Project: Community Roots

Architect: KAST Architects

Client: Community Roots

Services Consultant: Go Green Engineering Ltd

Mechanical, Energy & Electrical Specification

Project Team

Client: Community Roots

Architect: Kast Architects

Services Consultant: Will Slatcher @ Go Green Engineering

Document Control

Version	Date	Description	Author	Approver
1.0	24/03/2024	Client & Architect Draft Review	WS	
1.1	24/03/2024	Issue For Tender Purposes	WS	

Contents

Go Green Engineering Ltd, Unit 9, Splatford Barton Business Park, Splatford, Kennford, Exeter, EX6 7YN

Company Registration No: 07358786

1.0 INTRODUCTION

This document forms the Specification for Mechanical, Electrical & Ventilation (MVHR) Services for the proposed project prepared by Kast Architects.

Any conflicts or contradictions with any other contract documentation or drawings should be highlighted to the employer or their agent.

The Services detailed in this document include:

- Incoming Utilities – Water, Electricity, Gas, Data & Communications
- Space Heating
- Hot Water
- Ventilation
- Control Systems for heating, hot water, and ventilation
- Electrical Systems – Solar PV, EV Charging, Lighting & Small Power Distribution

The Specification does not include:

- Cold Water Distribution & Sanitaryware
- Fuel Storage
- Lighting & Small Power Layouts
- Below Ground Drainage
- Lifts or Access
- Fire Prevention Control
- Security, access control or CCTV
- Audio Visual Systems
- Smart Home Control and Integration

2 GENERAL REQUIREMENTS

2.1 CONTRACTOR RESPONSIBILITY

The design of the mechanical, electrical & ventilation services has been carefully undertaken to a brief agreed with the client & architect. The Specification sets out the technical requirements to achieve this brief and is designed to enable accurate pricing for tender. The design development and detailed design to progress the works to installation and commissioning will be the responsibility of the contractor, noting that any variations or changes to the specification must be agreed in writing with Go Green Engineering Ltd or the client/architect prior to implementation.

Contractor responsibility shall also include:

- Detail of all access requirements for maintenance of services in order to ensure that all plant and equipment associated with services can be safely and easily maintained
- Detailed design and location of any brackets and supports related to services and associated plant
- Final valve locations
- Detailed Pipework routes and photographic evidence of 1st fix works
- Ensuring clearances for safe operation of all equipment

- Spatial coordination of all services including those outside of this specification
- Setting to work and commissioning of all related plant and equipment
- Provision of commissioning reports in accordance with Building Regulations and Manufacturer's Instructions
- Liaison with Statutory Authorities to arrange the provision of new or amended Utilities

2.2 Inspection of Site

The contractor is advised to visit the site to fully understand the current situation of existing services (if applicable) and note constraints that may impact the installation performance, and to include consideration during tender. No claim by the contractor as a result of misinterpretations and misunderstanding of the extent and scope of the contract that could have reasonably been expected to have been solved by site investigation will be allowed.

2.3 Quality Standards

The Contractor will demonstrate quality control procedures and practices that ensure

- Compliance with ISo 9001 and ISO 14001 standards and procedures
- Compliance with the specification with regard to design, materials and workmanship
- Provision of samples of materials to the client prior to ordering
- All works and materials are provided in accordance with the appropriate British Standards or Code of Practice
- Where Dimensions are indicated on drawings, they are checked on site to ensure tolerances can be accommodated
- Compliance with all statutory instruments and regulations and local byelaws relating to the area of the site
- Compliance with the requirements of the Local Authority Building Control Inspector
- Notification of all authorities in accordance with their regulations and obtain any required approvals for the installation.

2.4 Builders Work, Penetrations & Accommodation of Building Services

The contractor shall identify the need for any builder's work, penetrations, chases, ducting, fixings, etc to accommodate building services within the building fabric, without compromising the structure or building fabric performance.

Pre-formed holes and openings should be utilised where available. Any additional work should only be undertaken by the following consent from the structural engineer and or Architect.

The contractor will be responsible for inspecting and confirming the suitability of all builder's work utilised for building services. This may include excavations for buried services and bases for the plant and supports. Where appropriate the contractor should arrange for inspection of work prior to concealment by relevant members of the project team and/or the building control inspector

2.5 Protection, Handling of Mechanical & Electrical Equipment

The contractor is to provide adequate and safe protection for all materials and products after installation:

- Ensure all items are protected against ingress of water and dust, formation of condensation, extremes, and rapid changes in temperature, building works and operations of others.
- Protect during erection all easily damaged materials with hardboard covers or heavy-duty polythene sheet.
- Protect all finished items from damage and paint splashes
- Install items such as grilles, diffusers, lighting fittings, switches, and controls etc as near to completion as practicably possible
- Only install filter media when the plant items concerned are being commissioned and tested
- Cap all open ends of pipes, ducts, conduit, and trunking etc except when being worked upon
- Leave plant and equipment in a ready to paint condition where specified as part of the works or to be carried out by others
- Paint/spray parts liable to corrosion immediately after removal of any temporary protection
- Replace material, plant, or equipment where deterioration or damage has occurred prior to handover

2.6 Operation & Maintenance

The contractor is to provide Record Drawings, Schedules, and Equipment Information to support the installed services and related plant equipment within 10 working days of Practical Completion.

These documents should include:

- Annotated drawings showing installed pipe/cable and duct routing for all services
- Annotated drawings showing the locations/routes of all underground services
- Details of all maintenance and servicing requirements as per manufacturer's instructions and warranty cover
- Copies of all related guarantees and warranties
- Copies of all User Manuals and related Manufacturer Instructions
- Copies of test and commissioning certificates for all equipment
- Gas Safety Certifications, Unvented Hot Water Certification and a Part F Commissioning sheet that shall be submitted to LABC
- Meter Readings at Practical Completion

3 PROJECT DETAILS

=

The client requires an emphasis on energy efficiency and the fabric performance of the building will be significantly better than current building regulations, to help minimise energy

consumption and improve the building performance to reduce carbon emissions and therefore have a positive movement for our climate emergency.

The following assumptions have been made during the design of the MEV services detailed in this document.

- The performance of the thermal elements is as specified in section 4.2.4
- The final Airtightness for the building will be specified in section 4.2.4
- All mechanical schematics and layouts within this specification shall be provided within Section 9 Supporting Drawings, Documents and Folders
- There will be no further design changes that impact the services required

Details relating to the consideration of improved airtightness which should be observed by all contractors has also been included within this specification.

4 DESIGN CRITERIA

4.1 General Criteria

The Mechanical and Electrical Services shall meet the following regulations, design guidance and recommendations:

- Relevant current British Stands (BS) and Harmonised European Standards (EN)
- UK Building Regulations
- Chartered Institute of Building Services and Engineering (CIBSE) Guides
- The Building Service Research and Information Association (BSRIA) Guides
- Health and Safety Executive Guidelines
- Health & Safety at Work Act and other Statutory Health and Safety Documents
- Construction (Design & Management) Regulations (CDM)
- Manufacturers Recommendations
- Water Regulations
- IEE Wiring Regulations BS7671
- The Institute of Gas Engineers Regulations
- Institute of Plumbing Engineering Design Guide
- The Control of Noise at Work Regulations 2005

All new services shall meet the minimum recommendations contained with the UK Government Domestic Building Services Compliance Guide 2021.

Where elements of the system have not been specified, the contractor shall ensure that all systems achieve CIBSE M, appendix 13.A1 indicative life expectations with a minimal design life of 25 Years as far as reasonably practicable.

Commissioning shall be undertaken in accordance with BSRIA & CIBSE Guidelines

4.2 DESIGN CRITERIA FOR MECHANICAL SYSTEMS

4.2.1 EXTERNAL CONDITIONS

The worst-case external temperatures are -1.0C for the ambient air and 10C for the ground respectively

4.2.2 Internal Conditions

Design Temperature. A design Temperature of 21C has been modelled for living areas, 21C for sleeping areas which is the standard for internal design temperature and has been agreed with the client, to ensure comfort. Higher temperatures of 23C+ can be achieved with higher flow temperatures but this would result in higher electrical consumption. However, this is only a design arrangement, temperatures can of course be increased beyond this if required once the building is completed.

Where the property has undergone extensive building works, there will be a significant amount of drying out during the first 6 – 12 months after construction is finished. This drying out can lead to running costs being significantly higher in the first year of operation as the moisture in the construction materials evaporates, especially if the building is completed in winter.

Overheating. The design should ensure that the building remains below 25C for at least 95% of the time. The property is reasonably well protected, and overheating will be managed by the mechanical ventilation heat recovery during the summer via the Bypass that will temper the incoming air supply to the MVHR system.. Additional cooling can also be provided by the UFH circuits, when long term and excessive outdoor temperatures are experienced

Humidity. The designed humidity of the building shall be optimised between 40 & 60%, this shall be balanced by the proposed MVHR units which can keep humidity levels optimised across the heat exchanger.

These parameters are compliant with both Passivhaus principles and CIBSE Guide A: Environmental Design.

4.2.3 Internal Heat Gains.

In order to calculate internal heat gains, occupancy rate has been calculated based on the liveable floor area for this project which is 280m2

Typical internal heat gain in winter is 2.5Wm2. These heat gains have been excluded for the purposes of heating system design and heat –pump sizing

4.2.4 Building Fabric & Airtightness

The construction will as a minimum, comply with Building Regulations Approved Document Part L1A 2020 (2020 Edition)

Performance of the thermal elements (walls, floors, roofs, windows, and doors) have been taken from the Building Regulations drawings provided by Stan Bolt as follows

Floors: 0.1 W/m2k

External Walls: 0.15 W/m2k

Windows: 0.8W/m2k

Doors 1.4W/m2k

Roof Flat 0.15W/m2k

The airtightness for the building shall equal or exceed 1.5 Air Changes Per Hour @ 50 Pascals as a minimum. It is recommended that the Main Contractor should air test the building in two stages. The first test should be carried out when the building has been correctly sealed, and services installed. The second test should be completed on completion. The 1st Air Test should no more than 10% above the minimum design requirement.

Heat loss Calculations for the property, based on the above values and measured drawings, have been quantified to peak heat load at 6.3kW @ -0.2C outside air temperature

Building Airtightness

It is paramount that all contractors consider the airtightness of the building during construction. Where any penetration takes place through the fabric of the building, this should be considered to ensure the building is sealed again, once the penetration has been made.

Within the supporting documents are several documents, advising on maintaining good levels of airtightness. This material should be absorbed by all contractors working on the construction of the project prior to any commencement of works, with reference to Architect details to maintain an airtight envelope as per the design requirement.

AeroBarrier should also be considered where the 1st air test is below an expected level of performance. Further information regarding Aerobarrier is contained within the supporting documents.

4.2.5 Ventilation

The Ventilation design must meet the requirements of both Building Regulations Approved Document Part F 2010 and Passivhaus Guidelines. These are summarised below:

Extract Rates required by Building Regulations Part F 2010

Room	Intermittent Extract Minimum Rate (ls)	Continuous Minimum High Rate (ls)	Continuous Minimum Low Rate (ls)
Kitchen	30l/s adjacent to hob 60l/s elsewhere	13l/s	
Utility	30l/s	8l/s	
Bathroom	15l/s	8l/s	
Sanitary Accommodation	6l/s	6l/s	

Supply rates required by Building Regulations Part F 2010

Whole House Dwelling Ventilation Rate	Number of Bedrooms				
	1	2	3	4	5

Whole Dwelling Ventilation Rate by Number of Bedrooms	13l/s	17l/s	21l/s	25/ls5	29l/s
Whole Dwelling Rate by internal floor area	The minimum supply ventilation rate must not be less than 0.3l/s per m2 of the internal floor area				

Extract Rate required by Passivhaus (m3/h)

Room	Maximum Extract Rate (m3/h)
Kitchen	60
Bathroom	40
Shower Room	20
WC	20

Supply Rates Required by Passivhaus

21m3/h of air per person based on a peak occupancy of 25 persons has been used to determine the peak ventilation rate of the building which is calculates as 603m3/h

For this property Building Regulations requires a ventilation rate requirement of 115m3/hr and this shall be the standard rate of ventilation for the building. However when the building increases occupancy levels and Co2 levels increase the ventilation rate shall increase to mitigate CO2.

4.2.6 HOT & COLD WATER DEMAND

Hot and Cold-Water systems should be designed in accordance with BS8558, BS EN 806 and HSE L8 – Legionnaires Disease; Control of Legionella Bacteria in Water and CIBSE guidance.

Design flow rates for appliances and fittings are as follows

Appliance/Fitting	Design (l/s)	Min (l/s)
Hand Basins (per tap)	0.10	0.10
WC Cisterns	0.10	0.10
Kitchen Sink (per tap)	0.15	0.15
Washing Machine	0.03	0.03
Dishwasher	0.15	0.15
Shower (hot or cold)	0.20	0.15
Bath (per tap)	0.40	0.30

4.3 Design Criteria for Electrical Systems

The products and installations provided by the contractor are to have minimum design life expectancy of 25 years. Where manufacturer information is not available, CIBSE recommendations shall be applied. The contractor is to notify the employer of any areas where this is not going to be achieved

All Products shall be fully tested before dispatch to include safety and earth continuity, high voltage electrical strength testing, full circuit functionality and checks on current draw. The installation shall comply with all the relevant Building Regulations, statutory instruments, and regulations, including any special regulations issued by the local electricity, gas or water authorities.

All Materials shall comply with the relevant British Standards including all aspects of the IEE Wiring Regulations (BS 7671:2008) current edition including amendments.

5 INCOMING SERVICES

The contractor shall be responsible for all liaison with the local water, electricity, and gas authorities. The contractor shall obtain and complete any necessary application forms on behalf of the client associated with the water, electricity and gas services including meter provision.

Any existing gas supply should be capped off by the gas supplier.

All incoming services should ideally be located within the plant room.

5.1 Water

The incoming mains water supply location shall be confirmed on site

The proposed hot water system is an unvented system with stored hot water and will therefore require minimum pressure and flow rate levels in order to work effectively. It is estimated that a minimum pressure of 3.0 bar with a flow rate of 35l/min will be required. A new 32mm water supply will be installed as part of the works and thus if the pressure and flow rate above is not achieved a boost tank or accumulator system may need to be included within the design.

The main contractor is to provide the water main connection from the Hot Water Cylinder Location to the curtilage of the property in order to connect to the incoming supply by Southwest Water

5.2 Electricity

A three-phase (3x60amp) electricity connection shall be available on the site, and this should be used for the supply of the property & annex. The supply shall provide sufficient capacity for the heat pumps and Electric Vehicle Chargers. The EV charger will allow fast charging capability of 7kW with a single-phase connection or 22kW with three phases depending on the arrangement of the three-phase supply and how this is utilised, which will be at the discretion of the installer and client confirmation.

The suitability of the supply should be checked by a qualified electrician in order to meet requirements of Building Regulations Part P and conform to BS 7671 Electrical Wiring Regulations Guide.

All equipment that requires permission to connect, shall be notified by the contractor to National Grid in the form of an ENA or G99 to ensure compliance

An ENA & G99 forms are supplied within the Supporting Drawings, documents and folders for the specified heat pump and solar PV system

5.3 GAS

There is currently no gas supply on site and no requirement for a new connection.

6 MECHANICAL SERVICES SPECIFICATION

6.1 SPACE HEATING & COOLING

The building shall be 100% satisfied by Underfloor Floor Heating provided by the proposed Air Source Heat Pumps, which shall also provide 100% of the hot water demand. There is a client requirement for mechanical cooling and the MVHR system shall allow building temperatures to remain stable via the Summer Bypass, Comfo Post & UFH system and reverse cooling via the Proposed Air Source Heat Pump. If an overheating risk still assessed within SAP, then the building design should be evaluated to mitigate this risk.

The proposed ASHP is also capable of delivering cooling via the UFH circuits & Comfo Post heat exchanger if the property should elevate in temperature above 25C.

6.1.1 HEAT DEMANDS & ESTIMATED PERFORMANCE DETAIL

The table highlights an estimated total demand for heating and hot water with a total annual demand for Electric required by the specified Heat Pump. This does not consider cooling requirements.

Design Energy Requirements

Energy Requirement	*Total Heating Demand*	*Heating Supplied by Heat Pump*	*SPF*	*Electrical Input*	*Renewable Heat Output*
Space Heating	*11,240 kWh*	*11,240kWh*	*4.76*	*4,202kWh*	*8,879kWh*
Domestic Hot Water	*5,434kWh*	*5,434kWh*	*3.8*	*1,430kWh*	*4,004kWh*
Additional Energy Consumption (Pasteurisation)				*0 kWh*	

Total Design Energy Output from Heat Pump	*16.674kWh*
Combined Seasonal Performance Factor (SPF)	*4.4*
Total Estimated Energy Input	*3789kWh*

Space Heating Design Summary

Total Number of Rooms	*4*
Total Area	*108m²*
Total Area Heated by HP System (if different)	*-*
Average Internal Temperature	*21 °C*
Star Rating of Worst Performing Room	*6*
Design Flow Temperature from Heat Pump	*35 °C*
SPF of Heat Pump at Star Rating	*4.4*
Total Design Heat Losses	*3382W*
Annual Space Heating Energy Requirement	*11,240kWh*

Domestic Hot Water Design Summary

Total Number of Bedrooms	*0*
Assumed Standard Occupancy	*5*
Daily DHW Requirement [ltrs]	*200 ltrs*
DHW System Efficiency (incl. losses)	*75%*
Annual DHW Energy Requirement	*5434kWh*

6.1.2 Heating Emitter Specification

The heat emitter specifications have been produced to ensure the heat output in each occupied room is satisfied with a flow temperature of 35C that is equal to or higher than the calculated demand. The total heat output of all emitters at 35C flow temperature is 3.58kW with an 10mm tiled floor, which is greater than the total peak heat demand of the property of 3.382kW.

Space heating shall be provided by Underfloor Heating in all areas. Towel Rails will be fitted in the bathrooms, which shall be electric only to client specification.

The flow temperature has been designed at 35C from the Air Source Heat Pump. However, this is to satisfy a worst-case scenario of heating demand based on -0.2C outside air temperature, so the heat pump will often operate at much lower flow temperatures controlled via weather compensation control to satisfy internal temperatures. It can also push to higher flow temperatures where required, should outside temperatures drop below -0.2C or when the building may require heating from cold. It is likely that when the heat pump be commissioned to the building a peak flow temp of 30C can be applied @ -0.2 C where a constant form of heating is applied.

The Table below specifies the heat output that will be provided for each room at 35C

DT54

ROOM	ZONE	No. OF CIRCUITS	MANIFOLD	UFH PRODUCT & FLOOR CONSTRUCTION	ROOM TEMPERATURE	STRUCTURAL OR FLOATING LAYER	Standard 1.0 TOG finish (R=0.10)	10mm Tiles (R=0.01)	4mm Vinyl (R=0.08)	10mm Timber (R=0.13)	1.5 Tog Carpet and underlay (R=0.15)
Bath	1	1	A	OctoPro at 150mm pipe centres	22°C	Screed	312 W	447 W	357 W	282 W	263 W
Ent Hall	2	1	A	OctoPro at 150mm pipe centres	19°C	Screed	346 W	494 W	373 W	312 W	291 W
Kitchen/Dining	3	3	A	OctoPro at 150mm pipe centres	21°C	Screed	1594 W	2280 W	1721 W	1437 W	1342 W

6.1.3 Heated Towel Rails

All Bathrooms, Shower Rooms and WCs towel rails, where required shall be electric only.

6.1.4 Underfloor Heating Systems

The Underfloor heating systems shall be supplied by OMNIE Ltd. All system designs have been provided and heat losses calculated so that the UFH provides 100% of the heating requirement from the Air Source Heat Pump at 35C flow temp. No other form of UFH should be considered without the heat losses of the building being assessed to ensure that a flow temperature of 35C or lower satisfies 100% of the heating demand.

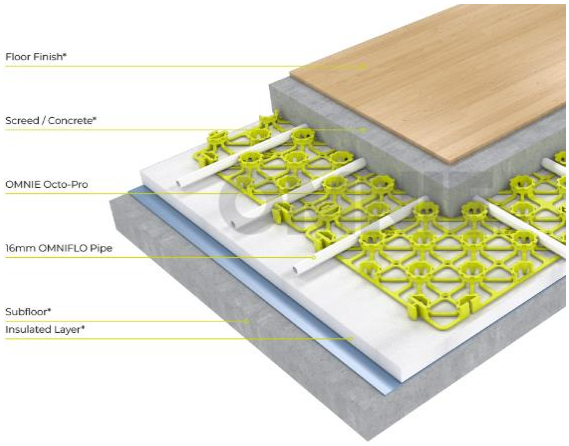
Ground & First Floor Heating System

OMNIE UFH OctopPlus

Supplied By OMNIE – Project Number - W43850-UA-2

Please Contact – Rob Shute - 01392 449368 - customer.service@omnie.co.uk

- Controls to be Stiebel Eltron EasyTron Supplied by BeGreen Wales Ltd
- Supply & Install OMNIE OctoPlus system to concrete Deck. The OctoPlus system should be laid over the concrete floor deck as per manufacturer's instructions, which are supplied within the supporting documents
- 28mm Copper or 32mm Uponor PEX Primary flow and return pipework shall supply the UFH manifold
- All 16mm PE-RT flow pipes away from the UFH manifold to be sleeved with 20mm black conduit until the pipe reaches the room in which it shall be heating, to prevent hot spots and overheating
- UFH layouts & Wiring Diagrams for controls specified are provided in the Supporting Document Folders
- 16mm PE-RT pipe laid into the Octo System with 150mm pipe centres
- A schematic of the Heating system is provided in the Supporting Document Folder for the for connection of the UFH manifold to the air source heat pump system
- Flow temperatures shall be controlled with the built it weather compensation of the heat pump Controller
- All Supporting manufacturer's instructions and control systems including wiring diagrams are included within section '9.0 Supporting Drawings Documents and Folders''



6.1.5 Cooling

Mechanical cooling has been requested by the client to stabilise building temperatures. It is considered that the MVHR system shall provide adequate air changes for general cooling capacity and that the building shall be purged manually where building temperatures become excessive of 25C.

However the MVHR system shall provide an additional level of cooling via the Bypass and where building temperatures increase above 23C, the proposed GSHP can also provide additional cooling via the UFH circuits if required by the client.

6.1.6 Space Heating Installation

Installation of the Space Heating systems shall conform to the following requirements:

- Heating Pipework is concealed generally within the wall, ceiling and floor voids
- Provision shall be made for the pipework expansion as required

- The contractor is responsible for all expansion design and installation
- Install drain points and manual air vents fitted at all high and low points within the system
- Contractor to provide all builders work holes as required
- All pipework system shall be flushed clean, and pressure tested as recommended by BSRIA
- All existing system to be flushed and cleaned where feasible with any redundant pipework removed where modifications have been undertaken
- The Contractor shall ensure all remaining pipework is insulated and labelled as necessary
- Care must be taken to prevent the introduction of pseudomonas and biofilm contaminates into the pipe systems
- Insulate and label all pipework, including valves and accessories

6.2 Heating Source

DETAILS OF HEAT PUMP

The contractor shall Supply & Install a Stiebel Eltron, WPL-A 07 HK 230 Premium, single phase Air Source Heat Pump Supplied by Be Green Wales Ltd as detailed within the Supporting Documents.

Project Number : PR002038

Please contact:

Begreen (Wales) Ltd

Unit 12, Haverfordwest Business Centre, Merlin's Court, Winch Lane, Haverfordwest, SA61 1SB

Tel: 01437 765111
Email: sales@begreenwales.co.uk
Website: www.begreenwales.co.uk

All internal equipment for the GSHP shall be positioned within the plant area and arranged around the MVHR design, with minimum clearances as per manufacturer's instructions.

Consideration to current lead times should be assessed by the contractor to ensure that the supply of the heat pump will not affect the completion of the project.

Connections to the ASHP shall require pipework & cables to be installed & concealed within the manufacturer supplied kit

Any exposed External pipework to be insulated with 19mm thick Armaflex Pipe Insulation. Pipework and cables shall be bought into the plant room at installers discretion. All pipework shall be minimum 28mm Copper or 35mm PEX or similar as per mechanical schematic provided.

All Pipework that is installed underground shall be Uponor Twin Thermoflex system, this can be used between the plant room and outdoor ASHP unit. This system also consists of two ducts to allow cables to be pulled through the same duct. Based on the distance from the ASHP location to the Plant Room, the 40mm version of the Thermoflex is recommended.

Consideration should be given as per manufacturer's instructions to seal all penetrations and service routes to ensure the duct remains airtight into the building. It is also advised that Proclima Roflex Grommets, should be used to seal the duct to the Vapour Check Membrane or airtight layer.

All Data sheets, Manufacturer's instructions, Mechanical & Electrical schematics as well as contracts can be found in the Supporting Drawings, Documents and Folders

The electrical contractor shall also confirm the connection of the heat pump with National Grid prior to the order of the heat pump, by completing the supplied ENA form supplied with the supporting documents.

6.2.1 Heating System Pumps

The HWS and Buffer systems is supplied with all pumping for the distribution side of the heating as well as the primary pump between the External ASHP unit and buffer/HWC

6.3 Hot Water Storage

The Contractor shall Supply & Install a Stiebel Eltron WPE Integrated 200ltr (GB) Heat Pump Specific Unvented Hot Water cylinder & combined buffer, that should be supplied by BeGreen Ltd with the Heat Pump. It shall be connected to the heat pump as per the mechanical schematic provided in the Supporting Documents.

6.3.1 Secondary Circulation

A secondary hot water loop shall not be required

6.4 Accumulator

Not Required for this project unless the current supply is not adequate. The installer shall be responsible for the testing of the water main to ensure that it is able to deal with the water demand of the building. If the water main is not adequate, a suitable accumulator should be considered.

6.5 Hot and Cold-Water Distribution

To Provide a balanced pressure hot and cold system to all outlets provided by a 22mm Combination Valve that shall be supplied with the Hot Water Cylinder

Alternatively, a hot and cold manifold arrangement would be considered if hot water can be delivered within 7 seconds to all outlets being turned on instead of the Secondary Circulation

6.5.1 Water Filtration

The contractor shall allow for a whole house water filtration system as specified within the Supporting Document Folders. This shall be installed on the incoming water main and provide cold water supply to all outlets and will include a bypass for servicing and maintenance. This shall be installed prior to any combination valve or distribution pipework, excluding outside taps.

6.5.2 Water System Installation

Installation of the hot water system shall conform to the following requirements:

- All pipework shall be installed in Uponor PEX Q&E or Uponor MLCP S Press Plus where concealed
- Exposed pipework shall be in chrome/copper with chrome/copper fixings and fittings.
- Joints in pipework runs located in voids shall be kept to a minimum and shall be accessible where possible.
- Insulate all hot and cold-water pipes, equipment, and ancillary items (valves etc.) to the minimum requirements of BS 5422 and in accordance with insulation manufacturer's recommendations.
- Where space allows, pipes should be insulated with Armaflex Class O closed cell insulation (lambda value of 0.038 W/mK or less) or equivalent. Pipes should be fitted with 13mm thick Armaflex that shall be glued, taped and vapour sealed including fittings, no pipework should be visible
- The Contractor shall be responsible for protecting any external or vulnerable hot water services from freezing
- Local isolation and drain points shall be available in order to minimise downtime caused by the need to drain wet systems and to facilitate the removal of pipe sections if required
- The Contactor shall provide a hot water service to serve all hot water outlets and thermostatic mixing valves

6.5.3 Thermostatic Mixing Valves (TMVs)

Where thermostatic mixing valves, are required by Building Regulations but not integral to the bath supply fitting, the Contractor shall:

- Provide local thermostatic mixing valves to mix down to temperature not greater than 48°C at all outlets.
- Provide Approved TMV2 type thermostatic mixing valves on services to all baths.
- TMVs are to be provided in accessible locations and are to be of a maintainable type.
- All TMVs are to be provided with isolation valves to facilitate maintenance.
- Be responsible for testing and commissioning all Thermostatic Mixing Valves and providing signed certification to demonstrate such to the Contract Administrator' satisfaction.

6.6 Above Ground Drainage

The Mechanical Services Contractor shall be responsible for the provision and installation of all above ground soil and waste drainage pipework from each WC, basin, sink, etc, including soil

vent pipes/stub stacks, to the 100 mm diameter soil/drain connections provided by the below ground drainage Contractor.

The whole installation shall meet the requirements of Building Control and shall generally be in accordance with BS EN 12056.

Generally, all pipework shall be concealed in voids/ partitions etc unless otherwise agreed with the client/Architect. Where concealed pipework is not possible, positions of exposed pipework should be agreed with the Architect.

Pipework shall be unplasticized polyvinyl chloride (UPVC) pipelines up to 150 mm for soil, waste and ventilation installations and shall conform to BS 4514. Pipe fittings shall be fully compatible with the adjoining tubes.

Pipes and pipe fittings shall be straight and correctly shaped, cleanly finished, round in cross-section and shall be free from cracks, surface flaws, laminations, and other defects.

Unplasticized polyvinyl chloride fittings shall be used which shall have characteristics similar to the adjoining pipework. Sockets or fittings shall be correctly formed, and the wall thickness, composition and performance shall conform to BS 4514. Fittings of one manufacturer shall be used throughout.

Spigot and socket joints shall be by jointing rings located within a groove or housing located near the mouth of each socket. Jointing rings may be either 'o' rings, 'd' rings or ribbed dependent on pipework and fitting manufacturer.

The correct expansion tolerances shall be provided within ring and seal joints by following the manufacturers' instructions. Any marks on fittings or pipe barrels indicating maximum depth of insertion shall not be exceeded. Cut ends of pipes or fittings shall be re-marked for the correct depth of spigot insertion.

Jointing by solvent welding shall be carried out strictly to the manufacturer's instructions. The corrector solvent cement shall be used for each manufacturer's pipework system. Ring seal joints shall be included at the manufacturer's recommended intervals to take up pipework expansion.

In addition, the installation shall be in accordance with the following clauses:

- The pipework in branch connections shall be arranged to allow free drainage of the system. Connections to mains and branch pipes shall be arranged to prevent cross flow from one appliance to another and shall be made with an easy sweep in the direction of the flow except where otherwise directed.
- The jointing between lengths of pipework and fittings shall be carried out in such a manner that a continuous smooth bore is maintained within the joint. No lipping or protrusion of the jointing material within the bore of the joint shall take place.
- In pipe systems of 75 mm and over where junctions and changes of direction take place in the horizontal plane, the junction or change of direction shall be achieved using angled fittings or groups of fittings having obtuse angles of not less than 112% unless large radius bends are used

- Where connections are to be made between UPVC stacks and cast iron or salt glazed earthenware drains, cast iron or UPVC adaptor fittings shall be used as supplied by the manufacturer for this purpose
- Where connections are to be made between UPVC pipework and sanitary ware the following methods shall be used
- Pipe or fitting with an integral enlarged socket, 133 mm internal diameter to accommodate the sanitary ware outlet with the final joint being made by a neoprene or synthetic W.C. mechanical seal connector gasket, suitable in size to ensure a tight fit between the gasket, pan outlet and UPVC Pipe
- Pipe spigot end with male and female neoprene or synthetic W.C. mechanical seal connector suitable in size to ensure a tight fit between the connector, the sanitary ware outlet and the UPVC pipe shall be used
- All waste pipework shall be installed entirely to the satisfaction of the Contract Administrator and in accordance with the requirements of the local Water Authority and the local authority's Building Control Inspector. Where excessive lengths of waste pipework are required, increases in pipe size may be necessary but only in accordance with the relevant British Standards
- SVPs shall be fitted, with air admittance valves in the stub stacks, as shown in the drawings and shall be fixed in strict accordance with the agreed drainage drawings and the manufacturers highest connected appliance. The remaining SVP shall be run directly through the roof terminating with a suitable weather cowl and flashing provided by the main contractor

The horizontal soil and vent pipes shall generally be installed to the gradients recommended in BS EN12056 or as indicated on the drawings. The soil and waste pipes shall be installed with the gradient falling towards the main vertical soil vent pipes.

The support system used for suspending a horizontal pipe system shall incorporate an adjustable drop rod capable of correcting small errors in alignment should these become apparent during the testing and commissioning of the system.

Access points shall be provided as indicated on the drawings and shall be faced to form a true completion of the bore of the pipeline and made gas and watertight with good quality rubber gaskets firmly secured with copper alloy bolts and washers. No part of a cover shall project into the pipeline bore.

Any waste or vent pipework in excess of 40 mm outside diameter passing horizontally or vertically through internal block walls or ceilings/ floors must be provided with an approved fire collar to achieve any required fire compartmentation. Anything less than 40 mm diameter must be Mastic sealed to eliminate smoke spread only. The contractor is responsible for all the above.

The underground drainage system will terminate in a socket to which the above ground drainage shall be connected by means of a caulked lead joint, if cast iron or a cement joint, if salt glazed clay ware.

Pipeline below 100 mm shall be fitted with a suitable reducing piece of flange to fit the drain socket.

The soil, waste and vent installations shall be tested in one operation. However, it may be necessary to soundness test in sections as the work proceeds. Tests should be carried out in accordance with BS EN 12056. Each installation shall be finally air tested with all the appliances connected at 38 mm water gauge for 3 minutes.

7 Ventilation

The ventilation strategy for the building is a Mechanical Ventilation Heat Recovery System to be operated in conjunction with natural ventilation for purge ventilation when required.

The contractor shall supply and install a whole house mechanical ventilation system with heat recovery (MVHR) in accordance with Building Regulations ADF 2010 "System 4 - continuous mechanical supply and extract with heat recovery". In addition, a recirculating hood is to be provided in the kitchen area.

No trickle vents in windows shall be required and no other form of extraction should be installed

If a woodstove is to be installed, it must be classed as room sealed with a direct air supply/kit to satisfy HETAS regulations.

7.1 Relevant Standards

This performance specification provides continuous ventilation for the building under standard operating conditions to comply with all relevant standards and current Building Regulations.

- Building Regulations

  - Approved Document Part F : Ventilation
  - Approved Document Part LI: Conservation of fuel and power in dwellings
  - Approved Document Part B: Fire safety
  - CIBSE Guide B: Heating, Ventilation, Air Conditioning and Refrigeration (2005)
  - Manufacturer's installation instructions

7.2 MVHR Unit & Performance

CVHVAC have been chosen to design, supply and installed the proposed MVHR system as detailed within the Supporting Documents. CVHVAC shall provide a detailed design for the building to meet the requirement of this specification. Alternatively, CVHVAC can also provide a design & supply for the system, if the main contractor has a specific ventilation contractor in place. A supply & Installation cost has been included within the supporting documents.

Project Number : Community Roots

Please contact: Mike Carrasco Managing Director

mike@cvhvac.co.uk

The Contractor shall supply & install .a Heliois Air 1 XC or XVP MVHR unit within the plant room, with an option for the unit to be ceiling or wall mounted, which shall be determined by the installer.

Product Part Number

Heliois Air 1 XC or XVP

Description

Additional Zoning options to Include

- PIR sensor – to detect occupation and increase airflow
- Co2 sensor – to detect high levels of Co2 and increase airflow
- Wall switch – increase airflow by pressing switch

Controllability

A Digital control panel shall be supplied to allow LCD controller functions as follows

- Weekly timer
- Holiday timer
- Summer by-pass
- night-time cooling
- Fault finding
- Speed Parameters
- Filter indicator
- Fire alarm integration
- Temperature sensors

Filtration

1x F7 large capacity pollen intake filter and 1 x G4 extract filter

Heat Exchanger

Highly efficient aluminium counter-flow heat exchanger that can provide up to 84% heat recovery and designed for lifetime use

Motors

The unit has 2 x low energy, high efficiency backward curved EC motors with heat and speed protection

Installation

The unit is be horizontal floor mounted or ceiling mounted, please ensure that the structure can take the weight of the unit etc.

The condensate drain point consisting of a metal 15mm BSP pipe is provided on the side of the unit that should be connected to a drain via a waterless trap

Installation of Ductwork

All Supply Air and Exhaust Air Ductwork shall be Lindab Galvanised Spiral

Dimensions & Unit Detail

Model

Unit data
General information

Order ref. number	40615	**Duct dimension**	500 x 300 mm
Unit type	AIR1 XVP 2500	**Weight (Unit)**	427 kg
Unit dimensions	2000 x 926 x 1641 (L x W x H) mm	**Delivery batch**	1 unit

Overview efficiency values

ERP 2018 compliant	yes	**Velocity class RLT (EN 13053)**	V1
HR efficiency supply air wet / dry (bal.)	86.9 / 82.0 %		

The unit will provide a maximum ventilation rate of 2500m3/hr. The requirement for the building is 30m3/h per person with a max occupancy of 30 people which shall require a peak ventilation rate of 900m3/h with a boost rate of 15% 1035m3/h.

7.3 MVHR Unit Configuration Condensate drain

Floor Standing

Ceiling Mounted

- A condensate drain will be required adjacent to the unit and should be fitted with a HepvO waterless trap or similar

Controls:

- Helios Control unit

7.4 Design Parameters

The Supply & Extract volumes for each unit and room are as follows and the system shall be commissioned within 2% of design rate.

7.5 MVHR Design

Mass Flow Ducting type:

Ducting to be Lindab Spiral Galvanised ductwork for all mass flow duct to outside for supply and exhaust. The supply air will need to be connected to the supplied wall terminal as per manufacturer's instructions.

It is required by the contractor to insulate all non pre-insulated ductwork with 19mm Thick sheet Armaflex, that shall be glued, taped and vapour sealed.

Supply & Return Air Ducting Type:

All Return Air ductwork to be Lindab Spiral Galvanised Ductwork, as supplied by Lindab or similar manufacturer

All Supply Air ductwork to be Lindab Spiral Galvanised Ductwork, as supplied by Lindab or similar manufacturer

Ducting layout:

The Contractor shall design a suitable system that shall be sized to the requirements of the peak ventilation rate.

7.6 INSTALLATION

Terminals:

- Ceiling supply terminals are to be Lindab Airy/KI or similar approved
- Ceiling extract terminals are to be Lindab Airy/ KU or similar approved
- Kitchen extract terminals shall be fitted with fleece filters
- External intake/exhaust terminals are to be to wall mounted

External duct insulation:

- External ducting to be insulated with closed-cell insulation layer (Armaflex or similar)
- Insulation thermal conductivity to be a maximum of 0.040 W/m.K
- Insulation thickness to be a minimum of 25mm

Acoustic requirements and sound attenuation:

- Sound limit in habitable rom = 25 dB(A)
- Sound limit in plant room and wet rooms = 35 dB(A)

Fire:

MVHR design to ensure appropriate fire protection when passing through construction elements in order to maintain a protected area. Where ventilation pipes pass through walls or ceilings, intumescent pipe collars may need to be provided. MVHR design is to be submitted to the building control officer to assess compliance with fire regulation requirements.

Particular attention should be given to the fireproofing of the Mass flow ducts passing through the garage to ensure this satisfies Building Control.

Installation:

The Zehnder unit will be installed in the location shown on the MVHR layouts in section '9 Supporting Drawings'

Airtightness around external duct penetrations:

- Airtightness layer to be maintained around external ducting penetrations using ProClima Roflex pipe grommets or approved equivalent.

Transfer openings:

- Internal Doors shall require a 10mm airgap between the finished floor and bottom of door for cross ventilation of the MVHR system. Acoustic air transfer grills can be used if door undercuts are not desirable.
- Pressure drops between rooms to be under 1Pa

Electrical:

- Unit to be connected to the mains electrical supply: 230VAC 50Hz
- Power supply to be located within 1 metre of the unit

Construction:

- All ducts and terminals to be kept protected from ingress of construction dust and debris with effective sealing of exposed ends with a temporary membrane until final fix of terminal units

7.7 Enhanced commissioning

- The System is to be commissioned to comply with Building Regulations ADF2010 and enhanced Passivhaus requirements.
- All accessible system components will be compared to submitted design to ensure it is installed as per the design
- All filters are to be checked that they are clean
- All air flows to be measured at terminals in normal and boost modes to ensure compliance with design requirements (as set out above)
- All rooms are to be tested for compliance with the acoustic requirements (as set out above)
- All commissioning details are to be entered into the "Final Protocol Worksheet" (attached with the MVHR detailed performance specification) and then the completed sheet provided to Go Green Engineering Ltd
- If a wood stove is to be installed, the system should be commissioned with a slight positive pressure to ensure no product of combustion is brought into the room
- Commissioning will be witnessed by Go Green Engineering Ltd

8 Control Systems

The control systems can be summarised as follows:

System	Control Mechanism(s)	Manufacturer/Model
Underfloor Heating	Easytron Room Sensor Thermostats - Thermostat locations to be advised by the architect.	
Combined heating system	Remote wireless control provided by Wi-Fi interface and Heatmiser applications on smartphones, tablets or via PC interface.	Easytron Internet Service Gateway 
Hot Water	-Time and temperature control provided by the Stiebel Eltron Heat Pump Controller.	
MVHR	-The MVHR shall be connected and controlled via the Helios Touch unit	Helios Touch Control Unit 

9 ELECTRICAL SERVICES SPECIFCATION

The electrical services shall comprise incoming electricity service, main switchgear, lighting, small power, telecommunication services, fire alarms, security systems, specialist systems and earthing and bonding.

The works shall include the removal of any remaining electric distribution system equipment and accessories within the building.

All installations to be in accordance with

- The IEE Wiring Regulations (BS 7671:2008) with amendments 1 & 2
- E.M.C (Electromagnetic compatibility) Regulations
- The Electricity Supply Regulations 1988 as amended

The contractor shall also be responsible for all connections of electrical items to the grid where permission is required. An ENA form shall be submitted to Western Power Distribution for confirmation that all services can be connected to the grid.

9.1 Main Distribution and Final Circuits

The local electricity authority's incoming supply shall be metered via a three-phase kWh metering equipment that shall be located within in the plant room as shown on the architect's drawings.

A multi-way single phase and neutral MCB distribution board and loose switchgear shall be provided for the supply of electricity to final circuits and plant items. The distribution board shall include a main Residual Current Device (RCD).

The final circuit distribution board shall be provided with MCBs for protection of all outgoing circuits, with an additional 20% spare capacity for future use.

Generally, final circuits shall be wired in LSF insulated and sheathed flat multicore cables ('twin & earth') run in ceiling and floor voids and drawn into PVC conduits within walls.

9.2 Small Power Distribution

Small power generally comprises wall mounted socket outlets for general use and fused connection units serving fixed appliances. Locations as shown in architectural layouts. Power sockets are to be positioned 400mm above finished floor level.

The final layout and arrangement of outlets within the kitchen shall be subject to the detailed design of the kitchen itself. Fused connection to be provided to supply potential ceiling mounted recirculating fan with charcoal filter.

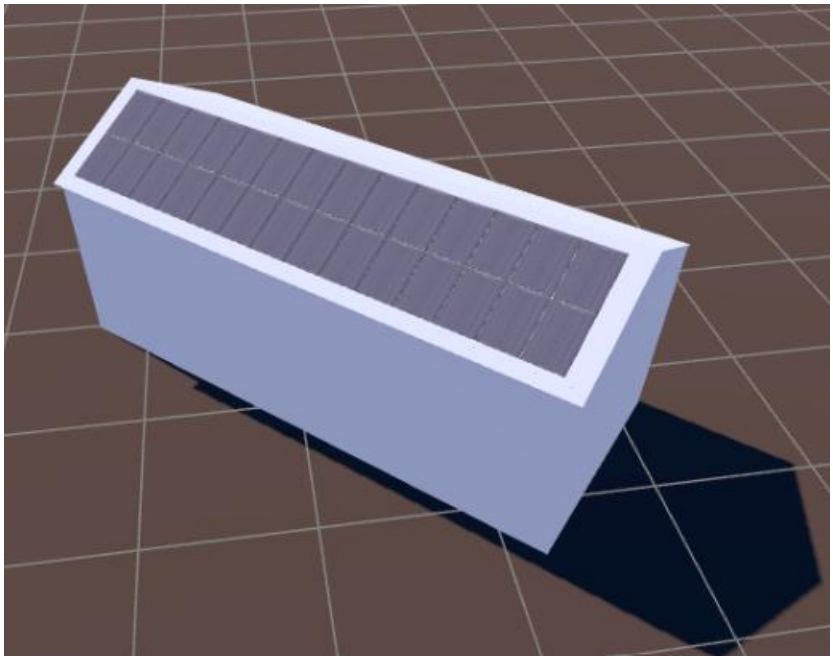
Generally, final circuits shall be wired in LSF insulated and sheathed flat multicore cables ('twin & earth') run in ceiling and floor voids and drawn into PVC conduits within walls solid and floors.

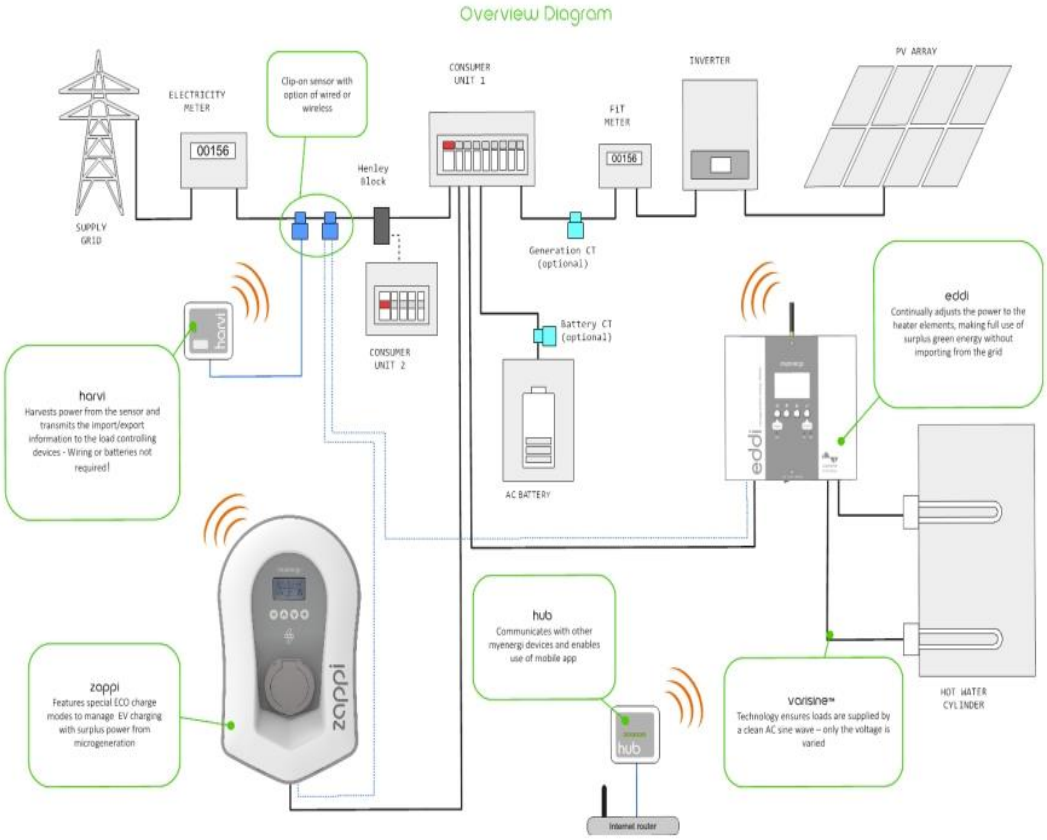
9.3 Solar PV, Solar Hot Water Booster & EV Charging

The Contractor shall appoint an MCS Accredited Contractor and they shall allow for the supply & installation of a 28 x 430W panel 12kW PV System as detailed in the supporting documents provided.

The Contractor shall allow for a mechanically fixed system. A mechanically fixed system has been allowed for within the design provided, but this should be checked with a structural engineer to see if the roof is capable of such loads.

The system shall be setup as per the system design below with allowance for the system to be connected to 2 x 4.6kw SolarEdge Home Battery 48V or similar.





The MCS accredited Contractor shall allow for the supply & Installation of a single & three phase MyEnergi Zappi EV charger for fast 22kW charging via the buildings three phase

connection. Consideration should be given for a suitable electrical tariff such as the Intelligent Octopus provided by Octopus Energy.

All detail relating to the EV charger is contained within the Supporting Documents Folder for reference.

The location of the charger should be agreed with the client/architect

10 COMMISSIONING

10.1 Testing and Commissioning of Services

The Contractor is to agree a programme with the Contract Administrator (CA) for pre-commissioning checks, setting to work, commissioning and performance testing, and allow for all costs incurred.

Where required, the Contractor will provide formal method statements supported by risk assessments detailing all commissioning procedures.

The Contractor will provide all necessary facilities to enable tests to be witnessed and inspections carried out either on site or at manufacturer's works.

The CA will only witness test proceedings, confirm recorded results and determine if the specified requirements have been satisfied.

If following test or inspection any plant or part thereof is shown to be defective or not conforming to the specification the CA will reject such defective parts by written notice, within reasonable time, indicating area of dispute.

Test all equipment, material and systems as detailed in this specification. If an inspection or test fails, repeat the procedure, until satisfactory results are obtained.

Following satisfactory completion of testing and when the installations are in a safe and satisfactory condition, set to work, regulate, and adjust, as necessary, to meet the specified design requirements.

Provide all necessary instruments and recorders to monitor systems during commissioning and performance testing. Provide test equipment subject to a quality assurance procedure complying with BS 5781.

Do not start performance testing, including system demonstration, system proving or environmental and capacity testing, until commissioning of the system is completed to the satisfaction of the CA.

Maintain on site full records of all commissioning and performance testing, cross referenced to system components and on completion of the Works include a copy in the Operating and Maintenance Manual.

Provide all certification documents for approval by the CA before any system is offered for final acceptance.

Testing and commissioning of the utility services; gas, fuel oil, electricity, and water, will be provided by the Contractor.

10.2 Commissioning Procedures

The following commissioning procedures will be included as a minimum:

- Pipeline pressure tests
- MVHR flow rate calibration as detailed in section 7-4.7
- Heat pump commissioning as per manufacturer's guidelines completed by Supplier Engineer
- VRF split system commissioning as per manufacturer's guidelines
- Full system flush for all wet systems
- Testing and calibration of control systems

Pre-commissioning examination and testing will take place to ensure that each system or item of equipment is complete, in a safe condition and all relevant notices are displayed. Completion for operational purposes implies the bulk of snagging and remedial work has been completed.

The Contractor is to finalise commissioning programme, taking into account site progress and availability of related services, with the CA and agree access required for controls etc.

The Contractor will provide a written statement to the CA confirming that each installation has been correctly tested and commissioned and that the performance requirements can be achieved.

10.3 Operational Handover

Once all systems have been successfully commissioned, the Contractor is to arrange a handover demonstration with the CA and the Client. This should include a comprehensive demonstration of all systems as well as their associated control systems and any related maintenance.

The Contractor will also provide the client with all relevant Operation and Maintenance manuals, commissioning certificates, gas safe certificate and equipment warranties.

11 SUPPORTING DOCUMENTS & FOLDERS

The design is based on the following drawings provided by Stan Bolt

2311 4 Combined
Draft General Arrange

The following drawings are provided by Go Green Engineering Ltd in support of this specification:

- OMNIE - All Floors UFH Heating Zone Layout

- BeGreen Wales Ltd – Stiebel Eltron Air Source Heat Pump providing Heating & Hot Water Schematic

The following folders have been provided to contain all Manufacturer Data Sheets, Manufacturer Instructions, User Manual, Installation Instructions and Commissioning Procedures relating to this specification that can be used for reference material. These should be provided to all contractors tendering for the works. This detail should also be used for handover documentation.

- Cold Water Supply & Filters
- Hot Water Supply
- Heating Distribution
- Air Source Heat Pump
- MVHR
- Controls
- Installation of Pipework
- Insulation of Pipework
- Heat Loss Report & Performance Estimate
- Solar PV, EV Charging & Solar Hot Water Booster
- WPD Documents