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1607 Chinley Community Centre

MECHANICAL SERVICES SPECIFICATION

Introduction

The works comprise the supply and installation of new Mechanical Services to new build community centre in Chinley, Lower Lane, SK23 6BE. Refer to the Architect's drawings and associated documentation for further information.

The Main Contractor shall employ a Mechanical Services Contractor to undertake the works detailed in this specification. The Mechanical Contractor shall have broad experience of undertaking projects of a similar nature and value.

This specification shall be read in conjunction with the Architectural Specification and Drawings, the Electrical Drawings, the Mechanical Services Specification and Drawings and the Structural Engineers Specification and Drawings.

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

The Contract includes the supply, delivery to site, off-loading, positioning, installation and commissioning of all items of equipment and materials required for the following works including all skilled and unskilled labour and all incidental items necessary for the full completion of the Mechanical Services Installation ready for handing over to the Client in working order and in accordance with the agreed programme. Throughout this specification the word 'Contractor' shall read as meaning Mechanical Engineering Services Contractor.

Chinley 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

The under-floor heating system shall be contractor design portion of this project and as described in this specification. 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 mains water supply shall be taken to new plant room and shall distribute to serve Accessible Changing, WC's, Shower, Cleaners Closet and Kitchen. The domestic hot water shall be provided by instantaneous electric water heaters WH-01, WH-02 and WH-03 as described in schedule, each water heater shall be complete with un-vented kit if required.

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

Contractor shall include for fitting 2 no electric showers provided by main contractor.

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. Drain cocks shall be located at all low points.

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, Accessible Changing, Shower Room and Cleaners Closet and additional Extract Ventilation shall be provided in the Main Hall and Social Space to augment the Natural Ventilation strategy.

Programme

Commencement and completion on site shall be agreed with the Main Contractor and shall be in accordance with the Main Contractor's Programme of Works. The Contractor shall pay particular attention to site access and traffic restrictions, noisy work limitations and permitted working hours, the details for which are contained within the Main Contract Conditions of Contract and Preliminaries.

Allowance for such factors shall be included within the tender. Claims for lack of knowledge shall not be considered.

Co-ordination, prior to the installation of any equipment the Contractor shall agree with other trades, the location of equipment, routes for ductwork, pipework, cables, trunking, etc. in order to avoid friction between the trades. This shall include all structural elements and services running through or adjacent the respective areas.

Installation Requirements

All services shall be installed to achieve reliability and disruption free operations. All components shall be fully accessible for maintenance and replacement. Items requiring regular adjustment or affording isolation facilities, where located in concealed positions shall

have removable access covers, tiles, or other suitable provision made to afford ease of access.

Contractor to satisfy himself that all plant spaces are adequate to house all items of plant as described.

All services shall be installed with all aspects of Health and Safety at Work fully considered. All systems shall be installed to be economical in operation and particular emphasis shall be placed on the use of energy conserving design techniques and reliable components.

When preparing installation drawings, the Contractor shall have due regard for all aspects of the building design, location of all proposed services and shall make himself aware of any co-ordination problems which need to be resolved before the installation commences.

The Contractor shall retain on site a full set of up to date drawings, marked up showing current progress including any agreed amendments and these shall be available for inspection at all times.

All dimensions given on drawings shall be verified by the Contractor on site before the installation commences. The Contractor shall comply fully with Section (Inspection and Testing) of this specification. The Contractor's attention is drawn to the requirement to comply with Building Regulations.

This includes the requirement to comply with Part L – Conservation of Energy. In addition to suitable metering of energy usage, energy saving measures must be provided, including photoelectric and presence detection for lighting.

Tender and Summary

Tenders shall comply strictly with the specification and shall not deviate from it. Should anything be omitted from this specification which is normally considered necessary for the proper operation of the proposed plant or compliance with any relevant code, standard or regulation, the contractor shall include for the provision of all materials and the execution of the associated works so omitted to the reasonable satisfaction of the project manager (pm) or his appointed representative, as if they were specified herein. Any costs or savings occasioned by departures from the specification shall not be included in the tender figure. Such extra costs or savings, together with a clear description of the variation(s) or deviation(s), shall be submitted separately at the time of tendering.

The Contractor shall complete all sections and elements of the Summary of Tender enclosed with this specification and return it with the tender submission.

The Contractor shall provide the following minimum information:

- Properly completed tender summary sheets.
- Schedule of proposed manufacturers for plant and equipment where not uniquely specified.
- Proposed programme identifying design and installation periods and key procurement dates.

The Contractor shall note that this project shall be carried out in accordance with the Health & Safety Executive Construction (Design and Management) Regulations 2015.

The Contractor shall include in the tender for complying with the CDM Regulations 2015 in full and as detailed in the Main Contract Preliminaries.

Builders Work

The builders work associated with the Mechanical Installation works shall be executed by the Main Contractor. The builders work comprises the elements of building work necessary to incorporate the services installation into the building/structure, fabric and finishes including cutting out of all chases, holes, forming openings and pipe sleeves, provision of supports/noggins in walls to accommodate fixing of services equipment and the provision of plywood backboards for the support of ceiling mounted grilles, etc.

The Contractor shall be responsible for marking out builders work where required.

All making good and painting shall be carried out by the Main Contractor.

Fire Stopping of small holes shall be coordinated with the main contractor. the contractor shall identify on layout drawings any small holes formed for the routing of services that breach the fire compartment walls.

The contractor shall include for all access equipment, lifting tackle, scaffolding, manual handling equipment, personal protective equipment and site operatives to enable all materials required for the works to be safely delivered, moved around the site, hoisted into position and installed.

The following is a schedule of the builder's work which shall be adopted as guidance only and shall be not limited to it:

Mechanical Services Builders Work

- External concrete pad for mounting ASHP's; 1300mm wide x 2250mm long x 150mm high above ground level. Dimensions to be confirmed by Mechanical Contractor.
- 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, 1300mm wide x 2250mm long x 1500mm high. Enclosure shall be removable to allow maintenance to the units. Dimensions to be confirmed by Mechanical Contractor and to be confirmed as suitable by Architect before installation (see Main Specification) .
- Provide, frame out and build-in 2 no 600mm x 600mm access panels in the corridor ceiling adjacent to Kitchen and shall be fire rated as required by Architects drawings. All access panel locations shall be agreed with Mechanical Contractor before installation.
- Provide support frame within wall construction to accept surface mounted Fan Convector 1500 x 700, 60 kg unit.
- Build in and provide 1 no 100mm diameter duct in plant room floor to accept Mains Cold Water Services.
- Form holes in external walls to accept ventilation louvres; 2 no 300mm high x 1150mm wide, 1 no 300mm high x 300mm wide.

- Undercut doors; 5 no 10mm and 3 no by 25mm.
- Excavate trench for incoming mains water services from existing service, approximately 600mm wide x 1100mm deep x 55 M long. Cover top and bottom with sand/pea gravel and back fill with graded material.

Tender Drawings

DRAWING NUMBER	DRAWING TITLE
CHIN-D3A-00-00-DR-M-5601	Proposed Ventilation
CHIN-D3A-00-00-DR-M-5602	Proposed Domestic Hot + Cold
CHIN-D3A-00-00-DR-M-5603	Proposed Heating
CHIN-D3A-00-00-DR-M-5604	Proposed External - Mechanical

Under Floor Heating

The underfloor heating shall be a “contractor design” however manifold locations and piping arrangements are shown on drawing 1607_ (56) _001 for coordination purposes any deviation from these shall be deemed to be included in the tender as with any subsequent builders work and/or electrical work.

Warmafloor (GB) are the preferred underfloor heating manufacturer, however alternatives may be put forward and identified at tender on an equal and approved basis.

The wet underfloor heating system (UFH) shall be designed, installed and commissioned by Warmafloor (GB) Ltd. Quotation number 34553

The Warmafloor Composite Blending Manifold, with BBA CERT.10-4738 accreditation, shall be installed to operate the UFH flow and return temperatures at 55°c flow / 50°c return subject to design criteria.

The manifold shall include AAV valve assembly, flow indicators, pressure and temperature gauges, isolating valves, thermal actuators, thermostatic control valve, Grundfos Alpha 2L 15-60 circulating pump and high limit flow protection thermostat, to interrupt the power supply, in the event the flow temperature exceeds a recommended safe level. Although flow temperatures should not exceed 55°c contractor shall include for pump and control valve assembly.

Pipework shall be a 5 layer polybutylene with an EVOH oxygen barrier layer in 16 or 20mm. The pipe shall carry a warranty of 100 years and manufactured in the UK.

Each individual zone shall have dedicated circuits controlled by the Sentio control system. The controls shall have the ability to protect floor finishes against overheating.

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.

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

contract to liaise with electrical contractor to set out thermostat locations provided by underfloor heating contractor.

Outside the occupancy period the underfloor 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 Architectural drawings. 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 Mitsubishi 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 R32 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, R32, 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

PUZ-W112VAA model – SP&N, Nominal running current 10.9 A, Maximum 28 A

ASHP Controls

All controls described below shall be confirmed as applicable to current standards and applications set out by the manufacturer regardless.

The ASHP will be able to interface with the space heating system by using the flow temperature controller module (FTC-2B) and shall operate as "slave" and "master". 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) shall be operated by the Heat Pump control system via a relay and power from the RHI metered electrical supply. 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.

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 unit.

The contractor (or representative) shall be a member of the Micro-generation Certification Scheme (MCS). 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.

Note: The electrical supply to Air Source Heat Pumps and LTHW pumps shall also be metered, 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 Convectors

A low temperature fan convector (FC-01) provides a heat boost facility in the Hall. The unit shall be surface mounted at high level.

Pipework and Fittings

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.

Dosing Pot
Supply, install and commission Chemical Dosing pot 3.5 L complete with mounting bracket, system connections, level action isolation valves etc.

Expansion Vessel
Supply and install suitable expansion vessel on heating circuit with 25% glycol mix or as specified by ASHP manufacturer.

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 two roof tile vents. Contractor shall construct ducting to suit this arrangement. 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 upper storeroom at high level and discharging through a wall mounted louvre. The fans shall be complete with ON/OFF speed controllers mounted on wall (see schedule).

Social Space extract fan EF-03; shall be located in roof space above the Change 02 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-04; shall be located in roof space above the Change 02 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 PIR detectors for an adjustable predetermined period.

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, 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 Legionella" 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 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.

Operation and Maintenance Manuals

Digital cad files shall be provided by the consultant for the contractor, to be digitally updated for the provision of “as fitted drawings” to be incorporated in to the O&M manuals.

The Contractor shall furnish to the Engineer before Practical Completion two 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.