

CGP | MEP

WYTHENSHAW PARK SPORTS HUB

Mechanical, Electrical and Public Health Services

Stage 3 Design Proposals

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- Bike Workshop
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- Café / Reception
- Kitchen/Prep
- Office and Staff Area
- Community Spaces
- Triage
- Clinical Rooms
- Treatment Room
- Toilet Facilities
- Storage areas
- Circulation areas
- Plant areas

The proposals within this document are reflective of the mechanical, electrical and public health engineering services design stage of the project, RIBA Stage 3, and will be reviewed and developed with the design team and Client throughout RIBA Stage 4.



Figure 2 - Proposed Ground Floor Layout

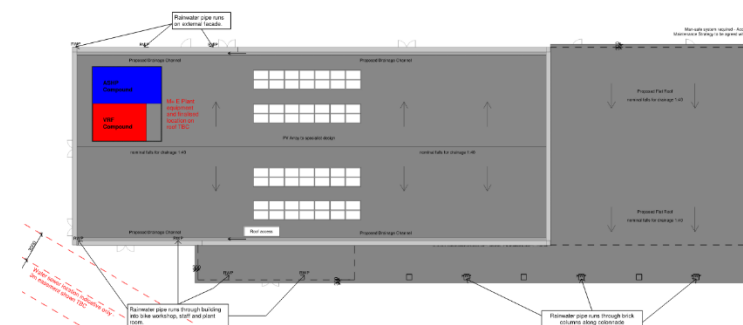


Figure 3 - Proposed Roof Layout



Figure 4 - Proposed Elevations



Figure 5 - Proposed Sections



Figure 6 - Proposed Site Plan

1.4 MECHANICAL, ELECTRICAL AND PUBLIC HEALTH SERVICES STRATEGY DRAWINGS

This document should be read in conjunction with the Stage 3 mechanical, electrical and public health (“MEPH”) drawings referenced in Appendix A.

1.5 PROJECT OBJECTIVES

The primary objective of the project is to create a new, modern, state of the sports hub facility for the local community.

The Client is driven to provide an energy efficient and sustainable building through design solutions to ensure the operational performance of the building is as efficient as possible.

1.6 KEY CONSIDERATIONS

The building services systems are to be designed to provide a low capital expenditure solution whilst achieving the relevant standards and planning policies.

Through the design of a low energy solution, the operation costs and carbon emissions will be reduced against the Building Regulation targets.

1.7 PLANNING POLICIES

The Manchester City Council has advised through consultation on the project that best endeavours are to be made for the development to be as sustainable as possible.

Whilst there are no set targets carbon targets for the construction and operation of the building (for example net zero operation and improvements above the Building Regulations Part L minimum target), the performance of the building fabric and the mechanical and electrical services have been designed to reduce energy consumption in the first instance and then offset the energy demand through LZC technologies in accordance with the energy hierarchy methodology (refer to section 3.1).

Improvements to the fabric of the building reduce the amount of heat lost and gained to reduce the heating and cooling demands for the building. The design looks to improve upon the fabric U-values, air permeability and solar control glazing against the values used in the Part L notional building.

Energy efficient systems including LED lighting and reduced energy pumps and fans reduce the electrical consumption of the building.

The energy consumption of the building is then reduced further through the proposed implementation of high efficiency heat pump technologies and PV panels that will produce on-site electricity, reducing reliance from the grid.

1.8 ENVIRONMENTAL AND SUSTAINABILITY ASSESSMENTS

There are no environmental and sustainability assessments required as part of this development as part of the planning application or the client aspirations. Whilst the project has been designed to promote sustainability in construction and operation, there are no BREEAM (or alternative assessment) criteria that needs to be achieved.

1.9 ENERGY

The following outlines the project requirements for Building Regulation Part L2 (2021 including 2023 amendments, “Part L2”) compliance, our approach to energy and sustainability for the project and the Energy Performance Certificate (“EPC”) target.

1.9.1 PART L2

The project will need to achieve Part L2 compliance via modelling, modelling will be undertaken at key stages to ensure the overall design proposals from the design team achieve compliance and the Client’s aspirations for the building.

In order to meet these requirements, the building design will be developed with the design team with a ‘Fabric First’ approach whereby the construction budget is invested in the building fabric and energy efficiency measures, rather than relying on an excessive amount of renewable energy technologies to achieve compliance.

Our approach to the building will follow the energy hierarchy described within section 3.1.

The CO₂ emission and primary energy rates of the building must not exceed the target

Target CO ₂ emission rate (TER), kgCO ₂ /m ² :annum	36.01
Building CO ₂ emission rate (BER), kgCO ₂ /m ² :annum	35.92
Target primary energy rate (TPER), kWh _e /m ² :annum	390.38
Building primary energy rate (BPER), kWh _e /m ² :annum	388.03
Do the building's emission and primary energy rates exceed the targets?	BER ≤< TER BPER ≤< T

Figure 7 – Output from the Part L BRUKL report

1.9.2 ENERGY PERFORMANCE CERTIFICATE

The building will also be provided with an Energy Performance Certificate at handover, the target rating for the project is ‘A’.

2.0 DESIGN CRITERIA

2.1 INTRODUCTION

The mechanical, electrical and public health engineering systems will be designed to achieve the following design criteria.

2.2 DESIGN AND INSTALLATION STANDARDS

The Mechanical, Electrical and Public Health engineering systems will be developed, designed, and where applicable, installed in accordance with, but not limited to, the requirements of the following:

- Building Regulations
- British Standards
- CIBSE guides and technical memoranda
- IEE Wiring Regulations
- The Electricity at Work Regulations
- Water Supply (Water Fittings) Regulations
- F-Gas Regulations
- The Construction (Design and Management) Regulations
- The Control of Pollution Act
- The Clean Air Act
- COSHH (Control of Substances Hazardous to Health) Regulations
- Disabled Discrimination Act
- Requirements of the Electricity Supplier
- Requirements of the Water Authority
- Requirements of the Gas Distributor
- Requirements of the Telecoms Providers
- Requirements of the Fire Authority
- Requirements of the Health and Safety Executive under the Health and Safety and Work Act
- Electrical Safety, Quality and Continuity Regulations

The current version of the above will be used to inform the design and installation requirements.

2.3 PLANT AND EQUIPMENT DESIGN LIFE

Using guidance from CIBSE the Mechanical, Electrical and Public Health engineering systems will be design and installed to achieve the following life expectancy:

- Mechanical engineering systems: 15 years
- Electrical engineering systems: 15-20 years

- Control’s systems: 15 years
- Ventilation plant: 10-15 years
- Pipework and ductwork: 20-30 years
- LV distribution and switchgear: 15-20 years
- Hot water generation plant: 20 years
- Electric panel heaters: 15 years

2.4 EQUIPMENT MARGINS

The following margins will be applied to mechanical plant:

Pumps	10% to peak flow rate and 21% to peak system resistance
Fans	10% to peak flow rate and 21% to peak system resistance
Plant	10% to total system requirements

2.5 ACOUSTICS

The below room noise ratings will be achieved by the building services systems serving or in close proximity to the room.

Area	Room Noise Rating
Wet Changing Areas	NR40
Dry Changing Areas	NR40
Changing Place	NR40
Bike Workshop	NR40
Entrance Area / Reception	NR40
Café Area	NR40
Café Kitchen (non-commercial)	NR45
Community Room	NR35
Office Areas	NR35
Staff Room	NR35
Triage	NR35
Clinical Room	NR35
Treatment Room	NR35
Toilet Facilities	NR40
Storage	NR40
Stairs / Corridors / Circulation	NR40
Comms / Server Room	NR40
Cleaners	NR40
Clean Utility	NR40
Dirty Utility	NR40
Plantrooms	NR45

Externally consideration will be given to the proximity of surrounding areas, following receipt of the acoustic specialist report and any associated planning conditions to ensure compliance is achieved.

2.6 HEATING AND COOLING

2.6.1 TEMPERATURES

The below room temperature criteria will be achieved by the building services systems serving the room.

External	Local DSY Weather data to be used
Area	Winter / Summer Temperatures
Wet Changing Areas	24°C / Uncontrolled
Dry Changing Areas	24°C / Uncontrolled
Changing Place	24°C / Uncontrolled
Bike Workshop	18°C / Uncontrolled
Entrance Area / Reception	21°C / Uncontrolled (if naturally ventilated) or 23°C
Café Area	21°C / Uncontrolled (if naturally ventilated) or 23°C
Café Kitchen (non-commercial)	15°C / Uncontrolled
Community Room	21°C / Uncontrolled (if naturally ventilated) or 23°C
Office Areas	21°C / Uncontrolled (if naturally ventilated) or 23°C
Staff Room	21°C / 23°C
Triage	21°C / 23°C
Clinical Room	21°C / 23°C
Treatment Room	21°C / 23°C
Toilet Facilities	18°C / Uncontrolled (toilet facilities outside of the thermal line of the building to be unheated but provided with frost protection)
Storage	16°C / Uncontrolled
Stairs / Corridors / Circulation	18°C / Uncontrolled
Comms / Server Room	16°C / 24°C (final upper temperature to suit the equipment requirements)
Cleaners	16°C / Uncontrolled
Clean Utility	16°C / Uncontrolled
Dirty Utility	16°C / Uncontrolled
Plantrooms	10°C / Uncontrolled

2.6.2 PIPEWORK

Heating and Cooling pipework will be designed not to exceed 300Pa/m and a velocity of 1.5m/s up to 50mmØ and 2.0m/s above 50mmØ, whichever is lower.

2.7 VENTILATION

2.7.1 FLOW RATES

The below ventilation requirements will be achieved by the building services systems serving the room.

Area	Ventilation Rate
Changing Areas	10ACH
Changing Places	10ACH
Bike Workshop	10l/s/p
Entrance Area / Reception	10l/s/p
Café Area	10l/s/p
Café Kitchen	40ACH or to match kitchen specialists' requirements, whichever is the greatest value (negative pressure)
Community Room	10l/s/p
Office Areas	10l/s/p
Staff Room	10l/s/p
Triage	10l/s/p
Clinical Room	10l/s/p
Treatment Room	10ACH
Toilet Facilities	6l/s per WC
Storage	N/A
Stairs / Corridors / General Circulation	N/A
Comms / Server Room	N/A
Cleaners	6ACH
Clean Utility	10ACH (positive pressure)
Dirty Utility	10ACH (negative pressure)
Plantrooms	To meet equipment requirements

2.7.2 DUCTWORK

Ductwork will be designed not to exceed 1Pa/m or the following velocities whichever is lower:

Riser	6m/s
Main Run	5m/s
Main Branch	4m/s
Final Connection	2.5m/s

Grilles and diffusers will not have a face velocity greater than 0.15m/s. External louvres will not have a face velocity greater than 2.5m/s.

2.8 DOMESTIC WATER

2.8.1 SYSTEM DESIGN

The domestic hot and cold-water services will be designed, installed and commissioned in accordance with the requirements of HSE Approved Code or Practice and Guidance L8 Legionnaires Disease; The Control of Legionella Bacteria in Water Systems.

2.8.2 PIPEWORK

Domestic Water Services pipework will be designed not to exceed a velocity of 1.0m/s up to 54mmØ and 1.5m/s above 54mmØ.

2.8.3 COLD WATER STORAGE

Cold Water storage will be calculated using the diversified peak simultaneous loading units running full capacity for a 30 minutes period with a 1-hour recovery period from empty.

2.8.4 HOT WATER STORAGE

Hot water storage within the building will be limited as direct electric point-of-use and electric showers are proposed. The point-of-use heaters will vary depending on the sanitaryware served and room type.

The catering requirements for the catering facility are to be confirmed by the specialist sub-contractor. An allowance for domestic hot water generation has been provided in the Stage 3 design but the final volume of storage to suit the usage is to be developed in the next design stage.

2.9 LIGHTING

2.9.1 INTERNAL

The below lighting requirements will be achieved by the building services systems serving the room.

Area	Illumination Level
Wet Changing Area	200 Lux
Dry Changing Area	200 Lux
Changing Place	200 Lux
Bike Workshop	500 Lux
Entrance Area / Reception	300 Lux
Café Area	300 Lux
Café Kitchen	500 Lux
Community Room	500 Lux
Office Areas	500 Lux
Staff Room	500 Lux
Triage	500 Lux
Clinical Room	500 Lux
Toilet Facilities	200 Lux
Storage	100 Lux
Stairs / Corridors / Circulation	150 Lux
Comms / Server Room	300 Lux
Cleaners	200 Lux
Clean Utility	300 Lux
Dirty Utility	300 Lux
Plantrooms	200 Lux

2.9.2 EXTERNAL

External lighting will be designed to provide:

Area	Illumination Level
Entrances / Exits	5 Lux
Escape Routes	5 Lux
Walkways	5 Lux
Car Park	20 Lux

Uniformity will be provided to achieve CIBSE/BS EN 12464 Lighting Requirements and will be measured at a height to suit the area served.

3.0 ENERGY AND SUSTAINABILITY

3.1 ENERGY HEIRARCHY

The proposed design has been modelled on the energy efficiency hierarchy of “Be Lean, Be Clean, Be Green” approach to energy efficiency in buildings.

- Be Lean – Energy demand should be minimised by optimising the design and construction of the building through measures such as passive heating, cooling and ventilation, thermally efficient materials and considerate design of the layout.
- Be Clean - Energy efficient systems, equipment and appliances should be selected to reduce the remaining energy demand
- Be Green – Energy should be supplied from Low and Zero Carbon (LZC) energy sources, such as air source heat pumps, photovoltaic cells etc.

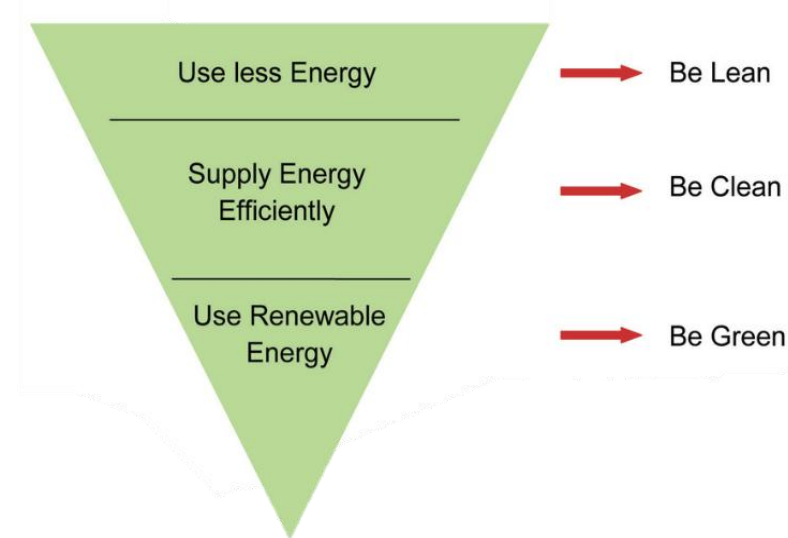


Figure 8 - Energy Hierarchy

3.2 BUILDING REGULATION CARBON EMISSIONS AND ENERGY CONSUMPTION MODEL

3.2.1 MODELLING SOFTWARE

The Part L2 (2021) carbon emissions and energy consumption model has been creased using IES engine version 7.0.28.

3.2.2 WEATHER FILE

The Test Reference Year (TRY) for Manchester Airport has been used to represent typical weather years as this is the closest weather file available for the development’s location.

3.2.3 OCCUPANCIES AND HOURS OF OPERATION

The occupancies and hours of operation for the building are set by the NCM templates with the model for the assigned building type.

3.3 ‘BE-LEAN’ FABRIC PERFORMANCE

3.3.1 U-VALUES

To try and achieve compliance with Part L2 through passive measures, improvements on the minimum building fabric values have been proposed to minimise the calculated operational energy use and carbon dioxide emissions. Table 1 demonstrates that fabric elements for the proposed building are surpassing the minimum Building Regulation standards and are either equal or an improvement on the notional building values which are used to calculate the TER.

The final u-values are still subject to any further energy modelling results and co-ordination with the architect. As such, the final u-values may vary from those proposed in Table 1.

Element	Building Regulation Maximum U-Values (W/m²K)	Building Regulation Notional U-Values (W/m²K)	Proposed U-Values (W/m²K)
Roof (flat)	0.18	0.14	0.14
Roof (pitched)	0.16	-	0.14
Wall	0.26	0.18	0.16
Floor	0.18	0.14	0.13
Doors	1.60	1.60	1.40
Glazing elements / roof windows (including frame)	1.60	1.30	1.30
Rooflights	2.2	2.01	2.01

Table 1 - Comparison of building fabric parameters for Part L2 2021 and the proposed design standards

3.3.2 AIR PERMEABILITY

The air tightness of a building impacts on its energy consumption and hence the CO₂ emissions. The lower the air tightness, the more heated warm air is retained within the occupied spaces of the building, therefore less energy is required to heat the building in winter. Part L2 identifies that air permeability of less than 8m³/hr per m² @ 50Pa should be achieved. It is the intention on this project to improve on the air permeability value to further minimise energy consumption with a target of 3m³/hr per m² @ 50Pa for this building.

Element	Building Regulation Maximum (m³/hr per m² @ 50Pa)	Building Regulation Notional (m³/hr per m² @ 50Pa)	Proposed (m³/hr per m² @ 50Pa)
Air permeability	8.0	3.0	3.0

Table 2 – Air permeability for Part L2 2021 and the proposed design standards

3.3.3 GLAZING PERFORMANCE

A low G-Value glazing (0.36) will be utilised for the glazing elements to reduce solar gains.

Element	Building Regulation Maximum g-value	Building Regulation Notional g-value	Proposed g-value
Windows	n/a	0.40	0.36
Rooflights	n/a	0.40	0.36

Table 3 - Comparison of glazing performance for Part L2 2021 and the proposed design standards

3.4 'BE CLEAN' - ENERGY EFFICIENCY MEASURES

To work towards compliance with Part L2, energy efficient measures are proposed to the building services to reduce the energy consumption and in turn reduce the CO₂ emissions calculated for the BER.

The energy efficient measures targeted are:

- Heat recovery efficiency increased
- Low specific fan powers
- VRF coefficient of performance increased
- Optimised zoning and controls
- Energy efficient lighting

3.4.1 HEAT RECOVERY

The heat recovery efficiency within the ventilation systems has been set to 80%. This will reduce the heat load and energy consumption of the ventilation heating coils.

3.4.2 LOW SPECIFIC FAN POWERS

The specific fan powers for the ventilation units has been set to 0.8W/l/s to reduce the auxiliary energy load of the building.

3.4.3 VRF COEFFICIENT OF PERFORMANCE

The air-to-air VRF units coefficient of performance has been set to 6.0 and 7.0 for heating and cooling respectively for all of the systems.

3.4.4 ENERGY EFFICIENT LIGHTING

Energy efficient LED lighting in combination with lighting controls will

be used throughout the proposed buildings, as opposed to merely standalone LED lighting. Lighting control systems will include daylight sensing and PIR (passive infrared sensors) detection to assure that the energy use and associated carbon emissions of the building lighting installation are as low as possible. It is proposed that the lighting is improved over and above the 2021 Part L2 Building Regulations with 110 luminaire lumens per circuit watt (lm/W) as a minimum.

3.4.5 'BE CLEAN' BUILDING SERVICES PLANT AND EQUIPMENT

The table below provides the building service systems input into the Part L model

Building Service	System Type	Efficiency	Comments
Heating (changing areas, plantroom,)	Direct Electric	100%	Electric panel heaters
Heating (café, bike workshop, office accommodation and GP areas)	VRF System	Heating SCoP 6.00	
Cooling (café, bike workshop, office accommodation and GP areas)	VRF System	Cooling SCoP 7.00	
Ventilation (changing areas, bike workshop, café, community room)	Mechanical supply and extract ventilation via local HRU	Specific fan power 0.8W/l/s. Direct electric heating coils. Heat recovery efficiency 80%.	
Ventilation (GP area)	Mechanical supply and extract ventilation via central AHU	Specific fan power 1.2W/l/s. Direct electric heating coils. Heat recovery efficiency 80%.	
Ventilation (WC accommodation not within changing area,	Mechanical extract ventilation via local extract fans	Specific fan power 0.3W/l/s.	

Building Service	System Type	Efficiency	Comments
cleaners store, dirty utility)			
Domestic hot water	Electric heaters with minimal storage. Electric showers. Electric heater with storage within kitchen.	100%	2,000 litres of stored hot water allowed for within the building. This is subject to final requirements for the kitchen.
Lighting	Artificial lighting provided throughout	Minimum Building Regulations	General 110lm/W allowed for. Daylight control allowed for. Monitoring and targeted alarms allowed for.
Power factor correction	Power factor correction	0.9 to 0.95 allowed for	

Table 4 – 'Be Clean' proposed building services

3.5 'BE GREEN' - ENERGY EFFICIENCY MEASURES

The planning requirements for the developed are to promote sustainability and reduce carbon emissions in operation where possible. Low and zero carbon technologies are proposed to improve the energy performance of the building and reduce the reliance from grid-based electricity where feasible through high efficiency heat pump technologies and solar PV panels.

Air-to-Air VRF systems are used to provide heating and cooling to the café, bike workshop, office accommodation and GP area and to condition fresh air in the ventilation units serving the GP and kitchen.

A PV panel array of 450m² and a peak output of 90.5kW has been allowed for within the Part L model. This has resulted in the BER having an equal carbon emission rating to the TER, thereby achieving compliance with Part L.

Energy Hierarchy Measure	Target Emission Rate, TER (kg.CO ₂ /m ² annum)	Building Emission Rate, BER (kg.CO ₂ /m ² annum)	Pass/Fail % Variance in CO ₂ emissions (BER / TER)
Be Clean with Air-to-air heat pumps and 450m ² PV panels	36.01	35.92	Pass +0%

Table 5 – ‘Be Clean’ with ASHP and PV panels TER and BER calculations

Energy Hierarchy Measure	Target Primary Energy Rate, TPER (kWh _{PE} /m ² annum)	Building Primary Energy Rate, BPER (kWh _{PE} /m ² annum)	% Variance in Energy Consumption against the Notional
Be Clean with Air-to-air heat pumps and 450m ² PV panels	390.38	388.03	+0%

Table 6 – ‘Be Clean’ with ASHP and PV panels TPER and BPER calculations

The calculated BER and BPER meets the minimum requirements for Part L and is thereby compliant with Part L (Table 5 and Table 6). It is recommended, however, that further improvements are made to reduce the carbon emissions of the building in the next design stage either through fabric improvements, energy efficiency and/or LZC technologies to increase the margin further.

4.0 INCOMING SERVICES AND PRIMARY PLANT REQUIREMENTS

4.1 INCOMING MAINS COLD WATER

A new metered incoming mains cold water supply (“MCWS”) has been submitted to United Utilities to provide an initial proposal and quotation for serving the development.

There is an existing water main and meter to the site that is served from the mains on Wythenshawe Road. Due to the lack of information obtained on the below ground water mains from the GPR survey, it is unknown what is served by this metered main although it is assumed that it currently serves the weightlifting facility that is to be demolished and the adjacent athletics cabin that is to be relocated as part of these works. There is the risk that the water main also serves other outlets or facilities and needs to be considered as a potential risk until further on-site surveys can determine otherwise.

The proposal is for a new metered connection to be made on Wythenshawe Road unless it can be determined the existing water main and meter is of sufficient capacity to serve the development’s peak and daily water demands.

A separate mains to serve new fire hydrants is to be taken upstream of the meter serving the building and athletics cabin. Two new fire hydrants are to be provided as part of these works. A fire hydrant is to be located north of the building within the car park and the second hydrant is to be located south of the building to serve the relocated athletics cabin (subject to the Building Regulation and Fire Officer requirements).

The utility water meter will be capable of providing a signal output to allow for monitoring and recording of consumption by the BMS. In the event of the new utility meter not having this capability, a sub-meter will be provided downstream of the utility meter to provide the output to the BMS.

The MCWS will enter the building within the Ground Floor plant room and will be complete with the necessary valve and stop tap arrangement.

The MCWS supply will serve the central cold-water storage tank only, no outlets will be provided directly from the MCWS supply.

The incoming MCWS pipework will be run in MDPE or barrier pipe as required to suit the ground conditions.

4.3 NATURAL GAS

There is no requirement for natural gas to serve the new facility.

The existing gas main on site is to be decommissioned, stripped back to the gas meter and removed from site. The gas main is to capped and isolated.

4.4 ELECTRICITY

A new Low Voltage (“LV”) three phase and neutral supply will be provided to the building, it is envisaged that a new sub-station will be required to serve the development. A full-size neutral will be provided.

An application has been made via Total Utility Connections to provide 450 kVA based on the current load assessment.

The new supply will enter the building via a metered service head located within the Ground Floor plant room.

4.5 TELECOMS AND DATA

All incoming communications will be provided by the Client.

4.6 EXTERNAL PLANT AREA

External plant is to be installed on the roof of the building, including but not limited to the following plant and equipment;

- VRF / DX Condenser Units
- Ventilation units serving the GP surgery and kitchen
- Solar PV panels

4.7 INTERNAL PLANT ROOM

The ground floor plant room will house the following plant and equipment:

- Cold Water Tank
- Cold Water Booster Set
- Cat 5 Water Tank and Booster Set
- BMS control panel
- LV Switch Panel and Distribution Boards

4.8 COMMS ROOM

A comms room will be required within the building to house the data cabinet and potentially head end services for the security system, BMS, etc.

The comms room needs to be situated to ensure that the data cable runs throughout the building do not exceed 90 metres.

A second comms room will be required within the clinic to house a data cabinet for the clinic area.

5.0 MECHANICAL SERVICES

5.1 INTRODUCTION

The following outlines the mechanical services proposals for the project and should be read in conjunction with the mechanical and electrical Stage 3 drawings.

This section covers the following strategies and systems:

- Heating and Cooling Services
- Ventilation
- Domestic Hot and Cold Water Services
- Above Ground Drainage
- Controls

5.2 GENERAL SERVICES DISTRIBUTION

The plantroom will accommodate the following mechanical services for the building including:

- Incoming water mains
- Cold water tank
- Cold water booster set
- Cat 5 water break-and-boost unit
- Controls panel

Cold water mains will be routed horizontally from the plantroom to serve the building, either exposed at high level or concealed within the ceiling void (subject to the ceiling type for the space). Vertical pipework drops into the rooms served are to be concealed within boxing for aesthetic purposes and to be protected from damage.

VRF pipework will be routed from the roof mounted external condenser units and through the roof into the ceiling void below. The VRF pipework within the café will be exposed at high level.

Ventilation units (with the exception of the ventilation units serving the kitchen and the GP facility) and ductwork are to be located within ceiling voids, where possible, or exposed at high level. Ductwork will be routed horizontally to serve the rooms and to connect to the louvres on the perimeter wall.

The ventilation units serving the kitchen and the GP facility will be located on the roof of the building, with ductwork dropping through the roof and distributed within the ceiling void to serve the air distribution diffusers, grilles and the kitchen.

5.3 HEATING AND COOLING

The areas identified on the strategy drawings as being served by direct electric emitters are to be provided with heating only. The emitters are to be sized to meet the heating demand of fabric losses and the fresh air provision through the mechanical ventilation system.

Where identified on the strategy sheets, a VRF system will provide heating and cooling as required by each room/area. The comms rooms will be provided with their own split DX system to provide heating and cooling. The VRF and DX condensing units are to be located externally on the roof of the building.

The size of the VRF system is subject to the final building fabric performance, the provision of glazing within the building and the usage of the building.

The heating coil within the kitchen supply ventilation unit and the AHU serving the GP facility will be served by a dedicated VRF unit to temper the fresh air supply to the room heating set-point.

The installation will be in accordance with BS EN 378 and commissioned in accordance with CIBSE Code R.

The electric heat emitters serving the changing area will be controlled by the BMS to meet the temperature set-point. The individual rooms will be served with a temperature sensor to monitor the room conditions.

The bike workshop will have a wall mounted controller for control of the electric heat emitters, linked to the BMS for monitoring purposes.

The GP clinical rooms, treatment room and all staff rooms and admin areas will have a wall mounted controller for control of the VRF unit serving the space with adjustable temperature settings within a pre-set bandwidth. The controllers will be linked to the BMS for monitoring purposes.

All public spaces served by the VRF system including the café, community rooms and waiting areas will be controlled by the BMS only.

The WC accommodation located on the west of the building with the door to the lobby leading directly to outside will be outside of the thermal line of the building and as such will be unheated.

Frost protection will be provided, however, by means of electric heat emitters to protect the building fabric.

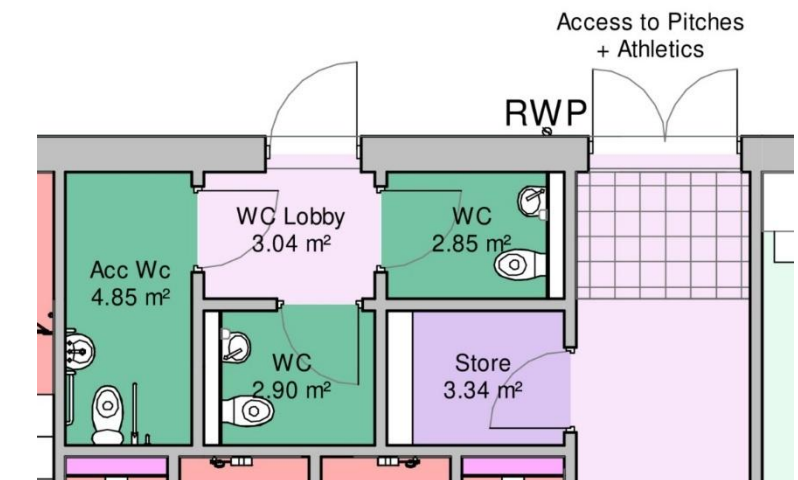


Figure 9 – WC accommodation to be unheated

5.3.1 VRF HEATING AND COOLING

The areas identified on the strategy drawings will be provided with a VRF system to provide heating and cooling as required by each room/area. The comms rooms will be provided with their own split DX system to provide heating and cooling.

The outdoor condenser units will be mounted on a big foot type support frame and will be located within the external ground floor plant area. Internally the rooms will be served via either wall mounted, ceiling mounted or void mounted units to control the space temperature.



Figure 10 - Typical External Condenser



Figure 11 - Typical Cassette Unit



Figure 12- Typical Wall Mounted Unit



Figure 13 - Typical Ducted Fan Coil Unit

The condensate drainage from each indoor unit will be run in plastic PVCU and will either be gravity or pumped as necessary.

All internal units will be complete with inlet filters to ensure the required air quality is maintained. All units will be complete with anti-vibration measures to control vibration from the unit.

Insulated copper refrigerant lines will link the indoor units and the external condenser units. All pipework and associated wiring from the external condenser units to the internal units will be routed in the ceiling void or exposed at high level on cable tray.

Refrigerant lines, power and screened control wiring is to be clipped along the full length of the run. All refrigerant pipework

will be selected, sized and installed by the equipment supplier, i.e. the total refrigerant system must be provided by a single specialist.

The design and installation of all internal units, outdoor units, interconnecting refrigerant pipework, branch controllers, interconnecting wiring, commissioning and testing is to be carried out by an approved refrigerant systems installer, authorised to install the manufacturer's equipment.

The manufacturer's system design parameters must be adhered to at all times and their recommended maximum refrigeration piping lengths must not be exceeded.

5.4 VENTILATION

The building will be provided with a full mechanical ventilation system which will be provided via a number of local ventilation units and extract fans located within the ceiling voids or at high level within the building and ventilation units located on the roof. Heat recovery will be provided on all units providing fresh air with the exception of the kitchen supply unit.



Figure 14 - Typical Void Mounted Heat Recovery Unit

The provision of ventilation units for the building is provided in Table 7.

Room Type	Ventilation Unit	Supply / Extract	Comments
Changing Room	Local HRU	Supply and extract	Controlled by BMS
WC Cubicles (not within changing areas)	Extract fan	Extract only, make-up supply from adjacent space	Controlled by BMS
Kitchen	Separate supply and extract units, no heat recovery	Supply and extract	Local control of extract hood and make-up supply
GP area	Centralised AHU	Supply and extract	

Table 7 – Ventilation Unit Types to Facilities

The supply and extract ventilation units will be complete with atmosphere and room side attenuators to achieve the acoustic requirements as required.

The provision of catering equipment within the kitchen will impact on the ventilation units serving it. Separate supply and extract ventilation systems have been allowed for at Stage 3 to serve the kitchen. Heat recovery is not proposed on this system due to anticipated low efficiencies and ongoing maintenance issues. The height of the exhaust discharge above the roof level is subject to the catering requirements and filtrations systems within the canopy and/or ventilation system. At this design stage, the discharge is to be 1.0 meters above the height of the roof eaves and/or screening for the removal of odours.

Internal heat recovery units and extract fans will be provided as required with intake / discharge to atmosphere via wall mounted louvres.

All supply and extract ductwork, with the exception of extract only systems will be insulated throughout, where ductwork runs externally or within the exposed services areas insulation will be finished with an aluminium clad.

All ductwork and associated access hatches are to be provided in accordance with DW144 and 172. Fire dampers will be provided to comply with the building fire strategy.

All supply and extract air handling units (with the exception of the kitchen) will be complete with a heat recovery element having a minimum efficiency of 80% for plate heat exchangers.

All ventilation units will be controlled separately by the BMS to meet the operational requirements of the building.

All void mounted heat recovery units and extract fans will be complete with inverter driven fans and filtration as required to meet the performance criteria.

The AHU serving the GP facility will be complete with inverter driven supply and extract fans, filtration and VRF fed coil to provide heating and cooling to temper the supply air to suit the internal room conditions (adjustable 22°C supply air temperature).

Throughout the building air will be introduced and extracted using a combination of swirl diffusers or four way diffusers and eggcrate grilles. Within toilet areas supply and extract valves will be used.



Figure 15 - Swirl Diffuser



Figure 16 - 4 Way Diffuser



Figure 17 - Supply / Extract Valve

5.5 HOT AND COLD WATER SERVICES

5.5.1 GENERAL

All pipework will be installed in copper tube and will be jointed with non dezincifiable fittings and valves. All exposed pipework will be finished in chrome. Plastic pipework will not be accepted. All hot and cold water services pipework will be insulated and vapour sealed throughout, where pipework runs within plantrooms, risers or where exposed internally and externally insulation will be finished with an aluminium clad. Where pipework is installed in an area susceptible to freezing electric trace heating will be provided.

The system design will allow the end user to implement a simple routine for checking the risk of bacteria including legionella.

Pipework passing through walls, floors, etc. will be sleeved and sealed to suit the acoustic and fire strategy requirements.

All hot and cold services pipework will be provided with identification banding as per BS1710.

All final connections will be complete with thumb turn type isolation valves within 300mm of the outlet.

All pipework will be full bonded to earth.

Manual drain off points will be provided at the end of all low-level runs.

All outlets will be complete with flow restrictors to comply with water authority requirements and will be set to work with a balanced outlet pressure.

A water sample will be taken to analyse the incoming water supply and, if required, an electromagnetic water softener will be provided on the main incoming supply to the building.

Pressure reducing valves will be provided, as required, to control the outlet pressure to provide a minimum of 1.5bar at the outlets.

Water sub-meters will be provided as follows on the cold water system (subject to final confirmation by the client):

- Utility water meter (potable water, or downstream sub-meter if a signal cannot be taken from the utility meter)
- Utility water meter – to be confirmed if required by United Utilities (hydrant supply or downstream sub-meter if a signal cannot be taken from the utility meter)
- Cold water sub-meter to the main water tank
- Cold water sub-meter to the break-and-boost unit
- Cold water sub-meter to the kitchen hot water generation unit
- Cold water sub-meter to the GP facility

5.5.2 COLD WATER SERVICES

A central cold water storage tank will be provided within the plant room to serve all outlets with potable water; no outlets will be served directly from the mains incoming supply.

The water tank will be complete with water temperature sensors that are monitored by the BMS. The system will be served with a three-stage booster set (duty/duty/assist) downstream of the tank.



Figure 18 -Typical Package Break Tank and Booster Set

A category 5 packaged break tank and booster set will be provided to serve the hose down areas wet change areas, external water

points on the roof of the building for cleaning purposes of the PV panels, a water point to the external bike store and a water supply to the irrigation system to serve the requirements for the football pitches (requirement subject to confirmation by the specialist pitch sub-contractor).

All external water points and pipework will be with trace heating to provide frost protection and will be insulated throughout including all fittings and protective covers on outlets.



Figure 19 - Typical Cat 5 Break Tank and Booster Set

A drinking fountain will be provided within the circulation space adjacent to the waiting area for the GP facility.

Cold water pipework distribution that is a potential risk of creating a deadleg with stagnant water will be looped to provide a flow of water through the pipework even if the appliance is not in regular use. Temperature sensors will be provided across the system

5.5.3 HOT WATER SERVICES

Domestic hot water will be generated via local direct electric water heaters and showers. All direct electric water heaters that have storage will be capable of storing the water at 60°C.

The point of use water heaters will be installed within the ceiling void where possible, local to the sanitaryware served. Hot water pipework lengths will be minimised and the water temperature in storage vessel and distribution to outlets are in accordance with the HSE Legionnaires' disease L8 guidance is adhered to. Where pipework lengths are at risk of the creation of bacteria including (but not limited to) legionella due to heat loss through distribution, the pipework will be served with electric trace heating to maintain the water temperature.

The size of the electric storage vessel to serve the kitchen is

subject to the final catering requirements. The space for a floor standing cylinder should be allowed for as part of the catering design for the kitchen.



Figure 20 - Typical Point of use Water Heater

All hot water outlets, with the exception of the kitchen and cleaners sinks, will be provided with thermostatic mixing valves (TMV3) to limit the hot water outlet temperature to 43°C. The outlets without mixing valves will be provided at 60°C.

All showers will be thermostatically controlled to 41°C.

The outlets without thermostatic mixing valves shall be provided with "Caution Hot Water" labels directly above the outlet.

5.6 ABOVE GROUND DRAINAGE

A complete above ground drainage system will be provided in accordance with BS EN 12056. The soil system will connect directly into the below ground drainage network.

All vertical discharge stacks, stub stacks, horizontal pipework, waste pipework and ventilation pipework will be PVC-U to BS-4514 and complete with a British Standard kite mark. Where connections are subject to high temperature discharge, they are to be made in copper.

Internal heat recovery ventilation units and VRF and DX fed units will be provided with condensate drainage. The condensate drainage from the indoor units will be run in plastic PVCU and will either be gravity or pumped as necessary. All condensate drainage to be a minimum of Ø25mm (or as recommended by the manufacturer) and laid to fall. Prior to connection to the main drainage stack a Hepvo Waterless Trap will be installed.

Floor gullies will be provided within the wet changing areas, showers and plant rooms as required. The gullies will be a

combination of linear and square as required to suit the floor arrangement and purpose of the gully.

Stub stacks complete with air admittance valves will not be permitted as ventilation stacks are feasible as part of the construction works.

Generally main soil vent pipes (SVP's) will run vertically with no offsets, however, where offsets are required, these will be made with long radius bends.

Long radius bends and long sweep pattern tees will be used throughout.

All vertical soil, waste and vent pipes will have access doors provided on each floor, above the flood level of the fittings served. Stack access points will be extended if necessary to permit maintenance access via boxing. In all cases, these will be extended above the flood level of the appliances.

Gullies will be provided with stainless steel grates finished to suit the atmosphere the gully is located in.



Figure 21 – Typical floor gully

All SVP ventilation discharge pipes will terminate 450mm above roof level and will be sealed as detailed on the drawings and required by the roofing contractor, each discharge will terminate with a roof cowl.

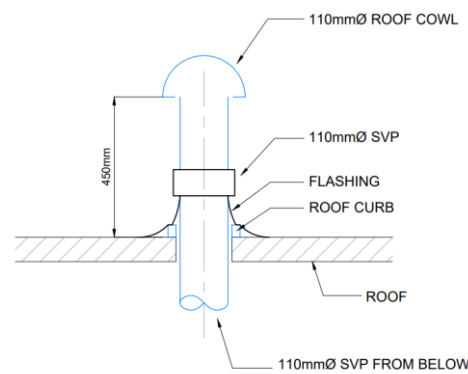


Figure 22 – Typical SVP Vent Detail

All pipework passing through walls, floors and ceiling will be sleeved and sealed to suit the acoustic and fire requirements of the element its passing through. Flexible joints will be provided wherever pipes cross expansion joints.

All pipework will be pressure tested strictly in accordance with the recommendations contained within the British Standards Code of Practice 5572.

5.7 BUILDING MANAGEMENT SYSTEM CONTROLS

A new central Building Management System (“BMS”) will be provided to serve the building to monitor, record and control building services.

The BMS for the building will comprise of a main control panel located in the plantroom and a separate control panel that is located in the GP area of the building. The two control panels will not be connected and interfaced with each other, however, the monitoring and recording electric and water sub-meters for the GP facility will be provided to both control systems.

The plant and equipment controlled and/or monitored by the main control panel located within the plantroom of the building will be, but not limited to, the following:

- Cold water sub-meters; monitor and recording
- Mains cold water temperature (including within the water tank and sentinel points in the GP facility); monitor and recording
- Cold water booster set; run, fault, enable and control
- Cold water break-and-boost unit; run, fault, enable and control

- Domestic hot water generation units (with the exception of the units within the GP facility); run, fault, enable
- Localised heat recovery ventilation units; run, fault, enable and control
- Kitchen supply and extract units; run, fault, enable and control
- Extract fans (with the exception of the fans serving the GP facility); run, fault, enable and control
- VRF systems (with the exception of those serving the GP facility); run, fault, enable and control
- Electric incoming meter and split distribution board sub-meters; monitor and recording
- Electricity generated by the PV panels; monitor and recording
- Electricity consumption by the internal lighting systems with out-of-range alarms (adjustable).

The plant and equipment controlled and/or monitored by the GP facility control panel located admin room (to be confirmed) will be, but not limited to, the following where the GP facility only is served:

- Cold water sub-meter; monitor and recording
- Domestic hot water generation units; run, fault, enable
- AHU; run, fault, enable and control
- Extract fans; run, fault, enable and control
- VRF systems; run, fault, enable and control
- Electrical split distribution board sub-meters; monitor and recording

The BMS will comprise of a main control panels located within the plantroom and GP admin, interconnecting on a communications bus system (local area network, “LAN”) to allow for two-way communication between outstations and the head end unit.

The BMS will be complete with a front-end PC located within the plantroom if required by the client, or provided with a data point connection for a portable device to be connected.

The consumption of energy for internal and external lighting will be recorded and monitored by the BMS with data held on the system for a period agreed with the client. Electric sub-meters on the split distribution boards serving the internal lighting, the building-mounted external lighting and supplies to feeder pillars will be recorded by the BMS. Pre-set (adjustable) consumption values will be input to the BMS that will alert when they are exceeded.

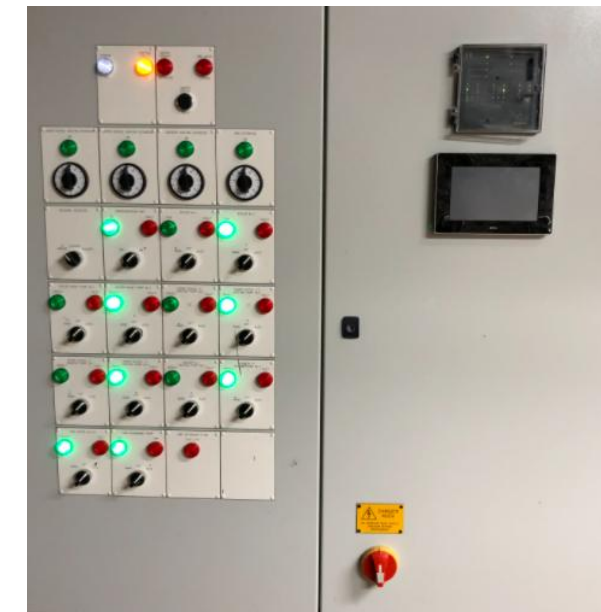


Figure 23 – Typical Mechanical Control Panel

6.0 ELECTRICAL SERVICES

The following outlines the electrical services proposals for the project and should be read in conjunction with the strategy drawings in Appendix A.

This section covers the following strategies and systems:

- LV Distribution and Metering
- Lighting and Emergency Lighting
- Small Power and Data
- Fire Alarm
- Earth Bonding
- Lightning Protection
- TV System
- PA System
- CCTV
- Security
- Access Control
- Equality Act Requirements

6.1 LV DISTRIBUTION AND METERING

A new two section Form 4 Type 2 low voltage switchboard will be provided within the ground floor plantroom.

All outgoing ways will be protected by MCCBs complete with electronic trips. Spare ways will be left unfurnished.

Each outgoing way to the sub distribution boards will have a multifunction meter measuring the following as a minimum; energy usage kWh, instantaneous energy kW and kVA, 30-minute max demand, line voltage, line current and power factor correction. All meters will be connected to a the BMS system to record all information on a rolling 12 month cycle.

New sub-distribution boards will be located around the building to segregate the building into manageable areas for maintenance as indicated on the strategy layouts. The new distribution boards will be split metered lighting and power boards. Close coupled AFDD cubicles and devices are not mandatory in this type of building and have not been included at this stage. A below the line cost will be provided should AFDD devices be required as recommended by BS 7671.

All panels and distribution boards will be sized to accommodate a spare load capacity of 10% and 20% circuit protective spare ways.

Sub metering will be provided, as a minimum, to the following:

- Mechanical Services Plant
- Large Items of plant to be separately metered
- Lighting
- Power
- Kitchen Equipment
- PV system

No back-up generator will be provided.

A spare unfurnished way will be left on the main panel board for power factor correction, to be installed by others if required following building handover.

Sub main distribution will XLPE/SWA/LSF cables run on medium duty return flange tray sized with 20% spare capacity.

Cables will be sized in accordance with the IET Regulations and will be sized to take account of design current, current carrying capacity, voltage drop, method of installation, grouping, ambient temperature, type of protective device and prospective fault currents.

Cables will not have a current carrying capacity less than the rating of their associated protective device, where a device has settings adjusted, a permanent warning notice should be installed adjacent to the protective device stating the adjusted settings which the cables have been sized to.

The electrical distribution systems will be designed to provide protection against overcurrent in accordance with the IET Regulations.

6.2 LIGHTING

Lighting and emergency lighting will be provided to all areas in accordance with BS EN 12464-1, BS5266 and CIBSE Guide 4, and Guide 6.

Lighting will be LED (L70 rated minimum with a minimum 5-year warranty on the drivers) throughout.

Building mounted external lighting will be provided to ensure pedestrian access and egress is sufficiently illuminated between the building and car park area and around the perimeter for security, as per CIBSE lighting guide 6 guidelines. Car park lighting and access road lighting to be provided via column mounted luminaires. External emergency lighting will be required to illuminate the route to a place of safety.

Emergency lighting will be integral to the general lighting and will be equipped with 3-hour emergency conversion kits in accordance with BS 5266-1. Emergency lighting functional testing will be via key switches located adjacent the distribution boards.

Escape signage will be provided in accordance with BS 5499-4 to emergency final exits, and to areas detailed on fire strategy drawings.

Lighting will be generally wired in LSF insulated and sheathed twin and earth cables installed within basket. Plant rooms will be wired in LSF singles in trunking/conduit.

Lighting will be controlled via either local presence detection, scene setting or manual switching to suit the operational requirements of the space.

6.3 SMALL POWER AND DATA

Small power and data will be provided throughout the building to suit the requirement of each room, allowing for flexible requirements where a room has several functions.

Small power will be generally wired in LSF twin and earth cables installed within basket and protected in conduit where dropping to low level. Plant rooms will be wired in LSF singles in trunking/conduit and protected in conduit where dropping to low level.

Two new server rooms will be provided as part of the works complete with sufficient patch panels to reach all areas of the development; all cabling will be standard Cat 6A.

Initial quantities for power and data outlet requirements are indicated in the room data sheets and layouts, generally switched twin socket outlets and RJ45 outlets will be provided throughout. Outlets will be a combination of white plastic; chrome finish and metal clad to suit the room served.

6.1 ELECTRIC VEHICLE CHARGING

A dedicated distribution board will be provided within an external feeder pillar to serve electric vehicle charging points. From this distribution board supplies to 2No. 7.4kW SP&N twin outlet external vehicle charging points will be installed, with the charging points provided by the electrical contractor. The distribution board will be sized to accommodate a spare load capacity of 10% and 20% circuit protective spare ways

The above quantity of charging points have been allowed in the load calculation. The final number of points will be in accordance with the planning requirements for the development.

In line with Building Regulations Approved Document S, where a new building which is not a residential building, or a mixed-use building has more than 10 parking spaces the following applies:

- a) one of those parking spaces must have access to one electric vehicle charge point; and
- b) cable routes for electric vehicle charge points must be installed in a minimum of one fifth of the total number of remaining parking spaces.

In line with the above, the proposed 2No. twin outlets exceed the requirements of point (a), To comply with point (b), cable ducts complete with draw wires will be provided by the main contractor to 20% of the remaining spaces for future charging points.

Cable ducts will be provided from the external feeder pillar to both the proposed and future charging points. Cable ducts to the future charging points will terminate in a precast concrete EV charger installation base complete with a universal adapter plate for future EV chargers.

6.4 FIRE ALARMS

A new fire alarm system will be installed in the building in accordance with the buildings fire strategy, building regulations and BS 5839 will be an analogue addressable with the panel sited within the main entrance lobby.

The fire detection and alarm system will be installed to comply with BS 5839 Part 1 Type L1.

All ceiling voids in excess of 800mm must be provided with void detection to meet the requirements of BS 5839.

Annunciation will be a combination of integral sounder bases and wall mounted sounders as appropriate.

Audible and visual annunciation will be provided throughout the building.

Fire alarm cabling will be a FP200 enhanced soft skin cable installed on basket protected with conduit where dropping to low level.

6.5 EARTH BONDING

Within the ground floor plantroom, a purpose made copper earth bar complete with copper bolted disconnection links will be provided at each end of the bar so as to allow disconnection of the main earthing terminal for testing purposes.

All main CPC and equipotential bonding conductors will be connected to the earthing bars and each will be numbered with proprietary cable markers.

In particular the following equipotential bonds from the main earth bar will be provided.

- Incoming Water supply
- The earth bars in all switchgear / distribution boards
- The heating, chilled and hot and cold water distribution pipework
- The ventilation ductwork
- The trunking, tray and conduit installations
- The building framework
- The lightning protection system
- VRF Pipework

All of the above equipotential bonding cables and /or tapes, and supplementary bonding conductor will be sized and located in accordance with BS 7671.

6.6 LIGHTNING PROTECTION

A Class 1 Lightning Protection system will be provided to the building in accordance with BS EN 62305 based on a risk assessment carried out by the specialist.

Where practicable the building structure will be utilised.

Type 1 and Type 2 surge protection will be afforded to incoming supplies and services where they enter the buildings including

external services DB. Type 3 surge protection will be installed to IT distribution boards.

6.7 TV SYSTEM

A TV cable backbone system will be provided to the server rooms thereafter; distribution will be by coax cabling to TV positions shown on small power and data layouts. The system will be capable of receiving the following:

- Freeview digital channels
- DAB radio

All aerials, dishes, cabling and distribution systems to be provided along with surge protection where the above cables enter the building.

6.8 PA SYSTEM

A PA system will be provided allowing announcements and background music to be made around the centre and the pitches.

Head end equipment is intended to be housed within the comms cabinet. Paging microphone will be situated at the main reception area, local music input will be provided within zones listed below.

The building will be zoned as noted below, a combination of ceiling or wall mounted speakers will be utilised as suited to the type of room.

Each of the following will be an addressable zone;

- Circulation Areas
- Café
- Pitches
- Changing Areas
- Clinic reception and circulation areas

On activation of a fire alarm the system will automatically be muted in all zones.

6.9 CCTV SYSTEM

A CCTV system will be provided consisting of fixed internal and external cameras intended to cover reception/servery, building perimeter and internal coverage to circulation spaces. CCTV

cameras will be connected to head end equipment via power over ethernet cabling back to the server room where head end equipment will be located.

The CCTV system will comply with BS 7958:2015.

A local playback 19" LCD monitor will be provided at reception or such location as agreed with the Client.

6.10 SECURITY SYSTEM

An intruder detection system will be provided throughout the centre utilising a combination of dual technology sensors and door contacts. The security panel will be situated within the office with a remote keypad sited adjacent the main entrance door.

Facility will be provided for remote connection to a monitoring station (Annual contract to be established by the Client with their preferred supplier).

A Panic alarm system will be provided to the reception desk and the servery counter with sounder in Office.

6.11 ACCESS CONTROL SYSTEM

Access control is proposed to turnstiles only.

Containment, power, fire alarm interface, and data wiring to comms cabinet shall be provided, with access control equipment provided by the Client.

6.12 EQUALITY ACT REQUIREMENTS

6.12.1 INDUCTION LOOP / ARRAYS

A number of induction loops / arrays will be provided throughout the centre. Each system will comply with the requirements of BS EN 60118: Part 4:2006 and be suitable for use with all types of hearing aid.

The following areas will be provided with induction loop / arrays:

- Reception Desk
- Servery Counter
- GP Reception Desk

The system will be a phased array induction loops (to prevent cross talk) within each area.

Each system will comprise a loop amplifier/power supply unit, microphone and loop.

The induction loop cabling will be concealed within the ceiling void where practicable.

6.12.2 ASSISTANCE ALARMS

An assistance alarm will be provided to each accessible WC this will comprise of the following equipment:

- Ceiling pull cord within each WC.
- Overdoor lamp/tone generator outside each WC.
- Reset unit within each WC.
- Indication of alarm location at a new panel within the reception area.

A separate system will be provided in the clinic.

All assistance alarm calls will be notified via a tone and will be shown on the call display unit located at reception showing the specific location of the alarm activation.

6.13 PHOTOVOLTAIC SYSTEM

A new roof mounted photovoltaic array will be provided. A notional allowance of 450m² of PV panel has been allowed with a peak output of 90.5kW.

The panels will be monocrystalline solar panels which will be mounted on the roof using box profile sheet metal fixings. The panels will be wired to solar inverters located in plant room.

The system will use electricity on site where possible and export any excess electricity generated to the grid.

7.0 APPENDIX A – MEPH DOCUMENTS AND DRAWING REFERENCES

Document Title	Document Number
MEPH Stage 3 Report	15138-CGP-00-ZZ-RP-N-0002
Electrical Services Ground Floor LV Distribution Strategy	15138-CGP-00-00-DR-E-6111
Electrical Services Ground Floor Lighting Control Strategy	15138-CGP-00-00-DR-E-6311
Electrical Services LV Schematic	15138-CGP-00-ZZ-DR-E-6001
Mechanical Services Ground Floor Domestic Water and Above Ground Drainage Strategy	15138-CGP-00-00-DR-M-5311
Mechanical Services Ground Floor Heating and Cooling Strategy	15138-CGP-00-00-DR-M-5611
Mechanical Services Ground Floor Ventilation Strategy	15138-CGP-00-00-DR-M-5711
Mechanical Services Ground Floor Above Ground Drainage Layout Sheet 1 of 2	15138-CGP-00-00-DR-M-5201
Mechanical Services Ground Floor Above Ground Drainage Layout Sheet 2 of 2	15138-CGP-00-00-DR-M-5202
Mechanical Services Ground Floor Domestic Water Layout Sheet 1 of 2	15138-CGP-00-00-DR-M-5301
Mechanical Services Ground Floor Domestic Water Layout Sheet 2 of 2	15138-CGP-00-00-DR-M-5302
Mechanical Services Ground Floor Heating and Cooling Layout Sheet 1 of 2	15138-CGP-00-00-DR-M-5501
Mechanical Services Ground Floor Heating and Cooling Layout Sheet 2 of 2	15138-CGP-00-00-DR-M-5502
Mechanical Services Ground Floor Ventilation Layout Sheet 1 of 2	15138-CGP-00-00-DR-M-5701
Mechanical Services Ground Floor Ventilation Layout Sheet 2 of 2	15138-CGP-00-00-DR-M-5702
Mechanical Services Roof Level Sheet 1 of 2	15138-CGP-00-RF-DR-M-5001
Mechanical Services Roof Level Sheet 2 of 2	15138-CGP-00-RF-DR-M-5002
Mechanical Services Schematic	15138-CGP-00-ZZ-DR-M-5991
Combined Services Site Plant Sheet 1 of 2	15138-CGP-00-ZZ-DR-N-9001
Combined Services Site Plant Sheet 2 of 2	15138-CGP-00-ZZ-DR-N-9002
Combined Services Roof Level Sheet 1 of 2	15138-CGP-00-RF-DR-N-9001
Combined Services Roof Level Sheet 2 of 2	15138-CGP-00-RF-DR-N-9002
Electrical Services Ground Floor Containment Layout Sheet 1 of 2	15138-CGP-00-00-DR-E-6101
Electrical Services Ground Floor Containment Layout Sheet 2 of 2	15138-CGP-00-00-DR-E-6102
Electrical Services Ground Floor Small Power and Data Layout Sheet 1 of 2	15138-CGP-00-00-DR-E-6201
Electrical Services Ground Floor Small Power and Data Layout Sheet 2 of 2	15138-CGP-00-00-DR-E-6202
Electrical Services Ground Floor Lighting Layout Sheet 1 of 2	15138-CGP-00-00-DR-E-6301
Electrical Services Ground Floor Lighting Layout Sheet 2 of 2	15138-CGP-00-00-DR-E-6302
Electrical Services Ground Floor Fire Alarm and Security Layout Sheet 1 of 2	15138-CGP-00-00-DR-E-6801
Electrical Services Ground Floor Fire Alarm and Security Layout Sheet 2 of 2	15138-CGP-00-00-DR-E-6802
Electrical Services Roof Level Lightning Protection Layout	15138-CGP-00-RF-DR-E-6901
Designers Risk Register	15138-CGP-00-XX-DRA-N-0001
MEPH Room Data Sheets	