d3associates

Shotton Parish Council

New Shotton Community Centre

Mechanical Specification

1442-M-50-001

January 2018

Compliance with Statutory Instruments, Regulations and Bye-Laws

The Contractor shall install and complete the works in accordance with the following relevant requirements:-

- Building Regulations.
- British Standards Specifications.
- Health and Safety at Work Act.
- Statutory Instruments.
- Local Authority Bye-Laws.
- Electricity Supply Regulations.
- IEE Regulations for the Electrical Equipment of Buildings.
- Gas, Water and Electricity Authorities' requirements.
- All relevant Codes of Practice.
- Notify all Authorities in accordance with their Bye-Laws.

Scope of Work

Shotton Community Centre is a new building which is to replace the function of an existing Community Centre on the site. The Mechanical services for the new Community Centre shall generally consist of the following.

Heating

Under floor heating shall be installed in all areas from distribution manifold(s) as indicated on drawings. The heat source for the heating shall be by air to water heat pump units located externally to the plant room.

Domestic Hot and Cold Water Services

A new domestic cold water supply shall be provided from an existing cold water supply serving the existing community centre, this existing main shall be isolated and new tee piece fitted with isolation valves fitted to the supply to the existing building and new, the new mains water supply shall be taken to new plant room and shall distribute to serve WC's, Cleaners Closet and Kitchen. The domestic hot water shall be provided by instantaneous electric water heaters WH-01 and WH-02 as described in schedule, each water heater shall be complete with un-vented kit.

A counter top Water Boiler WB-01shall be provided and installed in the kitchen and shall be as schedule.

All domestic hot and cold outlets shall be fitted with chromium plated ballofix valves. All outlets shall be hard piped with no flexible hose connections being acceptable.

Ventilation

Supply air Ventilation to areas shall be via natural means such as manually opening windows and motorised roof lights. Extract ventilation shall be provided in WC's, Kitchen and Cleaners Closet and additional Extract Ventilation shall be provided in the IT suite and Main Hall to augment the Natural Ventilation strategy.

The kitchen cooker shall be provided with a re-circulating type hood as described in schedule.

Tender Drawings

DRAWING NUMBER	DRAWING TITLE
1442-M-53-001	Mechanical Building Services - Domestic Water Services
1442-M-56-001	Mechanical Building Services - Heating Services
1442-M-57-001	Mechanical Building Services - Ventilation Services
1442-M-50-001	Mechanical Building Services - Mechanical Specification
1442-M-50-002	Mechanical Building Services - Details
1442-L(-1)104	Utility Connections
GHD31972	Myson Underfloor Heating Layout

Mechanical Equipment

All the Mechanical equipment scheduled in these documents along with the specified manufacturer, model and performance data, are preferred, however alternatives may be provided by the contractor, on an equal and approved basis. All alternative equipment must be identified in the tender return documentation. It is the intent to have fully workable and operational systems and any additional equipment required for either the specified equipment or the alternatives, which will be requiring additional components etc to make it a fully operational system, must be raised in good time with the engineer before tender submittal if this cannot be raised in good time then the contractor shall include them in the tender price and details of such.

Heating

Under Floor Heating

The under floor heating shall be supplied by Myson FLOORTEC Under floor heating, Eastern Avenue, Team Valley, Gateshead, Tyne and Wear, NE11 0PG. The manifold position(s) and zoning are shown on drawings. Refer to Myson Under Floor Heating quotation GHD31972.

The flooring construction shall be confirmed with the building contractor before ordering and relayed to Myson.

The under floor heating shall be designed to operate at 45°C flow and 40°C return adjustable.

Manifolds

3 No, 'A' rated pumped manifolds shall be located as per drawings.

Under Floor Pipework

Under floor heating pipework shall be MYSON FLOORTEC PEXcellent5 polyethylene pipe with five layers, which includes an integral oxygen barrier and shall be environmentally friendly and be produced with no chemical additives in either production or disposal processes. Quality guaranteed for 10 years and conforms to DIN4726 and BS7291-1-2001.

Controls

Control system shall have 27 no, 24V actuators and 3 no, 24V wiring centres, and 12 no, type MRTE Electronic room thermostats and 3 no MEP1c programmer to interface with the Air Source Heat Pump.

Pressure test pipework to a minimum of 3 bar and a maximum of 6 bar must be applied to all under floor heating pipework prior to and during floor fixing.

General Zone Temperature and Time Control

The temperature within each of the heating zones shall be sensed by a room temperature sensor and monitored by the under floor heating automatic control system.

Outside the occupancy period the under floor heating control system will open and close the under floor heating circuit manifold control valves in order to maintain a set back room temperature of 15°C

Screed Curing

Screed curing, a minimum of 21 days should be allowed for the screed to be fully cured before the heating system is commissioned (7 days for Anhydrite). At this time the under floor heating flow temperature shall be limited to 30°C and then increased by 3°C per day until the design flow temperature is reached.

The floor screed must comply with the requirements of British Standard 8204-1:2000. Particular attention must be given to screed thickness, bay sizes and expansion joints.

Floor Covering

Floor finishes shall be as identified on drawing 1442-L(-2)103. Ceramic Tiles or Vinyl floor coverings should not be laid until the screed has been fully dried. The heating should be turned off one day prior to laying these floor coverings. To avoid re-absorption of moisture, the flooring should be laid no more than 3 days after the heating is turned off. Where a timber floor is to be fitted, the floor must not be laid until the screed is fully cured and the heating system has been running for a minimum of 1 week. The screed moisture content should be checked to ensure that it falls between the acceptable limits as given by the flooring manufacturer.

Ambient Ait Temperatures

The under floor heating pipework should not be laid with ambient air temperatures below 0°C. Screed should not be laid with ambient air temperatures below 5°C.

Air Source Heat Pumps (ASHP's)

General

The ASHP's shall be Mitzibishi ECODAN with performance and details are to be as scheduled on the drawings.

The ASHP's shall be factory sealed, packaged, inverter driven. The inverter controlled compressor will allow for a soft start current at initial start, and optimise the unit capacity and efficiency to that of the connected heating system. The heat pump will use the outdoor air as its heat source and be optimised to run on 410A refrigerant. The refrigerant circuit shall be hermetically sealed and factory tested ready for installation.

The ASHP unit will comprise of:

Air to refrigerant stainless steel heat exchanger.
Inverter controlled evaporator fan(s).
Evaporator coil will be constructed from copper tubing and aluminium fins.
Inverter driven, R410A, hermetic compressor.
The heating or defrost cycle will be controlled by a four way valve, which will reverse the cycle of the refrigerant to change the mode of the outdoor unit.
Selectable 'low noise' mode to reduce sound level at normal conditions if required.

The range of units shall be capable of operation down to the following ambient temperatures.

The performance de-rate due to low ambient air temperature must be minimal, the defrost cycle should be both ‘sensed’ and ‘timed’ by the control system.

Electrical Details

W140 model – TP&N 16A BS EN 60947-2 Fuse

ASHP Controls

The ASHP will able to interface with the space heating system by using the flow temperature controller module (FTC5) and shall operate as “slave” and “master” with the master being connected to the BMS. The FTC will be connected to the ECODAN unit by a 1.5 mm^2, 3 core and earth cable. A PAR-W21 remote controller will be connected to the FTC at commissioning for the initial setting of the water temperatures when in operation. The ECODAN will target these temperatures when in operation. A temperature sensor shall be included with the FTC and it will be strapped and insulated to the water flow pipe from the ECODAN. The PAR-W21 controller can be removed from the system after commissioning.

The water flow temperature that the ECODAN will target for the heating will be programmed into FTC using initial setting mode on the PAR-W21 controller. Different water temperatures can be programmed in for space heating.

LTHW Pump (P-01A/B) to be powered and controlled from the BMS. (Power and control wiring by BMS Contractor). The specified pump includes a variable speed drive which shall be utilized for commissioning purposes only, with fixed speed during operation.

The FTC will have the ability to vary the space heating flow temperature depending on the outdoor ambient air temperature (Heating Eco Mode). The outdoor unit shall have a built in outdoor ambient air temperature sensor. By adjusting the water flow temperature to suit the outdoor ambient air temperature the efficiency and COP are maximised. A maximum flow temperature will be set for the lowest outdoor ambient air temperature, and a minimum flow temperature for the highest outdoor ambient air temperature. When in heating ECO mode, the ECODAN will vary the water flow temperature between the two set values depending on the outdoor ambient air temperature. The ECO mode can be over-ridden and the ECODAN will target a designated temperature by utilising the ‘Boost’ facility. Before these temperature settings are programmed into the system the contractor shall liaise with the under floor heating specialist to ascertain any limits on the flow temperature with regard to performance.

The FTC will have the following additional inputs and outputs to and from BMS:

- Run/Stop
- Normal/Error
- Compressor Lock-Out

Installation of Heat Pump Unit

The installation and commissioning of the ECODAN system shall only be undertaken by a Mitsubishi Electric approved ECODAN installer (AEI's) as well as being a member of the Micro generation Certification Scheme (see RHI).

It shall be the contractors responsibility to locate the units to provide unobstructed air flow, access for servicing and maintenance and correct installation of pipe work. The units shall be complete with anti-vibration mats and located and securely fixed on a concrete pad or paving slabs with security fencing and a lockable access door. Unit(s) shall be complete with condense drain kit and trace heating, including relay to avoid condense freezing.

All field supplied pipework shall be connected to the unit(s) by two 600mm long braided steel flexible pipes on the flow and return connections, supplied with the unit. All internal and external pipework shall be insulated to ensure minimal heat loss and with external pipework having maximum weather protection. The insulation shall be closed cell foam insulation (armaflex or equivalent). All insulation joints shall be joined by tape/glue to reduce heat losses and with external pipework protected with an approved paint finish to prevent UV degrading.

Pipework shall be protected from freezing by adding FERNOX ALPHA-11 anti freeze inhibitor to the primary circuit at a concentration of 25% by volume or as recommended by the manufacturer. To aid in filtering and plate heat exchanger protection FERNOX TF1 shall also be added to the primary circuit, this shall be provided by with the ECODAN unit by the manufacturer.

A flow setter valve(s) shall be installed in the primary circuit to prove the required minimum flow rate for the system. These valves shall be provided with the ECODAN uni

Renewable Heat Incentive (RHI)

The contractor shall include for all necessary components and documentation submittals (including schematics) required for the user to successfully apply for the RHI non domestic scheme. The contractor (or sub-contractor) shall be a member of the Micro-generation Certification Scheme. The Contractor shall install OFGEN RHI compliant Class 2 heat meters with insertion type temperature sensors on flow and return pipework (Not Strap On). Heat meters shall have digital integrators with display and BACnet or Modbus protocol to interface with a BMS system to allow energy usage to be recorded and displayed on a user PC or the like.

Note: electrical supply to Air Source Heat Pumps shall also be metered and recorded through the same system, with the electric meters supply and installation being part of the Electrical installation.

Heat Pumps shall be supplied, installed and commissioned by ACROL Air Conditioning Co Ltd, Saltmeadows Road, Gateshead, Tyne and Wear, NE8 3AH.

Main Hall Fan Convector

A low temperature fan convector (FC-01) provides a heat boost facility in the main hall. The unit shall be located at high level in the roof void above the Store with supply and extract spigots through the partition wall with associated grilles fitted in the Hall. The Unit shall be powered from the BMS with a control temperature sensor located in the Hall. The Unit shall only be enabled when an adjustable, manually operated timer is activated by a member of staff to run the unit for 1 to 4 hours, all through the BMS.

Heating and Domestic Hot and Cold Water Services

Pipework

All pipework shall be copper tube to BS 2871 Part 1 Table X assembled with Yorkshire `YP' capillary ring fittings up to and including 54mm to BS 864 employing ‘lead free’ solder rings. For ease of maintenance compression type fittings shall be used at connections to equipment. All materials and fittings shall be non dezincifiable and shall meet the requirements of the current Water Regulations

Horizontal pipes shall have a gradient set to clear air at the vent points. All reductions in size on horizontal pipes shall be made with eccentric fittings. Careful observation of parallels and symmetry of arrangement is required throughout always providing that the air gradients are maintained. Where fixed along walls, floors or ceilings, the pipe surfaces, or if insulated, shall have a clearance of 25mm from walls, 100mm from finished floor level at the lowest points and 100mm from ceilings.

All pipes shall be fixed with sufficient clearance from obstructions capable of resisting expansion. All pipes and plant, where practicable, shall have a clearance of 150mm from electric cables and/or conduits. Domestic cold water pipework shall not be run adjacent or above “hot” pipes.

Pipework Insulation

The following services shall be thermally insulated:

- The LTHW Heating installation from ASHP to manifolds.
- The H&CWS Installations.

Insulation shall be carried out by an approved firm being a member of the Thermal Insulation Contractors' Association. Insulation shall not be applied to any service until all the systems have been tested and witnessed, and be in accordance with this specification. All surfaces shall be thoroughly cleaned down and damaged areas painted before insulation is applied.

The thickness of the insulation (based on a 'k value' of 0.04 W/mK) shall be in accordance with the details indicated in the following table.

Pipe Size mm	LTHW Htg	HWS	MCWS
15	25	30	30
20/22	25	30	30
25/28	25	30	30
32/35	25	40	30
40/42	25	40	30
50/54	25	40	30

Insulation materials containing CFCs or where CFCs are used in the manufacturing process shall not be permitted.

Insulation Materials

Insulation material for pipework shall be mineral rock fibre rigid sections complying with BS 3958 Part 4; BS 5422, BS 476 Part 4 or 'Koolpen'. The insulation shall be finished in aluminium paper foil providing a Class 'O' surface spread of flame with all joints sealed. Bends and fittings shall be insulated with similar sections neatly mitred to fit with all joints sealed with aluminium tape.

Insulation of all valves and flanges in plant spaces shall be by fully insulated with purpose made ceramic filled valve/flange jackets neatly sewn throughout complete with velcro band fasteners and draw chords.

Identification of Services

The Contractor shall include for the identification of all services which shall be in accordance with BS 1710.

For pipework basic colour bands shall be placed either side of the safety colour band and shall be a minimum width of 75mm for diameters up to 50mm and 150mm wide for diameters above 150mm. Basic colour bands shall be located at all valves, junctions, service appliances, structural and fire penetrations, access openings to ducts and voids and at intervals not greater than 3 metres throughout the pipework installation. The band shall be

provided 75mm wide, showing direction arrows. The arrows and shall be black on a white background. The band shall be provided with lettering indicating the contents of the pipe. The lettering shall be black on a white background 10mm high for insulation diameters less than 50mm and 38mm for diameters greater than 50mm.

Expansion Devices and Anchoring

Expansion of pipework shall be taken up by the natural offsets and changes of direction of pipe runs and the installations shall be such to accommodate this expansion; alternatively expansion devices shall be fitted as specified

Anchoring of pipework shall generally comply with BS 3974 Parts 1 and 2 provided with steel brackets rigidly attached to the structure. Pipes shall be secured and guided such that they do not deform or become overstressed.

Fixing to Structural Steelwork

Welding to, or fixing beam clamps to, structural steelwork for brackets, supports or anchor points shall not be permitted without the approval of the Engineer. Drilling of structural steelwork for fixing of services will not be permitted without prior approval by the Engineer.

Brackets and Hangers

All brackets and hangers shall be fitted with special attention to freedom for expansion either in horizontal or vertical planes and for air elimination and drainage. Supports for pipework shall be arranged to allow freedom for expansion movement.

Where it is not practicable to use standard commercially manufactured brackets, the Contractor shall supply and fix suitable purpose made supports to suit the positions. All pipelines shall be individually supported; pipes slung from other pipes shall not be permitted.

All metal supports, tees, angle and channel iron, screws, bolts, etc. shall be provided and fixed by the Contractor who shall be responsible for the accurate setting out of same.

Table of Maximum Spacings for Pipework Supports

	Horizontal Spacings Metres			**Vertical Spacings Metres**		

Nominal Pipe Size mm	Steel or Iron Pipes	or UPVC ABS Pipes	or Copper Pipes	Steel or Iron Pipes	or UPVC ABS Pipes	or Copper Pipes
15	1.8	0.8	1.2	2.4	1.2	1.8
20	2.4	0.8	1.2	3.0	1.2	1.8
25	2.4	0.9	1.5	3.0	1.3	2.4
32	2.4	1.0	1.8	3.0	1.5	3.0
40	2.4	1.1	1.8	3.7	1.6	3.0
50	2.4		1.8	3.7		3.0

Supports Ceiling in & Roof Voids

Pipe supports shall be Flamco Type A clips supported from drop rods on Unistrut members either spanning between purlins or secured to the structure. In roof voids the Unistrut shall be clamped/bolted to steel roof supports (see above).

Brackets shall be malleable iron for steel pipes and brass for copper pipes.

Except where otherwise specially stated on drawings, horizontal and vertical pipes shall be supported at intervals not greater than those given in the above table.

Pipe Sleeves and Cover Plates

All pipes passing through walls, floors, ceilings, etc. shall be provided with a loose fitting sleeve keyed into the structure, finished flush with wall, floor except in bathrooms and toilets where they shall have a 15mm upstand above the floor or ceiling and complete with Flamco RKW white plastic Escutcheons. Wall sleeves shall not be used as supports for pipes and pipes shall in all cases be clear of the sleeves at all points.
Pipe sleeves shall, in all cases, be manufactured from the same material as the pipework conveying the service.

Isolating Valves

Sizes up to and including 50mm shall be Crane Fig. D155C/D151A/D237A gate valve, solid wedge disk, non rising stem, screwed in bonnet handwheel or lockshield pattern as applicable, threaded to BS 21, pressure rating PN20 or equal and approved. Alternatively, Crane Fig. D171 ACEXS improved leak resistance, bronze ball valve, quarter turn, lever operation, with extended stem to suit insulation thickness shall be used, include for adaptor kits for copper pipe. All valves on domestic Hot and Cold Water Services shall be WRAS approved.

Double Regulating Valves (DRV)

Sizes up to and including 50mm shall be Crane Fig. D921/ D923 double regulating valve (Y-Pattern globe valve incorporating a characterised throttling disk), 1" to 2" taper threaded to BS EN 10226-2 (ISO 7 – 1), ½" and ¾" parallel threaded to BS EN ISO 228-, pressure rating PN25, include for adaptor kits for copper pipe, or equal and approved.

Fixed Orifice Double Regulating Valves (FODRV)

Sizes up to and including 50mm shall be Crane Fig. D933/ D934 double regulating valve (Y-Pattern globe valve incorporating a characterised throttling disk), 1" to 2" taper threaded to BS EN 10226-2 (ISO 7 – 1), ½" and ¾" DN15 & DN20 parallel threaded to BS 2779 EN ISO 228-, pressure rating PN25, include for adaptor kits for copper pipe, or equal and approved.

Commissioning Valve Sets (CS)

Sizes up to and including 50mm shall be Crane Fig. D942, D941 or D940 depending on flow rate, fixed orifice double regulating valve, 1" to 2" threaded to BS EN 10226-2 (ISO 7-1), ½" and ¾" DN15 & DN20 BS 2779 (ISO 228) pressure rating PN25, include for adaptor kits for copper pipe, or equal and approved.

Check Valve (NRV)

Sizes ¾" to 3" shall be Crane Fig. D138, depending on flow rate, bronze swing check valve with metal disk, taper threaded to BS EN 10226-2 (ISO 7-1), pressure rating PN25, include for adaptor kits for copper pipe, or equal and approved.

Strainer (STR)

Sizes 15mm to 50mm shall be Crane Fig. D298 for heating and D297 for domestic (WRAS approved), bronze body to BS EN 1982 CC49K, stainless steel mesh to A.I.S.I type 304, taper threaded to BS EN 10226-2 (ISO 7-1), pressure rating PN16, include for adaptor kits for copper pipe, or equal and approved.
Each Heat Pump shall be fitted with heat pump manufacturers type F1 filter.

Ballofix Isolation Valve (BV)

To be installed at every domestic hot and cold water outlet, sizes 15mm to 28mm shall be Pegler ballofix isolating valve, straight pattern, compression ends, DZR brass, commercial chrome finish, WRAS approved, or equal and approved.

Thermostatic Mixing Valves (TMV)

Thermostatic mixing valves shall be CRANE D1089 TMV3 complete with integral strainer, check valves, isolation valves and tamper proof adjustment. TMV shall be tested and certified to the requirements of D08 specification under TMV3 scheme. Valves shall be

installed on all domestic hot water outlets on wash hand basins in public and assisted WC's, compression ends, DZR brass, commercial chrome finish, WRAS approved, or equal and approved.

Air Vents

Air cocks and air bottles shall be provided and fixed in the positions indicated on the drawings and where they may be required to vent the installations. Three air cock keys shall be handed to the Employer. Automatic air vents shall be installed at all high points in the system in order that the full system is automatically vented. These shall be Flamco Flexvent Super installed complete with an isolating ball valve.

Drain Cocks (DC)

The Contractor shall fit drain cocks to ensure that the entire system can be drained down. Drain cocks in Plant Rooms shall be of the gunmetal plug type with interchangeable hose unions and loose level handles. Emptying cocks above floors shall be fixed as unobtrusively as possible and are to be brass draw-off plugs type.
Drain cocks shall be provided to allow all sections of the hot and cold water services to be drained down. Drain cocks shall be Crane Fig. D341, WRAS approved, or equal, positioned such that the hose connection can be easily made. Provide 3 no. operating keys.

Thermometers.

Provision shall be made for temperature measurement by installing thermometer pockets in the positions indicated on the drawings and where specified. Pockets shall be stainless steel and comply with BS 2765 with external threads for attachment to the pipework and internal threads to accept the detecting element of a thermometer. Fittings shall be arranged so that the thermometer can be easily read from an access area. Pockets shall be filled with an approved paste or oil to ensure an accurate reading.

Thermometers shall be mercury in steel direct monitoring type with 100mm dial complying with BS 5235. The dial shall be graduated so that the normal working temperature is in the midpoint of the scale.

Pressure Gauges

Provision shall be made for pressure measurement by installing gauge connections in the positions indicated on the drawings and where specified. Gauge connectors shall comprise copper syphon pipe to BS 2871 Table X complete with gauge cock. Gauge cocks shall be bronze construction with lever handles and ends screwed to BS 21 to suit connections to the pressure gauge. Pressure gauges shall be direct mounting Bourdon type with 100mm dials complying with BS 1780 scaled in kPa on the outer scale and bar on the inner scale. Each pressure gauge shall be complete with an adjustable red pointer which can be set at the normal working pressure of the system. Pressure gauges shall have dials calibrated to read from zero to 1.3 times and not more than twice the operating pressure.

Ventilation

Supply, install and commission the ranges of ductwork as shown on the drawings.

The Ductwork Manufacturer and installer shall be a member of the Heating and Ventilation Contractors' Association Ductwork Group. Notwithstanding any sets, offsets and changes of section indicated on the drawings the Contractor shall allow for all ductwork sections which are required for the installations.

Ductwork shall be constructed and installed in accordance with HVCA Document DW 144 for low velocity ductwork systems.

Extract Ventilation

Kitchen extract fan EF-01; shall be located in roof space above kitchen and discharging through 2 no roof tiles. The fan shall be complete with ON/OFF speed controller mounted on wall (see schedule).

Main Hall extract fan EF-02; shall be located in roof space above the hall and discharging through a wall mounted louvre. The fan shall be complete with ON/OFF speed controller mounted on wall (see schedule).

WC extract fan EF-03; shall be located in roof space above the hall and discharging through a wall mounted louvre. The fan shall be a cabinet twin type with duty and standby with auto change over from a type 149-ACO14E factory controller, the extract fan shall operate by activation of one of four PIR detectors for an adjustable predetermined period, this function and power shall be controlled by the BMS (see schedule).

IT Room and Office extract fan EF-04; shall be located in roof space above the Hall Store and discharging through a wall mounted louvre. The fan shall be complete with ON/OFF speed controller mounted on wall (see schedule). Extract ventilation is to be provided in the IT Room and extract ventilation provided in the adjacent Office with a transfer grille in the connecting door.

BMS Operation Description

All electrical wiring works associated with the control system shall fully comply with BS7671:2008 17th edition IEE wiring regulations.

The heating is provided via two Air Source Heat Pumps, Mitsubishi PUHZ-HW140YHA2 each with a FTC2B BMS interface unit which will allow the BMS to monitor and display; Unit Running, Error and Defrost with BMS ON/OFF control. Duty and Standby LTHW circulation pumps, the BMS shall start the pumps and prove flow before starting the ASHP's; it is the intension that the LTHW heating system operates 24/7 with night set back to 15^{o}C, however with the facility to stop the ASHP's if there is NO flow in the system. The LTHW under floor heating system comprises of three multi-zone manifolds, each fitted with circulation pumps which shall circulate LTHW to the under floor heating zones at 45^{o}C flow and 40^{o}C return and each of the manifolds and subsequent zones shall be self controlling by the under floor

heating manufactures control system described elsewhere in this specification, however the BMS shall allow for 3 universal inputs from the three manifolds. The Main Hall shall also be provided with a low temperature fan convector, this shall operate as a timed heating boost facility. The fan convector shall operate from the BMS with an adjustable timer located in the hall which shall allow the fan convector to only run when the timer is activated for an adjustable 1 to 4 hour period and then be controlled by a wall mounted temperature sensor set at 20°C.

Toilet extract fan EF-03 is a cabinet twin fan assembly with duty and stand by fans with auto-switch over facility provided by the extract fan manufacturer. The fan shall be powered from the BMS on activation of one of four PIR occupancy detectors located in the Assisted WC, Cleaners Cupboard, Male WC and Female WC.

A requirement for the ASHP installation shall be that it is OFGEN RHI compliant and will require the metering and logging of the energy consumption with a graphic display from two electric meters (provided and installed by the electrical contractor) and one heat meter, class 2 conforming to MID-MI004, this meter and flow and return temperature sensors shall be provided by the BMS contractor and installed by the Mechanical contractor.

An additional two BMS temperature sensors shall be provided and installed by the BMS contractor, one located in General Purpose Room 13 to sense and record room temperature and a second located outside the Plant Room to sense and record the outdoor temperature.

BMS Points Schedule

Point Description	AI	AO	DI	DO	SW	Field Equipment
MCP1						
Electric Meter 1					1	Meter by others
Electric Meter 2					1	Meter by others
LTHW energy meter	1					Energy meter class 2 MID
Heating Pump Set				2		Enable & Trip
Pump DPS			1			FD113
Outside air temp sensor	1					QAC22
PIR 1 Cleaners Cupboard			1			24v ac PIR wired in parallel
PIR 2 Assisted WC						24v ac PIR wired in parallel

PIR 3 Male WC						24v ac PIR wired in parallel
PIR 4 Female WC						24v ac PIR wired in parallel
Room temperature sensor	1					QAA24
Immersion temperature sensor Flow	1					QAE2120.010
Immersion temperature sensor Return	1					QAE2120.010
Extract fan EF03			1	1		Enable, Fault
ASHP-01			2	1		Enable, Fault
ASHP-02			2	1		Enable, Fault
ASHP / UFH high limit stat			1			RAK
Fan Convector 01				1		Enable
FC-01 adjustable timer			1			1-4 hourTimer
Total i/o points count	**5**	**0**	**9**	**6**	**2**	

MCP 1 Outstation Equipment

1 x PXC22.1-E.D Controller
1 x TXi2.open module
1 x PXM30 fascia touch screen

Proposed MCP1

The control panel will be single section, measuring approx. 1000mm High, 800mm Wide, 300mm Deep c/w a 63A Door Interlocked Isolator.

Single Phase Power supplies

1 No. Panel internal socket for laptop use
1 No. EF-03 (1.9A Max)
2 No. Heating pumps (500w Max)
1 No. FC-01 (60w Max)

Three Phase Power supplies

2 No. ASHP (13A / phase)

Indicator Lamps

1 No. Power Live
1 No. Control circuit Fault lamp
2 No. ASHP enabled
2 No. ASHP fault
2 No. Pump enabled
2 No. Pump fault
1 No. Pump circuit flow failed
1 No. EF Enabled
1 No. EF Fault
1 No. FC01 Enabled
1 No. FC01 Fault
1 No. High limit hold off

Fascia Switches

2 No. ASHP On/Off/Auto
1 No. Pumps No1/Off/Auto/Off/No2
1 No. Extract fanOn/Off/Auto
1 No. FC-01 On/Off/Auto
1 No. Lamp test push button

All necessary breakers and interlocking relays, fully numbered wiring to outgoing terminals

Equipment Schedule

Device	Quantity
LTHW ultrasonic HID approved energy meter 40mm	1
Immersion DPS	1
Immersion limit thermostat	1
Outside temperature sensor	1

Room PIR ceiling mounted 24v ac	4
Immersion temperature sensors	2
Extension timer	1
Room temperature sensors	2

The BMS control system shall be provided and installed by the following, the contractor shall base tender sum upon this with no alternatives.

Ted Mason – Regional Manager

E.ON Control Solutions Ltd
Swale House
Mandale Business Park
Belmont Industrial Estate
Durham
DH1 1TH
Tel. Office: 0191 376 0060
Tel. Mobile: 07968 443 675

Email: ted.mason@eon-controls.com

Quote Reference: TM – Q127160

Testing and Commissioning

The Contractor shall include for the Testing and Commissioning of all the systems and plant installed under this contract.
Commissioning generally shall be carried out in accordance with the CIBSE Commissioning Codes and Publications.
Testing of all the various systems and plant installed under this contract shall include pressure tests, heating and contraction tests, calibration and operation tests to ensure that the whole of the contract is handed over in proper working order.
It is the Contractor's responsibility as part of commissioning to ensure that free movement is obtained at maximum expansion on all heat carrying systems.
The Contractor shall include for costs of all necessary attendance, labour, fuel, materials, electricity, heat, temporary equipment, tools and instruments required to carry out the Testing and Commissioning procedure.
The Contractor shall include for all arrangements to enable the Architect or his representative (including Insurance Company's Inspector) to test and inspect as

required at manufacturers works plant and equipment during the manufacturing and erection stages.
The Architect or his appointed representative shall be present to witness all aspects of on-site tests.
The Architect shall be given 5 working days' notice of all intended on site tests.
The Contractor shall include in his tender for the proper filling, venting and draining of all installations or sections of installations and make due provision for suitable disposal of the testing media, and shall make good all defects arising out of or caused by tests. If the test pressure is not maintained for the specified period the Contractor shall make good any weak joints, defective fittings or plant and repeat the test in the presence of the Architect or his appointed representative until the test conditions are maintained.
Certification of all tests made on site or at manufacturers works shall be forwarded to the Architect for his approval.
All tests shall be carried out and approved before any paint, thermal insulation or similar cladding material is applied to pipes or plant and before any services are concealed within the building structure.
Where necessary a separate set of drawings shall be provided by the Architect for the purpose of accurately recording site tests.
All site test certificates shall be signed by the Contractor and by the Architect or his representative appointed to witness the test.
When systems have been tested and drained down they shall be flushed out and/or cleaned and left ready for subsequent commissioning
The Contractor shall include for the necessary filling, recharging, venting and the like of the system and plant to allow commissioning to proceed at times to be agreed with the Architect.
When hot and cold water service pipes, fittings, pumps, plant, tanks, calorifiers and the like are newly installed, extended, renewed or in any way broken in sections or as a whole, the Contractor shall allow for suitable chlorination treatment (in conjunction with the supplying authority) and flushing out followed by confirmatory tests to ensure that bacteriological contamination is not present.
Sterilisation of the HWS/CWS installation shall be carried out in accordance with BS 6700, Section 3, Clause 13.9 on Page 61 and DHSS Code of Practice "Prevention of Legionellae" testing procedures. Installation and commissioning of such systems shall comply with CIBSE Publications TM13 and GN3 (1993).

All test certificates shall include the following particulars:-

Plant and Equipment

All plant and equipment specified of this specification shall be tested either on site or at the manufacturer’s works in accordance with the appropriate British Standards and Statutory requirements.

Heating Systems

The whole of the heating system shall be subjected to a hydraulic test pressure of twice the working pressure or 3.40 bar whichever is the greater; the test shall be maintained for a period of not less than one hour or as is necessary to inspect the whole of the installation.
Note: Under floor heating pipework may not be able to sustain the same test pressure as the main distribution pipework and therefore the two systems shall be tested separately.

Hot Water Services Systems

The whole of the Hot Water Service installation shall be subjected to a hydraulic test pressure of twice the working pressure or 3.40 bar whichever is the greater for a period of one hour or as long as is necessary to inspect the whole of the system.

Cold Water Services Systems

The whole of the main cold water supply systems shall be subjected to a hydraulic test pressure of twice the working pressure or 6.80 bar whichever is the greater for a period of one hour or as long as is necessary to inspect the whole installation.

Ventilation System

All ventilation systems shall be operated under normal working conditions during which time all joints shall be tested for air, water or steam leaks and all air inlets and/or outlets tested.

The systems generally shall be tested to conform with DW 144.

Commissioning

After the foregoing tests have been satisfactorily completed by the Contractor and at the appropriate stage of the works the Contractor shall carry out the necessary commissioning procedures which shall include the following:-

a) Setting to work all systems and plant together with associated control systems as specified and ensuring that the performance requirements have been achieved.

b) Balancing and regulating all systems and plant to meet specified performance requirements shall include the preparation of records/drawings giving the following typical information:-

i) External Conditions DB/WB.

ii) Circuit flow and return temperatures.

iii) Internal space temperatures DB/WB.

iv) Air flow volumes, relating to ventilation systems.

v) Settings of all circuit regulating valves and dampers.

vi) Settings of all automatic control elements and the like.

vii) Pressures and flow developed by pumps.

viii) Water draw off temperatures.

Mechanical and Electrical Services Builders Work

- External concrete pad for mounting ASHP's; 800mm wide x 2800mm long x 150mm high above ground level.
- Provide purpose made Security Enclosure for ASHP's, to be chain link type to provide free air flow. Enclosure shall be fixed to wall and base and enclosing ASHP's on three sides, 800mm wide x 2800mm long x 1500mm high. Enclosure shall be removable to allow maintenance to the units.
- Additional timber supports in roof truss structure to support Fan Convector Unit 60kg.
- Frame out partition wall between Main Hall and Store at high level to accept two grilles; 1500mm long x 150mm high.
- Provide, frame out and build-in 4 no 600mm x 600mm access panels into plaster board ceilings. The access panel in the kitchen shall be 1 hour fire rated. All access panel locations shall be agreed with Mechanical Contractor before installation.
- Build in and provide 3 no 100mm diameter ducts in plant room floor to accept Mains Cold Water Services, Mains Electrical Supply and Data.
- Form holes in external walls to accept ventilation louvres; 1 no 600mm x 400mm, 1 no 1000mm x 600mm and 1 no 500mm x 500mm.
- Build in 2 no vent tiles into roof tiles above kitchen for EF-01 exhaust.
- Undercut doors D06, D11, D12 and D16 by 25mm.
- Form hole in door D05 300mm x 300mm to accept air transfer grille.
- Excavate trench for incoming mains water services from existing service, approximately 600mm wide x 1100mm deep x 50 M long. Cover top and bottom with sand/pea gravel and back fill with graded material.
- Excavate trench for power cables to lighting bollards and car park lighting columns, approximately 500mm wide x 700mm deep x 110 M long. Cover top and bottom with sand/pea gravel and back fill with graded material.

- Provide 4 no concrete bases for bollard lighting, 300mm wide x 300mm long x 300mm deep, cast in base and flange plate to accept bollard.
- Provide 3 no concrete bases for car park lighting columns, 800mm wide x 800mm long x 1000mm deep or as recommended by manufacturer.

Maintenance Manuals

The Contractor shall furnish to the Engineer before Practical Completion* three copies of the Operation and Maintenance Manual. A copy of the complete set of manuals shall also be provided on a CD disc compatible with the Employers computer system.

The manual shall be of the loose-leaf lever arch type A4 size, having stiff covers, cardboard sub-divisions for each section, a ready means of reference and a detailed index.

The manual shall contain full Operating and Maintenance Instructions for each item of equipment presented in a form to deal systematically with each system and shall include for, but not be limited, to the following:

- Health and Safety Information
- Risk Assessment for the installations.
- Plant with nameplate details.
- Valves
- Automatic control items and systems and control settings.
- Type of lubricant required for each item and frequency of lubrication.
- Legend for colour coding of all services.
- Internal wiring diagrams of equipment and panels.
- Procedures for fault finding.
- Procedure to adopt in an emergency should any item fail in its operation.
- Itemised lists of essential and secondary spares for all plant and equipment.
- Index of As Fitted Drawing numbers and titles.
- Records of Performance Tests.

The manual shall contain Manufacturer's standard Operating and Maintenance Instructions and leaflets where these are applicable. Where the equipment is non-standard then information for the manual shall be obtained by the Contractor from the Manufacturer.
Standard `hand-out' cards supplied by the manufacturers with the equipment shall be fixed by the Contractor to plant room walls adjacent to the equipment.

Mechanical and Electrical Services Builders Work

- External concrete pad for mounting ASHP’s; 800mm wide x 2800mm long x 150mm high above ground level.

- Provide purpose made Security Enclosure for ASHP's, to be chain link type to provide free air flow. Enclosure shall be fixed to wall and base and enclosing ASHP's on three sides, 800mm wide x 2800mm long x 1500mm high. Enclosure shall be removable to allow maintenance to the units.
- Additional timber supports in roof truss structure to support Fan Convector Unit 60kg.
- Frame out partition wall between Main Hall and Store at high level to accept two grilles; 1500mm long x 150mm high.
- Provide, frame out and build-in 4 no 600mm x 600mm access panels into plaster board ceilings. The access panel in the kitchen shall be 1 hour fire rated. All access panel locations shall be agreed with Mechanical Contractor before installation.
- Build in and provide 3 no 100mm diameter ducts in plant room floor to accept Mains Cold Water Services, Mains Electrical Supply and Data.
- Build in and provide 1 no 100mm diameter duct in Hall Store Room floor to accept out going Electrical Supply to exterior lighting columns and bollards.
- Form holes in external walls to accept ventilation louvres; 1 no 600mm x 400mm, 1 no 1000mm x 600mm and 1 no 500mm x 500mm.
- Build in 2 no vent tiles into roof tiles above kitchen for EF-01 exhaust.
- Undercut doors D06, D11, D12 and D14 by 25mm.
- Form hole in door D05 300mm x 300mm to accept air transfer grille.
- Excavate trench for incoming mains water services from existing service, approximately 600mm wide x 1100mm deep x 50 M long. Cover top and bottom with sand/pea gravel and back fill with graded material.
- Excavate trench for power cables to lighting bollards and car park lighting columns, approximately 500mm wide x 700mm deep x 110 M long. Cover top and bottom with sand/pea gravel and back fill with graded material, provide surface to suit.
- Provide 4 no concrete bases for bollard lighting, 300mm wide x 300mm long x 300mm deep, cast in base and flange plate to accept bollard.
- Provide 3 no concrete bases for car park lighting columns, 800mm wide x 800mm long x 1000mm deep or as recommended by manufacturer.