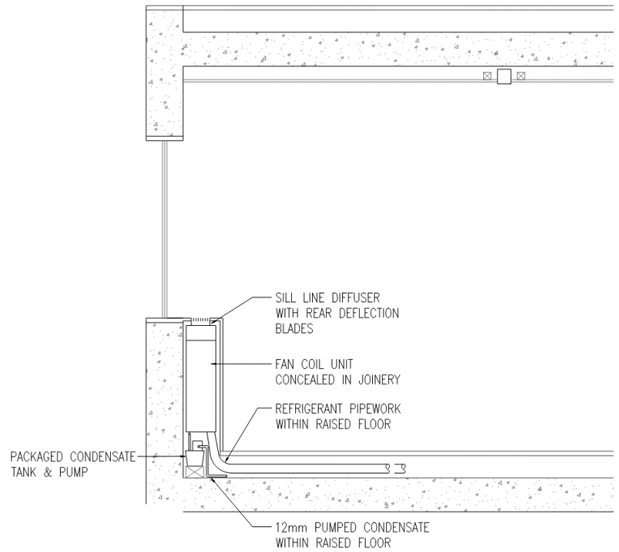

Figure 8 - 4th Floor FCUs

Underfloor air heating/cooling solution was assessed during the early design principle review, however, due to the required floor void depth the design team agreed this solution would not be pursued.

The heating / cooling external condensers shall be located within the 3rd floor closet wing, 1st floor roof level and courtyard at basement level.

Figure 9 - Typical Office Condensers

Figure 10 - Reception Condensers

6.2.2 Reception

Comfort cooling and heating shall be provided to the reception area by the reverse cycle heat pump system. The external condenser shall be located at the basement level below the entrance foot bridge at Bedford Row side (in the basement lightwell).

The reception shall also be provided with electric over door heater. Adjacent office with direct access from the Bedford Row at ground floor shall also be provided with electric over door heater.

6.2.3 Toilets and Ancillary Areas

Basement showers and toilets together with toilets on upper floor levels, shall be provided with electric underfloor heating.

Basement circulation spaces, the cycle store and all staircases shall be provided with electric heaters.

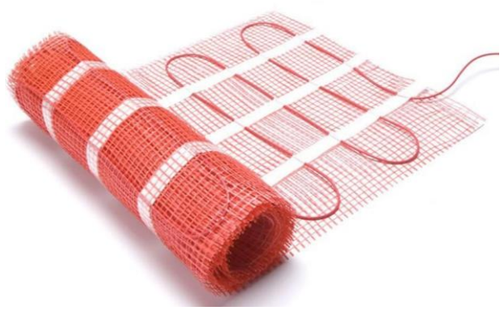

Figure 11 - Electric Underfloor Heating

Figure 12 - Electric Heater

Where circulation areas and toilets have no external windows or external fabric, there shall be minimal heat loss, therefore we anticipate that heating shall not be required in these areas.

6.3 Automatic Control Systems

The controls shall form part of a 'Design & Build' section of works to be carried out by the Contractor, the works shall include the design, provision, installation and setting to work of a complete BMS installation

The development shall be provided with a Building Energy Management System (BEMS) to fully control, monitor and record the various Mechanical, Electrical and Public Health systems.

The BEMS has full stand-alone intelligent outstation and/or local controllers, linked via main LAN to an Operator terminal. The BEMS shall not only control the Mechanical, Electrical and Public Health systems but also fully monitor the energy usage by the installation of local energy monitors. This shall be linked to software so that the building manager can record energy usage and identify where improvement to energy consumption can be made.

6.4 Vibration and Noise Control

System components shall be evaluated to determine the most cost effective approach to controlling transmitted noise and vibration. This is especially crucial for those spaces, which are directly adjacent to the mechanical spaces.

Close liaison with the Architect and Acoustician shall be maintained to properly address these design and construction related issues as the design progresses.

Principal measures shall include locating mechanical rooms away from noise sensitive areas, equipment selection with lower inherent noise levels, spring anti-vibration isolation bases for equipment, thickened structural slabs at equipment bases, duct silencers, flexible couplings at rotating equipment and vibration isolation hangers for piping systems in proximity to pumps.

A specialist acoustic consultant shall advise on the following areas:

- Acoustic separation between the zones of the building
- External back ground noise levels
- Design internal criteria

6.5 Risers

The riser strategy agreed with the Design Team comprises mechanical and electrical riser at each core (Bedford Row and Jockey's Field sides) with separate dedicated ventilation risers.

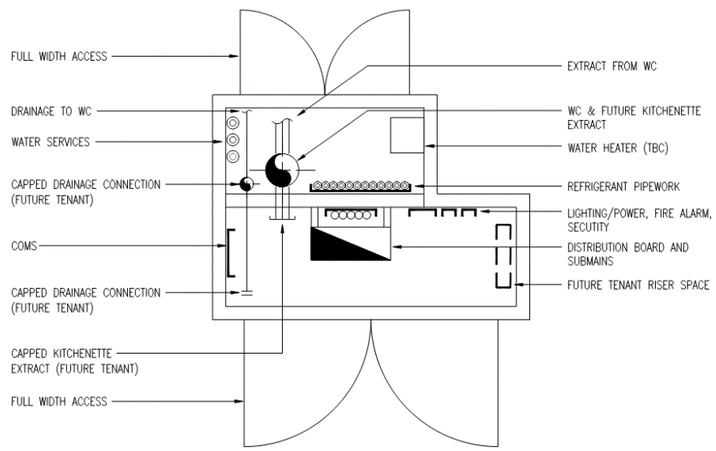

Figure 13 - Bedford Row Side Mechanical & Electrical Risers

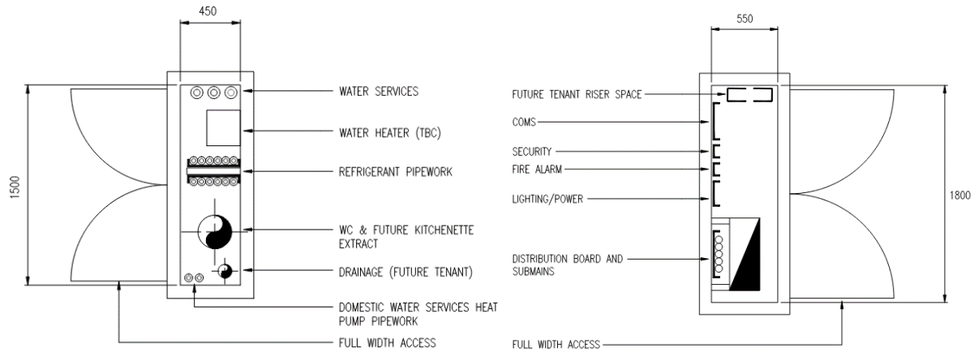

Figure 14 - Jockey's Fields Mechanical & Electrical Risers

7 PUBLIC HEALTH SERVICES INSTALLATIONS

7.1 General

The following list contains the systems and components which comprise the public health provision for this project:

- Domestic Hot & Cold Water Systems
- Non-potable Water System
- Above Ground Foul Drainage Systems
- Above Ground Rainwater Drainage Systems

7.2 Domestic Water Services

7.2.1 General

The building shall be provided with complete domestic hot and cold water systems serving showers, toilets, cleaners' cupboards and plant room.

7.2.2 Cold Water Services

The lead water main at Jockey's Fields side of the building shall be renewed (subject to confirmation from Thames Water) with plastic MDPE pipework.

The water main shall be extended into the basement plantroom, to feed a sectional cold water storage tank.

The water tank shall supply a packaged booster set, providing sufficient flow and pressure. The variable speed booster pumps shall be installed as in a duty/share/standby arrangement (three pumps).

The boosted cold water supply shall be provided with an electromagnetic water conditioner to control scale build up and ultra-violet disinfection systems to maintain water quality, reducing the risk of bacterial proliferation throughout the distribution systems and controlling water quality at the point of use at terminal fittings.

Cold water shall be distributed throughout the building via risers, with branches to serve each floor. Pipework shall be insulated and anti-vacuum / air release valves, plus surge protection devices shall be installed at the top of the risers. Pressure regulating valves shall be installed in the riser on the branch to each floor to protect fittings from excessive pressure. From the riser, pipework shall be distributed, to feed all outlets and local point of use water heaters.

Separately valved, metered and capped branch connections shall be provided at each floor for future use/extension by incoming Tenants to serve future Tea Points.

Due to water being an increasingly valued commodity, focus shall be on conservation and the avoidance of wastage. This shall be achieved by measures which shall include leak detection, flow restrictors, and shut off valves linked to the PIR systems in the toilet and shower areas which shall shut the supplies to these areas in periods of non-use. Their provision is also required towards achieving targeted BREEAM water related credits on the project.

7.2.3 Domestic Hot Water Services

Basement showers and toilets shall be provided with hot water generated by the heat pump system. A hot water cylinder shall be located in the basement plantroom and the external condenser at the first floor external plant area.

All Landlord's areas above Basement level shall be provided with local semi-storage electric water heaters to serve terminal fittings.

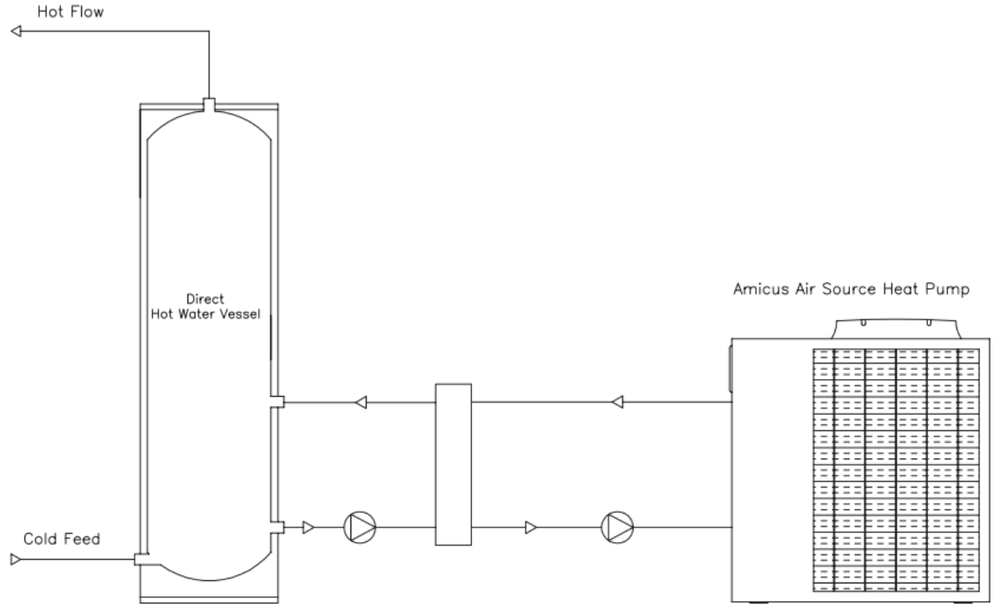

Figure 15 - Heat Pump Domestic Hot Water Schematic

7.2.4 Non-Potable Water System

Fittings which present a backflow contamination risk to the wholesome water system are to be provided with appropriate levels of protection in accordance with Water Regulations, thus, a local wall mounted packaged 'CAT-5' unit shall be provided in Basement plantroom, this shall supply a bib tap for the purposes of 'wash-down' in the Bin Store.

The cold water supply serving the 'CAT-5' unit shall be provided with isolation valves and water meter.

Figure 16 - Packaged CAT 5 Booster

7.2.5 Irrigation

A separately sub-metered cold water supply shall be extended to serve the irrigation/rainwater harvesting water tank (for tank 'top-up' during periods of dry weather) via a 'CAT-5' booster.

The control and final connection details to planters, etc. associated with the Irrigation system shall be designed by a Landscape Designer / Specialist Irrigation System Contractor. The details of the system as well as specification of the rainwater harvesting system for irrigation use falls under the Landscape Designer's duty.

7.3 Drainage (Above Ground)

7.3.1 Soil and Waste Drainage

The development shall be provided with the complete foul and waste drainage system serving toilets, cleaning facilities, kiosk and plantrooms.

Areas / items requiring drainage shall include though are not limited to, the following:

- Sanitary fittings (WCs, WHBs, sinks & showers)
- Floor Gullies, channels & outlets
- Condensate drainage from mechanical plant
- Temperature, pressure & expansion relief from hot water plant

A gravity pipework system shall drain all WCs, basins and sinks. Vertical stacks shall serve groups of appliances on different floors dropping and connecting into the main drainage runs at high level basement and discharge to the existing sewer connection(s).

The basement toilets, showers and plantrooms shall be drained back to drainage sumps below the basement slab and from there be pumped to the gravity outfall (by Structural Engineer). Strategy to be confirmed and developed further at next stage.

All stacks and horizontal run-out pipework shall be provided with ventilation and anti-siphon pipes to prevent the loss of water seals in the system caused by 'self' or 'induced' siphonage.

All floor gullies shall be trapped.

Access to the foul drainage system shall be provided at each level for stacks, at all changes of direction, at all penetrating stub stack wastes and at the point of connection to below ground system. Where pipes pass through fire rated structural elements all penetrations shall be fire sleeved.

Soil vent pipes shall discharge to atmosphere at roof level.

Adequate drainage facilities shall be provided for the mechanical services equipment and plant. Where condensate lines connect to the foul waste system they are to be fitted with waterless traps.

Stacks and stub-stacks are to be Cast Iron. Branch pipework from fittings to be PVC.

Drainage pipework running in occupied / sensitive areas is to be provided with acoustic insulation

7.3.2 Roof Rainwater Drainage

Above ground rainwater system shall be provided to collect surface water runoff, via gutters and rainwater outlets.

The upper roof surface finishes shall be designed so that run off is discharged via roof build-up falls, to the lower roof / roof sections first (to architect specification) before being discharged via roof outlets into a system of external or internal gravity rainwater down pipes.

Where practical, rainwater downpipes shall be routed to the rainwater harvesting tanks as required for the irrigation system. A rainwater harvesting and irrigation system including storage tank, pumps, controls, etc. shall be provided to serve the building. Complete package shall be designed, supplied and installed by a separately appointed system specialist.

8 ELECTRICAL SERVICES INSTALLATIONS

8.1 Low Voltage Distribution and Energy Metering

The building shall be provided with a main low voltage switchroom at basement level, adjacent to the Jockey's Fields elevation. The new UKPN low voltage service (400A TPN, 270kVA) shall terminate in a combined fused cut-out and CT (current transformer) chamber with local energy supplier meter provided.

The main low voltage electricity supply shall serve a building main MCCB (moulded case circuit breaker) distribution board within the switchroom.

From the building's main MCCB distribution board, sub main supplies, generally using 'low smoke zero halogen' (LSZH) armoured cables, shall be provided to tenant's and landlord's final circuit distribution boards at all floor levels. Separate sub main supplies shall be provided to main plant items, passenger lifts and separate safety and security systems.

Landlord's energy metering shall be provided to sub-main supplies and at final circuit distribution boards for energy usage monitoring meeting Building Regulations Part L requirements and CIBSE Technical Memorandum TM39.

Sub main cables shall generally be run on horizontal and vertical cabletrays within ceiling voids, electrical services riser cupboards and within the office floor central ceiling spine provision.

Figure 17 - Main MCCB Distribution Board

8.2 **Interior, Exterior & Emergency Lighting**

Lighting principles throughout he building shall be developed during subsequent design stages, however, In general, internal lighting installation shall be energy efficient and low maintenance. The design solutions and luminaires selected shall be suited to their required function and align with the architectural and interior design.

The lighting solutions shall be prepared with reference to all relevant legislation and design guidelines, notably the latest edition of the following:

- EN 12464-1: Lighting of Indoor Work Places
- CIBSE LG3 – The Visual Environment for Display Screen Use
- CIBSE LG7 – Office Lighting
- CIBSE / SLL – The Lighting Handbook
- ILE Guidance Notes for the Reduction of Obtrusive Light
- Building Regulations Part L

Lighting levels and luminaire types for designated areas shall be chosen and installed to conform to the requirements of the following table. The overall solutions shall be also note unified glare rating limits to prevent any discomfort from glare within each individual space as recommended in BS EN 12464-1.

Luminaire efficacy shall follow guidance within Part L2A:2013, and aim to achieve a minimum efficiency of 65 luminaire-lumens/circuit watt.

All areas of the building shall have emergency lighting provided to enable safe evacuation of the premises, complying with the requirements of BS 5266, BS 5499, BS 4533, the design code ICEL 1001 and 1003, the European Standards BS EN 60598-2-22 and BS EN 1838.

Emergency lighting shall comprise designated self-contained, non-maintained, high output emergency LED escape route/ anti-panic luminaires, along with self-contained inverter/battery packs provided to selected general lighting luminaires. The autonomy of all battery packs shall be three hours.

Self-contained, maintained, emergency ‘exit’ luminaires shall be fitted with three-hour battery packs and integrated legends as specified by the Architect.

The emergency lighting system shall provide a self-monitoring and testing system capable of feedback reporting to the lighting control system.

8.3 **Lighting Controls**

An addressable DALI lighting control system shall be provided to control & monitor all lighting within office floor areas (subject to further consideration during the next design stage):

Elsewhere, local lighting control systems shall be implemented to provide control of the lighting installation and optimise energy efficiency. In general, control shall include:

- Local presence/ absence detection (PIR).
- Areas with perimeter glazing or roof lights shall be provided with daylight sensors.
- Local Switching for the plant and store areas

Final circuit wiring shall be carried out LSZH (low smoke zero halogen) multicore cables run on cabletrays and baskets within ceiling voids and risers and within steel conduits where concealed flush within walls and floors.

8.4 **Small Power Systems & Mechanical Plant Supplies**

Small power to the tenants’ office floors shall be provided by the tenants upon their occupation of the floors. A system of perimeter steel skirting trunking shall be provided for their use, for the housing of both small power final circuits and voice/data structured cabling.

Within the landlord’s common parts, small power shall be provided generally comprising general purpose 13A switched socket outlets.

Other supplies shall eb provided to fixed equipment including items of mechanical plant generally comprising:

- Water heaters
- Hand dryers
- VRV fan coil units and cassette units
- Supply and extract fans
- External condensers
- Ventilation air handling units
- Pumps and booster sets
- Electric space heaters
- Electric underfloor heating
- Security equipment

Final circuit wiring shall be carried out LSZH (low smoke zero halogen) multicore cables run on cabletrays and baskets within ceiling voids and risers and within steel conduits where concealed flush within walls and floors.

Final circuits serving main and external mechanical plant shall be carried out LSZH (low smoke zero halogen) multicore armoured cables run on cabletrays.

8.5 Fire Detection & Alarm

The Building shall be provided with a new analogue addressable fire alarm system comprising control & indicating equipment, manual call points, automatic detection, sounders and interface modules.

The system shall afford cover to BS 5839: Part 1 - Category L1 (&M).

The Fire Alarm Panel, complete with standby batteries and battery charger unit, shall be flush mounted and located within the entrance/reception area at Ground Floor.

The Fire Alarm installation shall be wired in BS8519:2008 compliant cables (Prysmian FP200 typically).

The cause & effect schedule shall be developed during the Stage 4 design.

Figure 18 - Fire Alarm Panel

8.6 Security Systems

8.6.1 Accessible WC Personnel Alarms

Each accessible WC shall be provided with a personnel alarm system which shall signal to a central panel located within the Ground Floor reception area.

8.6.2 Disabled Refuge Intercom

An emergency communication system shall be provided at each disable refuge location providing two-way communication between the refuge and the central call handling panel locate within the Ground Floor reception area.

8.6.3 Door Access Control

Subject to further design consideration, a door access control system shall be provided to the entrance doors (from external) to the building comprising external proximity card reader, internal 'push to egress' and emergency egress buttons with controlling door solenoid magnets.

At each office space entrance from the landlord's common parts, cableways for future access control provision (by the tenants) shall be provided.

8.6.4 Door Video Entry System

Subject to further design consideration, the main and secondary entrances to the building (from external) shall be provided with a video entry system providing two-way audio-visual communication from external call stations (adjacent to each entrance) to the Ground Floor reception area (desk mounted handset subject to design development). The system shall be capable of expansion to allow communication from the entrance doors to each and every separate tenant's demise with cableways provided to allow the provision of receiving handsets within each office space.

8.6.5 CCTV Surveillance System

Subject to client brief, a system of CCTV surveillance cameras may be provided externally adjacent to external entry points in to the building including coverage of the Bedford Row lightwell.

8.7 Tenants' Data & Telecommunications Systems

Data and telecommunications systems shall be provided to the office floor areas by the occupying tenants, extended from the main incoming telecommunications services at basement level via distributing cableways within the electrical riser cupboards.

Within the office floor areas a system of perimeter steel skirting trunking shall be provided for the distribution of the tenants' voice/data structured cabling.

Figure 19 - Perimeter Steel Skirting Trunking

8.8 **Earthing**

The building's main electrical earth shall be located within the main LV switchroom at basement level.

All earthing and bonding throughout the building shall be provided in accordance with the requirements of the 18th Edition IET Wiring Regulations BS7671.

8.9 **Lightning Protection**

The building shall be provided with a new lightning protection system in accordance with the requirements of BS EN 6205. A detailed risk assessment shall be carried out during the Contractor's detail design works.

The system shall comprise roof tapes, down conductors and earth terminations. Where feasible, the structure shall be utilised for down conductors and earth terminations. All exposed tapes shall be agreed with the architect during the Stage 4 detail design.

8.10 **PV System**

A grid connected Photovoltaic panel array shall be provided at Jockey's Fields roof (system extent and capacity to be established during the next design stage). The system shall be connected to the landlord's low voltage distribution system and be designed, supplied and installed by a credited supplier/installer.

Figure 20 - Photovoltaics

APPENDIX A - SERVICES PRINCIPLES DRAWINGS