



MECHANICAL SERVICES INSTALLATION SPECIFICATION

for

MITCHELLS & BUTLERS PLC

INN KEEPERS LODGE

1-3 YORK STREET (BROWNS), MANCHESTER

Date: 22ND December 2025

Ref: B3322-BMT-SP-M-FI_40_80_1000

Issue: T1

Building Management Technology Ltd

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MECHANICAL & ELECTRICAL SERVICES PROJECT INFORMATION SHEET & BRIEF – B3322

Brand	IKL MANCHESTER
Site Name & Address	1-3 YORK STREET MANCHESTER
Build type	NEW BUILD
Designer	ALLISON PIKE
Quantity Surveyor	GLEEDS
Structural Engineer	EGNIOL CONSULTING
BREEAM?	YES – VERY GOOD
Electricity Capacity	138 KVA / 200Amps – NEW SUPPLY
Gas Capacity	N/A
Water capacity	2.8 l/s at 3.0 bar – 3000L STORAGE TANKS & BOOSTER
Main plant locations	BASEMENT
Plant deck construction by?	N/A
Noise Constraints?	YES, PLANNING RESTRICTIONS
Planning restrictions?	YES – LISTED BUILDING
Main Heating type?	VRF HEAT RECOVERY R32
Main Heating fuel?	ELECTRIC
Main Aircon / Ventilation types?	VRF HEAT RECOVERY & HEAT RECOVERY VENTILATION
Water Heating type?	ELECTRIC – 3No 300DDDD CYLINDERS
Kitchen canopy primary filters?	NO COOKLINE
ESP?	N/A
UV System?	N/A
Odour Control?	N/A
Fine Filtration?	N/A
Kitchen Extract Discharges to?	N/A
Canopy Fire Protection?	N/A
Fire Rated Ductwork?	N/A
Sprinklers?	N/A
Landlord Interfaces?	N/A
DIRECTS REQUIRED	
Cellar Free Cooling unit	N/A
LIGHTING	SEE ARCHITECTS DRAWINGS FOR LIGHTING REQUIREMENTS
BACK OF HOUSE LIGHTING	N/A



PART 1 – IS NOT INCLUDED WITHIN THIS SPECIFICATION

All contract documentation shall be provided by the Quantity Surveyor.

This Specification refers to Mechanical Contractor or Contractor in relation to all mechanical works.

This Specification shall be read in conjunction with the Building Management Technology Drawings, Architects Drawings, Designers Drawings and (where provided) associated Specialist Services Drawings / layouts.

The layouts shall be enhanced and taken on board by the successful tenderer to produce working and construction drawings and finished detail.



**MECHANICAL SERVICES
SPECIFICATION**

PART 2

STANDARDS OF INSTALLATION, MATERIALS AND WORKMANSHIP



Issue: February 2025

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Mechanical Services Specification - Part 2

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2. STANDARDS OF INSTALLATION, MATERIALS AND WORKMANSHIP

The following Clauses apply to ALL sections of the work.

2.1 STANDARDS OF MATERIAL & WORKMANSHIP

All materials, equipment and workmanship shall be in accordance with the specification and drawings.

Should any part of the work be installed which is not in accordance with the specification and drawings or is considered by the Consultant to be unworkmanlike or insufficient for the purpose intended, the Contractor shall, immediately up to being instructed by the Consultant rectify such work to the Consultant's satisfaction. Should the Contractor refuse or delay to rectify the works, the Consultant shall have the work rectified by others and the costs incurred shall be deducted from any payment due to the Contractor.

All materials shall be new and, together with equipment or work supplied or executed, shall comply with current British Standards and Codes of Practice where available. British Standards or Codes of Practice shall be deemed to refer to the latest editions. All electrical equipment and work connected shall comply with the latest edition of the Regulations for the Electrical Equipment of Buildings of the Institution of Electrical Engineers.

The Consultant will be at liberty to order the removal and replacement or reinstatement, at the Contractor's expense, of any faulty or inferior materials or equipment supplied or work executed.

The work is to be carried out in accordance with all current codes of practice and Health and Safety Executive legislation and recommendations.

It is the Contractor's responsibility to ensure that materials conform to the latest requirements of the Local Authority, Water Company and British Standards.

This specification is to be read in conjunction with the drawings. Any discrepancy is to be brought to the attention of the Project Manager who will advise of any corrections. Any minor item of work normally associated with each trade shall be deemed to be included whether or not specific mention is made in either document. Any item omitted in error, but obviously required for the completion of the works to their true intent shall be deemed to be included in the contract. No financial or other claim for compliance with this Clause shall be made by the Contractor and the signing of any Contract shall be deemed to be full acceptance of this Clause.

All of the work covered by this specification is for the supply, installation, completion, commissioning and setting to work of the whole of the Mechanical Services Installations.

2.1.1 SAFETY/CDM REGULATIONS

All works are to be carried out without undue inconvenience and nuisance, and without danger to occupants and users of adjacent buildings.

Provide for all costs incurred by complying with all Safety, Health & Welfare Regulations appertaining to all personnel (including those contractors employed on the Site, the Client's staff and their specialist Contractors and all other persons on, or about the Site).

The Contractor, before submitting his quotation, shall acquaint himself with the statutory regulations governing the works to be undertaken and in particular but not limited to:

- The Factories Act and The Construction Regulations
- The Offices, Shops and Railway Premises Act.

- The Construction Regulations.
- The Health & Safety at Work, etc. Act
- Management of Health and Safety at Work Regulations.
- Provision and Use of Work Equipment Regulations, and other Orders and Regulations affecting the Works.

The Contractor will also be required to acquaint himself with all HSE Approved Codes of Practice and comply with same, particularly but not limited to the following:-

- Management of Health and Safety at Work.
- Managing Construction for Health & Safety.
- Electricity Safety on Construction Sites.
- Guidance on the Electricity at Work Regulations.

The Construction (Design and Management) Regulations 2015 require a Principal Designer to be appointed by the Employer, and throughout this Clause, the terms “CDM Regulations” and “Regulation” shall mean The Construction (Design and Management) Regulations 2015 and the terms “Principal Contractor” and “Contractor” shall have the meanings stated in these Regulations.

The CDM Regulations require the Employer to take reasonable steps to ensure that a prospective Principal Contractor be both competent and able to allocate adequate resources to manage the Health & Safety aspects of the project.

In fulfilment of this requirement, the project Pre-Tender, Pre-Contract Health and Safety Plan will be issued as a Tender document, upon which basis Tenders/Prospective Principal Contractors shall submit the required information.

Execution of the Works on Site will not be permitted to commence until all the stages and conditions have been met in full and approved by the Principal Designer.

Any delay in the commencement of the Works caused by failure of the Contractor to provide the necessary information will not be held as a valid reason for extending the Completion Date of the Contract.

The design has been structured to avoid or minimise the use of any raw materials understood to be hazardous to installers, users, or demolition contractors. Areas of potential risk/caution may comprise;

- The need for mechanical lifting devices to raise and lower heavy/large equipment.
- The use of access towers/ladders etc to enable safe working to high level equipment.
- The need for protective clothing, face masks, goggles, helmets and specialist tools and equipment etc specific to particular construction trades.
- The disposal of waste products, chemicals, redundant consumable (e.g. old fluorescent tubes), packaging and wrappers.
- The storage and use of adhesives, chemicals and combustible products fully in accordance with Manufacturers’ recommendations.
- The requirement to accord with all statutes, British Standards, Codes of Practice and trade organisation procedures, e.g. BESA, IET, NIC, EIC, testing and ongoing maintenance.

It is a requirement that all systems are certified as properly commissioned and that they accord with the design intent. In addition to which, full maintenance documentation and procedures shall be provided to the user.

2.1.2 DELETERIOUS MATERIALS

The Contractor shall ensure that none of the following materials shall be utilised on this project:

- Asbestos or asbestos containing products as defined in the Control of Asbestos Regulations 2012 or any statutory modification or re-enactment thereof.
- Asbestos substitutes Crocidolite or any naturally occurring or man-made mineral fibres (e.g. Rockwool or slag wool) with a thickness of 3 microns or less and a length of 200 microns or less unless appropriately sealed to prevent migration of fibres.
- Lead paint, or any materials containing lead, which (in any case) may be ingested, inhaled or absorbed, except where copper alloy fittings containing lead are specifically required in drinking water pipe work by any relevant statutory requirement.
- Polyisocyanate and urea formaldehyde foam or other materials which may release formaldehyde in quantities which may be hazardous with reference to any limits set by the Health and Safety Executive.
- Polytetrafluoroethylene (known as PTFE) except when used as a non-stick sealing within valves or as an isolating tape.
- Chlorofluorocarbons including in the manufacture of insulation, but accepting use in the refrigerant systems.
- Products containing cadmium referred to in the Environmental Protection (Controls or Injurious Substances) (No 2) Regulations 1993.
- High alumina cement in structural elements.
- Wood wool slabs used as permanent shuttering or form work to concreting or in structural elements.
- Calcium chloride in admixtures for use in reinforced concrete.
- Naturally occurring aggregates for use in reinforced concrete which do not comply with *BSEN 12620* and/or naturally occurring aggregates for use in concrete which do not comply with *BS 8110-2*.
- Ready mixed concrete containing aggregate apt to cause “mundic concrete”.
- Aggregates for use in reinforced concrete which do not comply with *BSEN 12620* and aggregates for use in concrete which do not comply with the provisions of *BS 8110-2*.
- Calcium silicate bricks or tiles.
- Slip bricks.
- Vermiculite with a thickness of 3 microns or less and a lengths of 200 microns or less unless appropriately sealed to prevent migration of fibres.
- Timber treated with Pentachlorophenol.
- Iberian slate.
- Colliery waste as fill material, except material present on site.
- BOSS White and hemp.

Any other substances generally known to be deleterious, including but not limited to, substances not in accordance with British Standards and Codes of Practice or which are published in the Building Research Establishment Digests as being deleterious at the time of incorporation within the development.

Should any such materials have been inadvertently specified, the Contractor must immediately bring the Project Managers attention to the matter.

2.1.3 CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH

The Control of Substances Hazardous to Health (COSHH) regulations aim to protect persons against risk to their health, whether immediate or delayed, arising from exposure to substances regarded by the Dangerous Substances Regulations 1984 as very toxic, toxic, corrosive, harmful or irritating.

It is the Contractor's responsibility to make himself acquainted with the requirements of the Act and shall consequently make his employees, sub-contractors and other users of the site aware of any harmful or hazardous material being used that might pose a risk to health.

Where the possibility of risk occurs the Contractor shall take all necessary precautions to minimise exposure and shall provide suitable protection for the correct working environment.

If asbestos is discovered during the course of the contract, it must not be disturbed but instruction sought from the Supervising Officer before continuing.

2.1.4 EXISTING SERVICES

The Contractor shall not without the Project manager's permission interfere with the operation of existing water, electrical, gas, drainage and other services.

In the case of services owned by statutory authorities or private owners the permission of the authority or private owner shall be obtained.

The Contractor shall be responsible for any loss or damage occasioned by any unauthorised interruption or interference and make good to the satisfaction of the Project manager, authority or owner as applicable.

The Contractor is to ascertain if there are any existing gas, water or electric services on, above or below ground level within the area or vicinity of the intended works within the boundaries of the site. It is a requirement of the contract to ascertain the existence of any such services and that they be fully identified before any excavation or crane works commence. A detailed survey by the appropriate supply authorities shall be commissioned by the contractor where any doubts or concerns exist.

2.1.5 NOTIFICATION TO WATER SUPPLY COMPANY

The Contractor shall be responsible for notifying the Water Supply Company of the proposed date of commencement of the works on site in order that their inspector may examine the works during the installation period and ensure that the Model Water Supply Regulations are being complied with in full.

2.1.6 LEGIONELLA

The Contractor shall undertake the installation of all systems in a manner as to ensure that the risk of Legionella is minimised and that plant or water systems are so installed and constructed that they will be safe without risk to health when used. Adequate information shall be provided in the Operating & Maintenance Manuals to instruct the Client's representatives on the necessary procedures that must be undertaken to ensure that the plant and water systems remain safe in use and without risk to health.

The Contractor's attention is drawn to the obligation contained within the Approved Code of Practice (ACOP). The Prevention or Control of Legionella (including Legionnaires Disease) L8. A risk assessment shall be undertaken by the Contractor in respect of all plant and water systems. This assessment shall be provided to the Project Manager prior to installation, with a copy included in the Operating & Maintenance Manual(s). A record of hot and cold water system temperatures shall be provided by the installing contractor as the base line for future record keeping by the user.

2.1.7 CO-ORDINATED SERVICES INSTALLATION

The Contractor shall ensure that his work does not obstruct the fixing or future maintenance of other services by acquainting himself with the general arrangement of all other services.

The Contractor shall ensure that his progress does not impede the progress of other trades and shall fully co-operate with others to that end.

The Contractor shall make do allowance for the progressive installation of mechanical services to meet the Main Contractor's overall programme. In addition the Contractor shall liaise at all times with the Electrical Contractor, particularly when setting out piping runs. Any work, which has to be re-done due to negligence in this respect, will not constitute an extra.

Particular care shall be taken to prevent obstruction of electrical service positions, cable routes, switch positions, access positions and obstruction of sanitary engineering services, rodding positions etc. Services installed in service void/riser/shaft shall be so arranged to permit maximum access along the void/riser/shaft and all services, equipment and plant shall be readily accessible for maintenance.

All plant, equipment etc, are shown on the Architects Drawings in approximate positions. Their exact location shall be determined from the Sub Contractors installation drawings or by consultation on site.

All parties concerned will be required to co-operate in the planning of these arrangements.

2.1.8 FIRE BARRIERS / NOISE TRANSMISSION / AIR TIGHTNESS MEMBRANE

The mechanical installation shall not reduce the integrity of any wall or ceiling or floor in respect of its ability to withstand the spread of fire or its ability to block sound transmission or its effectiveness as an air tight membrane.

Where the mechanical installation must pass through a building element (wall, floor etc.) great care must be taken. Openings made in such elements to allow the installation of pipe work or duct work, shall be made good in such a way as to restore the fire, sound or air tightness integrity of the building element.

Any electrical containment passing through fire compartments, shall be fire stopped within the trunking itself. (electrical contractor to install). The electrical trunking lid

shall be provided with the means to inspect the internal firestopping from either side of the fire compartmentation.

The Contractor shall not cut or penetrate any membrane without prior permission from the Main Contractor. The Contractor is to agree with the Main Contractor on the necessary measures to seal any air tightness membrane that must be penetrated during the construction of the project.

2.1.9 FIRE PRECAUTIONS

The Contractor shall take all reasonable precautions to avoid the outbreak of fire, particularly in work involving the presence of naked flames or sparks. All sites shall be considered non smoking, Contractors shall not smoke within the confines of the site.

When equipment or vessels which may contain inflammable liquids or gases are not in use they shall be removed, together with any stored liquid or gas, to a safe place of storage.

The Contractor shall observe and comply with the conditions contained in the policy of insurance, against loss or damage by fire.

2.1.10 CLEARING OF SITE

The Contractor, at the end of each day's work, shall remove all rubbish, waste materials, surplus materials etc. All equipment, tools and implements shall be stored away in a proper manner.

The site shall be thoroughly cleared of all equipment, materials and rubbish on the completion of the works.

2.1.11 DRYING OUT OF WORKS

The drying out of the works will be the responsibility of the Principle Contractor who will, subject to the approval of the Project Manager, be allowed to use the heating system at his own risk, but only in collaboration with the competent engineer who must provide the skilled supervision for the working of the plant.

All costs in connection with the fuel, supervision, replacement of defective, worn or damaged parts, cleaning down the plant prior to acceptance by and to the satisfaction of the Project Manager shall be borne by the Contractor.

The use of the heating installation by the Contractor for the purpose of drying out the building will in no way release the Contractor of any responsibility under the terms of the contract, nor be deemed as partial acceptance of such services by the Employer.

2.2 ELECTRICAL EQUIPMENT

The Contractor is to allow for fixing any electrical control equipment that is mounted on equipment of his supply.

The Contractor is to mount all control panels.

The Contractor shall provide details of all electrical equipment supplied and installed by himself to the Electrical Sub Contractor to allow the Electrical Sub Contractor to supply and connect all relevant equipment appropriately.

2.2.1 ELECTRICAL STARTERS/DIAGRAMS

The Contractor is to supply all necessary starters and wiring diagrams, for equipment of his supply, and hand them over to the Electrical Contractor for fixing.

2.2.2 EMBEDDED SYSTEMS, DATE COMPLIANCE

Embedded systems contain a computer or a computer like device, which is used to control the operation of plant, machinery and equipment.

All equipment shall be date compliant with neither performance nor function being affected by date changes.

In particular:-

- Rule 1 -No value of current date will cause any interruption in operation.
- Rule 2 -In all interfaces and data storage, the century in any date must be specified either specifically or by unambiguous algorithms or inference rules.
- Rule 3 -All calendar functions shall recognise leap years.

2.3 MATERIALS MANAGEMENT

2.3.1 SETTING OUT WORKS

The Contractor is to set out the whole of the works and be responsible for the correctness of the position, levels and dimensions of the works. If at any time during the progress of the works any error shall appear or arise in the position, levels or dimensions of the works, the Contractor shall at his own expense remove and amend the work to the satisfaction of the Consultant.

2.3.2 SERVICE DISTRIBUTION

Electrical Services shall be separate from any water pipework by a minimum of 150mm. No pipework shall run above or in the vicinity of electrical distribution boards or control panels.

Mechanical Services pipework and ductwork mains shall run vertically inaccessible builder's work shafts and horizontally in readily accessible ceiling voids.

Pipework and ductwork branches shall run horizontally, generally in readily accessible ceiling voids and vertically in purpose provided accessible builder's work enclosures.

Where it is unavoidable that pipework has to run within generally inaccessible ceiling voids, such pipework shall be welded/soldered and no pipe joints in straight runs unless longer than standard pipe lengths. All such pipe runs shall be kept to a minimum and shall be pressure tested prior to the commencement of insulation and ceilings.

The Contractor shall install sufficient commissioning valves and volume control dampers to allow the correct commissioning and setting to work of all systems. A commissioning plan to show the location of all such items shall be provided to the Engineer for comment prior to the commencement of the installation on site.

The Contractor shall provide isolation valves to the flow and return connections at each item of plant that has piped supplies. Additionally, isolation valves shall be provided at each major branch junction. Commissioning and isolation valves shall be located in positions where they can be easily accessed without being virtually intrusive. The location of all such valves where they are proposed within occupied areas must be agreed in advance with the Architect.

All valves shall be suitably identified and a corresponding valve chart affixed with the plant area. Valve chart shall be incorporated within a wooden frame and glass front arrangement.

Local isolation valves on final connections to sanitary fittings and equipment, etc. shall be located at the sanitary fittings and equipment but concealed behind readily removable access panels if provided.

2.3.3 PLANT ACCESS

The Contractor shall ensure that adequate withdrawal space for air handling unit heating and cooling coils, filters and fans has been provided, as required by the CDM Regulations and the manufacturer's instructions.

2.3.4 MATERIAL STORAGE/OWNERSHIP

All material and equipment shall be stored under proper cover and in such a manner as to prevent deterioration, damage and distortion and to protect any anti-corrosive finish, flanged or screwed ends etc.

All bright or polished parts of all material and equipment shall be protected to prevent corrosion or tarnish.

All materials and equipment placed in store on the site shall not be removed, except for being used on the works, without written authority by the Consultant.

2.3.5 PROTECTION OF THE WORKS

All equipment, materials, components and the various installations shall be in perfect condition when handed over.

Pipework stored on site shall be supported clear of the ground and, together with all other stored materials, shall be suitably protected against the weather and the ingress of foreign material.

All equipment, plant motors and materials, fixed or unfixed, shall be protected against ingress of dirt or moisture into working parts by means of polythene covers or equal. Precautions against mechanical damage by other trades shall be provided where necessary.

Precautions shall be taken and all necessary protection provided to safeguard the work during frost and bad weather.

The Contractor must suitably cover up and protect where practicable all work carried out and materials provided to minimise the risk of damage during the progress of the works. Any damage caused due to the need of such protection shall be reinstated at the Contractor's cost.

Incomplete sections of the works shall be left in a safe condition and shall include for any temporary works necessary to give protection from unauthorised interference.

The Contractor is to take all necessary precautions to avoid damage by his workmen to other work. The cost of such damage, should it occur, will be debited to the Contractor, regardless of the precautions taken.

Any damaged work shall be remedied using approved materials and methods. The timing of such operations must be agreed to align with the programme requirements.

2.3.6 PROTECTION OF EXISTING EQUIPMENT DURING THE WORKS

Where it is necessary for the contractor to work in a finished area such as an office containing carpet, desks and equipment, the Contractor shall provide all necessary working platforms, covers and other protection, to ensure the existing arrangements are unaffected by the works.

2.4 PAINTING

All new brackets, steelwork and pipe work to be prepared, primed, undercoated and top coated as protection against rusting.

When connecting to existing pipe work the Contractor shall clean at least 150mm either side of a connection point, removing all loose material and cleaning rusted surfaces back to bare metal. Following this cleaning process the Contractor shall paint all steel surfaces with red oxide, or similar approved paint ensuring no bare metal remains.

Where galvanised metal is cut or damaged the area shall be cleaned and painted with zinc rich paint.

All gas pipework shall be painted and primed as above and in addition shall receive a top coat of yellow ochre for identification purposes.

2.5 SECONDARY STEELWORK

Unless indicated on the drawings, the Contractor is to supply any necessary secondary steelwork, supports/hangers etc to support his equipment.

The Contractor shall be responsible for the detail design of such secondary steelwork, supports/hangers etc and their fixing to the structure.

The Contractor shall be responsible for ensuring the building structure is adequate to support the intended loadings generated by the mechanical services plant, supports/hangers, etc.

Where supports are sat on building fabric the Contractor shall install suitable protective membranes to prevent damage to the building fabric or finishes. For example, where Bigfoot style support blocks are sat on PVC roof membranes, suitable fleece shall be incorporated below each support block.

Where supports penetrate the building fabric externally the Contractor shall install suitable weathering to prevent future water ingress.

2.6 PIPEWORK INSTALLATIONS

Pipework indicated on the drawings are nominal sizes relevant to the material proposed.

All pipework to be installed to allow for the following:

- Proper venting and draining of the complete system.
- Full and adequate clearance to enable insulation to be applied in accordance with the requirements of this specification.
- No pipework is to be fixed closer than 150mm to the floor, unless specific agreement is obtained from the Consultant.
- No pipework is to be fixed to skirting boards or other decorative woodwork.
- Pipe work must not set before passing through walls or ceilings, but must run in a straight line.

2.6.1 PIPE WORK MATERIALS

Pipework shall conform to the following table unless specifically noted in Part 3.

Service	Up to 32/35mm	40/42mm to 108/100mm
Heating	Copper R250 half hard (previously known as Table X) or Mild Steel (medium grade)	Mild Steel (medium grade)
Chilled Water	Mild Steel (heavy grade)	Mild Steel (heavy grade)
Gas	Galvanised Mild Steel	Galvanised Mild Steel
Hot Water Service	Copper R250 half hard (previously known as Table X)	Copper R250 half hard (previously known as Table X)
Cold Water Service	Copper R250 half hard (previously known as Table X)	Copper R250 half hard (previously known as Table X)
Open Vent	Copper R250 or Galvanised Mild Steel (to match the main system i.e. copper/copper or Mild Steel/Galvanised Mild Steel)	Copper R250 or Galvanised Mild Steel (to match the main system i.e. copper/copper or Mild Steel/Galvanised Mild Steel)

2.6.1.1 EXTERNAL WATER SERVICES

External water service from the water company's combined water meter/stop cock to the internal stop cocks shall be in MDPE (blue) polyethylene tube to *BS 6572*.

The MDPE polyethylene services shall be laid by the Contractor. The preparation of the trenches, bedding on sand, and backfilling shall be carried out by the Main Contractor after the water company's inspection.

The MDPE polyethylene service on entry to the dwellings shall be sleeved within a suitably sized PVC duct (provided and fitted by the Main Contractor). The service within the sleeve shall be insulated and caps shall be fitted to seal the sleeve, all by the Contractor.

All unconnected pipe ends shall be provided with temporary end caps. The internal MDPE service shall be fully supported prior to the connection of the stop cock. The internal stop cocks shall be MDPE X Cu GM or DZR combination stop cocks, such as *Pegler Yorkshire* manufacture.

2.6.1.2 COPPER PIPEWORK

The Mechanical Sub Contractor shall allow for all pipework to be of copper which shall comply with *BS EN 1057: 2006* Black Label half hard.

Copper tube shall be light gauge with ends prepared for capillary type fittings. Pipe ends shall be cut cleanly with purpose made cutters or hacksaws and shall be square cut. All cut ends to have the swarf removed and the bores reamed out and the pipework re-rounded, with the outer surface free from deep scratches.

The copper pipework shall be jointed by means of copper or DZR brass pushfit fittings and shall be manufactured by Messrs *Conex & Yorkshire*. Connections to boilers shall be by means of compression fittings. The compression fittings shall be gunmetal or DZR as manufactured by *Conex* or *Pegler Yorkshire*. Connections to barrier polybutylene/polyethylene pipework by means of push fit copper or DZR brass fittings with the insert liner into the polybutylene pipe to be connected to copper pipework.

Reduction in pipe diameters shall be made by using concentric fittings in the vertical applications and eccentric fittings in the horizontal applications.

Springs and sets shall be formed on light gauge copper tube blender, using the correct size formers. The springs and sets may also be formed by hand by using an internal spring. Unsatisfactory bends or sets will be rejected.

Bare copper pipework shall not be buried in walls or underground.

All pipework to be installed to allow for the following:

- Proper venting and draining of the complete system.
- Full and adequate clearance to enable insulation to be applied.
- No pipework is to be fixed closer than 150mm to the floor, unless specific agreement is obtained from the Client.
- No pipework is to be fixed to skirting boards or other decorative woodwork.

Pipe work must not set before passing through walls or ceilings, but must run in a straight line.

All pipework shall be supported by means of *Unifix* plastic twin or single clips, pipe brackets shall be spaced at 1.2m horizontal and 1.8m vertical.

Air bottles complete with ½" manual air vents, shall be fitted at all high points.

Drain points shall be provided on the flow and return pipework at all low points. The drain cocks shall be to *BS 2879 type B*.

The pipework within cylinder cupboards and in the service space at the rear of the kitchen units shall be carried out in copper pipework.

The pipework and valves within the roof spaces shall be fully insulated in accordance with *Building Regulations, Water Regulations, BS 8558 and BS EN 806*

Due allowance is to be made for expansion of the pipework by change of direction of pipe runs.

Exposed water pipework in toilets and changing areas shall be chromium plated. Exposed pipework in other areas shall be painted as directed by the Architect.

2.6.1.3 **SOLDER JOINTS**

Lead free solder is to be utilised on hot and cold service pipe work. It is recommended that it is used throughout. Self cleaning fluxes are not to be used under any circumstances.

2.6.1.4 **BARRIER POLYBUTYLENE AND POLYETHYLENE**

The polybutylene and polyethylene barrier pipework shall conform to *BS 7291* and the barrier pipe to conform to *DIN 4726* and *DIN 4727*.

Barrier polybutylene and polyethylene shall have ends prepared for push fit or press type fittings. Pipe ends shall be cut cleanly with purpose made cutters, and shall be square cut, hacksaws cannot be used. All cut ends to have the swarf removed and the bores reamed out and the pipework re-rounded.

The purpose made bends on the pipework shall be made using bend former (obtainable from the pipe manufacturers) and the radius of the bends conform to the pipe manufacturer's recommendations for supported and unsupported pipework.

All pipe fittings shall be installed in accordance with the manufacturer's instructions. All pipework shall be supported by means of *Unifix* plastic twin or single clips. Pipework shall be supported at 300mm centres in the horizontal and 500mm in the vertical. Pipework passing through walls and floors shall be sleeved to prevent mechanical damage.

Barrier polybutylene and polyethylene pipework where passing through fire barriers, shall be protected from contact with intumescent foam or strips.

Air bottles complete with ½" manual air vents, shall be fitted at all high points on the heating system.

Drain points shall be provided on the flow and return pipework at all low points whether. The drain cocks shall be to *BS 2879* type B.

The pipework within the first floor void shall be insulated to reduce heat losses and where laid in notched joists the pipework shall be laid on felt to reduce the possibility of noise transmission.

The pipework and valves within the roof spaces shall be fully insulated in accordance to *Building Regulations, Water Regulations* and *BS BS 8558* and *BS EN 806*.

Barrier polybutylene and polyethylene pipework shall terminate at 350mm away from any heat generating source.

2.6.1.5 **STEEL PIPEWORK**

Shall be to *BS 1387*, "medium black", with malleable cast iron fittings. Jointing shall be achieved by screwed joints or flanges as appropriate to the application. Unions/flanges shall be incorporated to facilitate maintenance work with specific regard also to the ability to remove pipe work across main plant room access routes.

2.6.1.6 **PLASTIC PIPEWORK**

Shall be polybutylene piping, fittings and jointing system to *BS 7291: Part 2* with electro-fusion welded joints.

No plastic pipework shall be installed or utilised to provide Hot Water Service with circulation. All pipework services shall be installed in line with manufacturers recommendations and following BESA specification for plastic pipework

Installers shall undergo training carried out on site by the manufacturer's representative prior to starting work on site.

The Contractor to include for all training associated costs.

Stop valves shall be in accordance with the manufacturer's recommendations.

Where commissioning sets are installed the Contractor shall install metal sections prior to and after the valve of the length required by the manufacturer to ensure smooth flow through the commissioning valve so a correct reading may be attained at commissioning.

2.6.2 **SUPPORTS**

Supports on view are to be of the school board type, of screw on pattern. Support to pipework in voids and plant rooms is to be by Munson rings, drop rods and rocker nuts as appropriate to allow for lagging.

Supports shall be fixed to the building and structure in appropriate locations that will be suitable for the load to be supported.

Supports shall be installed with due regard to the movement of the pipework.

Vertical pipes should be adequately supported at the base, to withstand the weight of the vertical pipe and the fluid it contains, branches from the vertical pipe should not be used as a means of support for the pipe.

Where pipework contains valves, strainers and other ancillaries the frequency of spacing shall be reduced to account for the additional weight.

Supports for straight pipework shall be at intervals not greater than following centres:

Pipe Nominal diameter (mm)	Rod Size minimum (mm)	Horizontal run interval for spacing of supports (m)		Vertical run interval for spacing of supports (m)	
		Copper	Steel	Copper	Steel
Up to 15	6.4	1.2	2.0	1.8	2.4
20/22	6.4	1.5	2.4	1.8	3.0
25/28	6.4	1.5	2.4	2.4	3.0
32/35	10	1.8	2.4	3.0	3.7
40/42	10	1.8	2.4	3.0	3.7
50/54	10	1.8	2.4	3.0	4.6
65/67	10	2.4	3.0	3.7	4.6
76/80	10	2.4	3.0	3.7	4.6
100/108	13	2.4	3.0	3.7	5.5
150	13		4.5		5.5
200	16		6.0		8.5
Clip/split ring Material		gunmetal	cast metal	gunmetal	cast metal

Where pipework contains valves, strainers and other ancillaries the frequency of spacing shall be reduced to account for the additional weight.

2.6.3 SLEEVES & FLOOR PLATES

All pipework passing through walls or floors are to be fitted with a pipe sleeve of compatible material.

The Contractor shall fire stop all sleeves with rock wool insulation. The insulation to be inserted between the sleeve and pipework wall at the earliest opportunity.

The Contractor shall assume all sleeves are fire stopped in this manner until instructed otherwise.

The Contractor to ensure that the sleeves are not filled with plaster.

In all places where sleeves are visible, floor/wall plates are to be securely attached. At each pipework wall/ceiling penetration that is exposed to view the Contractor shall

supply and fit a white plastic collar to hide the sleeve. These shall be fitted after all plastering is complete.

2.6.4 TEMPORARY PLUGS

Special attention is drawn to the plugging of all open ends during the course of erection of the installation. These must be approved fittings; under no circumstances will wood, paper, cloth etc be permitted.

2.6.5 VALVES/STRAINERS/DRAIN COCKS

Install where indicated on the drawings and elsewhere as necessary, valves in accordance with the following table. The valves listed are for pipework up to 50mm and PN16:

Valve Description	Valve Manufacturer	Reference
Isolating (wheel head)	Crane	D151
	Hattersley	33X
	Pegler (copper installations)	GM63
Isolating (lock shield)	Crane	D237
	Hattersley	30LS
	Pegler	GM63LS
Isolating (ball)	Crane	D171
	Hattersley	100C
Gas Isolation (ball)	Crane	D171
	Pegler	PB300
Service Valves	Hattersley	108C
	Pegler	808
Double Regulating Globe	Crane	D921
	Hattersley	1432 – 1432C
Metering Orifice	Crane	D901
	Hattersley	1000 – 1000C
Commissioning Station	Crane	D902 + D901
	Hattersley	2432 – 2432C
Non Return	Crane	D140
Strainer Y type	Crane	D295
	Hattersley	817
Test Points + Extension Tube	Crane	P84 + P83
Drain (on view)	Crane	D340 – D341

	Hattersley	370 - 371
Drain (concealed)	Hattersley	81 HU
	Crane	D344
Stopcocks	Pegler Yorkshire	501 DZR / 551 DZR
Automatic Anti-Vacuum	RWC	ADMT 503 Type
Pipe Interrupter	Arrow Valves	DB / DC Type
Check Valve Single	Pegler Yorkshire	801
Check Valve Double	Pegler Yorkshire	802

2.6.5.1 COMMISSIONING STATION

Provide and install to the mains in plant areas, sub mains and elsewhere as necessary to fully balance and commission the heating and chilled water systems. Double regulating valves complete with metering station, including fixed diameter orifice plate and test points.

Commissioning Stations shall be installed with suitable length straight sections of pipework before and after each valve to ensure readings may be obtained.

Each double regulating valve shall be complete with metering station, installed with tapings above the horizontal line of the pipework.

2.6.5.2 THERMOSTATIC BLENDING VALVES

The Contractor shall supply and install thermostatic blending valves to all outlets which serve basin within disabled toilets, and any other areas which may be used by the general public.

These valves shall comply in all respects with the requirements of TMV3, and incorporate strainers and isolating valves at inlets.

The Contractor shall check that the taps, installed by others, on the basin or sink do not contain an integral thermostatic blending valve. Approval shall be obtained before the contractors installs a doubling up of the thermostatic blender.

2.6.5.3 PRESSURE REDUCING VALVE

The Contractor shall confirm with the manufacturers the maximum pressure that can be contained by a terminal device / item of plant especially when the device is to be connected to mains pressure cold water or any pressurised or boosted water system. The contractor shall bring to the attention of the Consultant any such requirement, should the valve not be indicated on the contract drawings. The contractor shall install an adjustable pressure reducing valve to any water service prior to a terminal device which requires protection from over pressurisation i.e. electric unvented water heaters or other terminal device that the supplying manufacturer recommends a valve should be installed.

The valve shall be suitable for reducing the fluid pressure down from its initial state to a pressure of between 1 and 2 bar.

Should two pressure reducing valves be required to attain suitable pressure reduction ranges across each valve, the Contractor shall provide these.

The Contractor shall install a pressure gauge to the pipework on both sides of the valve. A gauge direct mounting on the valve shall not be used.

The contractor shall ascertain the water pressure within the mains prior to installing the pressure regulating valve.

2.6.5.4 CONNECTIONS TO SANITARYWARE

The Contractor shall run his pipework to connect to sanitaryware, with a chrome plated screwdriver operated ball type service valve within 300mm of the sanitary ware connection. The final connection to the sanitary ware will be made by the Contractor.

2.6.5.5 SAFETY RELIEF VALVE

The Contractor shall install safety temperature and pressure relief valves to all pressurised and sealed systems. Each valve shall be located in a maintainable location. Each valve shall be installed with a tundish on discharge with suitable waste pipe i.e. at least one size larger than the valve. The waste pipe shall be routed to drain. Where located in a basement or below the natural drainage level the waste pipe shall be routed to a catch tank, which shall contain a sump pump to remove any discharge to the natural drain.

2.6.5.6 ANTI-VACUUM VALVES & CHECK VALVES

Install where indicated on the drawings, and elsewhere as necessary to comply with the Water Regulations, AVV and Check Valves to guard against back syphonage

2.6.6 GAUGES, GENERAL

Use dial type gauges of robust construction, enclosed in dust tight metal cases. Retain dial glass with stainless steel bezels screwed to case. Use white dial scales indelibly and clearly marked with black lettering to indicate measured values. Select scale ranges which indicate "Normal" when pointer is vertical or central on scale.

Dial case to be 100 mm diameter for direct connection to equipment. Mount gauges with dial face in vertical plane.

2.6.6.1 TEMPERATURE GAUGES, GENERAL

Bourdon Type, mounted direct in pocket.

Use temperature gauges with pocket and provided with gland attachment on thermometer stem.

Use separate type pockets, threaded 15/19mm BSP and manufactured from stainless steel.

Screw pockets into tapped bosses or stools set in pipelines or vessels. Fill pockets with oil to *BS 7207* to ensure contact with thermometer bulb.

Provide gauges with dial graduation in degrees Celsius.

Ensure pointer movement is clockwise for increase in temperature.

Provide with metal shielding around sensing element to prevent effects of local radiation from equipment.

2.6.6.2 PRESSURE & ALTITUDE GAUGES

Use vapour pressure type gauges to *BSEN 837-1*.

Ensure dial graduation is from zero to between 1.5 and 3.0 times normal working pressure. Dial graduation to be in bar (gauge) on instruments reading head or working pressure, or in Pascal where pressure differences across plant items are to be established i.e. pumps. Where fitted on boilers and pressure vessels, clearly mark scale with operating and maximum permissible working heads in accordance with *BS 759-1*.

Ensure dial movement is clockwise for an increasing head.

Provide flexible piping where gauge is subject to noticeable vibration.

Fit gauge cocks preceding all connections to altitude and pressure gauges; copper alloy, tapered ground plug with ebonite lever.

2.6.7 VIBRATION ISOLATION / FLEXIBLE CONNECTIONS

Supply and install at each pump connection suitable flexible connections as manufactured by Engineering Appliances Ltd or equal approved. Contractor to liaise with the manufacturer to determine a suitable product.

All flexibles on heating circuits shall comply with DIN4809.

Where the working pressure exceeds 1.5bar G, Tie bars shall be fitted.

For working temperatures up to 70°C the rubber bellows shall be high tensile synthetic reinforced.

For working temperatures between 70°C and 100 °C the bellows carcass shall be steel wire mesh reinforced.

Supply and install at each fan coil unit suitable flexible connections as supplied by the approved supplier. Contractor shall liaise with the approved manufacturer to determine a suitable product with particular reference to the water temperature and water treatment chemicals currently employed.

2.6.8 NOISE & VIBRATION

Great care is to be taken to prevent noise or vibration penetrating the building. All necessary precautions are to be taken in the way of flexible connection, resilient mountings etc. Such connections and supports shall be deemed as necessary for all items of rotating or active plant.

It is recommended that fan units are suspended wherever possible.

2.6.9 DRIP TRAYS

A drip tray shall extend under each cooling coil and associated valve sets and shall be fabricated from non-corrosive material. External faces shall be insulated to prevent condensation. Each drip tray shall have a drain connection flush with the bottom of the drip tray.

2.6.10 METERS

2.6.10.1 WATER METERS

The Contractor is to install water meters of class C or higher to the cold feed of any open vented heating or chilled water system, any calorifier of 300 litres or above or irrigation system.

2.6.10.2 GAS METERS

Where the building area (gross) is 500m² or greater the contractor shall ensure there is a meter to measure the total gas consumption of the building. Where a boiler installation has an input of greater than 50 kW a separate individual meter shall be provided.

2.6.11 CLEANING / DOSING POT

After the final flushing through of the heating and/or cooling system, a suitable corrosion inhibitor is to be added during the filling of the system.

The Contractor shall supply and install a proprietary dosing pot.

The Contractor shall supply a certificate to record the dosing chemical, the quantity of chemical installed, the dosing percentage required, and the dosing percentage installed.

2.6.12 DE-AERATOR/DIRT SEPARATOR

Supply and install into LTHW and CHW circuits, an air and dirt separator with flanged pipe work connections.

The unit to be installed in accordance with the manufacturer's recommendations and the AAV and drain connections are to be piped to floor level.

For chilled water circuits the air venting shall be of the degassing / vacuum type to account for the micro bubbles within the water volume.

2.6.13 AUTOMATIC AIR VENTS

Install where indicated on the drawings and elsewhere as necessary automatic air vents. An 8 mm discharge pipe is to be taken from the vent to discharge in an agreed location.

The Contractor shall install Automatic Air Vents to conform to the manufacturer's optimum venting recommendations.

2.6.14 AIR BOTTLES

Air bottles are to be installed at the high points of each circuit and be equipped with an automatic air vent in the roof void or means of manual venting elsewhere in the building.

2.6.15 EXPANSION OF PIPES

Due allowance is to be made for expansion of the pipework by change of direction of pipe runs. Where this is not possible, stainless steel bellows shall be provided along with necessary anchor points etc.

2.6.16 FLUSHING AND CHLORINATION

Water systems shall be flushed, cleaned and chemically dosed in accordance with the *BSRIA BG 29/2021 Pre-Commission Cleaning of Pipework Systems*.

2.6.17 CHLORINATION INJECTION POINT

The Contractor shall ensure that injection points in the form a 22mm branch connection incorporating a stopcock and plugged end to facilitate chlorine injection, are suitably located to enable full chlorination of all cold water service pipework.

2.6.18 CHLORINATION

On completion of the works, or subsequent to any alteration to the water systems, the new system shall be chlorinated in accordance with *BS 8558 Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages – Complementary guidance to BS EN 806* and *HSC ACOP&G L8 Legionnaires' disease: the control of legionella bacteria in water systems* and tested until a satisfactory sample has been obtained.

The tests shall be carried out by an independent Laboratory.

The Contractor shall provide test result certificates of all water samples for the system.

These certificates shall be provided in the Operating and Maintenance manuals.

Project completion will not be accepted until satisfactory certificates are produced.

The Contractor shall produce certificates to prove the water is suitable for drinking and a certificate to indicate the system does not contain legionella.

The Contractor will be responsible for the costs of all such tests and chlorination's.

2.6.19 DISINFECTION

On completion of each section of the works, each new system shall be disinfected in accordance with BS8558 and HS(G)70 and tested until a satisfactory sample has been obtained.

The Named Sub Contractor shall provide test result certificates of water temperature at each outlet for the system along with temperatures of the hot water pipe prior to the blending valve if fitted.

The certificates shall be provided finally in the Operating and Maintenance manuals. Project completion of each section will not be accepted until satisfactory certificates are produced.

The Named Sub Contractor shall produce certificates to prove the water temperatures around the system at each outlet.

2.6.20 CONNECTION SIZES

The connection sizes on the items of equipment specified may vary from that of the interconnecting pipes or ducts. Any adjacent valves, dampers etc are to be of pipe or duct size with the transformation to the equipment's connection size taking place as close as possible to the equipment. The only exception to this shall be the Contractor's responsibility to check that all DRV's, metering stations and three port valves are sized adequately for their correct operation at the design flow.

2.7 AIR CONDITIONING INSTALLATIONS

The installation shall utilise R407C or R410A within circuits that contain both new internal cassette units and external condensers.

The units shall be positioned as indicated on the Contract drawings. Prior to any installation works the Contractor shall liaise with the Services Engineer in confirming final locations.

The whole installation shall be carried out in accordance with BS 4434 and the Safety Code for Refrigerating Systems Utilising group A1 and A2 refrigerants, the latter being published by the Institute of Refrigeration.

2.7.1 REFRIGERATION PIPEWORK

The whole installation shall be carried out in accordance with *BS 4434* and the *Safety Code for Refrigerating Systems Utilising group A1 and A2 refrigerants*, the latter being published by the Institute of Refrigeration.

The Contractor shall pipe between indoor and outdoor units using deoxidised copper, designated C106, manufactured to the requirements of *BS 2871*. Pipework up to 22mm OD may be fully annealed, over 22mm OD to be half hard temper. All pipe work shall be delivered to site internally de-greased.

The Contractor shall size and provide all pipework sizes and details especially with regard to refnet connections. This shall be carried out for all new systems.

Longest possible lengths of copper pipe shall be utilised to minimise joints on site. The appropriate refrigerant installation tools must be utilised to avoid the use of elbows.

Ends of pipework shall be sealed, remaining so, until fitted. Pipe ends to be cut clean and square with pipe axis, where possible using wheel cutters and de-burred, re-rounded and cleaned of cuttings. Pipe ends and inside of fittings shall be thoroughly cleaned prior to joining.

All joints shall be brazed in accordance with *BS 1723*, the system to be continuously purged with nitrogen during brazing to prevent internal oxidation, and all excess solder and flux removed on the completion of joints.

The Contractor shall take all precautions required to avoid hazards during the brazing operations including, but not limited to, the following list:

- Ensure that the area of operation is safe for carrying out the work involved and free from combustible waste materials.
- Provide adequate heat shielding and where necessary heat sinks.
- Ensure that the office maintenance and building manager is given prior notification of any hot work to be carried out.
- Comply with the office safety rules, obtaining a Permit to Work for Hot Procedures.
- Report to the office maintenance and building manager on completion of hot work each day where work has been carried out in any void, duct, unoccupied space or any other concealed location.
- Acquaint himself with office fire drill procedure, be responsible for adequate ventilation of the work area, confirm that all operatives are aware of the dangers of the mis-use of oxygen for ventilation purposes and ensure that there is adequate means of escape from confined spaces.
- Carry out a Risk Assessment for each process/location.

The Contractor shall provide adequate flexibility in the pipelines to allow for thermal movement.

The Contractor shall bracket all refrigerant pipework adequately.

All pipework shall be laid and clipped to new cable tray which shall be wide enough to ensure each pipe is not installed on top of another pipe.

Pipelines, valves and fittings particularly where located less than 2m above floor level shall be adequately guarded. Channels or ducts for refrigerant should not contain other pipelines or electrical wires unless they are adequately separated and protected against condensation.

All pipelines shall be correctly sized and installed to prevent the trapping of oil and sludging the suction line, vapour locks or flash gas formation, and shall be installed with the minimum number of joints.

All refrigerant pipework shall be insulated to the highest standards to avoid random condensation.

All pipework (suction, liquid and discharge) shall be insulated with slip-on close cell elastomeric (as manufactured by Armaflex or equal), pipe insulation, with a fire performance Class 'O' of the Building Regulations, having a wall thickness of not less than 13mm. Insulating must be protected when exposed to atmosphere by special paint or weatherproof covering.

All joints (after pressure and leak testing), shall be properly glued and vapour sealed to provide a complete seal, to prevent any condensation and shall be clearly marked for ease of identification.

After installation of pipework and prior to sealing of insulation joints and starting of equipment, pipework shall be pressure test to 28 bar (400psi) held for 24 hours and checked for leaks, vacuumed/dehydrated to (-752mm Hg) and held at that setting for 1 (minimum) to 4 hours, depending on pipe length.

The refrigerant charge weight must be calculated to the actual installed length of pipework (not as per drawing) and in accordance with the manufacturer's

recommendations and instructions. The Contractor shall submit copies of his calculations to the Engineer for comment prior to the start of installation.

The charging shall be carried out with an appropriate charging station and under the supervision of the manufacturer or his approved agent.

Pipework shall be properly and tidily fixed and supported at a minimum of 2 metre centres and run on galvanised trays. All pipework shall be tagged with ID numbers (condensing unit ref) at 3m intervals.

Pipe supports shall not restrict expansion or contraction of the pipe and must not be applied to refrigerant Refnet joints or headers.

The Contractor shall support the installation/system to the requirements of Clause "2.5 Secondary Steelwork"

The Contractor shall commission the refrigeration system to the requirements of Clause "2.13 Testing and Commissioning"

The Contractor shall provide Condensate pipework and pumps, as necessary, to ensure that all new units are fully serviced.

2.7.2 CONDENSATE PIPEWORK

A comprehensive condensate drainage system shall be provided from each cooling coil drip tray to remove the produced condensate, discharging to waste.

A glass trap shall be connected to the drain connection of the cooling battery. This trap shall have access points to allow cleaning and dosing.

Wherever possible, gravity drainage shall be used. Where this is not possible a peristaltic pump pumped system shall be provided.

Where pipe work passes under or drops below beams, sump type pumps shall be utilised to remove the produced condensate.

All small bore plastic interconnecting pipe work shall be kept to the minimum possible length.

All gravity condensate runs shall be plastic laid to fall of 1 in 50 minimum. Installed with a minimum clearance of 75 mm above the suspended ceiling level. All high points shall have accessible points to allow dosing/cleansing to be carried out. Where runs of condensate pipe work require lift due to insufficient ceiling void depth or structural beams, sump type condensate pumps shall be utilised.

All condensate pumps shall be suitable for their application both physically and acoustically.

All condensate pipe work shall be insulated.

The Contractor shall route all condensate to a suitable external drain point. The pipework shall terminate 250mm above finished floor level.

Where an external drain point is not possible and only after prior agreement shall the contractor route condensate pipe internally to terminate with a doseable glass trap, into the flushing cistern located above a urinal bowl or a rain water pipe or a soil and vent pipe. In the case of a soil and vent pipe there shall be an air gap between the glass trap and the soil and vent pipe connection which shall have a minimum of a P type trap.

2.7.3 F-GAS REGULATIONS

The Contractor shall commission and record information regarding the installed stationary refrigeration air conditioning equipment.

The record sheet shall be completed for each separate refrigerant circuit, including systems with less than 3kg of charge.

The record shall be completed and presented in the Operating and Maintenance Manuals.

The record shall include;

- Plant name.
- Reference No./ Serial No.
- Plant manufacturer.
- Location of plant.
- Cooling loads served.
- Refrigerant type.
- Refrigerant quantity (kg).
- Year of installation/Commissioning date.
- Personnel/Company performing the installation.

2.7.4 CONTROL WIRING

The Specialist sub contractor shall be responsible for the interconnecting control wiring between the comfort cooling equipment, indoor and outdoor units and control wiring between remote controllers, centralised controller and all other relevant components. This work shall be co-ordinated with the electrical installation for the routing and trunking of the cables.

All control wiring shall be carried out screened cabling with coding and tagged and an ID number at termination points for ease of identification and maintenance.

Control wiring shall not be run with power wiring and the following spacing shall apply:-

Current capacity:-

10 Amps	Spacing:	300mm
50 Amps	Spacing:	500mm
100 Amps	Spacing:	1000mm

2.8 VENTILATION INSTALLATIONS

2.8.1 DUCTWORK

Ductwork is to be of the spiral wound type (unless shown otherwise) to the BS EN 1506 range of preferred duct sizes with suitable pre-formed fittings and brackets as required. Ductwork to comply generally with *DW 144*, and particularly with the following details:

Item	Circular
Joints	Fig. 60
Supports	up to 400mm dia. 25mm x 3mm spit clip, minimum.
Connections to Equipment	Fig 18 Angle type.
Strengthening	None (Minimum sheet thickness 0.8mm).
Branches	Fig. 140 Shoe type.
Access Doors	Double skin insulated.

2.8.2 ANTI VIBRATION MOUNTINGS

Great care is to be exercised in preventing noise from the system entering the building. To this end the fan units are to be mounted on suitable anti-vibration mounts. It is also recommended that the units are suspended.

2.8.3 SUPPORTS

Supports are to comply with *DW 144* and are to incorporate a resilient material to prevent metal to metal contact. Where ductwork is carrying cold air the Contractor shall insulate between the support and ductwork to prevent a cold bridge being formed, in accordance with the insulation clauses of this specification.

2.8.4 FLEXIBLE DUCTWORK

Any flexible ductwork is to be of the insulated type, with a maximum acceptable length of 500mm, and is to be securely fixed in accordance with the manufacturer's recommendations. Flexible ducts shall be the same size as the metal ducts serving them. All metal ducts feeding a flexible duct shall terminate with a down turned bend, such that the flexible duct drop is substantially vertical.

2.8.5 FLEXIBLE FLANGE CONNECTIONS

The Contractor shall supply and install a flexible flanged duct connector to all items of plant.

2.8.6 FIRE DAMPERS

Dampers to be installed to suit the fire barrier they are install in to.

Dampers to match the requirements of BS9999, install Fire Smoke type as required. As a minimum Supply and install fusible link fire dampers in the locations shown on the drawings. The fire dampers shall be installed and built into the structure, complete with all necessary installation frames, such that the fire resistance equals that of the barrier it penetrates. The fire dampers shall be installed in accordance with the manufacturer's guidelines with specific care being given to the independent support of the fire damper and frame to the building structure.

Fire dampers shall not be installed in kitchen extract ductwork.

2.8.7 ACCESS DOORS

The ductwork shall incorporate access doors in the following locations:

- At each air flow and temperature sensor.
- At both sides of each fire damper.
- At both sides of each volume control damper.
- At the top and base of any duct riser.

2.8.8 VOLUME CONTROL DAMPERS

Supply and install volume control dampers, with ductwork spigots to suit the attaching ductwork in the locations to provide an effective Installation and allow full balancing and commissioning

Dampers shall be opposed blade type when installed in ductwork sized 200mm and above.

Dampers shall be flap type when installed in ductwork sized 160mm and below.

2.8.9 FILTER MEDIA

The Contractor shall supply and install filters that are marked/stamped with the grade of filter and its manufacturer.

Where bag filters are to be installed glass fibre media shall be used unless installed within kitchen supply ventilation systems where synthetic filters shall be used.

The contractor shall write in permanent marker, on the filter media housing, the date the filter media is installed, the date shall be visible when the units access panel is removed.

All filters shall be to EN 16890.

Filters grades shall be to the following schedule.

Service	BS779:2012 (old standard)	BS16890
Supply Air Minimum, Pre Filter	G4 Pleated Panel Filter	ePMCoarse 65%
Panel Filter	M5 Pleated Panel Filter	ePMCoarse 85%
Panel Filter	F7 Pleated Panel Filter	ePM1 55%
Bag Filter	M6 Synthetic Bag Filter	ePM10 70%
AHU Standard, Bag Filter	F7 Synthetic Bag Filter	ePM1 50%
Bag Filter	F8 Synthetic Bag Filter	ePM1 70%
Rigid Bag Filter	M6 Rigid Bag Filter	ePM10 70%
Rigid Bag Filter	F7 Rigid Bag Filter	ePM2.5 55%
Rigid Bag Filter	F8 Rigid Bag Filter	ePM1 70%
Rigid Bag Filter	F9 Rigid Bag Filter	ePM1 80%

2.8.10 LOUVRES, GRILLES AND DIFFUSERS

External discharge and intake louvres shall be complete with bird mesh screens. The Contractor shall allow for the supply, installation and weathering of the louvres. Provide plenum boxes fixed directly to each louver to be used for the connection of the ductwork system.

The Contractor shall be responsible for advising on the size and location of the louvres and ductwork plenums.

Louvres shall be sized on a maximum face velocity of 2.0m/s and to provide a minimum of 50% free area. The location of the louvres shall be based on the positions shown on the Architect's planning drawing and shall be agreed with the Architect.

Provide blanking for any louver or part louver area not used for intake, discharge or local ventilation.

2.9 INSULATION INSTALLATIONS

2.9.1 INSULATION – GENERAL

Thermal insulation materials and their installation shall conform to the following British Standards or Codes of Practice and shall have local authority approval.

<i>BS 5422</i>	<i>Insulation materials on pipes, ductwork and equipment. Minus 40°C to plus 700°C.</i>
<i>BS 5970</i>	<i>Code of Practice for thermal insulation of pipework and equipment. Minus 100°C to plus 870°C.</i>
<i>BS 3927</i>	<i>Rigid phenolic foam in the form of slabs and sections.</i>
<i>BS 3958-Part 2</i>	<i>Calcium Silicate Preformed Insulation</i>
<i>BS 3958-Part 4</i>	<i>Bonded preformed man-made mineral fibre pipe sections.</i>
<i>BS 3958-Part 5</i>	<i>Specification for bonded man-made mineral fibre slabs.</i>
<i>BS 1710</i>	<i>Identification of pipelines and services.</i>

Insulation materials shall be either non-combustible to *BS 476 Part 4* or shall be rated Class 'O' for the *UK Building Regulations, approved Document B, Appendix A12(b)* (unassisted by facings) when tested to *BS 476 Parts 6 & 7*.

The following insulation materials shall not be installed within buildings:

Asbestos or asbestos containing materials.

Expanded or extruded polystyrene foam

Polyurethane or polyisocyanurate foam

The smoke obscuration factor for any insulant or facing thereto shall not exceed 5% when tested to *BS ISO 5659-Part 2*.

The Client wishes to obtain the enhanced capital allowance for installing an approved insulation installation. The Contractor shall install the insulation accordingly.

2.9.2 SCOPE OF WORK FOR INSULATION

The Contractor shall allow for the thermal insulation of pipework, ductwork, plant, valves and other items of the mechanical services contract work as specified.

The whole of the thermal insulation work shall be carried out by an approved firm of specialist traders who are members of the Thermal Insulation Contractors Association.

Insulation as specified shall be applied to the following services:-

- Refrigeration pipework and equipment which is not factory insulated.
- Chilled water pipework.
- Mains cold water, cold water supply and hose reel systems.
- Hot water supply and circulation return pipework.
- Heating pipe work not used as an effective heating surface.
- Primary and secondary condenser pipe work including condenser plates.
- Cold water storage tanks.
- Calorifiers and heat exchangers.
- Air conditioning and ventilation supply air ducting including fresh air intakes, flexible ducting, plenum boxes and return air ductwork where required for energy conservation considerations.
- Fan coil unit and cooling battery drip trays.
- All condensate pipework (where located in a cold roof / ceiling void)
- Boilers, Flues and Generator Flues, when not factory pre-insulated.
- Boilers, when not factory pre-insulated.

2.9.3 INSULATION MATERIALS

The following insulation materials are generally acceptable for use within buildings, except where their use is restricted in specific areas:-

Rigid phenolic foam pipe insulation, nominal density 37kg/m³ and with an aged thermal conductivity value not exceeding 0.025 W/mK at mean temperature 10°C. Bore face of sections coated with a non odorous passivating solution. All sections with factory applied reinforced aluminium foil facing. Kooltherm pipe insulation as manufactured by Kingspan Industrial Insulation.

Rigid phenolic foam laminate, nominal density 37 kg/m³ and with an aged thermal conductivity value not exceeding 0.022 W/mK at mean temperature 10°C. Laminate to have reinforced aluminium foil facing auto-adhesively bonded to one face during manufacture. Kooltherm duct insulation as manufactured by Kingspan Industrial Insulation.

Resin bonded mineral wool pipe insulation with factory applied reinforced aluminium foil facing, nominal density 130kg/m³ and with a thermal conductivity value not exceeding 0.043 W/mK at mean temperature 100°C. Rockwool or similar.

Resin bonded, foil faced, mineral wool duct insulation in a range of densities 36kg/m³ to 100 kg/m³ dependant on location. Thermal conductivity value not exceeding 0.043 W/mK at mean temperature 100°C Rockwool or similar.

Pre-formed foil faced, calcium silicate sections, nominal density 240 Kg/m³ and with a thermal conductivity value not exceeding 0.058 W/mK at mean temperature 100°C Hitherm or similar.

2.9.4 MATERIAL RESTRICTIONS

All insulation materials shall be free from the use of CFC's in their manufacture and as a finished product.

Phenolic foam insulation shall not be used on services operating above 120°C.

Insulation materials containing man made mineral fibre are not to be installed in kitchens, food preparation areas, food storage areas or other sterile areas (including ceiling voids and ducts and access from these areas).

Phenolic foam insulation shall not be used in return air plenums as a lining or on pipework greater than 100mm when located in basement plant rooms.

2.9.5 FITTING OF INSULATION

Any insulation work which is at variance with the specification or is inferior in quality of material and installation shall be removed and replaced by the Contractor at his own expense.

The Contractor shall protect all adjacent surfaces of plant and equipment during the insulation programme.

Insulation shall be of uniform thickness and shall be at least the thickness specified.

To ensure that the correct thickness of insulation has been applied, the Contractor shall if required, cut out one section for examination of each type of insulation specified.

The Contractor shall allow for the cost of cutting out and making good in his tender.

Unless otherwise agreed with the resident engineer, pipes shall be insulated individually. A minimum of 25mm clearance shall be maintained between final insulated surfaces of adjacent pipes.

Insulation on all access doors, manhole covers etc. shall be left clear of the permanent insulation to permit removal and replacement without damage.

The Contractor shall provide the resident Engineer with a manufacture's certificate of declared thermal conductivity value appropriate to the temperature of use.

Particular attention shall be given to the final appearance and finish of all insulation which shall, on completion, present a neat and symmetrical appearance running in line with pipe layouts.

All pipeline insulation shall be installed to allow removal of flange bolts and nuts, ends shall be finished with a neat bevel or with end caps.

2.9.6 PIPEWORK INSULATION - GENERAL

Pipework shall be insulated with pre-formed foil faced sections one metre in length. Insulation shall be a close fit to the pipe with tight butt joints. After installation all joints in the facing are to be sealed with 50mm wide self adhesive aluminium foil tape.

All insulation regardless of outside finish shall be supported with non-ferrous metal bands applied firmly and squarely at not greater than 300mm centres with not less than two bands on any shorter length.

See selection Tables I – V for thickness' of materials.

2.9.6.1 PLANT ROOMS & OTHER VIEWABLE INSULATION

Pipework shall be insulated in accordance with Clause "2.9.6 Pipe work insulation – General" and then finished with stucco embossed aluminium sheeting to the following thickness:-

- Vessels and flue piping 1.25 mm

- Pipework 100mm diameter and above 0.91 mm
- Pipework up to 100mm diameter 0.70 mm

Cladding shall include manufactured bends, tee sections and end caps at termination points.

Installation/fixing of cladding on hot services shall be with 'pop' rivets or self tapping screws at maximum 100mm centres.

Installation/fixing of cladding on services operating below ambient shall be 12mm wide aluminium or stainless steel strapping at a maximum 300mm centres.

All valves, flanges, unions and expansion joints shall be contained in two part fabricated aluminium boxes, hinged on one side and with quick release toggle fasteners on the opening side.

The boxes are to be lined with insulation to match the type and thickness of adjacent insulated pipe work.

2.9.6.2 **CEILING & FLOOR VOIDS, BUILDER'S DUCTS & OTHER HIDDEN INSULATION**

Pipework shall be insulated in accordance with Clause 2.9.6 Pipe work Insulation - General" the foil facing constitutes the final finish.

Valves, flanges, unions and expansion joints on hot services shall be enclosed in purpose made covers comprising mineral wool blanket sandwiched within silicone rubber coated glass fibre fabric. The covers are to be demountable and secured with 'Velcro' pads or nylon pull cords.

Valves, flanges, unions and expansion joints on cold services shall be insulated with foil faced oversize sections or purpose made moulded foam boxes. The insulation and foil facing on adjacent pipework is to be taken into the box and sealed down to the pipe surface. Joints in the box are to be sealed with 50mm wide self adhesive aluminium foil tape.

2.9.6.3 **EXTERNAL TO BUILDINGS**

Insulation shall be installed in accordance with Clause 2.9.6 Pipe work Insulation - General" Weather protection to the insulation shall comprise one of the following systems:-

- Two full applications of a polymeric emulsion mastic such as Childers CP55 or similar (two colour system), reinforced with open weave glass cloth No. 10 between coats. (Childers Encacel T to replace CP55 under low temperature or damp conditions).
- Insulation to be wrapped in 0.8mm thick PIB sheeting with 30mm wide longitudinal laps and 50mm wide circumferential laps all solvent welded to be weather tight.
- Insulation to be wrapped in VentureClad 1577cw, 5 ply laminate, Black in colour 1577CW-B. Install with 75mm over lap to all joints. Installation to create absolute vapour barrier. Manufacturers recommendations to be followed.

2.9.6.4 **BURIED SERVICES**

Insulation shall be installed generally in accordance with Clause "2.9.6 Pipe work insulation general" except that when phenolic foam is fitted the density of the insulant is to be increased to 60kg/m³.

Waterproofing of the foil faced insulation shall comprise a rubber bitumen compound on a PVC carrier applied spirally as a continuous tape with a 50% overlap.

Insulated buried pipe work shall be bedded in a fine aggregate such as sand and over filled for a depth of 150mm with the same aggregate.

2.9.6.5 **PIPE SUPPORTS**

On services up to 100° C pipe work is to be separated from the clip or strut by fitting high density phenolic foam 'K' block or Rocklap H&V pipe insulation inserts for use with pipe hangers.

The 'K' Blocks will have a bonded spreader plate and full wrap around foil facing. When Rocklap H&V pipe insulation inserts are fitted they are also to be supplied with a fully bonded foil facing.

Thickness of blocks will match adjacent insulation and they are to overhang the clip by 25mm on either side. Joints between block and adjacent insulation are to be sealed with tape on services below 20° C.

Where load bearing insulation is not used, segmented liners suitable for the pipeline temperature shall be installed. Fit insulation up to each liner and carry facing vapour barrier across the liner prior to bracketing.

Where load bearing insulation is used, carry through insulation and finish, and provide a 2mm thick sheet metal protective sleeve (for installation by pipe erector).

Where non-load bearing insulation is used, close butt to high density segmented phenolic foam liners or polyisocyanurate pipe supports with metal sleeve. Ensure the vapour barrier is maintained (for installation by pipe erector).

2.9.6.6 **VALVE JACKETS**

All new valves within plant rooms boiler rooms or external to the building fabric including isolating, regulating, strainers, 3 port valves, flanges, etc. shall be fitted with purpose made valve jackets with 50mm thick infill/insulation. Each jacket is to be tailor made being flexible and removable, generally with velcro fasteners. As manufactured by www.pipelagging.com or www.theinsulationshop.co.uk or equal approved. The Contractor shall discuss the project's valve requirements with the manufacturer to obtain the specification that suits the system and application i.e. suitable for external mounting as necessary.

2.9.6.7 **INTEGRITY OF VAPOUR BARRIERS**

Vapour barrier integrity is to be ensured throughout. Repair immediately any damage to vapour barriers and where such barriers have been applied as an integral part of the insulation.

Where aluminium sheeting is used for protection, submit proposals for securing sheeting without impairing the insulation, to match the original arrangement.

2.9.6.8 **FROST PROTECTION**

Before the application of insulation, all pipework conveying cold water, chilled water or containing standing water in sprinkler systems where the pipework is externally exposed or located in unheated parts of a building shall have electric trace heating tapes fitted.

2.9.6.9 **ELECTRICAL TRACE HEATING CABLE**

Where electrical trace heating cable is installed to either provide frost protection or as an alternative to a hot water circulation pipe, the cable shall be installed adjacent to the piped service. This shall be done in line with the manufacturer's recommendations i.e. wrapped or in a straight line parallel to the pipe to be heated/protected. the cable shall be suitably wrapped at each valve or fitting.

To accommodate the trace heating cabling the installed insulation shall have a bore size one pipe size bigger than the installed pipework.

When labelling the pipework with colour banding, an additional orange band shall be applied with the text TRACE HEATED adjacent the pipe service colour banding.

2.9.7 DUCTWORK INSULATION – GENERAL

All ductwork as referred to in Clause “2.9.2 Scope of work for insulation” shall be insulated with foil faced rigid insulation slab, slotted slab or flexible blanket dependant on the location (See selection Table VI for thickness of material).

Rigid slab insulation where fitted to rectangular ductwork is to be cut on site so that the top and bottom slabs overhang by the thickness of insulation, on all corners.

The insulation is to be bonded to all faces with a two way fire resistive contact adhesive. Insulation to inverted surfaces and sides of ducts where they exceed 0.5 metres in depth is to be additionally supported with pre-bonded nylon hangers and washers at 300mm centres.

Where aluminium foil constitutes the final finish to mineral wool insulation it is to be enclosed in 25mm mesh galvanised wire netting.

2.9.7.1 PLANT ROOMS & OTHER VIEWABLE INSULATION

Ductwork shall be insulated in accordance with Clause “2.9.7 Duct work Insulation – General” and then finished with 0.91mm thick Stucco embossed aluminium sheeting secured with ‘pop’ rivets or self tapping screws at maximum 100mm centres.

2.9.7.2 CEILING & FLOOR VOIDS, BUILDER’S DUCTS & OTHER HIDDEN INSULATION

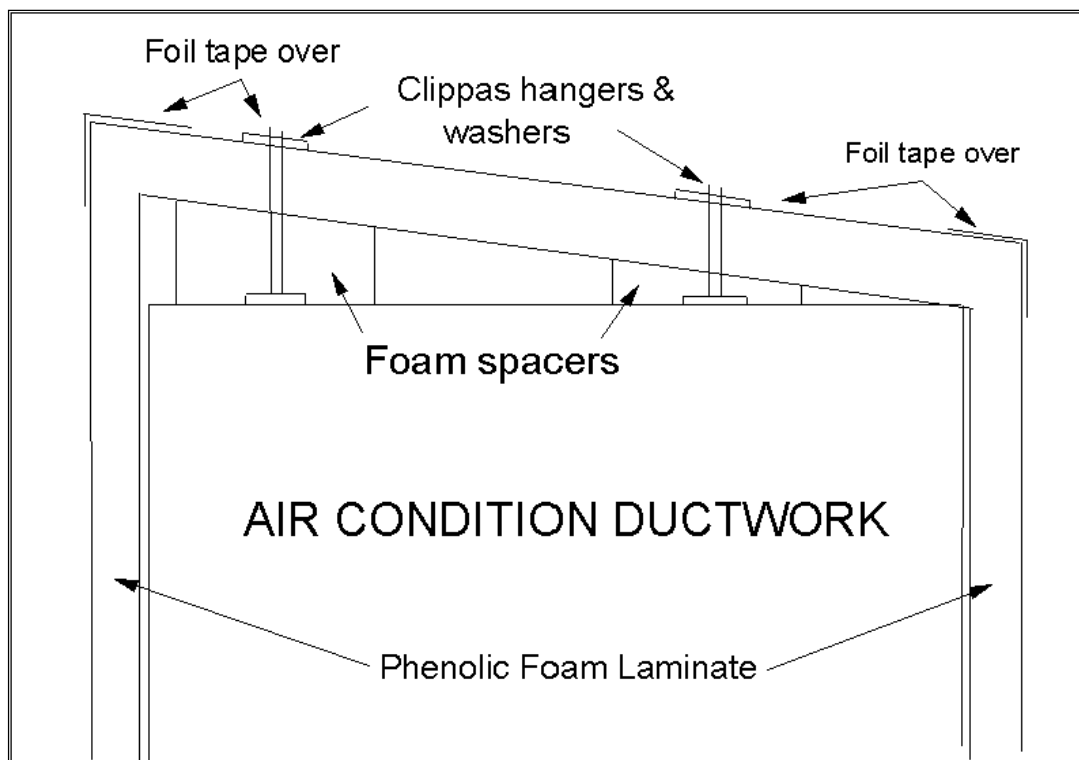
Ductwork shall be insulated in accordance with Clause “2.9.7 Duct Work insulation – General”, which is the complete specification, except that mineral wool insulation will be enclosed in 25mm mesh galvanised wire netting.

2.9.7.3 EXTERNAL TO BUILDINGS

Ductwork shall be insulated in accordance with Clause “2.9.7. Duct work insulation – general”

Weather protection of duct insulation will be in accordance with one of the three options given for pipe insulation under Clause “2.9.6.3 External to Buildings”.

Insulation to the top side of external ductwork is to be laid to falls to avoid 'ponding' on the weather proofing membrane as indicated below;



- Bond Clippas nylon hangers to top side of duct at 800mm centres in two rows each 50mm in from edge of duct.
- Impale 100mm wide phenolic foam spacer strip over hangers along the face and bond with Childers KP31 adhesive.
- Bond side insulation with Childers KP31 adhesive.
- Impale top insulation over hangers and secure with Clippas washers, let into surface of foam. Cut off surplus spike.
- Tape all joints and protrusion through foil with 75mm wide self adhesive aluminium foil.
- Apply weatherproof system.

N.B. Thickness of Spacer:Ductwork up to 500mm width - 10mm

Ductwork 500mm to 1000mm width - 20mm

2.9.8 INSULATION OF TANKS & CISTERNS

All cold water feed/expansion, storage tanks and cisterns that are not pre-insulated shall be insulated with 30mm thick foil faced phenolic foam laminate or 50mm thick foil faced resin bonded mineral wool slab, secured to the surface with a combination of adhesive and insulation hangers/washers. All joints in the foil facing to be sealed with 75mm wide self adhesive foil tape.

Tank/Cistern lids and inspection openings are to be similarly insulated with removable covers.

In plant areas insulation to be finished with Stucco embossed aluminium sheeting.

In roof areas the foil facing to insulation constitutes the final finish.

2.9.9 DUCTWORK SUPPORTS

Insulated ductwork shall be isolated from support bars by the inclusion of foil faced heavy density phenolic foam strip.

The spacer is to match the thickness of adjacent insulation and shall overhang the support bar by 25mm width each side. Joints between the spacer and adjacent insulation are to be sealed with self adhesive aluminium foil tape.

See also Clause “2.6.2 Supports”

2.9.10 INSULATION MATERIAL / COVERING SELECTION

SERVICES	LOCATION	INSULATION MATERIAL							COVERING			
		01	02	03	04	05	06	07	A	B	C	D
HTHW & MTHW Steam Steam condensate	Plant Rooms			O			O		O	X		
	Occupied Areas			O			O		O	O		
	Ducts / Voids			O			O		O			
	External			O			O		X		X	
LTHW DHW HWS	Plant Rooms	O		O				O	O	O		O
	Occupied Areas	O		O				O	O	O		O
	Ducts / Voids	O		O				O	O			
	External	O		O				O	O		O	O
CWS, Chilled Water & Condensate [Must be installed with a vapour barrier]	Plant Rooms	O		O				O	O	X		O
	Occupied Areas	O		O				O	O	O		O
	Ducts / Voids			O				O	X			
	External	O		O				O	X		O	O
Duct work Air Conditioning [Must be installed with a vapour barrier]	Plant Rooms		O			O			O	O		
	Occupied Areas		O			O			O	O		
	Ducts / Voids		O		O			O	X			
	External		O			O		O	X		X	O
Refrigerant	Plant Rooms							X		O		O
	Occupied Areas							X		O		O
	Ducts / Voids							X				
	External							X				X

- Notes:
- O Indicates optional choice of insulant or finish
 - X Indicates mandatory requirement for a vapour barrier (foil or otherwise)
 - Y Calcium silicate to replace mineral fibre in sterile areas (Clause 2.9.4 refers)

Where an option of covering is allowed, externally the finish must be water tight with the insulation and pipe work being kept dry.

2.9.10.1 TABLE I: CHILLED AND COLD WATER SERVICES

Required thickness' of Low K Phenolic Foam or Mineral fibre faced with bright Class 'O' aluminium foil with still air conditions of +25°C

Pipe Size		Thickness of Insulation (mm) faced with bright Class 'O' aluminium foil					
NB (mm)	OD (mm)	Temperature of Water (°C)					
		10		5		0	
		PF	MW	PF	MW	PF	MW
15	21	15	40	20	45	25	45
20	27	15	25	20	40	25	40
25	34	20	30	20	40	30	40
32	42	20	30	25	40	30	50
40	48	20	30	25	40	30	50
50	60	20	35	30	45	35	50
65	76	20	35	30	50	40	65
80	89	20	35	30	50	40	65
100	114	25	40	35	60	40	65
125	140	25	40	40	60	45	75
150	168	25	45	40	60	45	75
200	219	30	45	45	70	55	75
250	273	30	50	45	70	55	80

Thickness' for insulation based on *BS 5422*; Table 10+11 indicative thickness in accordance with ECA recommendations to control heat gain. Table 6+ 7+8 Minimum thickness to prevent condensation. Table 31 Minimum thickness to protect against freezing (8h) is satisfied.

Finishes

Plant Rooms-Stucco embossed aluminium sheeting

Hidden Areas-Aluminium foil

External -Mastic finish, PIB or Venture Clad

2.9.10.2 TABLE II: HOT WATER SERVICES

Required thickness' of Low K Phenolic Foam or Mineral fibre faced with bright Class 'O' aluminium foil for non domestic hot water services operating at 60°C with ambient at 15°C.

Pipe Size		Thickness of Insulation (mm)	
NB (mm)	OD (mm)	PF	MW
15	21	20	35
20	27	20	35
25	34	25	40
32	42	25	40
38	48	25	45
50	60	30	45
65	76	30	50
80	89	30	50
100	114	35	60
125	140	35	60
150	168	35	60
200	219	35	60
250	273	40	60

Thickness' for insulation are based on Enhanced Capital Allowance thickness Environmental thickness for non domestic hot water to control heat loss.

Finishes

Plant Rooms-Stucco embossed aluminium sheeting

Hidden Areas-Aluminium foil

External -Mastic finish, PIB or Venture Clad

2.9.10.3 TABLE III: HEATING SYSTEMS PIPEWORK

Required thickness' of Low K Phenolic Foam or Mineral fibre faced with bright Class 'O' aluminium foil for non domestic heating services operating at 75°C with ambient at 15°C.

Pipe Size		Thickness of Insulation (mm)	
NB (mm)	OD (mm)	PF	MW
15	21	20	45
20	27	20	50
25	34	25	50
32	42	25	50
38	48	30	55
50	60	30	55
65	76	35	60
80	89	35	60
100	114	35	65
125	140	40	65
150	168	40	65
200	219	40	70
250	273	45	70

Thickness' for insulation are based on Enhanced Capital Allowance Criteria for non domestic heating to control heat loss.

Finishes

Plant Rooms -Stucco embossed aluminium sheeting

Hidden Areas-Aluminium foil

External -Mastic finish, PIB or Venture Clad

2.9.10.4 TABLE IV: HEATING SYSTEMS PIPEWORK

Required thickness' of Low K Phenolic Foam or Mineral fibre faced with bright Class 'O' aluminium foil for non domestic heating services operating at 100°C with ambient at 15°C.

Pipe Size		Thickness of Insulation (mm)	
NB (mm)	OD (mm)	PF	MW
15	21	30	50
20	27	35	60
25	34	35	70
32	42	35	70
38	48	35	80
50	60	35	80
65	76	40	90
80	89	40	90
100	114	40	100
125	140	45	100
150	168	45	100
200	219	45	105
250	273	50	110

Thickness' for insulation are based on Enhanced Capital Allowance Criteria *BS 5422* Table 12, 13.

Finishes

Plant Rooms-Stucco embossed aluminium sheeting

Hidden Areas-Aluminium foil

External -Mastic finish, PIB or Venture Clad

2.9.10.5 TABLE V: STEAM OR HTHW SERVICES

Required thickness' of Mineral fibre insulation or calcium silicate insulation for services operating at 150°C with ambient temperature taken as 20°C.

Pipe Size		Thickness of Insulation (mm)	
NB (mm)	OD (mm)	CS	MW
15	21	385	245
20	27	380	245
25	34	310	230
32	42	360	255
40	48	370	260
50	60	325	260
65	76	325	265
80	89	350	265
100	114	350	265
125	140	350	265
150	168	350	265
200	219	350	275
250	273	350	275

Calcium silicate insulation to be fitted to these services in areas where the use of mineral fibre is restricted see Clause 2.9.4.

Finishes

Plant Rooms-Stucco embossed aluminium sheeting

Hidden Areas-Aluminium foil

External -Mastic finish, PIB or Venture Clad

2.9.10.6 TABLE VI: DUCTWORK

Minimum thickness of phenolic foam laminate or foil faced mineral slab for condensation control on chilled air ductwork. Air handling plants, cooler battery casings, vessels, tanks and other associated equipment

Minimum Temperature of Air Inside Ductwork									
0°C		5°C		10°C		15°C		20°C	
Thermal Conductivity W/Mk									
0.025 PF	0.035 MW	0.025 PF	0.035 MW	0.025 PF	0.035 MW	0.025 PF	0.035 MW	0.020 PF	0.035 MW
Thickness of Insulation									
60	85	50	65	35	45	25	38	20	38

Data based on an ambient temperature of +25°C with a relative humidity of 80%.

Table based on BS5422 Table 10, Table 11 for temperature deltas of 10 and 25 are also satisfied.

Extract and Recirculation Ductwork

All air conditioning and ventilation ductwork extract and recirculation ductwork shall be insulated with rigid phenolic foam laminate or foil resin bonded mineral wool slab.

Finishes

Plant Rooms-Stucco embossed aluminium sheeting

Hidden Areas-Aluminium foil

External -Mastic finish, PIB or Venture Clad

2.9.11 EXISTING INSULATION

Where existing insulation is removed or damaged to enable works, the contractor shall replace with new insulation, to match the original arrangement.

2.9.12 CAVITY FIRE BARRIERS

Existing fire barriers shall be retained. All shall be made good following the installation works.

Seal any gaps at junctions of cavity barriers and suspended ceilings, structural soffits, ducts, pipes, etc, using mineral wool or other approved material to prevent penetration of smoke and flames.

Ensure that fixing to ceiling does not impair fire expansion of grid system or otherwise affect fire resisting performance.

2.9.13 SOUND BARRIERS

Existing sound barriers shall be retained. All shall be made good following the installation works.

2.10 IDENTIFICATION OF SERVICES

2.10.1 SERVICES IDENTIFICATION

All services shall be identified by the use of purpose design plastic tapes. The background colour of the tape shall be in accordance with *BS1710*. Services being identified will be printed in white lettering on a band at least 76mm wide.

Bands are to be located around the whole circumference of the service and at all points where the service cannot be readily identified.

Flow, return and reverse return arrows are to be applied adjacent to each band. Ductwork shall be identified by means of service arrows, indicating service and direction of flow in accordance with BESA DW144.

The application of identification shall follow after all services are correctly painted and insulated.

2.10.2 GENERAL REQUIREMENTS

Identify all new pipework, ductwork, equipment, appliances and ancillaries comprising the various systems, using colour ranges given in *BS381C* and *BS4800*. Use Express Electrical and Engineering Supplies Ltd, 0141 941 3689 or equal approved. Labels may be self-adhesive or fixed or glued in place with an appropriate adhesive to prevent the labels coming loose or lost.

2.10.3 PIPEWORK IDENTIFICATION

Standards – Colour code and label to *BS 1710*.

To each pipe at least once in every room/space, enclosed area.

Apply colour bands, 275-300mm wide, at intervals not exceeding ten metres; at every junction; at every valve; and at every inspection and access position into service shafts, false ceilings, bulkheads etc.

Each Pipe marking is to consist of a basic identification colour, and centre code or safety colour.

On top of the base colour each identification band shall include direction of flow arrows and text confirming the service /circuit description. Where appropriate, fluid or gas pressure.

The text shall be suitably sized and legible from point of normal approach.

Pipe OD including insulation	Text Height
not greater than 50mm	19mm
Greater than 50mm less than 150mm	32mm
Greater the 150mm less than 250mm	64mm

Service Description	12 D 45 Green	18 E 53 Blue, 00 E 53 Black	12 D 45 Green
Cold Water Service	◀		CWS
Tank Cold Water Service	◀		TCWS
Boosted Cold Water Service	◀		BCWS
Mains Cold Water Service	◀		MCW
Hot Water Service Flow	◀		HWS F

Hot Water Service Return	▶	Blue	Black	Blue	HWS R
Low Temperature Heating Water Flow	◀	Blue	Black	Blue	LTHW F
Low Temperature Heating Water Return	▶	Blue	Black	Blue	LTHW R
Chilled Water Flow	◀	Blue	Black	Blue	CHW F
Chilled Water Return	▶	Blue	Black	Blue	CHW R
Service Description	08 C 35 Yellow Ochre	10 E 53 Primrose Yellow	08 C 35 Yellow Ochre		
Natural Gas	◀	Yellow			NATURAL GAS
Service Description	12 D 45 Green	18 E 53 Blue, 04 E 53 Red	12 D 45 Green		
Sprinkler Main	◀	Blue	Red	Blue	Sprinkler

NB The above label colours assume that the water contained in the pipework is derived from a public water main. Where the water is derived from a non potable source the blue black banding becomes 00 A 09 Silver Grey, 00 E 53 Black banding.

2.10.4 DUCTWORK IDENTIFICATION

Standards - Colour code and label to BS 1710 and BESA *Specification DW 144* (Appendix C).

To each duct at least once in every room/space or enclosed area.

Apply colour Triangular in shape, each side being 150mm, at intervals not exceeding ten metres; at every junction, at every damper and at every inspection and access position into service shafts, false ceilings, bulkheads etc.

The triangular shape shall point in the direction of air flow.

Service Description	Triangle Colour	Text	Text Colour
Supply Air	Red	SA	White
Fresh Air	Blue	SA	White
Kitchen Extract	Green	KE	Black
Return Air	Grey	RA	Black
Extract Air	Brown	EA	White

2.10.5 PLANT & EQUIPMENT IDENTIFICATION, LAMINATED PLATES

Standards

Identify each item of equipment by name and, where possible, by agreed reference characters. Provide colour identification as called for in work sections and, in all cases, colour fire fighting equipment red.

Identification Colours

Use primary and secondary identification colours of associated system.

Plates

Use rectangular metal or laminated plastic, securely fixed to each item of equipment.

Lettering

Laminated plates, multi-coloured with outer layer removed for lettering.

Legends

Engrave plates with an approved text. Incorporate operating duty of equipment where this is not incorporated in other labelling.

2.10.6 VALVE IDENTIFICATION

Standards

Identify each valve, cock, stop valve, air vent, drain cock etc with disk engraved with numerical reference, except where exposed in occupied areas.

Identification Colours

Use primary and secondary identification colours of associated system for painted or self colour discs.

Discs

Securely attach metal or laminated plastic discs; minimum diameter 35mm to each item.

Legends

Engrave discs with permanent characters, minimum height 6mm.

Incorporate in operating instructions relating to regulating valves and flow measuring equipment, details of flow rate, pressure differential and setting as appropriate.

2.10.7 DANGER & WARNING NOTICES

Hazardous Systems

Colour code and label hazardous systems and equipment to requirements of Health & Safety Executive Guidance Notes.

2.10.8 ELECTRICAL LABELLING

All isolators shall be fully labelled using engraved white traffolyte labels fixed securely to the isolator with PVC rivets or nuts and bolts.

Allow to produce new distribution board schedules where circuits are amended or new circuits are derived.

2.11 CLEANING OF SYSTEMS PRIOR TO TESTING

Immediately prior to testing and commissioning of the completed work or part thereof, the Contractor shall clean thoroughly all parts of the system and related plant to ensure that no foreign matter is present.

The Contractor shall be responsible for all damage arising due to failure of compliance with this clause.

2.12 INSPECTION & TESTING BEFORE CONCEALMENT

Whenever work requiring inspection or testing is subsequently to be concealed, due notice shall be given so that inspection may be made or tests witnessed before concealment. Failure to give such notice may necessitate the Contractor uncovering the works and reinstating at his own expense.

2.13 TESTING & COMMISSIONING

The Contractor shall set to work the completed installation or part thereof and make all necessary adjustments to ensure correct functioning.

After the installation, or part thereof, has been set to work and adjusted the Contractor shall, in the presence of the Consultant or his representative, test and demonstrate that the works function properly and meet the design criteria and performance specification.

The Contractor is to provide all labour, materials, power, apparatus and properly calibrated and certified instruments for carrying out tests of the plant, materials, work or workmanship in accordance with the contract.

The Contractor shall take all records during all tests and on completion thereof shall provide two typed copies of the test reports and records.

The above general requirements shall be read in conjunction with any particular requirements specified elsewhere.

2.13.1 HEAT TEST

After satisfactory completion of pressure test and prior to the application of insulation where practical all hot water heating and domestic hot water mains are to be put into operation and maintained at working pressure and temperature for a period of one hour after which period the mains are then to be allowed to cool down and shall be examined for any defects which, if found must be made good.

2.13.2 REGULATION AND CIRCULATION TEST

The whole of the new installation and an affect circuits of existing systems shall be regulated to ensure an even circulation through every branch in accordance with the commissioning circulation test procedure laid down in the appropriate CIBSE Commissioning Codes.

2.14 TESTING AND COMMISSIONING MECHANICAL SERVICES

The correct and thorough commissioning of these works is of prime importance. The Contractor's attention is drawn to the requirements of the *CIBSE Commissioning Code M* and the detailed constraints required by them. Over and above these it shall be the contractors' responsibility to FULLY commission all services. Copies of all readings and measurements obtained shall be offered for the Project Manager's approval and finally ALL services shall be demonstrated to the Project Manager as functioning fully in accordance with the figures previously submitted, the design intent, and manufacturers published performance criteria for the specific equipment installed. No tests required by the Project Manager shall constitute an extra to the contract. Failure to fully comply with this Clause shall be regarded as a "failure to perform" by the Contractor. As such a failure is always critical to the Employer's occupation, the Project Manager reserves the right at 12 hours notice to employ an alternative specialist commissioning engineer to complete the works, all costs resulting from which shall be chargeable to the Contractor. The Project Manager's decision in this matter shall be final.

The Contractor must provide all necessary instruments which are required for the tests and all labour for firing and running the Plant during the tests; the fuel and water will be provided by the Employer. Any faulty materials and/or workmanship revealed during the above tests shall be removed and/or rectified or replaced by the Contractor at his own expense and a further test or tests made to the complete satisfaction of the Project manager's representative.

2.14.1 PRESSURE TESTING - GENERAL

Comply with procedures given in *BESA Guide to Good Practice for Site Pressure Testing of Pipework TR6*. Ensure safety precautions detailed in *HSE Guidance Note GS4 Safety in Pressure Testing* are adopted.

Provide a blanked connection to accommodate a check gauge in addition to the accurate gauge fitted to section under test.

Test concealed or buried pipe work before any permanent covering is applied. Advise appropriate personnel, in advance, of the time pressure tests may be witnessed.

The Named Sub Contractor shall provide test result certificates of water temperatures at each outlet for the system.

2.14.1.1 PRESSURE TESTING – WATER CIRCULATING

Carry out Hydraulic Pressure Testing as described in *BESA Guide to Good Practice for Site Pressure Testing of Pipework TR6*. Test section by section for one hour, as the work proceeds and prior to application of thermal insulation as follows:

Operating gauge pressure less than 3.5 bar, test gauge pressure 7.0 bar.

Operating gauge pressure 3.5-7.0 bar, test gauge pressure twice operating pressure.

Operating gauge pressure greater than 7.0 bar, test gauge pressure 14.0 bar or one and a half times operating pressure whichever is the greatest.

2.14.1.2 PRESSURE TESTING – BOILERS AND CHILLERS

Each boiler/chiller, after erection/installation, shall have all connections blanked off and be subjected to a hydraulic pressure test of 1.5 times the working head for a period of two hours, providing this is not at variance with the manufacturer's specified test pressure.

2.14.1.3 PRESSURE TESTING – GAS & AIR PIPEWORK

All pipework carrying gas and air is to be tested to an air pressure of twice the normal working pressure for a period of two hours. In addition to this air test, the Contractor must include for any tests required by the local Gas Authority and for commissioning all gas equipment on completion of the installation.

2.14.1.4 PRESSURE TESTING - VENTILATION

All ventilation ductwork shall be tested in accordance with *BESA DW144*. Where classifications are not specifically detailed, all ductwork shall be deemed to be Class B (medium pressure) and shall be tested to 400 Pa or the maximum operating pressure (whichever is the greater). Sectional testing shall be considered at the discretion of the Project Manager. All ductwork fittings, coils etc shall be deemed to be PART OF THE INSTALLATION for the purposes of these tests.

All air systems with greater than 1.0m³/s air flow rate shall be pressure tested in line with Building Regulations.

2.14.2 COMMISSIONING

Carry out commissioning of installations in accordance with the procedures, checks and tolerances given in the *BSRIA Commissioning Water Systems and Commissioning Air Systems* to achieve the standards set in the *CIBSE commissioning codes*.

2.14.2.1 COMMISSIONING WATER DISTRIBUTION SYSTEMS

Preliminary Checks:

Carry out checks and procedures as detailed in *CIBSE Commissioning Code W, Section W5*.

Ensure system is statically complete as defined in *BSRIA Commissioning Water Systems (BG2/2010)*.

Use pre-commissioning check list from *BSRIA Commissioning Water Systems (BG2/2010)*.

Setting to Work and Regulation:

Set to work and regulate water distribution systems in accordance with *CIBSE Commissioning Code W, Sections W6 and W7*, and *BSRIA Commissioning Water Systems (BG2/2010)*.

Measurement:

Use instruments for measurement detailed in *BSRIA Commissioning Water Systems (BG2/2010)*.

2.14.2.2 COMMISSIONING AIR DISTRIBUTION SYSTEMS

Preliminary Checks:

Carry out checks and procedures as detailed in *CIBSE Commissioning Code A, Section A1*.

Ensure system is statically complete as defined in *BSRIA Commissioning Air Systems (BG49/2024)*.

Use pre-commissioning check list in *BSRIA Commissioning Air Systems (BG49/2024)*.

Setting to Work and Regulation:

Set to work and regulate air distribution systems in accordance with *CIBSE Commissioning Code A, BSRIA Commissioning Air Systems (BG49/2024)*.

Measurement of Air Flow:

Use instruments for measurement and methods of measurement detailed in *BSRIA Commissioning Air Systems (BG49/2024)*.

2.14.2.3 COMMISSIONING AUTOMATIC CONTROL SYSTEMS

Preliminary Checks & Settings to Work

Carry out commissioning of automatic control systems in accordance with the manual prepared by the controls equipment manufacturer. Carry out the checking and setting up procedure as detailed in the *CIBSE Commissioning Code C, Section C5, C6 and C7*.

Measurement:

Carry out tests and record all data outlined in accordance with *CIBSE Commissioning Code C, Appendix C8.2.2*.

2.14.2.4 COMMISSIONING PLANT ITEMS

Comply with the manufacturer's recommendations for setting to work.

2.14.2.5 LOAD TEST

Upon completion of the cooling, heating and hot water installations, the Contractor must carry out a full two days test on the system to ascertain that the whole of the apparatus is functioning correctly and efficiently, that expansion is taken up adequately and that the correct room temperatures are obtainable under design conditions; regulating valves, thermostats and other plant shall then be adjusted and permanently fixed.

2.14.2.6 ENVIRONMENTAL TESTS, ARTIFICIAL LOADS

Carry out environmental testing to prove the performance of the systems. Utilise existing building loads or provide test arrangements to simulate the full range of operating conditions and duties.

2.14.2.7 INSTRUMENTS & GAUGES FOR TESTING & COMMISSIONING

Ensure instruments are correctly calibrated. Record details of instruments used on record sheets.

Submit evidence of correct calibration of instruments to be used in connection with commissioning and testing.

2.15 OPERATION & MAINTENANCE MANUALS & RECORD DRAWINGS

The Contractor will be required to submit 1 electronic version of "operation and maintenance" manuals and "as fitted" record drawings. The electronic copy shall be presented via email or cloud sharing software utilising PDF, Word, Excel and AutoCAD software in all cases.

All such documentation shall be submitted to the Project Manager for comment in draft format a minimum of three weeks before practical completion. All comments shall be returned within 14 days at which point two corrected copies shall be lodged with the Contractor on site, before practical completion. One copy shall be submitted to the Project Manager. All finished copies shall be provided before release of any retention.

Failure to provide such complete and adequate documentation by practical completion shall require the Contractor to provide a competent engineer on site during all times that the clients staff occupy the building. Also a one hour call-out shall be required for all other times. If such a service is not provided the Project Manager shall arrange for it by others with all associated costs to be deducted from the Contractor.

2.15.1 OPERATION & MAINTENANCE MANUALS

The Contractor will be responsible for the provision of Operating and Maintenance manuals which form part of the Health and Safety File required under CDM regulations. It is intended that the manuals will be a fully comprehensive document which should include the following:

- a) Title page showing project name, address, date and installers address and telephone number.
- b) Index.
- c) Introduction including Health and Safety guidelines.
- d) General description of all systems and equipment.
- e) Start, run and shut down procedures for all systems and equipment.
- f) Emergency procedures.
- g) Fault tracing.

- h) Schedule of routing maintenance.
- i) Details of health and safety hazards in carrying out maintenance.
- j) Design and Performance data.
- k) Manufacturer's literature and technical data sheets.
- l) List of recommended spares.
- m) Schedule of test and commissioning results.
- n) Schedule of "As Fitted" drawings.
- o) Names and addresses of Manufacturers, Service Companies, etc
- p) COSHH data sheets.
- q) Details of health and safety hazards in carrying out clearing alterations or demolition of the works.

The above is given as an indication as to the scope of the document and is not an exhaustive list.

The manuals shall be contained in A4 size, plastic covered, loose leaf, 4 ring binders with hard covers, each indexed, divided and proprietary titled.

The manuals shall be complete in draft form and submitted to the Consultant before practical completion for his approval, prior to production.

In order that the various duties imposed by the Health and Safety at Work Act 1974 may be complied with, the issue of the Practical Completion Certificate will be conditional upon the availability of the completed and approved Operation and Maintenance manual. Equally this shall apply to the "As Fitted" record drawings.

2.15.1.1 CLIMATE CHANGE LEVY/ENHANCED CAPITAL ALLOWANCE

The Contractor shall provide to the client, from all relevant manufacturers, proof that installed equipment has been approved by the Capital Allowance Scheme. This information shall be part of the operating and maintenance manuals.

2.15.2 AS FITTED RECORD DRAWINGS

The Contractor shall provide accurate drawings of the whole installed work, to scale and clearly endorsed AS FITTED RECORD DRAWING near the title block.

When approved, the above drawings are to be supplied in quantities and format as detailed elsewhere within this specification.

The drawings or sets of drawings to a scale of not less than one hundredth full size, shall show the following as installed:

2.15.2.1 MECHANICAL WORKS

- i) The location, including level if buried, of public service connections provided within this contract whether carried out by the Contractor or by the appropriate Authority, together with points of origin and termination, size and material of pipes, line pressure and/or other relevant information.
- ii) The layout, location and extent of all piped services showing pipe sizes throughout, together with all valves etc.
- iii) Location, identity, size and details of all apparatus and control equipment served by, or associated with, each of the various services.
- iv) Layout, location and extent of all air ducts, showing all dampers, acoustic silencers, grilles, diffusers and other equipment. Each duct and each terminal component shall be marked with its size and the air quantity flowing.
- v) Location and identity of each room or space housing plant, machinery or apparatus.

- vi) At not less than one twentieth full size the detailed general arrangement of all plant rooms, machinery spaces, air handling plants, tank rooms and/or apparatus.
- vii) A schematic drawing of each service indicating all plant items, valves, dampers etc. and commissioning information.
- viii) Provide a suitably sized water proof valve chart to be mounted in each plant room. The chart is to show valve number, description of function, service controlled and valve size.
- ix) Controls documentation - the controls specialist shall supply a folder containing four copies of the following:-
- x) Complete Operating Instructions for the Control System and Associated Hardware:
 - Wiring Diagrams
 - Controls Strategy Drawings
 - A Description of the Control System

Data Sheets of valves, sensors, controllers and all other equipment installed.

A detailed schedule of the set points of all equipment.

Control equipment shall be thoroughly bench tested at the manufacturer's factory prior to delivery to site in accordance with BS:5486. These tests shall include demonstration of the complete control sequence detailed herein, and may be witnessed and certified by the Engineer.

2.16 PRACTICAL COMPLETION MEETING

The Contractor is required to comply with specific requirements at hand-over of the completed project. Certain of these requirements are to be provided to the Consultant / Project Administrator by the Contractor, and are itemised below;

- Maintenance pack as detailed in the mechanical specifications.
- Water chlorination certificate/s.
- Water Legionella certificate/s.
- Air balancing commissioning figures.
- Heating Water & Chilled Water, balancing and temperature commissioning figures.
- Hot Water balancing and temperature record figures from all outlets.
- Cold Water temperature record figures from all outlets.
- Control commissioning certificate and report.
- F-Gas Regulation record information.
- Operation and maintenance manuals.
- "As Built" drawings.

NOTES:

All certificates to be presented in plastic protective covers.

Where original certificates not available, photocopies to be provided.

The Contractor to attend this meeting if so requested.

2.17 HANDOVER

On completion of the contract the Mechanical Contractor shall leave the contract area in a clean and tidy condition and clean down all equipment either new or existing forming part of the complete installation.

Immediately prior to handover of the works provide a Completion Certificate certifying the overall completion of the works in accordance with the specification, drawings and variation instructions.

The Certificate should be provided on the date agreed upon for completion but, in the event of the Works not being complete on that date, a statement of outstanding work is to be provided, stating the date on which the Works will be completed, and the Completion Certificate will be provided on the date that the Works are actually completed.

The Completion Certificate should state, wherever applicable, that the installations conform to the Appropriate Regulations.

The Contractor shall allow for a total of two days attendance on site for staff training/demonstration of the installed systems.



PART 3

PARTICULAR SPECIFICATION

FOR

MECHANICAL SERVICES INSTALLATIONS

INN KEEPERS LODGE

1-3 YORK STREET (BROWNS), MANCHESTER

**ISSUE: T1
22/12/2025**

SPECIFICATION FOR MECHANICAL SERVICES INSTALLATIONS

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Appendix A - Sanitary Ware

Water fittings Schedule

Water Commissioning Handover Sheet

Appendix B – Pricing Offer Document

Building Standards Kitchen Ventilation Policy (BSKVP)

Refer also to;

Mechanical and Electrical Drawings.

Catering Contractors Drawings

Designers Drawings

Structural Engineers Drawings

Drawing Schedule

4 SCOPE OF WORKS

The Mechanical Contractor shall be responsible for, supply, installation, testing, commissioning and setting to work of the complete Mechanical Services installation. The Mechanical Contractor shall comply with all aspects of this document, together with Main Contract, M & E Preliminary Documents and Specifications.

The Mechanical Contractor shall be responsible for the complete Mechanical installation. This shall also involve the production and distribution (to all relevant parties), of Mechanical builder's work drawings and information required by other members of the design team and other interested parties. The Mechanical Contractor shall also provide to all interested parties, all requested information and prior to, during and after, the construction phase and in due time.

The Mechanical Contractor shall comply with all aspects of the Construction Design Management Regulations and shall provide relevant Risk Assessments to the Planning Supervisor and Client.

Works shall include, but not be restricted to, the supply, installation, commissioning and setting to work, and where applicable, the inspection and servicing of the following:

- Hot Water Services - crimped fittings and joints.
- Cold Water Services - crimped fittings and joints.
- Ventilation Services
- Air Conditioning – crimped fittings and joints.
- Wiring for Controls and Plant
- Disinfection/Chlorination of the complete hot and cold water distribution systems, from the point of supply into the building through to all points of use.
- Final connection of all Mechanical plant and Sanitary ware

The Mechanical Contractor shall allow for lifting and positioning/locating plant and shall be responsible for arranging any road closures, etc.

In addition, the Mechanical Contractor should note that this project falls under BREEAM VERY GOOD, is a listed building and will be subject to the Building Regulations. The Mechanical Contractor shall work in full co-operation with all members of the design team (inc. Electrical contractor) and shall be responsible for the production of all requested information to allow the completion of the “**As built**” **SBEM** - and all other submissions as may be required to obtain a successful completion.

4.1 COMPLIANCE

This part of the Specification shall be read in conjunction with all other specification parts, all related drawings including those produced by the Architect/Designer and Structural Engineer, the whole to be considered and read as a complete document.

Information related to the fabric of the building may be gained from the Architects/Designers drawings and related information/data sheets, to establish the construction of the building and materials used. Such information shall be used to determine methods to be employed for fixing and material/equipment to be used.

The whole of the works detailed will be supplied, installed, tested and commissioned in compliance with BS:7671 (18th Edition of the IEE Wiring Regulations for Electrical Installations), together with the relevant British Standard Code of Practice and any Statutory Regulations or requirements. Where possible this specification includes references to British Standards, HVCA documentation, the Water Regulations and

the Building Regulations. The specification also requests the relevant authorising bodies (i.e. Gas Safe, Local Fire Officer) are approached to ensure compliance.

The Contractor is responsible for complying with and if necessary obtaining approval from the relevant authorities:-

- Building Regulations or Technical Standards (Building Control or Approved inspector)
- Approval of Water Fittings and Pipe-work Schemes - Water supply (water fittings) Regulations.

Confirmation of compliance with the above shall be submitted to the Contract Administrator.

The Mechanical Contractor shall include for all costs associated with obtaining these approvals and liaising with on-site inspectors.

The Mitchells and Butlers standard contract preliminaries are to be adhered to at all times unless otherwise confirmed by Mitchells and Butlers in writing.

4.2 REGULATIONS

The installation shall be carried out in strict compliance with the latest editions of the following documents (in addition to the references noted herein):

- IEE Wiring Regulations (BS: 7671:2019) – 18th Edition (plus latest amendments),
- CIBSE Codes and Work Regulations 1989
- Control of Substances Hazardous to Health (COSHH) Regulations
- Control of Asbestos Regulations 2012
- Health & Safety at Work Act
- Gas Safe requirements
- The Water Regulations
- HVCA Documentation
- District Surveyor and Building Control Officer requirements
- Current Building Regulations and Euronorms
- All relevant British Standards and Euronorms.
- Construction (Design and Management) Regulations 2015
- F.Gas Regulations
- Ozone Regulations

**ALL EQUIPMENT SUPPLIED AND INSTALLED SHALL BE CE MARKED.
ONLY WRAS APPROVED PRODUCTS WILL BE INSTALLED.**

4.3 MECHANICAL CONTRACTORS DESIGN RESPONSIBILITIES

4.3.1 GENERAL

The Mechanical Contractor shall be responsible for the final, **SUPPLY, INSTALLATION, TESTING COMMISSIONING AND SETTING TO WORK** of the Mechanical installation. There are certain exceptions which are set out within this document, therefore it is imperative that this document is read in its entirety to ensure all items not required of the Mechanical Contractor are met and included within the tender costs. Mitchells and Butlers will take no liability for the cost of items not included that should have.

4.3.2 DESIGN STAGE RESPONSIBILITIES

The Mechanical Contractor shall highlight any information that cannot be identified on the tender drawings in advance of submitting a tender cost.

The Mechanical Contractor's additional responsibilities, during the design stage of the project shall include, but shall not be limited to the following;

- Issue of adequate builders work / construction / coordination drawings and specifications (including all revisions) to all parties.
- Attendance at pre-start meeting.

4.3.3 CONSTRUCTION STAGE RESPONSIBILITIES

The Mechanical Contractor's design responsibilities during the construction stage of the project include, but not be limited to, the following;

- Production and issue of any builders work construction drawings at least 4 weeks prior to the start of works on site.
- Liaison with the client team
- Co-ordination and liaison with services suppliers.
- Amendment and issue of drawings as and when required.
- Production and issue of Mechanical installation programme and a detailed commissioning programme at project start.
- Attendance at regular site meetings including handovers.
- Correction of defects reported at snagging.
- Co Ordination and cooperation with MAB staff and operations team.

4.3.4 POST COMPLETION RESPONSIBILITIES

- Attendance at post contract review meeting (6 weeks after handover).
- 12 months defects liability
- 2 independent seasonal commissioning visits (BREEAM)
- 2 service visits (all plant) including filter cleaning / replacement

4.3.5 INSURANCES

The level of Professional Indemnity Insurance required from the Mechanical Contractor shall be set by the Client.

A copy of the Insurance Certificates shall be lodged with the Contract Administrator prior to start of the design stage.

The Mechanical Contractor shall have and shall maintain, Professional Indemnity Insurance extending to his obligations under this Building Contract, for a minimum cover of £1,000,000 (unless otherwise stated by the client) in respect of every claim

and such cover shall be maintained for a period of no less than 12 months from the date of the issue of the certificate of making good defects under the Building Contract.

4.3.6 BUILDER'S WORK DRAWINGS

The Mechanical Contractor shall produce builder's work detail drawings and schedules illustrating all co-ordinated builder's work requirements for approval by the client's structural engineer, 4 weeks prior to starting on site. Builder's work drawings shall include details of bases supports, openings through the structure, openings through the roof, wall chases, ducts, trenches, frames and secondary metalwork required.

Weatherproofing details shall be included on the drawings and shall be fully co-ordinated with the main contractor and roofing contractor.

THIS WILL BE CRITICAL WHERE THE SERVICES PASS THROUGH THE ROOF FOR PIPED AND VENTILATION SERVICES

4.3.7 WORKING DRAWINGS

The Mechanical Contractor shall be responsible for the production of working drawings and specialist construction drawings from the tender/construction drawings as detailed in the Employer's standard preliminaries. The Mechanical Contractor's working drawings shall demonstrate the method of on-site co-ordination of the Mechanical engineering services with other services and the building structure. A fully up to date set of drawings shall be maintained on site.

The Mechanical Contractor is responsible for providing all necessary information, including construction drawings, to allow the Electrical Contractor to produce co-ordinated drawings to allow co-ordinated services installation. These shall be issued in a timely manner to allow the Electrical Contractor to complete the on-site installations within the required timescale.

Working and specialist construction drawings shall be issued in AutoCAD dwg format.

The Contractor shall use and maintain a full set of drawings and specification on site during the construction phase. All site modifications shall be marked on the site copy of the drawings.

The Contractor shall hand a full set of the modified construction drawings to the M&E consultant at the handover /practical completion meeting.

4.4 BUILDING REGULATIONS COMPLIANCE

The Contractor shall be notified by the design team when any service indicated on the tender drawings requires amending or changing.

The Tender drawings represent the approved scheme with respect to Building Control and the Building Regulations any change by the Contractor may contravene the submitted drawings.

4.5 HEATING

4.5.1 GENERAL

The existing wet radiator system is to be isolated and removed.

The contractor is to allow for the **SUPPLY, INSTALLATION, TESTING AND COMMISSIONING** for a complete Heating system for the IKL via a Toshiba heat recovery R32 VRF (variable refrigerant flow) heatpump air conditioning units.

The ground floor lobby and staircore is to be heated with an over door heater and electric column radiators.

4.6 HOT AND COLD WATER SERVICES

4.6.1 GENERAL

The Mechanical Contractor shall allow for the supply, installation, testing, balancing, commissioning, sterilisation and chlorination for the boosted hot and cold water services within the building.

Within the first week the contractor shall install a pressure gauge to the incoming water supply to the site to determine the site's "normal" water pressure and allow monitoring of the pressure during the contract works.

Water flow limiting devices will be provided to all water outlets (BREEAM) Arrow Valves combined flow limiting and isolation valves will be used.

4.6.2 INCOMING COLD WATER MAIN

The existing basement water supply will be modified with the break in being out of hours.

The new supply will be completed with check valve, stop cocks, injection point (chlorination), and water meter with remote monitoring (BREEAM).

This new supply will be extended to serve the site temp basement offices as well as being routed to the new water storage tanks.

4.6.3 PRESSURISATION / BOOSTER SET

The Mechanical Contractor shall supply, install a pressure booster set to ensure balanced and adequate tap/appliances pressures throughout.
Any pressurisation equipment will be located in the basement and be sited to avoid noise transfer to adjacent areas.

Access into the basement is restricted by the staircase and the mechanical contractor is to check the plant equipment sizes before ordering.

The water tanks will required a steel base to elevate the tank drain point to allow a gravity drain to be installed to and adjacent room for connection to waste

The booster set shall be complete with a Break cistern complete with Water Regulation (G16.13) Accessories for Cold water storage Cisterns. The Cistern be part of booster at ground floor level or separate at roof level.

The overflow and warning pipes shall discharge to the adjacent area. The warning pipe shall be fitted with a warning pipe alarm to indicate a fault to the basement managers office

Each safety valve shall discharge to drain via a separate tundish.

TANKS AND BOOSTER MANUFACTURER - AQUABOOST

4.6.4 HOT WATER CALORIFIER

The Mechanical Contractor shall supply, install and commission, within the plant room 3No MEGAFLOW 300DDDD.

Each Complete with expansion buffer vessel.

The hot water distribution shall be piped including a secondary return to serve all the outlets within the bedrooms and linen stores, including all showers, basins, and any other ancillary sinks.

The Mechanical Contractor shall install isolation and stop valves to all incoming and outgoing service connections. The cold water service shall be protected from back flow and back syphonage with suitable WRAS approved non return valves.

The Calorifier shall be installed with a thermometer & pressure gauge, over temperature and over pressure protection, the discharge of each safety valve shall be piped to / via low level each with tundish to terminate into the same gravity drain as the water storage tanks.

The contractor shall install with due regard to sterilisation requirements of the Hot Water system.

Temperature gauges shall be installed on HWS Flow and on the secondary return pipework each within 500mm of the cylinder connections. The HWS balancing valve will be the Danfoss MTCV.

4.6.5 PUMPS

Domestic hot water pumps shall be single head type and shall be mounted in the correct plane as specified within the manufacturer's literature to prolong pump life. Small pumps shall be wall mounted using a suitable wall bracket with anti-vibration fixings. The pump shall not be supported by the pipe-work alone. Large pumps may be floor mounted and again shall be mounted using a suitable stand with anti-vibration fixings.

All pumps used for pumping domestic hot water shall be bronze or stainless steel.

The pump shall be manufactured by GRUNDFOS Alpha 2 25-40

The domestic hot water secondary distribution system shall be extended to all areas. The Mechanical Contractor shall supply and install on the common return adjacent of the hot water heaters a stainless steel secondary circulation pump, sized to meet the demands of the complete secondary return system.

The secondary pump shall be wired direct via 24h timeswitch to allow intermittence pasteurisation of the hot water in the cylinders

The Mechanical Contractor shall be responsible for the supply, installation and commissioning of all pumps throughout. The pump and electrical feed connection shall be clearly labelled and identified with local isolation.

ALL PUMPS SHALL BE 'A' RATED to "Europump" criteria.

4.6.6 PIPEWORK

The Mechanical Contractor shall install all domestic flow and return pipework to all equipment, sinks and items of sanitary ware, as shown on the Contract Drawing and Architect's drawings.

The domestic hot and cold pipe-work and return shall be of EN1057-R250 Half Hard 15-54mm and EN1057-R290 Hard 67-159mm, formerly BS2871 Part 1 Table X, copper material, or the equivalent for copper press fit.

All domestic flow and return pipe-work shall be constructed of copper, hidden and protected. Where pipe-work is likely subject to be subject physical damage the pipe-work shall be suitably protected.

All pipe-work shall be concealed within ceiling voids/risers or boxed in where possible. Pipe-work should be suitably insulated and located so as not to transfer heat to adjacent pipe-work (BS: EN806, BS 8558, BS 5422:2023).

A pumped secondary return circuit shall be installed to complement the domestic hot water circuit. Pipe-work 'dead-legs' shall be kept to a minimum and shall be no more than 500mm long for sinks and 1500mm long for basins.

All joints shall be crimped, the contractor shall use propriety fittings and jointing methods. The manufacturers recommendations shall be adhered to.

Plastic or HEP₂0 pipe-work and connections shall not be used without prior written approval from the M & E Consultant, and not used in any hot water circulation circuits.

The domestic hot water flow and return pipe-work shall incorporate a visual temperature gauge, installed at each calorifier.

Intumescent fire resisting sealant shall be applied where pipe-work passes through walls, floors, protected areas and fire barriers.

Servicing valves shall be installed at each and every outlet, appliance, draw-off point, pump and ancillary equipment item.

All outlets shall be fed from the distribution pipework. The returns shall be connected to the flow pipework and shall incorporate a DANFOSS MTCV to allow each circuit to be balanced.

4.6.7 BLENDING VALVES

Blending valves shall be installed to all customer areas and staff wash hand basins.

For efficiency the blending valves shall be installed after the return branch connection (so that cold water is not fed back into the return pipe-work). Final discharge temperatures at Whb's shall be as Clauses G18.5 and R18.5 within the Water Regulations Guidelines. All blending valves shall comply with the requirements of TMV2 as a minimum.

TMV's shall be HORNE Heatstat T2 DN15 being complete with integral check stud coupling and compression fittings for 15 copper pipe.

Contractor to use Heatstat T2 DN15 flushing kit to commission each blending valve.

G18.5 requires a 43degC Maximum.

Contractor to set all outlets to be 41degC plus/minus 2degC.

All hot water outlets not supplied with blended water shall have scald warning labels suitably placed close to the tap, 30 x 45mm size "DANGER very hot water".

The contractor shall double check the specification of PHT/AWC basin taps /sanitary ware. The preference being to install standard TMV prior to a standard tap rather than a TMV tap assembly.

Contractor to check the Architects sanitaryware schedule to confirm if the TMV is inbuilt or not.

4.6.8 PRESSURE REDUCING VALVES

The Mechanical Contractor shall install Pressure Reducing Valve at the entry to the unit. The valve shall be after the meter and between two isolating valves.

This is a requirement where the site is being served with water pressure of 6Bar and above. As noted where site testing indicates that the water pressure is below 6Bar a pressure reducing valve is not required to be fitted.

The valve shall be complete with down stream pressure gauge to confirm the site pressure.

The valve shall be set at 3Bar discharge pressure.

4.6.9 OUTLETS / FINAL CONNECTIONS

The Contractor shall supply and install all outlets in accordance with the manufacturer's recommendations and the WRAS Guidelines.

The Mechanical Contractor shall allow for the supply and install of all items of sanitary ware as detailed in Mitchells & Butlers Brand Standard Documentation. Any variations from the schedule are to be agreed with the Architect/ Designer.

4.6.10 STERILISATION & CHLORINATION

Before connection to the local water main, **the incoming building main will require sterilisation in accordance with BS:EN806 & BS8558** and Water Regulations Clause R13. Samples should be taken to ensure correct chlorine concentration.

Noted at Surrey Street Sheffield the water main is existing and is reused, therefore does not need the water company to connect/reconnect the water main. The Mechanical contractor shall still sterilise and chlorinate the water services following the installation of all pipework to provide MAB with certificate's to show the install services are clean prior to handover.

Water storage tanks and distribution pipework are subjected to the same requirements (BS: EN806 & BS8558 and Water Regulations Clause R13) and the Contractor shall include for these works and will provide Certificates of completion for the Health & Safety file.

The Mechanical Contractor shall be responsible for the full sterilisation of the entire installation and shall ensure that the sterilisation procedure meets with the approval of the Local Authority Water Fittings Inspector.

4.7 VENTILATION

4.7.1 SYSTEMS DESCRIPTION

The Mechanical Contractor shall install the supply and extract fans within the building

All fans are to be accessible with specific where necessary for access through the ceiling for future maintenance and associated co-ordination of the hatch.

The Contractor shall provide all necessary lifting gear/equipment and not assume beneficial use of equipment supplied by others.

4.7.2 FRESH AIR SUPPLY

Mechanical Ventilation, shall be provided to each bedroom.

4.7.3 GENERAL DUCTWORK

Shall be fabricated using galvanised mild steel sheet, or spirally wound galvanised mild steel sheet, with joints and fasteners in accordance with the recommendations of HVCA DW144.

The ductwork systems shall be complete with the necessary fixtures and fittings as required, i.e. fire dampers, volume control dampers and turning vanes, etc., the complete assemblies being manufactured and installed in accordance with the dictates and recommendations of the BESA Specifications applicable to the system.

Rectangular fire dampers shall be of the manual damper type, with blades mounted outside of the air stream and shall be a minimum of 1 hour Fire Rating. Access doors shall be provided adjacent to each fire damper all in accordance with the recommendations of the relevant BESA Specification for Ductwork. Circular fire dampers will have external handle on duct sized below 250mm diameter.

The contractor is to liaise with the Architect on access to all dampers.

Volume control dampers within ductwork up to 200mm dia. shall be of the single blade type, with adjustable locking handle mounted externally to the ductwork.

Volume control dampers within ductwork of 250mm dia. and above shall be of the multi leaf type with adjustable locking handle mounted externally to the ductwork. Access doors shall be provided adjacent to each fire damper all in accordance with the recommendations of the relevant BESA Specification Ductwork.

In addition to the requirements for access doors associated with Fire Dampers and Volume Control Dampers, provisions shall be made for the installation of access doors to facilitate total internal cleaning of the ductwork systems.

DUCTWORK SHALL BE LEAKAGE TESTED TO ACHIEVE CLASS A STANDARDS.

FIRE DAMPER DROP TESTING WILL REQUIRE WITNESSING AND ALL DAMPERS WILL HAVE UNIQUE IDENTIFICATION LABELLING

ANY FAN/AHU SHALL ACHIEVE CLASS L2 LEAKAGE STANDARDS AS A MINIMUM.

THE MECHANICAL CONTRACTOR SHALL SUPPLY AND INSTALL PURPOSE MANUFACTURED CRAVATS TO ASSIST WITH WEATHERPROOFING DUCT PENETRATIONS THROUGH ROOFS. THE MECHANICAL CONTRACTOR

SHALL PROVIDE DRAWN DETAILS TO THE MAIN CONTRACTOR TO CONFIRM THE WEATHERPROOFING DETAIL.

4.7.4 FLEXIBLE DUCTWORK

Final connections to heat recovery units and roof terminals shall be of the helically wound wire type, with plastic fabric coating, as 'Regaduct' or similar. Flexible connections shall be limited in length to 500mm and shall be installed with 'manufactured bends' fully supported by flat band straps or similar.

All room mounted diffusers and grilles are to be mounted to solid duct.

4.7.5 FIRE DAMPERS

The Mechanical Contractor shall install fusible link fire dampers in line with Part 2 of this specification

4.7.6 BEDROOM VENTILATION

The bedroom toilet ventilation shall comprise of either a ducted system with in line supply and extract heat exchange unit. extract fans ducted to terminate at roof level via tile replacement cowl, or centralised AHU roof plant connected to dormer roof louvres.

Supply air shall be installed and ducted to each bedroom

The bathroom units shall be controlled via with light switch demand control. To ramp the fan speed from trickle to 15l/s when the bedroom toilet facility lights are turned on, the fans will overrun for 5 minutes (adjustable) when the lights are turned off

The unit shall be automatic temperature control with the bypass dampers in free cooling mode until external fresh air ambient reaches 15deg.

Extract grilles shall be located in the wall central to the shower cubicle, in coordination with the toilet lighting layout.

The WC door between the toilet and the bedroom shall allow air to pass freely under it, this being achieved by under-cutting the door at low level.

The Mechanical Contractor shall arrange the central bedroom duct extract system connections with due consideration to prevent cross-talk and odour transfer, i.e. staggered and not in line. Acoustic flexible ductwork will be used.

Vectaire Studio bathroom units will be installed

S&P CAD 1300 Ecowatt unit for the centralised ventilation will be installed and supported from the adjacent walls – Architect to be informed on access hole size for installation, unit to be supplied in smaller parts if possible.

4.7.7 DIFFUSERS AND LOUVRES

The Mechanical Contractor shall be responsible for the **SUPPLY, INSTALLATION AND COMMISSIONING** of all grilles, diffusers and registers.

THE MECHANICAL CONTRACTOR SHALL UTILISE DIFFUSERS/GRILLES FROM THE WATERLOO RANGE.

The diffusers shall be suitable for supply or extract air and have either hinged or removable perforated face plate with rear mounted air deflection plates. The Mechanical Contractor shall use the schedule of equipment to identify the grilles required the bin store and cleaners store grilles shall have integral fire dampers. All

grilles and diffusers shall be finished to a BS or RAL colour to be selected by the Designer and shall complement the brand theme.

All grilles and diffusers shall be complete with removable core, plenum box and rear mounting fixings.

No grilles or diffusers are to be held in place with through the face fixings.

Ductwork which is visible through grilles shall be painted out internally BLACK.

The Mechanical Contractor shall allow for the protection of paint finishes to all grilles, diffusers, etc., for the duration of the works.

Grilles shall contain internal balancing dampers which shall be set and adjusted by the Mechanical Contractor as required during commissioning.

Access to remote dampers for air valve grilles will need considering.

4.8 AIR CONDITIONING / COOLING

4.8.1 GENERAL OBJECTIVES

The Mechanical Contractor shall allow for final **SUPPLY, INSTALLATION TESTING AND COMMISSIONING** of the complete air conditioning system for the building.

The manufacturer / distributor will be employed for the commissioning process.

The Air Conditioning provides heating and cooling to the building.

The system shall be installed with all interconnecting refrigeration pipework, condensate pipework, power cabling and interconnecting controls cabling.

Condensate off each unit to be run to bedroom service duct and connect to drain stack with an inline dry trap in a vertical position.

The contractor to install a basket /cable tray between the indoor and outdoor units to lay the interconnecting pipework and cabling on.

All refrigerant pipework shall be insulated See Section 2 for installation standards.

Note a single-phase power supply is to be taken to each cassette / control box and a separate three phase supply routed to the external condenser.

The Site has a designated loading bay compound for the condensing units.

The Contractor shall provide all necessary lifting gear/equipment and not assume beneficial use of equipment supplied by others.

4.8.2 SYSTEMS DESCRIPTION

The Mechanical Contractor shall install seven systems to minimise refrigerant content.

The installing Contractor shall be approved and trained to install Toshiba equipment and install all equipment in line with the manufacturers recommendations to achieve and maintain the manufacturers 3 to 5 year warranty after installation.

Indoor Bedroom units:	one way ceiling cassettes
Reception:	ducted fan coil unit
Outdoor unit;	vertical discharge heat recovery R32 condenser.
Wall controllers	simplified hotel type
Centralised controller	to manage all controllers and fire alarm interface

See schedule and drawings for unit references

Each System to be complete with manufacturers Joints and Mode Change Units.
Following Manufacturers recommendations with regard to interconnection cabling and connection points.

Available from Cool Solution Distribution - Leeds
Contact number:- 0113 2799520; Contact name :- Andrew Keegan

4.8.3 REFRIGERENT PIPEWORK BRAZE

The Contractor shall use a proprietary flared fittings and brazed joints.

The contractors installing engineers shall have been trained and use oxygen free nitrogen when brazing.

Hot work permits to be in place and site rules to be followed

The manufacturers recommendations shall be adhered in all respects and to maintain the 5 year warranty.

BS EN 378 to be followed for the whole installation.

4.9 HVAC CONTROL SYSTEMS

4.9.1 GENERAL

To supply, install and commission the independent and individual control systems to control the Mechanical plant to achieve efficient energy consumption. The system shall be easy for the end user to operate.

The Mechanical Contractor shall be responsible for confirming all duties and electrical requirements to the Electrical Contractor prior to starting on site.

4.9.2 SYSTEM DESCRIPTION

The control system shall be supplied, installed and commissioned by the contractor

All power supplies shall be by the Electrical Contractor with local isolator and final power connections.

All controls wiring and final connections shall be by the Mechanical Contractor.

Where the Mechanical Contractor utilises suppliers or sub-contractors he shall take responsibility for the necessary controls wiring.

4.9.3 CONTROL REQUIREMENTS

The controls are to be wall mounted unit and shall be provided within the plant room which shall house all the controls necessary for the HWS generation and all Ventilation systems.

COSHH/Cleaners/Bin Store Extract Fan/Store shall operate 24 hours a day.

Hot Water Calorifier

The water heater shall have integral controls.

This shall initiate to achieve a 65 degrees

Anticipated settings; 24/7 operation

Once a week at 3am the HWS return pumps will switch off for

Air Conditioning

The air conditioning units are to be set up to operate during room occupation hours via room key card. Blades are to be set up not to blow directly at large pendants light fitting via settings in the controller.

Anticipated settings minimum; demand control

21°C temperature, detector mounted within the wall controller.

Unoccupied rooms will default to frost protection 15deg

The wall controller mounted as indicated on – see architects drawing

The room controls shall be of the simplified type to allow temperature adjustment and on off control.

Centralised controller to be located in the cupboard at the side of reception 2nd floor

Water Boosters

The water boosters shall be automatic in control and maintain a pressure to serve all areas at all times.

Warning pipe discharge alarm and general booster pump fault to be indicated in the basement managers office

4.9.4 TESTING & COMMISSIONING

The Contractor shall fully test the operation of all control systems upon completion and shall make due allowance for a full demonstration of the controls to a Client's Representative.

4.9.5 ASSOCIATED MECHANICAL CONTRACTOR WIRING

The Electrical Contractor shall be responsible for providing all electrical power supplies and isolators to all Mechanical Contractor installed equipment.

The Mechanical Contractor shall be responsible for all field control wiring, control interconnecting cabling and all control final connections to ensure the correct operation of the plant.

The Mechanical Contractor shall be responsible for commissioning and ensuring the correct operation of the Mechanical plant.

The Mechanical Contractor shall be responsible for highlighting to the Electrical Contractor, the electrical supplies required for the equipment proposed, including but not limited to:-

- Hot Water Generation plant & controls (including thermostats)
- Hot water distribution pump
- All ventilation fans and controllers
- All air conditioning plant and air handling units

The Mechanical Contractor shall be responsible for ensuring all final circuit wiring complies with the system of wiring requirements detailed within the Electrical Specification.

4.10 COMMISSIONING

The Mechanical Contractor shall utilise independent commissioning specialist's to complete and verify all heating, air conditioning, hot & cold water and ventilation systems.

The commissioning period shall start 10 days prior to Practical Completion, the contractors program of works shall allow for the necessary installation to enable a full commissioning period to be attained.

4.11 OPERATING AND MAINTENANCE MANUALS

Refer to specification part 2.

4.12 RECORD DRAWINGS

The Electrical Contractor shall provide Record Drawings in the form of ONE set of black and white prints for:

1. All underground and buried pipework, ducts and services.
2. Detailed layouts of switch room and plant rooms, etc.
3. Schematic drawings of Electrical Services, showing equipment details and cable sizes.
4. Layout drawings of Electrical Services, no smaller than 1:100 scale including main cable tray and trunking routes, major conduit runs, wiring routes for specialist services, (i.e. fire alarm, security systems, etc.). circuit references, and if necessary special installation details.
5. Automatic control installations including wiring and schematic diagrams
6. Any manufacturers' specialist drawings

The requirement to produce drawings containing adequate details as listed above may require the production of a number of similar plan layouts, each containing a separate, or combination of, various services. It is important that the drawings are produced in a clear, concise manner to allow detailed information to be interpreted by the Employer.

Record drawings shall be cross referenced where necessary to plant and equipment schedules, operating instructions, etc., included in the Operating and Maintenance Manuals.

The Contractor shall provide preliminary installation drawings at an early date in the contract. These shall be updated in accordance with such revisions that may take place during the course of the contract. Draft copies of these drawings should be kept on site during installation to allow revisions to be included.

Record drawings shall be submitted 2 weeks, as a minimum, prior to practical Completion. A draft copy of the drawings shall be submitted to the Contract Administrator/Consultant for approval.

As a minimum requirement these drawings will consist of two drafts sets in the form of prints, issued at the time of Practical Completion, one to be submitted to the Employer for his use and one to the Contract Administrator/Consultant for his comment prior to the final issue of originals and prints as detailed. Final copies of record drawings, including all comments made by the Contract Administrator/Consultant shall be available, no later than 2 weeks after Practical Completion.

Upon approval of the draft record drawings the Contractor shall issue the following to the Engineer:-

- a) 1no. sets of black and white prints of these originals shall also be submitted.
- b) 2no. USB C memory sticks containing all the drawings contained within the O&M Manual in AutoCad DWG and PDF format.
- c) All drawings contained within the O&M Manual shall be uploaded to the Employer's Portal in AutoCad DWG & pdf format.

Note:

- 1) A sum will be held back from the contract sum if O&M's are incomplete or inadequate.

The Client holds the right to charge for the provision of CAD drawings.

4.13 HANDOVER

The Mechanical Contractor shall provide draft certificates and hand marked up as fitted drawings at practical completion.

Contractor to finalise all certificates and As Fitted Drawings in 10 working days, issue to relevant parties and upload to the clients portal as well as issue to Principle Safety.

Immediately prior to handover of the works provide a Completion Certificate certifying the overall completion of the works in accordance with the specification, drawings and variation instructions.

The certificate should be provided on the date agreed upon for completion but, in the event of the Works not being complete on that date, a statement of outstanding work is to be provided, stating the date on which the Works will be completed and the Completion Certificate will be provided on the date that the Works are actually completed.

The Completion Certificate should state, wherever applicable, that the installations confirm to the Appropriate Regulations, i.e. DW172, Water Regulations, Gas.

The Mechanical Contractor to demonstrate to the Reactive Contractor all the elements of the Mechanical Installation.

The Contractor to provide information to allow the completion of the clients PPM form with the reactive contractor and the client.

The Contractor shall allow for a total of two days attendance on site for staff training/demonstration of the installed systems.

APPENDIX A

SANITARY WARE



The Mechanical Contractor shall include for the supply, delivery, installation and commissioning of all the sanitaryware as detailed on the Architect's drawings and information.

INSTALLATION HANDOVER CERTIFICATE

Domestic Water Services

Contractor:

MAB Order No:

Contractor's Job Ref No.:

HOUSE DETAILS

Name:

Address:

BUN:

ENGINEER'S DETAILS

Name:

Page No: 1 of:

HOT WATER GENERATOR - APPLIANCE DETAILS

Type

Installation complete

(Yes/No)

Manufacturer

Gas Certificate Issued

(Yes/No)

Model

Gas Certificate Number

TEMPERATURE RECORD

Appliance

Stored Water °C (60°C Minimum)

Return Temp °C (50°C Minimum)

Flow Temp °C

Cold Inlet Temp °C (20°C Maximum)

Outlet Schedule

Outlet		Cold Water	Hot Water	Notes & Recommendations
REF.	Description	Record temperature as outlet is opened and time to reach less than 20°C or at 2 minutes	Record temperature as outlet opened and time to reach 50°C or at 1 minute	
Continue schedule on additional pages as necessary.		Must be less than 20°C in less than 2 minutes	Must be more than 50°C in less than 1 minute	

Notes to LHM; Any hot water temp at less than 50°C should be rejected & any cold water temp at greater than 20°C should be rejected.
 Where an outlet is blended to achieve 41°C, a 2°C rise (maximum) is acceptable.
 Where the outlet is blended the word "BLENDED" is to be inserted in the notes column.
 "HOT WATER" hazard labels are to be applied to all non-blended hot outlets.

House Confirmation

I confirm I have been demonstrated and explained the operation of the work carried out;

LHM (or representative)

Engineer

Signature

Signature

Print

Print

Position

Date

Date



APPENDIX B

PRICING OFFER DOCUMENT



Form of Tender

Mitchells & Butlers plc

BRAND **IKL MANCHESTER**

SITE NAME **1-3 YORK STREET, MANCHESTER (ABOVE BROWNS)**

Having read the Conditions of Contract and Schedules of Work delivered to us, and having examined the drawings referred to therein, we hereby offer to execute and complete in accordance with the Conditions of Contract.

Whole of the works as described for the sum of £.....

(in words).....

Should obvious errors in pricing or errors in arithmetic be discovered before acceptance of this offer in the priced Schedule of Work submitted by us, we agree that these errors will be dealt with in accordance with Alternative 2 of Clause 6.4 of the 'Code of Procedure for Single Stage Selective Tendering, January 1996'.

Date this.....day of.....20.....

Name.....Position.....

Company.....

Address.....

.....

Signature.....

Note: This tender is fixed by the employer.

Mechanical Services Tender Breakdown

£ p

1. Preliminaries :	
a. Site Management & Set-up/H&S	
b. Access Equipment	
c. Lifting Equipment	
2. IKL Strip out :	
a. Existing LTHW Heating System.	
b. Existing H&CWS	
3. IKL Carter Hot & Cold Water Distribution :	
a. Hot Water Calorifiers	
b. Hot Water Distribution including circulation pump	
c. Cold Water Distribution	
d. Cold Water Leak Detection	
e. Cold Water Sub Meters	
f. Break tank & Booster set	
g. AFL Valves and Cartridges	
h. Pressure Testing	
i. Sterilisation & Chlorination	
j. Water Sample & Legionella Testing and Certificates	
4. IKL Ventilation :	
a. Bedroom Local Ventilation	
b. Central Ventilation	
c. Storage / Linen / Other Ventilation	
d. Basement Ventilation	
e. Kitchen Supply Ductwork	
f. Commissioning	
g. Fire Damper Drop Testing	
5. IKL Air Conditioning :	
a. Bedroom AC	
b. Refrigeration pipework and Insulation	
c. Condensate Pipework	
d. Controls - Wiring & Panel etc	
e. Condensing Units	
f. Bigfoot Support System	



g. Pressure Testing	
h. Commissioning by Manufacturer	
6. IKL Controls :	
a. Controls Timeswitches	
b. Controls Wiring	
7. IKL Heating	
a. Staircore Radiators & Overdoor Heater	
8. IKL Insulation :	
a. Insulation to Supply Ductwork	
b. Insulation to Extract Ductwork	
c. Insulation to Heating Pipework services	
d. Insulation to Hot and Cold Water Pipework services	
e. Trace Heating to External Pipework	
9. IKL Sanitary Ware	
10. IKL Above Ground Drainage	
11. IKL BREEAM Seasonal Visits	
12. IKL Service Visits	
13. IKL As Fitted Drawings / O&M's	
14. IKL Test Certificates	
15. Any Items not listed above	
a	
b	
TOTAL TENDER SUM (Fixed Price)	£
Carried to tender documents	_____
Signed on behalf of	
Company	
Name	
Signature	
Date	

**Dayworks Declaration****Overheads & Profits**

Percentage addition on nett cost of basic rate to cover establishment charges and profit.

Labour	 %
Materials	 %
Plant	 %
Sub-contractors	 %
Fares and Allowances	 %

Schedule of Labour Rates

Site Working Foreman	£...../hr
Ventilation Labour	£...../hr
Air Conditioning Labour	£...../hr
Plumbing Labour	£...../hr
Labourer	£...../hr

Signed on behalf of

Company

Name

Signature

Date



Details of Sub-let Work

The Contractor shall list below (and on separate sheets if necessary), details of any and every element of sub-let works included in this tender. Failure to disclose may render the tender void.

Element to be Sub-let	Name & Address
.....	
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.....	

Signed on behalf of

Company

Name

Signature

Date



Schedule of Deviation/Alternative Manufacturer Proposals

The Contractor shall provide a comprehensive list of Deviations and Alternatives to those specified in the Standard Specification and Scope of Works documents.

Alternatives may not be accepted after tender

Component	Manufacturer
.....	
.....	
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Signed on behalf of

Company
Name
Signature
Date